VESUVIUS PLC

Think beyond.
Shape the future.

Annual Report
2021

Strategic report

Contents

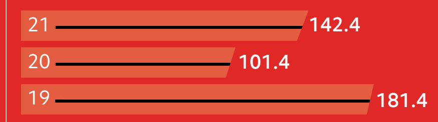
Financial performance

	2021	2020	Change: Reported basis	Change: Underlying basis[1]
Revenue	£1,642.9m	£1,458.3m	+12.7%	+18.1%
Trading profit[2]	£142.4m	£101.4m	+40.4%	+50.4%
Return on sales[2]	8.7%	7.0%	+170bps	+190bps

	2021	2020	Change
Profit before tax	£127.6m	£64.5m	+97.8%
Headline earnings per share[3]	35.3p	23.2p	+52.3%
Recommended final dividend	15.0p	14.3p	
Group full-year dividend	21.2p	17.4p	
Year-end net debt[2]	£277.1m	£175.1m	
Net debt to EBITDA ratio	1.4x	1.2x	

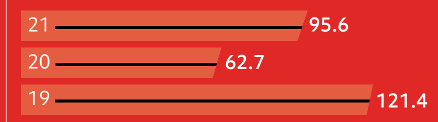
Revenue
£m
£1,642.9m

Trading profit[2]
£m
£142.4m

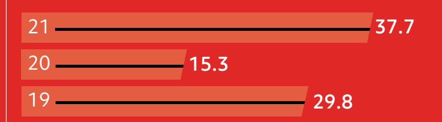


Operating profit
£m
£132.7m

Headline earnings[2,3]
£m
£95.6m



Statutory EPS
p
37.7p



Free cash flow[2]
£m
-£0.3m

1. Underlying basis is at constant currency and excludes separately reported items and the impact of acquisitions and disposals.
2. For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.
3. Headline results refer to continuing operations and exclude separately reported items.

Forward-looking statements

This Annual Report contains certain forward-looking statements with respect to the operations, strategy, performance, financial condition and growth opportunities of the Vesuvius Group. By their nature, these statements involve uncertainty and are based on assumptions and involve risks, uncertainties and other factors that could cause actual results and developments to differ materially from those anticipated.

The forward-looking statements reflect knowledge and information available at the date of preparation of this Annual Report and, other than in accordance with its legal and regulatory obligations, the Company undertakes no obligation to update these forward-looking statements. Nothing in this Annual Report should be construed as a profit forecast.

Think beyond.

Shape the future.

Our purpose

Vesuvius is a global leader in molten metal flow engineering and technology, serving process industries operating in challenging high temperature conditions.

We think beyond today to create the innovative solutions that will shape the future for everyone, delivering products and services that help our customers make their industrial processes safer, more efficient and more sustainable.

In turn, we provide our employees with a safe workplace where they are recognised, developed and properly rewarded, and aim to deliver sustainable, profitable growth to provide our shareholders with a superior return on their investment.

Our business

We think beyond today's products

and shape the future through innovation

At a glance

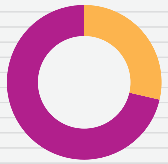
Our business

We are a global group with a business model based on offering customised products, solutions and services from production facilities in close proximity to our customers.

Our two divisions – Steel and Foundry – mainly serve the global steel and foundry industries.

Our global presence

	Group	Americas	EMEA	Asia-Pacific
Revenue	£1,642.9m £471.4m Foundry £1,171.5m Steel	£505.9m 19.9% Foundry 80.1% Steel	£644.8m 30.9% Foundry 69.1% Steel	£492.2m 34.9% Foundry 65.1% Steel
Continents	6			
Countries	40			
Employees	11,204	3,367	4,352	3,485
Sales offices	75	21	28	26
R&D centres	6	1	3	2
Production sites	54	18	19	17



This map shows our production, R&D and commercial sites worldwide

Divisional overviews

Steel Division

Operating review 44

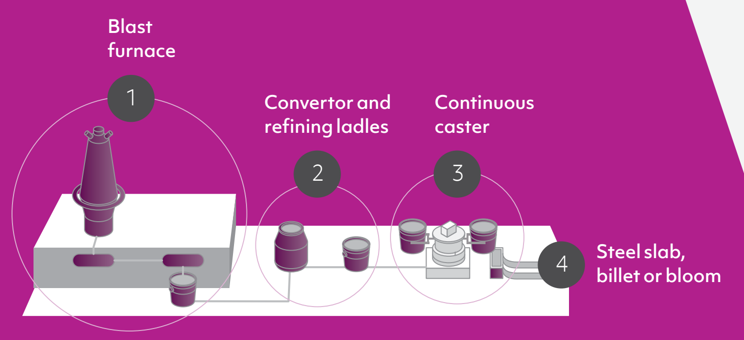
Revenue
£1,171.5m
2020: £1,045.4m

Return on sales
8.7%
2020: 7.3%

Trading profit
£102.0m
2020: £76.4m

Overview

Our customers are steel producers and other high-temperature industries. Vesuvius is a world leader in the supply of refractory products, systems and solutions. These help our customers increase their efficiency and productivity, enhance quality, improve safety and reduce their costs and their environmental impact.



Business unit

Steel Flow Control

Operating review 45

What we do

The Vesuvius Flow Control business unit supplies the global steel industry with consumable ceramic products, systems, robotics, digital services and technical services. These products are used to contain, control and monitor the flow of molten steel in the continuous casting process.

How the process works

The continuous casting process enables steel manufactured from a blast furnace or an electric arc furnace to be cast without interruption, whilst protecting it from the atmosphere. Avoiding atmospheric contact is crucial as it significantly reduces contamination and oxidation of the steel being produced.

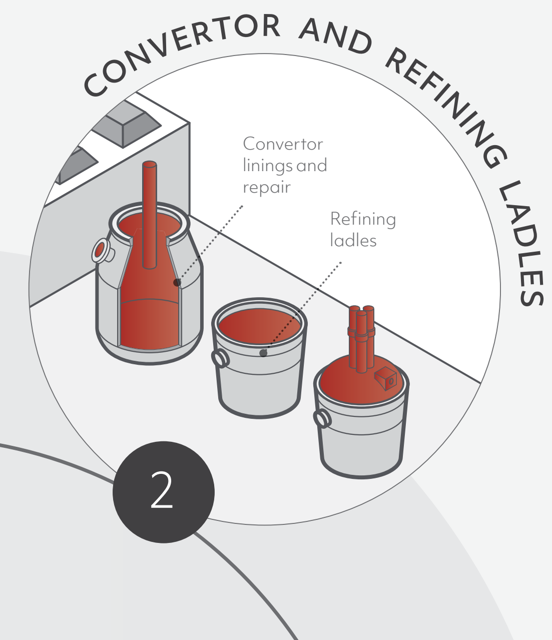
Our products

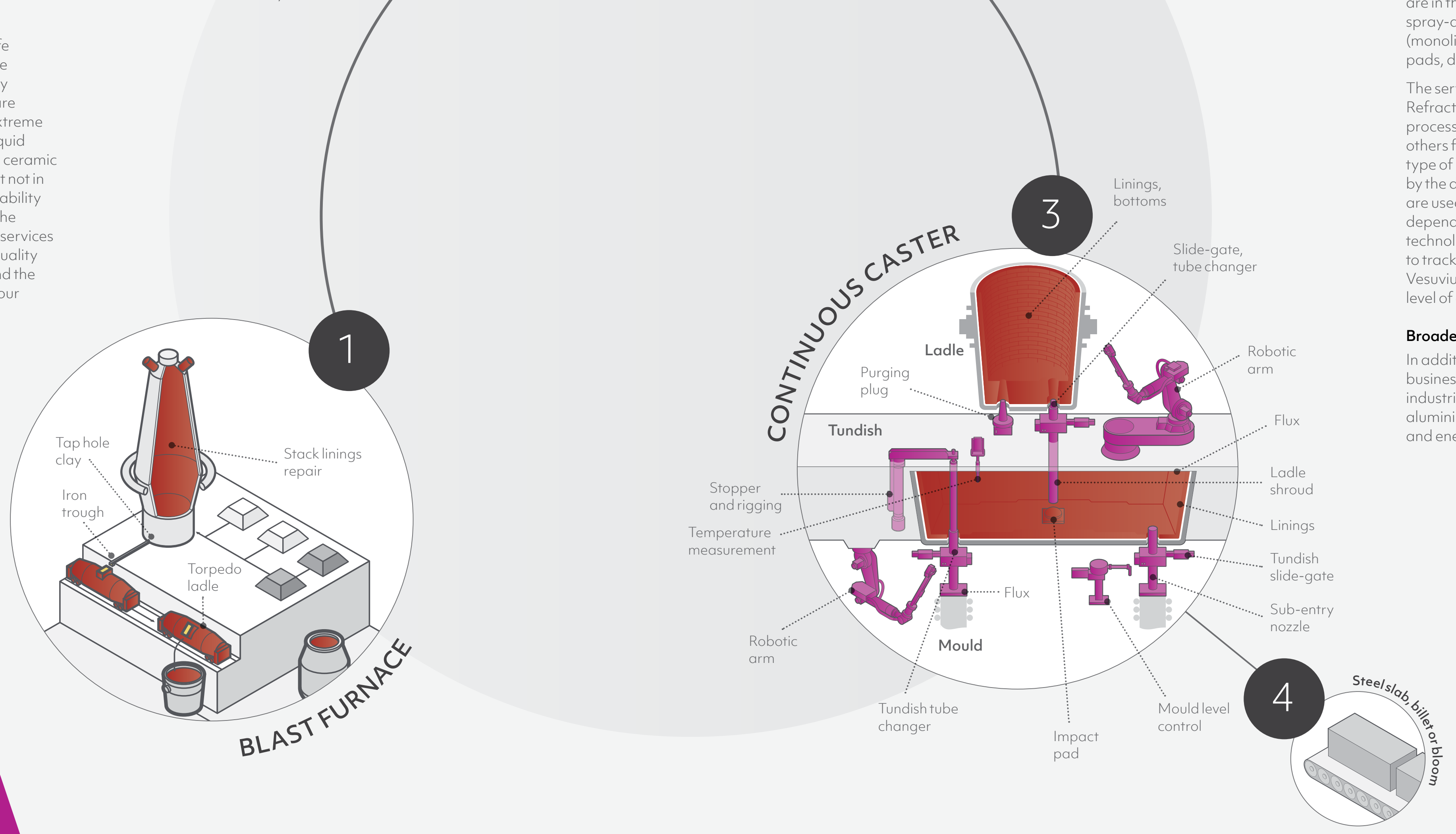
The consumable ceramic products that Vesuvius supplies have a short service life (often a matter of a few hours) due to the significant wear caused by the extremely demanding environment in which they are used. These products must withstand extreme temperature changes, whilst resisting liquid steel and slag corrosion. In addition, the ceramic parts in contact with the liquid steel must not in any way contaminate it. The quality, reliability and consistency of these products and the associated robotic solutions and digital services we provide are therefore critical to the quality of the finished metal being produced and the productivity, profitability and safety of our customers' processes.

Steel Sensors & Probes

Operating review 47

The Sensors & Probes business unit offers digital measurement solutions to our customers to enable them to make their underlying processes more efficient and reliable. The business unit focuses on providing a range of products that enhance the control and monitoring of our customers' production processes, complementing Vesuvius' strong presence and expertise in molten metal engineering. These products include temperature sensors, oxygen, hydrogen and sublance probes, and iron oxide and metal sampling for the steel, aluminium and foundry industries. By using these technologies, customers can focus on critical parameters within their processes, enabling them to refine their production methods to improve quality, lower production costs and maximise efficiency.





Steel Advanced Refractories

Operating review 46

What we do

Vesuvius' Advanced Refractories business unit supplies complete value-added solutions to its customers, including specialist refractory materials and advanced installation technologies, which harness mechatronic solutions, computational fluid dynamics capabilities and lasers.

Our customers and the process

Our main customers are steel producers and manufacturers of steel production equipment, where our products accompany the steel-making process from its early steps all the way to the end of production in the rolling mill. The specialist refractory materials are subject to extreme temperatures, corrosion and abrasion, and are in the form of powder mixes, which are spray-applied or cast onto the vessel to be lined (monolithics) and refractory shapes (e.g. bricks, pads, dams and other larger precast shapes).

The service life of the products that Advanced Refractories supplies into the steel-making process can vary (some a matter of hours and others for a period of years) based on the type of refractory and the level of wear caused by the demanding environment in which they are used. An integral part of our success depends on our best-in-class installation technologies which use robots and lasers to track the performance of installed Vesuvius refractories, as well as the high level of collaboration with our customers.

Broader offer

In addition, Vesuvius' Advanced Refractories business unit supplies other high-temperature industries such as primary and secondary aluminium, copper, cement, petrochemicals and energy from waste.

Divisional overviews

Foundry Division

Operating review 48

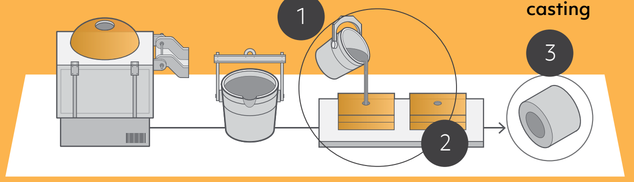
Revenue
£471.4m
2020: £412.9m

Return on sales
8.6%
2020: 6.1%

Trading profit
£40.4m
2020: £25.0m

Overview

We are a world leader in the supply of consumable products, technical advice and application support to the global foundry industry, improving casting quality and foundry efficiency. Our primary customers are ferrous and non-ferrous foundries serving various end-markets, from large bespoke castings to high-volume automotive pieces. We operate in the foundry sector under the Foseco brand.



Business unit

Foundry

What we do

The casting process is highly sequential and is critically dependent on consistency of product quality and productivity optimisation. Working alongside customers at their sites, our engineers provide on-site technical expertise in addition to advanced computational fluid dynamics capabilities to develop the best customised production solutions.

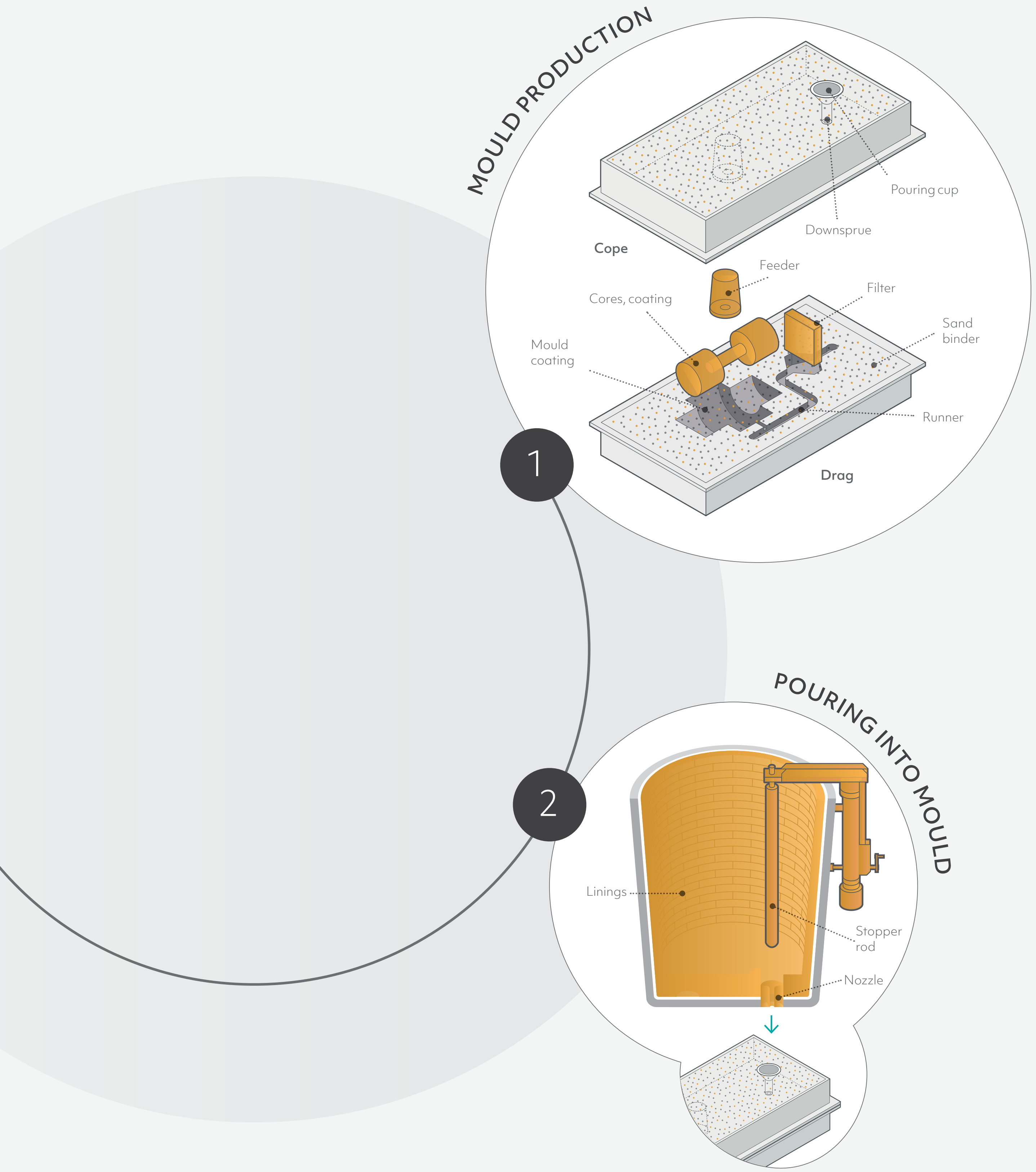
Our products

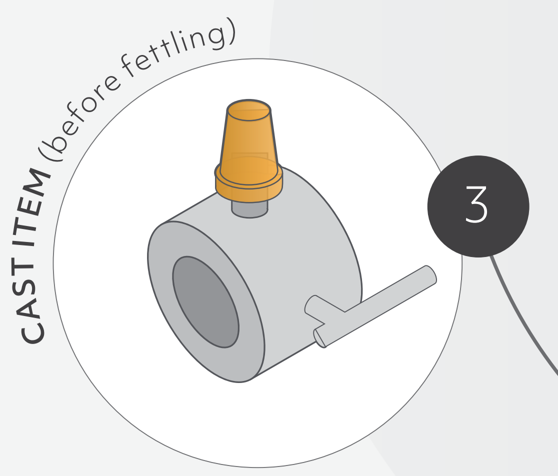
The conditioning of molten metal, the nature of the mould used and, especially, the design of the way in which metal flows into the mould are key parameters in a foundry, determining both the quality of the finished castings and the labour, energy and metal usage efficiency of the foundry. Vesuvius' products and associated services to foundries improve all of these parameters. Each of our products typically represents a small element of the overall cost of the foundry process but contributes significantly to product quality and yield, thus driving efficiency and reducing environmental impact.

In Foundry, customers are evolving towards more sophisticated and increasingly complex castings with increased requirements for cleaner and lighter metal, resulting in a greater need for Vesuvius' products.

Our customers

We are also focused on expanding the cross-selling opportunities between the Advanced Refractories business unit and Foundry Division. Foundries utilise the refractory products manufactured by Advanced Refractories, which allows us to offer a complete product offering to our customers.





Chairman's statement

Maintaining strong momentum during disrupted trading conditions

Revenue
£m

£1,642.9m

21	1,642.9
20	1,458.3
19	1,710.4

John McDonough CBE
Chairman

"On my visits to our sites I am consistently struck by the dedication and focus of our people and their commitment to building the business through excellent customer service"

2021 was another challenging year for Vesuvius. Despite a recovery across the majority of our end markets starting at the end of 2020, the COVID-19 pandemic continued to result in operational restrictions and promoted wide-spread global supply chain and freight disruption together with raw material and freight cost increases. Throughout this uncertain trading backdrop, our top priority remained the health and safety of our people and other stakeholders as they interacted with Vesuvius. Despite all of our efforts, we lost 11 people to the pandemic during 2021. We offer our sincerest condolences to all those who have lost family and friends.

Throughout 2021 the Board prioritised actions to respond to the continuing pandemic, particularly where they pertained to the well-being of our employees. I am incredibly proud of the great efforts that have been made across the globe to enable our employees to be vaccinated. In India, for example, we made available private vaccinations for all of our employees and their immediate families.

Our local site managers have continued to work tirelessly to implement measures to protect and support our employees whilst at the same time keeping our plants operational to serve our customers. On my visits to our sites I am consistently struck by the dedication and focus of our people and their commitment to building the business through excellent customer service.

We therefore start 2022 with renewed vigour to face the challenges that lie ahead. Whilst supply chain, freight issues and cost inflation may persist well into 2022, we know that our people have the determination and capability to overcome these challenges.

Strategy

We continued to progress our strategy successfully in 2021. Despite the difficult circumstances, the Board was happy to support further key investments in the Group. In December 2021, we acquired the business of Universal Refractories, which enhanced our presence and expertise in the US and positions us well for growth.

Alongside targeted M&A, we also invested in our existing operations, commencing a programme to increase capacity in VISO* products and slide-gate capacity in Europe and slide-gate capacity for South East Asia. These investments will strengthen Vesuvius' manufacturing base, which coupled with our ongoing R&D investment – delivering regular new product launches – reinforces Vesuvius' position for the future.

Sustainability

Sustainability remains at the core of our strategy and in 2021 we progressed our plans to achieve our objective of reaching a net zero carbon footprint at the latest by 2050. Our Sustainability Council, chaired by the Chief Executive, met on a quarterly basis to oversee the Group's sustainability activity, monitoring progress against our targets and assisting the Group with identifying and assessing the implications of long-term climate-related risks and opportunities. Our operational targets – driving emissions reduction; increasing manufacturing efficiency; reducing waste; and critically, enhancing the efficiency of our customers' operations – are clear areas of focus for 2022 and the future. The Board believes that the ongoing formalisation and increased breadth of our sustainability initiative is a fundamental building block in the future of Vesuvius – both as we examine our own operations and as we further understand how to contribute to better sustainability outcomes for our customers.

All of our activities are underpinned by our CORE values – Courage, Ownership, Respect and Energy. We have considerable pride in how our values and our commitment to pursuing them run through Vesuvius from top to bottom. These CORE values promote our determination to be a company that is at the forefront of active, rather than reactive sustainability. They are recognised annually – as they were again in December – when we hosted the global Vesuvius finals ceremony for our "Living The Values Awards".

Stakeholders

The Board values every opportunity to engage with our various stakeholders. The Non-executive Directors, both collectively and individually, have always sought to meet as many colleagues as possible; and in doing so, they have broadened and deepened their knowledge and understanding of the global business.

Again in 2021, the pandemic restricted the Board's ability to travel to as many locations as we would have liked. Where possible, the Non-executive Directors made physical site visits, including to the European shared services centre in Krakow, Poland, as well as visiting our operations in Skawina in Poland, Borken in Germany, Ghlin in Belgium, Suzhou in China, and Charlotte, Cleveland and Pittsburgh in the USA. In each case the questions and feedback we received from our employees gave valuable insights that the Non-executive Directors could take back into the Board's deliberations and discussions.

Where we have been unable to travel, we have continued with 'virtual' site visits conducting meetings with sites in China, India and NAFTA.

The Group again conducted an employee engagement survey in 2021 through our I-Engage programme, and it is a pleasure to see the participation rate remaining reassuringly high, above 90% in both of the past two years.

Corporate Governance

We were delighted to welcome Dinggui Gao as an independent Non-executive Director in April. He brings with him nearly 40 years of global operational experience and has already made a strong contribution to the Board.

Unfortunately, due to pandemic-related restrictions, Board meetings started the year being held virtually. However, it was a pleasure to welcome the majority of Board members back to in-person meetings in June. Despite the challenges of remote meetings the Board has learnt from this experience and incorporated some elements of it into regular Board meetings.

Dividend

Our dividend policy aims to deliver long-term dividend growth, provided this is supported by cash flow and underlying earnings, and is justified in the context of our capital expenditure requirements and the prevailing market outlook. The Board has recommended a final dividend of 15.0 pence per share (2020: 14.3 pence per share). If approved at the Annual General Meeting, this final dividend will be paid on 27 May 2022.

Annual General Meeting

The Annual General Meeting will be held on 18 May 2022. The Notice of Meeting and explanatory notes containing details of the resolutions to be put to the meeting accompany this Annual Report and are available on our website: www.vesuvius.com.

Reflections and farewell

Having served for nine years as the Chairman of Vesuvius, this will be my last Annual Report to shareholders. During the year we commenced a process to select my successor, more details of which are set out in the Corporate Governance Report. I am pleased to report that this process is progressing well.

For my own part, I am delighted by the progress Vesuvius has made during my tenure and the organisation it has become. I am particularly proud of the Board's detailed focus on global safety, especially during the pandemic. Safety sits at the core of the promise we make to our employees and everyone who visits Vesuvius sites. Much progress has been made, and there is more to come. The Board has also increased its focus on quality processes and operational performance, as well as maintaining strong and robust governance and risk management processes.

Vesuvius' global management structure has evolved to delegate authority to managers to act locally with resilience and agility. During the pandemic, this enabled us to respond rapidly and effectively to ensure that production was maintained and customers were supplied as required. This decentralised management structure, which draws deeply on the skills of our talented managers, remains the cornerstone of Vesuvius' flexibility and responsiveness.

Meanwhile, we have invested significantly in R&D, underpinning one of the cornerstones of Vesuvius' strategy, that of technology leadership. We have rejuvenated our manufacturing footprint to enable profitable and cash-backed growth, and developed our IT and systems capability to deliver improved customer management and systems security. In doing all of these things, we have strengthened Vesuvius for the present and the future.

Vesuvius has a strong, cohesive and diverse Board which embraces our Group values and culture of open debate. We continue to support and constructively challenge management to deliver the Group's strategy.

I have every confidence that your Directors will continue to lead Vesuvius from strength to strength and I wish them, and all of our colleagues across the globe, the very best in doing so in the years ahead.

John McDonough CBE
Chairman
3 March 2022

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Chief Executive's strategic review

Delivering resilient results, whilst protecting our employees and the security of supply to our customers

Trading profit
£m

£142.4m

21 142.4
20 101.4
19 181.4

Patrick André
Chief Executive

"Vesuvius ended 2021 in a strong position, our dedicated management teams have laid the foundations for future growth"

During 2021, we delivered resilient results and protected the health and safety of our employees and the security of supply to our customers, despite the persistent COVID-19 crisis and unprecedented supply chain disruptions.

Priority given to the protection of the health and safety of our employees. Best ever safety result

During 2021, our priority remained the protection of the health and safety of our employees. We remained focused on adapting the lay-out of our operations to ensure safe social distancing while enabling the ramp-up of our production to cope with the increased level of activity of our customers. We also continued to promote remote working whenever possible and supported vaccination of our employees and their families each time it was legally possible to do so. I was deeply saddened that despite these efforts, we lost 11 of our colleagues to COVID-19 in 2021. My thoughts remain with their families and friends.

Throughout 2021, we maintained our efforts to improve the safety performance of our operations. Our Lost Time Injury Frequency Rate (LTIFR) progressed further to 1.06 from 1.16 in 2020, our best result ever.

Despite this improvement, we remain unsatisfied and will intensify our efforts in 2022 to make further progress towards our objective of zero accidents.

See more in the **Our people** section on p82–96

Net debt to EBITDA

1.4x

21 1.4
20 1.2
19 1.1

Strong operational performance and resilient financial results despite very challenging supply chain disruptions

In 2021, our two main end markets of Steel and Foundry recovered significantly from the low point of 2020. In Steel, the recovery was particularly strong in the world excluding China, while in China, after a positive start to the year, steel production declined significantly in the second half. In Foundry, all sectors and all geographies exhibited positive growth, with the notable exception of the automotive sector, which remained at a low level of activity, equivalent to 2020, due to the persistent shortage of semi-conductors.

At the same time as our end markets were recovering, we were confronted with extraordinary supply chain disruption for raw materials and logistics services – both in respect of pricing and in respect of their physical availability, which impacted businesses around the globe.

Thanks to our decentralised, entrepreneurial, non-matrix business model, and the dedication of our management teams and personnel worldwide, we were able to react quickly to these challenges, increasing prices to compensate for raw material and logistics costs increases, while at the same time protecting the security of supply to our customers. We had to declare a temporary force majeure on two product lines during the second half of the year but were able in both cases to subsequently find solutions that avoided interrupting the production of our customers.

In this challenging environment, our Flow Control, Foundry and Sensors & Probes business units registered strong commercial performance, outperforming their underlying markets and gaining market share globally, while at the same time adjusting prices upwards to compensate for cost increases. Our Advanced Refractories business unit however, lost market share in 2021 as priority was given very early in the year to pricing over volumes to compensate for raw material and logistics cost increases. As a consequence of this overall strong commercial performance, our underlying revenue increased by 18% in 2021, to £1,642.9m. This increase was made up 75% by volume increments and 25% by price.

This strong growth in our revenue supported a significant increase in our trading profit and return on sales: our trading profit was £142.4m in 2021, compared with £101.4m in 2020 and our return on Sales reached 8.7%, +190bps vs 2020 on an underlying basis. Our trading profit and return on sales were, however, negatively impacted by the timing difference between the pace of our price increases and the pace of the raw material and logistics cost increases we incurred. This generated a headwind of £14m in trading profit for the full year, although this headwind was fully eliminated by year-end as cost inflation was successfully passed through to customers.

We continued to focus on cash generation in 2021 and further reduced our working capital intensity to 20.9% of sales, as compared with 23.2% in 2020 and 24.0% in 2019, despite investing in raw material inventory to mitigate some of the supply chain disruptions we experienced, and the necessary increase in working capital investment associated with a rebound in our end markets.

Thanks to this effort, we maintained our Net Debt to EBITDA ratio at 1.4x, a very limited increase as compared with 2020 (1.2x).

See **Financial review** section on p40–43
See **Our strategy** section on p14–15

Launch of an ambitious manufacturing expansion programme to support future organic growth in Flow Control

To support the strong growth and market share gains of our Flow Control business, we launched an important programme to increase our VISO* and slide-gate plate manufacturing capacity. These expansions will increase the VISO* and slide-gate capacity at our Skawina plant in Poland by 35% and 100% respectively, as well as increasing the VISO* capacity of our Kolkata plant in India by 50%.

These strategically important investments will support our ongoing expansion in the fast-growing markets of EEMEA, India and SE Asia.

Sustained R&D effort supporting strong New Product launches

Despite the pandemic, in 2020 we resolved to maintain our R&D investment. Thanks to this decision, we were able to launch 27 new products in 2021, more than double the number of new products launched in 2020. Consequently, our new product sales ratio (the share in our turnover contributed by products which didn't exist five years ago) reached 15.3% in 2021 (vs 12.4% in 2020).

In 2021, we continued to increase our investment in R&D, in particular expanding our mechatronics centre of excellence in Belgium, which now supports both our Flow Control and Advanced Refractories robotics technology business. We also decided to increase our R&D investment to focus further on sustainability, with the development of innovative products and solutions that will lead the market in helping our customers improve their sustainability performance by reducing their CO_2 emissions, and by improving the safety of their people.

Expansion in North America through the acquisition of the Universal Refractories business

We were pleased to announce the acquisition of the business of Universal Refractories, Inc. at the end of 2021. A specialty refractory producer based in Pennsylvania, Universal Refractories serves the Steel (tundish applications) and Foundry (consumables) industries. The acquisition delivers further expertise to our core business in both the Steel and Foundry markets in North America and in particular provides new opportunities in the growing sector of electric arc furnace steel producers. We are looking forward to the opportunity to integrate the Universal teams and know-how into the Vesuvius business and are expecting to derive significant synergies from this integration.

Significant progress in our sustainability journey

In 2020, we decided to launch a new comprehensive action plan to accelerate our sustainability efforts – bringing together all of our environmental, social and governance initiatives into a global co-ordinated programme with clear priorities, quantified targets, and milestones. In particular, we made a commitment to reach a net zero carbon footprint at the latest by 2050.

2021 was the first full year since the launch of this new Sustainability strategy and, on most parameters, we are running ahead of schedule. In particular, we have continued to make significant progress in the reduction of our carbon footprint with a 16.5% reduction in our carbon intensity as compared with our base year 2019 (versus 3.9% in 2020). We achieved this by improving the energy efficiency of our plants worldwide (9% improvement as compared with 2019) and shifting an increasing number of our operations to carbon-free electricity. We will make further progress in 2022.

We also continued to advance in our journey towards greater gender diversity. Females now represent 21% of our top management, a level that we consider is still too low, but which represents a significant improvement as compared with the level of 12.5% in 2019.

In parallel, we engaged in a comprehensive multi-year programme to assess the sustainability performance of our suppliers worldwide, with a particular focus on greenhouse gas emissions, anti-bribery and corruption, and child and forced labour. More than 40% of our raw material supplier base has already been assessed.

We are very proud to see these efforts and progress starting to be recognised: our MSCI rating progressed from BBB to A and our EcoVadis rating increased from Silver to Gold during the year.

Given our strategic focus in this area, we expect to make significant further progress in 2022.

Board Chairman

As you will have read in the Chairman's statement, John McDonough CBE will be stepping down from the Board later this year. John has served as Chairman of the Board since the Company demerged from Cookson Group plc in 2012. Since then he has successfully guided the Company and worked tirelessly in the service of the Group's stakeholders. He has been a source of invaluable advice and guidance and has been a tremendous support to me and the Board as a whole. On behalf of the Group, I offer him my sincere thanks for all that he has done for Vesuvius over the years.

Outlook

Both our end markets of Steel and Foundry remain positively oriented at the start of 2022. In 2021, Vesuvius demonstrated its ability to successfully pass-through cost inflation through price increases and will continue to do so in 2022, as necessary. Strategic R&D and capacity investments are proceeding as planned and will support market share gains going forward. While we remain concerned about the potential direct and indirect impacts of recent geopolitical events, which have led us to suspend our deliveries to Russian customers for the duration of hostilities, we are nevertheless confident that the Group will deliver a significant improvement in financial performance in 2022.

Patrick André
Chief Executive
3 March 2022

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Our strategy

Strategic objectives

We are dedicated to accelerating the achievement of our Strategic Objectives to deliver profitable growth. In particular, we will focus our efforts on the high-quality, high-technology segments of the steel and foundry markets, and increase the automation and efficiency of our manufacturing base. We will drive this change with a team of skilful, motivated and talented people.

- Deliver profitable growth
- Generate value for our shareholders
- Maintain an efficient capital structure
- Always put safety first
- Think beyond in innovation
- Run best-in-class sustainable operations
- Foster talent, skill and motivation in our people

We measure and monitor our performance against these Strategic Objectives through our Key Performance Indicators (KPIs).

See our **Key Performance Indicators** on p38 and 39

Execution priorities

Vesuvius has articulated a number of key execution priorities. These enable us to achieve our core Strategic Objectives of delivering profitable growth, generating value for our shareholders and in line with our sustainability initiative delivering a better tomorrow for our stakeholders.

Reinforce our technology leadership

Vesuvius was built and grew through technology breakthroughs. These enabled the steel continuous casting and foundry industries to improve significantly their efficiency and quality. We focus on delivering market-leading technology which continues to drive our unique value proposition and underpins our ability to deliver ongoing value enhancement to our customers.

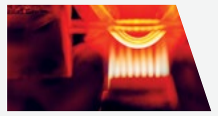
Develop our technical service offering and increase penetration of value-creating solutions

Our technology has been widely adopted by the most sophisticated producers in the most advanced markets. However, marked differences remain in the penetration of our solutions within the industry. Consequently, there is a wider audience of customers who we believe can benefit from our solutions. As steel and foundry markets in developing economies become more quality focused, we have the opportunity to significantly increase our penetration of these markets through the value delivered by our solutions.

Capture growth in developing markets

Building on our long-standing presence in all markets, we can leverage the high growth enjoyed by our customers' industries in emerging markets, which are large consumers of steel goods and foundry castings.

Improve cost leadership and margins



We continuously pursue initiatives to adapt our business and our cost base to the changing trading environment. This is central to our efforts to improve profitability. We have embedded the principles of lean manufacturing across all our sites, continuously focusing on quality and productivity.

Drive sustainability

See our **Sustainability** section on p50 to 101

In line with our updated Sustainability initiative, we are taking steps within the organisation to create a better future for our planet, our customers, our people and our communities. We develop products that seek to help our customers drive efficiency and reduce their environmental footprint, and we are focusing on our own operations to reduce our environmental impact. We focus on giving our employees opportunities for growth and development, and support wider and deeper engagement with our communities.

Progress in 2021

Reinforce our technology leadership

During 2021, we invested 1.8% of our revenue in R&D. We remain committed to spend c.2% of sales on innovation every year. We invest throughout the product cycle from front-end innovation to existing product development, focusing on the projects that deliver the highest impact to our customers.

In 2021, our Advanced Refractories business unit invested significantly in the development of a new mechatronic Centre of Excellence in Ghlin, Belgium. This is now fully operational and will be the global flagship for our Steel Division mechatronic capability.

We continue to work on products that combine developments in robotics, automation and data analytics capabilities with our well-established material science research and modelling ability. In addition, bringing together our diverse research capabilities continues to strengthen our technology leadership. We have also increased our focus on products that help our customers improve their own safety performance and environmental footprint.

Develop our technical service offering and increase penetration of value-creating solutions

In 2021, we dramatically stepped up our new product launch programme with 27 new products launched in 2021, vs 10 in 2020, including the following highlights by business unit:

Flow Control: launch of the Air-Shield* Technology, which creates a better seal between the two plates of our slide-gate mechanism to increase the yield and quality of steel produced.

Advanced Refractories: launch of the BASILITE* QuickStart composition which is an energy-efficient tundish lining developed to be used on a 'QuickStart' heating cycle. It eliminates the typical drying cycle, increasing productivity and reducing energy costs and CO$_2$ emissions.

Foundry: launch of the new FEEDEX* FEF sleeve range which eliminates fluoride emissions for high pressure greensand iron casting customers. This new range supports foundries in reducing harmful emissions and hazardous waste while delivering high thermal and feeding performance at the same time.

In 2021, Advanced Refractories installed 21 laser and mechatronics solutions at customer locations. More than 30 projects are under discussion for the future.

Capture growth in developing markets

The sales volume of the Steel Division in 2021 outperformed steel production in the world by 13.7%, with particularly strong performance in India, Japan, China, South America, Vietnam and EEMEA.

Our Foundry Division registered strong sales growth in emerging countries in 2021: with growth of 68% in South America; 36% in India; 35% in Vietnam; and 52% in Turkey. In China, although our customers faced decreasing activity through 2021, we were able to grow by 12%, outperforming the market.

Improve cost leadership and margins

We have continued to deliver on our restructuring savings programme with a further £4.1m of recurring savings delivered in 2021.

Our rigorous working capital management has also paid dividends as we achieved a 20.9% ratio of trade working capital to sales, showing an improvement of 230 bps vs 2020 despite the build up of inventory required to enable us to serve our customers under current market conditions.

Throughout 2021, our teams continued to pursue opportunities to implement lean practices and automate processes in our plants to increase productivity and quality.

We also focused on price management in 2021 to respond to the increase of our input costs and adapt the price of our products accordingly. This remains a strong focus in 2022.

Drive sustainability

In 2021, despite the challenging environment created by the COVID-19 pandemic, we made good progress on our nine sustainability targets. This exemplifies the commitment of Vesuvius' people to work for a better tomorrow, for the benefit of all stakeholders.

In 2021, we spent time analysing the risks and opportunities created for the Group by climate change, focusing on three long-term scenarios. Work then took place to ensure that these were accurately reflected in the Group's strategic planning. In 2021, we also launched a sustainability assessment programme for our suppliers and developed a methodology to assess the sustainability performance of our products.

Our efforts have been recognised with our MSCI rating improving from BBB to A, and our EcoVadis rating moving from Silver to Gold. Vesuvius was also honoured to be included in the *Financial Times*' European Climate Leaders list.

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Our external environment

Solutions for the changing demands of business

Climate change and the Vesuvius proposition

Almost two thirds of Vesuvius' revenue comes from providing goods and services to the steel industry. One third of Vesuvius' revenue is generated from the provision of products and solutions to the foundry industry. The remainder comes from products sold to high temperature industries such as aluminium, cement and energy from waste.

Steel

Steel production is a highly energy-intensive process. The World Steel Association has estimated that the steel industry generates between 7% and 9% of global direct emissions from the use of fossil fuel. However, steel continues to play an integral part in the modern world. Steel is a necessary material for the sectors and technologies that will drive a more sustainable economy. It is also infinitely recyclable and the by-products created during steel making, along with the waste energies, are valuable resources.

Vesuvius' consumables enable our customers to increase manufacturing throughput whilst lowering energy consumption. For several decades, Vesuvius' products have been assisting the steel industry in reducing greenhouse gas emissions by increasing yields and end-product consistency, therefore improving the energy efficiency of production.

Foundry

Foundries consume large amounts of energy in heating metals, generating significant amounts of CO_2. They are experiencing a drastic change in their end-markets as parts of the world shift towards hybrid and electric vehicles, accelerating a transition away from traditional ferrous casting, as well as a significant movement towards green electricity generation.

Vesuvius' products help our Foundry customers to maximise their energy efficiency and increase the ratio of metal melted to finished end castings. We systematically monitor the positive CO_2 impact of our products.

The future

The pressure on the Steel and Foundry industries to reduce greenhouse gas emissions, particularly CO_2, is increasing significantly as governments are enforcing stricter regulations, especially in the EU, the US and, recently, China.

Our customers will continue to focus on reducing absolute energy consumption and CO_2 emissions (through the elimination of higher emission processes) and reducing normalised energy consumption and CO_2 emissions via increased efficiency.

Our customers are following several different routes to deliver this reduction and to comply with stricter regulations. The rise of scrap availability and of its recycling is supporting a shift to electric arc furnaces away from blast furnaces, to produce steel – in particular, in the US and the EU. We also expect this trend to gain momentum in China as the country implements its strategy towards net zero. Alongside this, the use of hydrogen in steel production, particularly in the EU27+UK, to manufacture 'Green Steel' is gaining traction and more and more steel producers are exploring hydrogen-based steel-making technologies.

In addition, failure to introduce a Carbon Border Mechanism Adjustment in more regulated regions like the EU is likely to accelerate the delocalisation of steel production from these areas.

In Foundry, as the move to hybrid/electric vehicles and low-carbon forms of transport accelerates, the foundry industry will shift away from manufacturing internal combustion engines. We expect aluminium and steel foundries to grow at a higher rate than iron foundries to support the manufacture of lighter-weight components for vehicles. Governmental funding and regulations are supporting these trends.

In construction, we also see a continued trend of using lighter-weight steel and glass to replace concrete.

How Vesuvius will respond

We work closely with our customers to develop new products and technologies to meet these challenges with sustainability being a critical focus in new product development.

Our Steel Division is participating in hydrogen R&D projects to develop solutions for the future of steel making. Additionally, we continue to develop new products with superior sustainability characteristics.

Our Foundry Division teams are developing new filtration, feeding, mould coating and molten metal treatment products to support the availability of higher-performance metal and the manufacture of lighter-weight components for the automotive industry. They are also developing new products for aluminium foundries to support the fast-growing market in electric vehicles.

Technical upgrade of steel and foundry

What's happening

Our view on the long-term growth for the global steel and foundry markets remains positive. The importance of technology to differentiate steel and foundry producers continues to grow, supported by the development of more demanding product applications.

Whilst lower-quality construction steels are currently benefiting from solid growth, this stems from government investment in infrastructure programmes to shield their economies from the ongoing impact of the COVID-19 pandemic. We believe this is only a temporary phenomenon.

Steel producers are increasingly focused on supplying higher-quality steel grades for automotive and power generation, where the consistency of the finished steel is fundamental. This is driving an above-market growth forecast for high-technology steel in all regions.

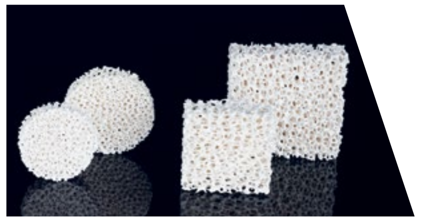
In foundries, there continues to be a trend towards higher metal and process quality, as they focus on a greater number of applications that require castings to combine high strength with thinner, lighter profiles and greater complexity.

How we are responding

Vesuvius is strongly positioned to facilitate these upgrades and to benefit from these trends. We have a wide product and service offering designed to support the production of high-technology steel and complex casted components across our broad, global manufacturing base.

We continue to invest heavily in R&D with dedicated centres of excellence to think beyond what exists today.

Vesuvius' innovative portfolio of products and services, together with its global footprint, enable us to provide high-technology solutions to our worldwide customers.



Improving quality with our new products

In Flow Control, we have enhanced our Composite Design Technology (CDT) with a new solution, the Surface Layer CDT, that allows us to design a broader range of shapes and sizes for our slide-gate plates and use a greater proportion of recycled materials, while maintaining a high level of performance. By combining this technology and our innovation on the composition of the plates, we can offer high performing and sustainable products with greater flexibility in design.

Our Foundry Division launched a new filter range this year, the STELEX* pureflow filter, for small castings in steel and other high temperature alloys. This filter range minimises inclusions to improve the purity of the metal, reduces dependency on zirconia (which is often difficult to source) and optimises filtration capabilities.

Automation – safety and efficiency

What's happening

Companies face ever-increasing regulation and scrutiny to ensure safety and reduce emissions from their operations and products.

Advancements in automation can help transform production, bringing greater consistency whilst lowering cost and delivering significantly improved safety performance in a plant. Thus robotics can support or even substitute operators in hazardous production areas.

Market volatility is increasing and labour shortage is a growing challenge, creating uncertainty and requiring even more flexibility in production. Automation can create more flexible operations to enable a more rapid response to changing market conditions.

How we are responding

Vesuvius has the global and in-depth capability to combine know-how in steel mills and foundries with robotic capabilities to deliver superior safety performance in hazardous areas of production.

We provide laser technology to assess refractory wear, allowing targeted repair with our broad range of refractory consumables and application solutions – for efficient and safe operation.

We have invested significant resources in the development of our mechatronics capabilities to shape the future operations of steel and foundry plants with our current robotics offering (e.g. Tundish, Continuous Casting) as well as with new automation capabilities in other areas. We are also exploring new ways to integrate continuous data capture into our solutions to give our customers further insights into the use of consumables in their production processes.

Leaving the most hazardous work to robots

In 2021, our Advanced Refractories business unit commissioned several tundish spray robots at customer sites allowing them to automate the re-lining process of their tundishes, thus increasing the safety and reliability of their operations, and reducing the downtime of their equipment.

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Our markets

Steel Division

Business units

Flow Control

Steel production volume is the primary driver of demand for Flow Control's products, whilst the trend for 'high-technology steel' allows us to leverage our advanced solutions and achieve above-market growth rates.

Sensors & Probes

Steel production volume and the need to increase the quality and consistency of cast steel drives demand for our Sensors & Probes business.

Advanced Refractories

Steel production volume and certain other high-temperature industries, such as aluminium, copper, cement, petrochemical and energy from waste, are the drivers for the Advanced Refractories business unit's product demand.

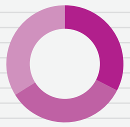
'High-technology steel'

'High-technology steel' is our internal segmentation that describes steel which is either high performing, e.g. advanced high-strength steel for automotive applications, or for which the production process to produce the steel is complex, e.g. the near net shape production process, which is a continuous casting process that produces steel in very thin slabs near to its final required thickness.

These processes and steel grades, where the consistency of the finished steel is paramount, are gaining momentum worldwide because they provide steel producers with either differentiated products or significant benefits in terms of cost savings and a reduced environmental footprint.

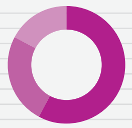
Vesuvius' internal segmentation of global crude steel production

Steel type:
33% High-technology
33% Medium-technology
34% Commodity



Flow Control business unit end markets

Steel type:
58% High-technology
25% Medium-technology
17% Commodity



Steel usage

High-technology
- Near net shape production process
- Stainless steel
- Engineering steel: bearing, shafts, tools, etc.
- Automotive steel

Medium-technology
- Construction sheets: roofing, cladding, etc.
- Heavy plates for ship building, pipe

Commodity
- Basic rebar for concrete reinforcement

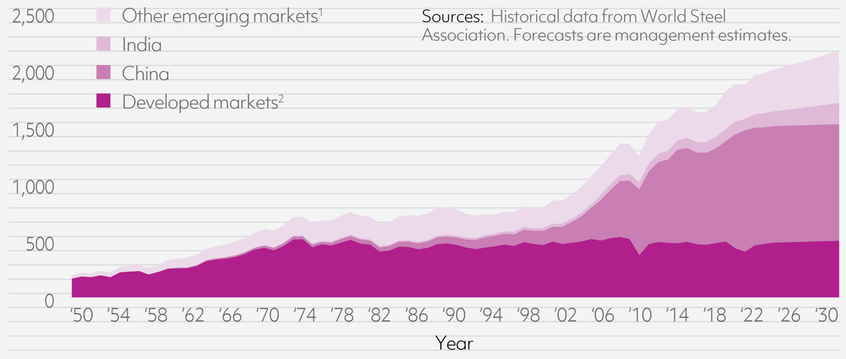
Crude steel production is a structurally growing market

The COVID-19 crisis has disrupted global demand and supply chains around the world. However, from the end of 2020, we have observed a strong rebound in steel demand and thus in production, as our customers were restarting and increasing capacity to meet their own customers' demand. Despite steel producers facing issues ramping up production to meet full demand, crude steel production in the world, excluding China, increased by 12.5% in 2021 compared to the prior year, while China's crude steel production in 2021 decreased by 3%, reversing a growth trend that has been running for several years.

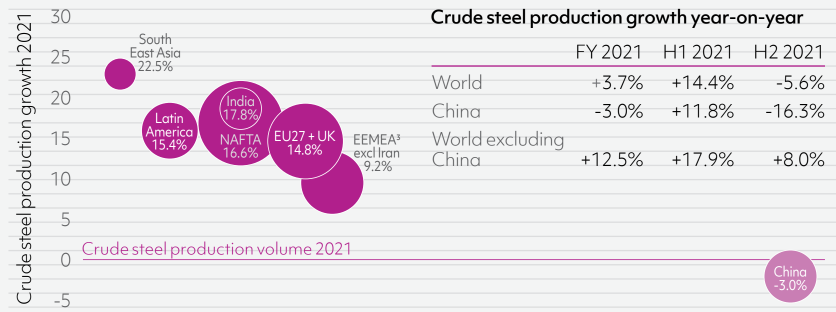
In 2021, we saw the driving forces behind steel production changing, primarily influenced by decarbonisation targets in the US, EU and China. China is now targeting net zero by 2060 and limiting crude steel outputs and exports. We believe this action will benefit other regions. 2021 saw a strong rebound in US and EU27+UK, production at 18.3% vs 2020 and 14.8% vs 2020, respectively. However, we believe the long-term growth will mostly come from emerging regions, in particular from India and South-East Asia, EEMEA and Latin America.

Longer term, we expect global crude steel production to grow at a rate of 1.3% per annum and excluding China, at a rate of 2.5%.

World crude steel production (mt)



Changing driving forces in global crude steel production



Crude steel production growth year-on-year

	FY 2021	H1 2021	H2 2021
World	+3.7%	+14.4%	-5.6%
China	-3.0%	+11.8%	-16.3%
World excluding China	+12.5%	+17.9%	+8.0%

Notes to the above charts:
1. Eastern Europe, Middle East (incl. Turkey), Africa, Latin America and South East Asia.
2. EU27, UK, USA, Canada and North Asia.
3. Eastern Europe, Middle East (incl. Turkey) and Africa.

Foundry Division

Higher sophistication, demanding higher-quality metal and increasingly complex castings is the long-term driver for product demand for the Foundry Division.

Foundry industry end-markets

The most important end-markets for the foundry industry are general engineering, light vehicles, including passenger cars and light commercial vehicles, medium and heavy commercial vehicles, construction, agriculture and mining equipment, power-generation equipment, and railroad.

Whilst the COVID-19 pandemic caused a sharp decline in Foundry end-markets in 2020, end-markets rebounded in 2021 with particular improvements in general engineering (12.7%) and mining and construction equipment (19.2%). However, the automotive market continued to suffer from the severe semi-conductor supply shortages in 2021, which significantly impacted light vehicle production, especially during the second half of the year, leading to only a slight increase in production volume of 2.5% in 2021.

Above-average market growth for highly sophisticated and complex castings

The Foundry Division benefits from its capabilities to improve highly sophisticated and complex castings, which are the segments of the foundry market growing the fastest. Foundry customers are evolving towards these types of casting because of increased requirements for cleaner metal to cast complex shapes with thinner sections.

Whilst Foundry Division products typically represent less than 5% of a foundry's production costs, they contribute significantly to the improvement of product quality and manufacturing efficiency, whilst reducing the environmental impact of the casting process and improving the ratio of finished castings to the amount of metal poured. The latter is a key parameter for foundry efficiency.

Technology changes and environmental drivers

New technologies, such as 3D printing, are expected to continue to influence the metal casting industry, allowing for faster prototyping and production of smaller volume parts. Environmental regulations, driven by the desire to reduce volatile organic compound emissions and the use of silica within the industry, are also expected to continue to tighten.

This will drive the trend to find processes and consumable products which support production efficiency and reduce a foundry's impact on the environment.

Iron casting

Iron casting is split between grey and ductile iron, with grey iron representing most of the metal being cast. This is a cost-efficient and robust process producing components that do not need to tolerate extreme mechanical stress. All iron castings require filters and coatings, but grey iron is not as reliant on feeding system utilisation due to its lower shrinkage on solidification. Conversely, ductile iron production requires more sophisticated consumable feeding products to cope with the high shrinkages of metal whilst solidifying.

Steel casting

Steel is used to cast components requiring very high mechanical performance. Steel casting is the most demanding casting process due to higher melting temperatures and greater tendency for shrinkage. This drives greater demand for consumables and technical expertise in this segment.

Aluminium/Non-ferrous casting

Aluminium casting is the segment of the foundry market growing the fastest, capturing a significant share of the light vehicle market. Being molten below 700°C, aluminium can be cast in iron moulds which can then be reused. The casting process growing the fastest is High Pressure Die Casting (HPDC), supported by the growth of electric vehicle production. Vesuvius develops and supplies fluxes, filters and machines that refine the composition and cleanliness of the metal.

Business model

A profitable, flexible, cash-generative model focused on sustainable growth

Strategic alignment

- Deliver profitable growth
- Generate value for our shareholders
- Maintain an efficient capital structure
- Always put safety first
- Think beyond in innovation
- Run best-in-class sustainable operations
- Foster talent, skill and motivation in our people

What we do

We develop and manufacture high-technology products and solutions predominantly for supply to the steel and foundry casting industries, operating a profitable, flexible, cash-generative and growth-building business model. Over many years, we have built the brand equity of our Vesuvius and Foseco products through technology leadership, reliability and service.

The sustainability of our model

The items we have now formalised in our Sustainability initiative have long been at the heart of Vesuvius' value proposition. We act as a responsible corporate citizen, developing products that help our customers to improve their efficiency and reduce their environmental impact.

Our key resources

Financial capital

We use the cash generated by our business to invest in innovation, people, operating assets, technology and sales to generate further growth.

Manufacturing capital

We have a global footprint, with 54 production sites on six continents, giving us proximity to our customers.

Intellectual capital

We have six R&D centres of excellence, together with dedicated R&D staff worldwide, generating innovative products and services that help our customers make their industrial processes safer, more efficient and more sustainable.

Human capital

We invest in developing our skilled and motivated workforce of more than 11,000 people and provide them with a safe environment in which to work.

Social capital

We champion our Values and our ethical conduct. We maintain strong relationships with customers and our wider stakeholder groups.

Natural capital

We utilise high-quality raw materials, secured through reliable and well-developed and sustainable supply chains.

R&D centres of excellence	Employees	Production sites
6	11,204	54

How we deliver

- Our industry experts are embedded at many customer locations and are therefore ideally placed to collaborate with customers to identify their needs, and potential service and process improvements. This also enables us to grow our solutions and service portfolio.
- We develop high-technology products that deliver quality enhancement, efficiency gains and energy savings to our customers. We focus on environmental sustainability in our own business through the efficient use of energy and natural resources.
- Our model is profitable by allowing value pricing for bespoke products and services. It generates growth as we enlarge our market with additional innovative products and solutions.
- Our model is resilient to end-market volatility due to the flexibility of our diversified manufacturing footprint and adjustable cost base, increasingly supported by automation.
- Our commitment to ethical business delivers strong, long-term, sustainable commercial relationships.

The value we create

Our investors

Strategic alignment

Our cash generative and low capital intensity business provides returns to our shareholders and underpins sustainable growth.

Our customers

Strategic alignment

Our investment in innovation creates cutting-edge products and solutions, delivering enhanced value for our customers and differentiating us from our competitors. Our technology solutions improve customer safety and remove operators from the most dangerous parts of our customers' processes. We embed technical experts within our customers, giving us a fundamental understanding of their needs and delivering them access to our global network of highly skilled individuals.

Our suppliers

Strategic alignment

Maintaining cost-effective access to high-quality raw materials is vital to our success. Our suppliers are critical to our business.

Our people

Strategic alignment

We focus on the health and safety of all our staff. We engage with our people, encouraging and rewarding high performance to create an environment where all can realise their individual potential.

Our communities

Strategic alignment

We are committed to maintaining positive relationships with the communities in which we operate. Our social responsibility activities complement our Values and we encourage our employees to engage with communities and groups local to our operations.

Students and graduates

Strategic alignment

Attracting new talent to Vesuvius is vital for the Group's continuing success. Recruiting new students and graduates feeds the talent pipeline and allows us to tap into new sources of up-to-date business ideas and R&D capability.

Our sustainable competitive advantages

Global presence

Using our global expertise to identify and create market opportunities

Vesuvius is present on six continents, supporting the development of global steel and foundry manufacturing processes with new technologies. We have manufacturing capability in all the main steel and foundry markets and hire and train local engineers. Our local manufacturing, local expertise and global knowledge of customers' processes give us a special relationship with our customers.

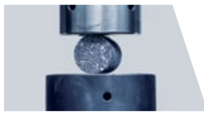
See more about **Our global presence** on p4 and 5

Optimised manufacturing

Low-cost lean manufacturing provides reliable 'just-in-time' products

Our successfully tested products can be produced at high volumes across all of our manufacturing footprint, guaranteeing cost-competitive and time-efficient delivery. We optimise our cost-competitiveness by investing in low-cost production sites and increasing production automation – and have established manufacturing facilities to support our expansion in emerging markets.

See more about **Our operations** on p44–49



Advanced technology

Our technology centres develop value-adding solutions involving engineered systems and high-value consumables

Our continuing investment in Vesuvius' R&D centres of excellence is reflected in all areas of our offering. We have knowledge of the most advanced ceramic and metallurgical techniques using state-of-the-art equipment and the most advanced technologies of flow simulation and finite element analysis. We are therefore able to provide our customers with sophisticated, innovative, custom-designed solutions.

Read more about our **Value-added solutions** on p14 and 15

Service and consistency

Serving our customers reliably, competitively and consistently with consumables critical for their manufacturing processes

Alongside our global presence, we ensure a local service to our customers, from inventory management to high-quality technical support at their sites and the ability to swiftly modify production and supply to reflect changes in customer requirements. Our knowledge of end-market processes, specifications and techniques around the world gives our experts an unparalleled ability to support our customers.

Read more about **Our operations** on p44–49

Section 172(1) Statement

Effective engagement with stakeholders promotes the long-term sustainability of the Group

Under Section 172 of the Companies Act 2006, the Directors have a duty to promote the success of the Company over the long term for the benefit of shareholders as a whole, having regard to a range of other key stakeholders and interests.

The Directors must have regard (among other matters) to the:

- Likely consequences of any decision in the long term
- Impact of the Company's operations on the community and the environment
- Interests of the Company's employees
- Desirability of the Company maintaining a reputation for high standards of business conduct
- Need to foster the Company's business relationships with suppliers, customers and others
- Need to act fairly as between members of the Company

Vesuvius employee photography competition
Saugata Datta – see inside back cover

The Board is responsible for the overall direction of the Group. It focuses primarily upon strategic and policy issues and is responsible for the Group's long-term success. It sets the Group's strategy, oversees the allocation of resources and monitors the performance of the Group, to ensure that the Group is structured appropriately for the challenges and opportunities of the future.

In performing these duties, the Board is focused on the sustainable success of the Group in the long term, and the existence of a culture that supports this success.

The Board recognises the need for the Group to have effective engagement with, and encourage participation from, all key stakeholders to promote these long-term interests. The Group's key stakeholder groups, reflecting those who have the biggest impact on the business and modes of engagement, are outlined in the table on pages 26 and 27. The Board has regard to the activities undertaken throughout the Group in considering its own Section 172 responsibilities.

Likely consequences of any decision in the long term

Throughout the year, the Board considered the long-term consequences of the decisions it made, focusing on the interests of relevant stakeholders as appropriate.

Examples of how these activities impacted some of the key decisions taken by the Board during 2021 are given below.

Acquisition of the assets and business of Universal Refractories, Inc.

Stakeholder alignment

- Shareholders
- Employees
- Customers
- Suppliers

Strategic alignment

The Board approved the acquisition of the assets and business of Universal Refractories, Inc. in December 2021. This is a strategically important acquisition for Vesuvius, supporting our commitment to shareholders to develop our technical service offering.

It significantly expands our North American presence among electric arc furnace steel producers, delivering further expertise to our core business in steel tundish applications, while also further strengthening our Foundry business. This allows us to enhance our customer offering and will provide further opportunities for our suppliers. We are delighted to welcome 140 of Universal's employees to the Group.

Ongoing operational response to the COVID-19 pandemic

Stakeholder alignment

- Employees
- Shareholders
- Customers
- Suppliers

Strategic alignment

Recognition of the impact of COVID-19 continued to play an important part in the Board's decision-making throughout 2021. With the primary focus remaining on protecting the health and safety of employees, the Board monitored the level of COVID-19 throughout the Group and the steps that were being taken in each country to enable employees to be vaccinated.

The Board also monitored the impact of the pandemic on global supply chains, in particular on the Group's ability to source and ship raw materials to fulfil customers' orders on a timely basis, and the increasing costs that resulted. The Board oversaw the Group's response to these challenges, and scrutinised the actions being taken to promote continuity of supply and ensure that the Group's financial position was protected by the pass-through of additional costs.

Capital investment in VISO and slide-gate capacity

Stakeholder alignment

- Shareholders
- Employees
- Customers
- Suppliers
- Communities

Strategic alignment

The Board approved the investment in additional slide-gate capacity in Europe, and VISO and slide-gate capacity for South East Asia. The Board considered the current Group capacity and the need for expansion to ensure that the Group was able to continue to fulfil customers' orders on a timely basis.

The Board noted that the new equipment would produce products more efficiently, thus supporting the Group's sustainability objectives. Consideration was given to the appropriate geographical location for the extra capacity as well as the environmental consequences of increased production. The Board noted the actions taken to make adjustments to project planning and the additional improvements to legacy production processes at the nominated sites. The additional capacity will also create additional jobs in Poland and India.

Strategic alignment

- Deliver profitable growth
- Generate value for our shareholders
- Maintain an efficient capital structure
- Always put safety first
- Think beyond in innovation
- Run best-in-class sustainable operations
- Foster talent, skill and motivation in our people

See more about **Our strategy** on **p14** and **15**

Section 172(1) Statement continued

Interests of the Company's employees

The Board takes the health and safety of our employees as its primary responsibility. Throughout 2021, it continued to monitor the impact of the COVID-19 pandemic on employees, focusing particularly on the roll-out of vaccinations around the world and any steps that Vesuvius' businesses could take to facilitate the availability of vaccinations for their staff.

At each Board meeting, the Board received a report on the Group's performance against Health and Safety KPIs and reviewed, in detail, the circumstances of any Lost Time Injuries that had been recorded since its last meeting.

As part of the regular schedule of business unit presentations, the Board reviewed progress against the specific HR objectives for each business unit and monitored the initiatives that are being implemented to enhance the career and personal development of employees, and talent development as a whole within the Group.

In October, the Company undertook its third global employee engagement exercise. The Board oversaw this process, which commenced with an engagement survey, aimed at canvassing the opinions of all of our >11,000 employees worldwide. The Board received feedback on the results, including comparator data versus the norm for other global manufacturing companies and considered what this indicated about the culture of the Group. It reviewed management's response to the outcome of the survey and the follow-up actions that would be undertaken throughout the Group. Further information about the survey can be found on pages 91 and 92.

Further information about the work of the Board's Committees in considering and supporting the interests of the Company's employees can be found in the Nomination and Remuneration Committee Reports on pages 125–153.

Need to foster the Company's business relationships with suppliers, customers and others

During 2021, the Board received regular updates from the Chief Executive on the actions being taken throughout the Group to ensure continuity of supply for the Group's customers despite the supply chain disruptions caused by the COVID-19 pandemic and the increased cost of raw materials and freight. The Board received regular updates on the impact of the pandemic on the Group's suppliers, and the availability and pricing of raw materials. The Board discussed the need to pass these increased costs through to customers to protect the Group's business and the Chief Executive was tasked with ensuring this was being appropriately actioned throughout the Group. The Board was then kept apprised of progress in the price negotiations being undertaken with customers.

The Board received presentations from the business unit Presidents, Head of Strategy and President Operations and Technology on end-markets, the Group's relationships with customers and key matters of concern to them. It discussed the steps being taken by the Group to respond to customers' ongoing requirements, and the research and development, marketing and new product launch strategies being actioned to respond to these. The Board regularly reviewed information on the Group's performance against key manufacturing quality targets and was updated at Board meetings on actions undertaken to rectify any significant quality issues or customer complaints. The Board considered market trends at each meeting and undertook a thorough review of macro trends and their likely long-term implications at the Board's annual strategy meeting.

Alongside the regular customer contact maintained by the Chief Executive the full Board visited a steel customer in Belgium in September. This provided the Directors with the opportunity to speak directly to one of our customers about their business and to hear from them first-hand about their immediate challenges and longer-term expectations.

In addition to understanding business unit-specific procurement and pricing issues during the year, the Board also received an update from the Group's Chief Purchasing Officer and discussed the Group's procurement organisation structure, raw material supply, relationships with its suppliers and its purchasing practices.

Impact of the Company's operations on the community and the environment

The Group's Sustainability initiative ensures that sustainability is consistently at the centre of the Group's strategy. A key tenet of Vesuvius' business has always been to support our customers' efforts to reduce their own environmental footprint and improve safety on the shop floor (especially exposure to hot metal). The Sustainability initiative provides further detail about the Group's efforts in this regard and the actions Vesuvius has committed to take to reduce its own environmental footprint and create a better tomorrow for our people and stakeholders.

The Board received bi-annual presentations from the VP Sustainability on the work of the Sustainability Council and the Group's progress against its sustainability targets. It also received specialist advice on the ongoing governance and regulatory changes to ESG disclosure requirements. The Board and Audit Committee monitored the Group's progress with TCFD compliance, reviewing the results of the Sustainability Council's detailed scenario and risks and opportunities analysis. Further details of the Board's oversight of the Group's sustainability activities can be found in the Sustainability section on pages 50–101.

The Board recognises that the success of the Group's operations is dependent on maintaining positive relations with the communities in which we operate. The Board encourages Vesuvius' sites to support their local communities through charitable activities and community events. As part of our commitment to encourage more young people to pursue careers in scientific and technical subjects, Vesuvius looks for opportunities to develop the next generation of leaders in our sector and supports training and education programmes. In 2021, this included partnering with the Polytechnic Faculty of Mons in Belgium, supporting their Mechatronic Award and operating a young apprentice programme in Piedade, Brazil to provide professional training to young people with minimal education. Further examples of the Group's activities can be found in the Community section on page 99.

Desirability of the Company maintaining a reputation for high standards of business conduct

The Group's Code of Conduct states that Vesuvius must maintain an unquestioned reputation for integrity. The Board takes seriously the Group's obligation to maintain this high standard of business conduct and assessed compliance with this requirement through a variety of mechanisms during 2021, including reports from Internal and External Audit, along with feedback from the Group's employee engagement survey.

Vesuvius agrees terms with its suppliers and seeks to pay in accordance with those terms.

When reviewing the Group's tax strategy, the Board ensured that the Group's approach to tax management reinforced the need for the Company to maintain a reputation for high standards of business conduct.

In addition, the Board received formal reports during 2021 on the Group's compliance activities, including the Group's risk assessment programme and training practices, and specific issues raised through the Group's Speak Up helpline and internal reporting processes. Further details of the Group's compliance activities can be found in the Our communities section on pages 97–101.

Need to act fairly as between members of the Company

The primary focus of the Board's business decisions is on ensuring the long-term sustainability of the Group. The Board recognises that, in seeking to maintain long-term profitability, the Group is reliant on the support of all of its stakeholders, including the Group's workforce, its customers, suppliers and the communities in which its businesses operate.

In taking capital allocation decisions during 2021, the Board was cognisant of the need to balance the interests of different stakeholders. Decisions on the Group's approach to investment opportunities, working capital, capex, R&D, investment in people, dividend policy and pension contributions, taken during the year, were all considered against this backdrop.

Relations with shareholders

The Board is committed to communicating with shareholders and other stakeholders in a clear and open manner and seeks to ensure effective engagement through the Company's regular communications, the AGM and other investor relations activities. During 2021, the Company undertook an ongoing programme of meetings with investors. The majority of these meetings were led by the Chief Executive and Chief Financial Officer, and during 2021 a large portion were conducted by virtual means.

In advance of each AGM, we write to our largest shareholders inviting discussion on any questions they might like to raise and making the Chairs of the Board, the Audit Committee and the Remuneration Committee available to meet shareholders should they so wish.

In addition, the Chair of the Remuneration Committee wrote to our largest shareholders and key governance agencies in early 2022, to provide additional detail on changes to the Group's executive remuneration proposals and invite further engagement. Feedback was received from the majority of shareholders and governance agencies and dialogue entered into with a number of them regarding the specifics of the proposals. As a result of this engagement, the Committee was pleased to be able to implement these changes with the support of shareholders. Further detail is contained in the Directors' Remuneration Report on pages 130–153.

The Company reports its financial results to shareholders twice a year, with the publication of its annual and half-year financial reports. In addition, to maintain transparency in performance, we also issued a number of trading updates during 2021. Presentations or teleconference calls were held by the Chief Executive and Chief Financial Officer with institutional investors and analysts on each of these dates.

In a normal year all the Directors attend the Company's AGM, providing shareholders with the opportunity to question them about issues relating to the Group, either during the meeting or informally afterwards. In 2021 travel restrictions operating in the UK curtailed attendance at the AGM. It is hoped that the majority of Directors will be able to attend this year's AGM in person.

Section 172(1) Statement continued

Our Stakeholders

Why we engage	Types of engagement undertaken	Issues relevant to the stakeholder group
Our people With our decentralised management model, the dedication and professionalism of our people, their capacity for owning their roles and their drive for results are the most significant contributors to Vesuvius' success. We focus on the health and safety of all our staff, and engage with our people, encouraging and rewarding high performance to create an environment where all can realise their individual potential.	Fundamental focus on health and safety and the care of all employees Continuing dialogue between employees and their managers, including the conduct of regular performance reviews Competitive remuneration and benefits strategy, emphasising talent development with tailored career-stage programmes. Living the Values and other award schemes celebrate individual achievements Global communication mechanisms include an internal intranet, global email communications and a Vesuvius app, alongside forums such as local 'town hall' meetings. The Group is reconstituting its European Works Council, operates local works councils and recognises trade unions Wide-ranging internal training is offered on key job-related issues, with programmes such as the Vesuvius University – HeaTt – and the Foseco University	Health and safety Diversity and inclusion Remuneration evolution International mobility Employee engagement Development and retention Career opportunities Sustainability performance
Students and graduates Attracting new talent to Vesuvius is vital. Recruiting new students and graduates feeds the talent pipeline and allows us to tap into new sources of up-to-date business ideas and innovation.	The Group maintains contact with universities to identify and develop talent and undertakes R&D collaborations which complement our in-house R&D capability Our businesses attend careers fairs and provide student work placements and internships Vesuvius' website provides prospective applicants with detailed information about the Group	Career opportunities, personal development, engagement and retention Research and innovation Training and mobility Business sustainability
Customers Engaging with our customers helps us to understand their needs and identify opportunities and challenges. Collaborating with our customers enables us to use our expertise to improve the safety and efficiency of their manufacturing processes, enhance their end-product quality and reduce their costs.	Senior-level dialogue is maintained with all key customers, including Directors' visits to customers' sites, as appropriate Our business model focuses on collaboration with customers, to provide customised solutions, and more than 2,500 Vesuvius representatives are embedded at customer locations The Group manages customer relationships on a global basis as required, complemented by diverse local servicing capability We engage with customers on safety leadership and support their training requirements. During the pandemic there has been a greater focus on virtual training We provide technical customer training, including the Foseco University, and participate in industry forums and events. In 2021, the majority of these interactions had to be conducted virtually with more focus on e-learning	Customer satisfaction Product quality and performance Innovation and provision of solutions Health and safety Sustainability performance
Suppliers and contractors Maintaining a flexible workforce through the use of contractors and cost-effective access to high-quality raw materials is vital to our success. Our contractors and suppliers are critical to our business.	In a normal year Vesuvius conducts regular visits to key suppliers. In 2021, opportunities for such visits were more limited Senior-level relationships are built with large suppliers. In 2021, the majority of these meetings were held virtually All suppliers/brokers have regular interaction with the Global Purchasing Team Dedicated category directors build long-term relationships and product expertise There is a rigorous and consistent supplier accreditation procedure Effective working protocols, including work risk assessments, are established with contractors	Operational performance Responsible procurement Trust and ethics Payment practices

Why we engage	Types of engagement undertaken	Issues relevant to the stakeholder group
Investors Continued access to funding is vital to the performance of our business. We work to ensure that our investors have a clear understanding of our strategy, performance and objectives. Supportive investors are more likely to provide the Company with funds for expansion.	Vesuvius' Investor Relations Strategy managed by the Group Finance Director and Chief Executive includes regular meetings with key and prospective investors The Group's Annual Report provides an overview of the Group. Regular announcements and press releases are published to provide updates on the Group's performance and progress The AGM provides all shareholders with an opportunity to directly engage with the Board There is ongoing dialogue with the Company's analysts to address enquiries and promote the business	Financial performance Strong governance and transparency Sustainability performance Diversity and inclusion Director remuneration Board performance
Lenders (banks and debt investors) The Group needs to access funding to ensure it has sufficient financing to run the business and fund future growth. We ensure that our relationship banks have a clear understanding of our strategy, performance and objectives. We engage with lenders to fulfil our compliance obligations and to ensure that we have clear knowledge and awareness of market sensitivities and trends.	Group Treasury maintains an ongoing dialogue with key lenders through the relationship banks and other local banks in the countries in which Vesuvius operates. In 2021, this dialogue was maintained by virtual means The Group Treasurer, Group Head of Corporate Finance and CFO hold regular meetings with key personnel from banks and other lenders who provide the Group's debt funding. In 2021, these meetings were held virtually Representatives from the banks are invited to the Group's results presentations Annual Report and Financial Statements	Financial performance Group internal control and audit processes Strategic planning and ability to repay debt Gearing and monitoring of financial covenant ratios Business continuity planning Transparency and ethical behaviour
Communities We are committed to maintaining positive relationships with the communities in which we operate. Our social responsibility activities complement our Values and we encourage our employees to engage with communities and groups local to our operations.	Provision of work experience and internships to local university students and school children Sponsoring of charitable activities Participation in local volunteering initiatives	Operational performance Transparency and ethical behaviour Environmental performance
Environmental agencies and organisations Good environmental management is aligned with our focus on cost optimisation and operational excellence. We engage with appropriate organisations to ensure that we are complying with regulatory requirements, and to publicise our performance.	Signatory to the UN Global Compact Online Sustainability Report published on the Vesuvius website Visits and inspection of sites by government agencies Annual Report and Financial Statements Response to environmental research as part of customer and supplier due diligence Participation in environmental and social responsibility research and questionnaires	Governance and transparency Operational performance Reporting on performance metrics Environmental performance
Governments and regulatory agencies National governments set the regulatory framework within which we operate. We engage where appropriate to ensure that we can help in shaping new policies, regulations and standards, and ensure compliance with existing requirements.	Transparent communication with government officials as required Participation in appropriate government and industry working groups Membership of industry associations and contribution to best practice guidance Lobbying and direct contact with appropriate bodies on key business issues	Trust and ethics Governance and transparency
Pensioners and deferred pensioners Providing for and managing future pension liabilities in our defined benefit schemes is an important part of financial planning.	Ongoing contact with members of the Group's pension plans, including annual member updates and contact on specific regulatory developments Contact with the trustees and custodians of the Group's defined benefit plan	Trust and ethics Financial performance

Section 172(1) Statement continued

Employee involvement

Vesuvius adopts an open and honest approach to employee communications, with regular updates from senior management across businesses and operations within the Group. The Senior Leadership Group comprising the 160 most senior managers in the Group participates in monthly webcasts with the Group Executive Committee, to ensure clear communication of the Group's key targets and priorities. In September, this Group met for a three-day off-site leadership meeting to discuss the organisation's challenges and objectives for 2022.

The Board and Group Executive Committee usually visit operations throughout the year, touring the sites, meeting with employees and conducting 'town hall' meetings when they do. These activities were curtailed during the first half of 2021 by COVID-19-related travel restrictions, but some visits did take place in the second half. Other regular employee communications include direct email updates on the financial performance of the Group, the industrial environment in which Vesuvius operates and other significant operational developments. The Company operates an employee intranet which distributes Company news and events, and an employee 'app' for information dissemination, as well as undertaking local initiatives for employee engagement on a site-by-site basis.

The HR department is the primary point of contact for employees on employment and workplace matters, operating with an open-door policy and advising employees of any local legal, tax, pension or other employment changes. There are numerous employee-sponsored and led representative bodies within Vesuvius which differ with respect to jurisdiction and geography.

The Group's agreement constituting its European Works Council (EWC) was terminated in 2020, following notice given by management, and with the subsequent departure of the United Kingdom from the European Union. Management has nominated Poland as its representative country under the relevant legislation and has constituted a Special Negotiating Body which is engaged in discussions on the formation of a new EWC Agreement and Council.

Senior management, supported and facilitated by the HR department, encourages open dialogue and consults with all employee representative bodies, as appropriate.

All members of the Group Executive Committee participate in the Vesuvius Share Plan and receive awards of Performance Shares, which vest in accordance with measures set against financial and sustainability targets. For certain senior managers, awards are made under the Vesuvius Medium Term Plan (MTP). These managers participate in the MTP at varying percentage levels, and awards are made in shares and based on the same measures and targets as the Annual Incentive Plan. In this way, a broad cadre of management has incentives that are aligned with shareholders' interests.

Employee engagement

In accordance with the UK Corporate Governance Code, Jane Hinkley is the designated Non-executive Director responsible for overseeing engagement with the workforce.

Vesuvius is a diverse, multinational Group, with four business units, employing more than 11,000 people located in 40 different countries. The Board has adopted an approach that builds on existing engagement initiatives and targets specific issues for attention when considering employee engagement. These processes engage the entire Board and are overseen by Jane Hinkley.

The primary mode of engagement for Directors is through direct interaction with the workforce during the Directors' site visits.

During 2021, these engagement activities were again curtailed by the COVID-19-related travel restrictions. However, during the latter part of the year, the Chairman and each of the Non-executive Directors were able to visit sites in Belgium, China, Germany, Poland and the US. The Non-executive Directors also held a 'virtual' Board visit with managers in Vesuvius India and South East Asia, to hear more about the activities of the Group there. During the visits the Directors were able to interact with a cross-section of different employees, from various functions and organisational levels. At most sites 'town hall' meetings were held, providing the Non-executive Directors with the opportunity to engage with the workforce to explain the function of the Board and also to explain how executive remuneration aligns with wider company pay policies. These meetings gave the Non-executive Directors the opportunity to hear the views of employees and answer their questions about the organisation. A more extensive site visit schedule is currently being planned for 2022, as soon as travel restrictions allow.

In 2021, the Board also oversaw the launch of the Group's third employee engagement survey. This provided the Board with valuable insight into the attitudes, engagement and concerns of employees. The data was analysed in a number of different ways, identifying the results of various sub-groups of employees and providing the Board with a valuable opportunity to track areas of organisational strength and weakness. The Board considered the key workforce-related issues highlighted in the survey and other employee feedback in reviewing management actions with regard to employee engagement. Further information about the survey can be found on pages 91 and 92.

Risk, viability and going concern

The Board continually monitors the internal and external risks that could significantly impact the Group's long-term performance

The Group undertakes a continuous process to review and understand existing and emerging risks.

Risk management in 2021

Each year, the Board exercises oversight of principal risks through a specific review of the way in which the Group manages those risks. This process provides the Board with a clear understanding of the individuals within the business responsible for the management of each specific risk and the mitigation in place to address it. The Board also reviews and establishes the Group's risk appetite for those issues identified as principal risks and the associated adequacy of the steps being taken to mitigate them.

The Board has overall responsibility for establishing and maintaining a system of risk management and internal control, and for reviewing its effectiveness. The Group undertakes a continuous process of risk identification and review, which includes a formal process, conducted annually, for mapping risks from the bottom up, with each major business unit and key operational, senior functional and senior management staff identifying their principal risks. This assessment undergoes a formal review at half-year. The results are compiled centrally to deliver a coordinated picture of the key operational risks identified by the business. These risks are then reviewed by the Group Executive Committee. As part of this process, each Director contributes their individual view of the top-down strategic risks facing the Group – drawing on the broad commercial and financial experience they have gained both inside and outside the Group. The results of this assessment are then overlaid on the internal assessment of risks to build a comprehensive analysis of existing and emerging risk.

The process extends to cover both financial and non-financial risks, and considers the risks associated with the impact of the Group's activities on employees, customers, suppliers, the environment, local communities and society more generally. As in previous years, in 2021 the Group's assessment of principal risks was reviewed and considered against any emerging risks and uncertainties that were identified through our Board review process.

The Board continues to monitor the implications of emerging macro trends on the business, including automation in manufacturing, business digitalisation, automotive electrification, and in particular the significant steps being taken in our end-markets to combat climate change as businesses commit to future net zero emissions targets. All of these could act as disruptors to our business. Commentary on some of these areas is contained in the Our external environment section on pages 16 and 17 of this Report. No additional critical macro trends were identified in 2021.

The Board was able to return to conducting physical site visits in 2021, particularly in the latter part of the year. The Board continues to believe that this direct engagement with our staff is the most effective way to assess the 'temperature' of the organisation – hearing first-hand about issues, concerns and potential risks that might impact the Group.

The Directors' views on each of the above issues, and on emerging risks in general, were independently gathered and integrated into the management discussions and actions taken on risk.

Risk remains an integrated part of all business unit presentations to the Board, informing the Board of the operational approach taken to risk management on a day-to-day basis.

Changes to risk in 2021

The effects of the COVID-19 pandemic continued to be felt in certain geographies and disciplines of the business in 2021. Managing the physical risks to our staff and in our interactions with customers continued to be a priority, where our protocols for remote working, social distancing, and management of production processes continued to be followed. As with many companies, Vesuvius was exposed to post-COVID-19 disruptions in global trade, which placed supply chains under stress and affected elements of the Group's financial performance.

Against the backdrop of the continuing pandemic, and its development during the year, the Board continued to focus on the Group's existing risks, and the processes to mitigate and manage them. It also remained alert to other emerging risks. The Board noted again the increasing presence of cyber threats to business in general, further commentary on which is set out in the section on business continuity below. Other emerging risks were assessed, with the Board considering security of raw material supply, business disruption driven by increasing inflation and interest rates, and the continuing work required to ensure that the Group's decentralised management and talent pipeline can deliver the consistent profitable growth identified in the Group's strategy. It was noted that a number of these and other issues were already addressed in the Group's principal risks and by related mitigation activities.

Risk, viability and going concern continued

Issues identified in certain of the Group's principal risks materialised during the year. The Group's existing measures in mitigation were initiated and additional actions taken specific to the challenges posed by the continuing COVID-19 pandemic. These were most notably:

Business interruption: With the mandatory shutdowns of 2020 predominantly behind us, our manufacturing operations remained operational throughout the year with enhanced health and safety protocols in place, in each case in line with prevailing national rules. Remote working remained the norm in many countries, with more than 1,500 people still working from home at year end. Vesuvius also experienced the effects of the global trade disruption, seeing significant increases in price for freight and raw materials, and disrupted logistics, affecting the predictability of our global supply chain. Our central purchasing team focused on addressing these issues, but two product line supply interruptions were experienced.

End-market risk: Whilst end-markets began to pick up at the end of 2020, with overall demand continuing to grow during the year, our end-markets did not return fully to pre-pandemic levels. We also saw significant raw material price increases throughout the year. The Group's diversified sourcing strategy helped mitigate this challenge, with raw material costs offset by the implementation of price increases.

People, culture and performance: Across the Group, our people continued to work in difficult circumstances and lockdowns affected different parts of the business. The protocols put in place in 2020 – access to virtual IT tools to support remote working, increased PPE provision and changes to site working conditions – remained in force for all of the year. Internal communication remained a focus, building on the success of the processes put in place in early 2020. Once again, the focus on Values was maintained, with our Living the Values Awards competition running again on a 'virtual' basis, with the Group's senior leadership participating to celebrate the stories and achievements of our Values finalists. Our annual Senior Leaders' conference was held in person, with enhanced health and safety protocols in place for those who could travel, and with a significant number of staff who could not travel joining remotely.

Health and safety: Our very strong focus on health and safety and the consistency of its application across the Group continued to place us extremely well to respond to the pandemic's challenges. In certain jurisdictions our workforce was affected more acutely than in others with the development of the Omicron variant, but operations were managed carefully to ensure security of supply for our customers.

It is clear that the COVID-19 pandemic has introduced shifts in working patterns and trading environment that will not unwind for several months, and in some cases much longer. The Board continues to monitor these changes, and in particular the disruption that they could drive for global businesses and, in particular, for supply chain security. Consequently, the mitigations established by the Group to address its principal risks will remain strongly relevant as 2022 progresses.

Despite these challenges, the Board has not identified any overall material change to the Group's identified principal risks and uncertainties, albeit that within those risks a number of issues manifested themselves in 2021. No new principal risks were identified during the year. As such, the Group's statement of Principal Risk and Uncertainties was unchanged in 2021 from 2020.

The crisis unfolding in Ukraine since the end of the year has the potential to generate direct and indirect impacts that are reflected in our Principal Risks, namely End Market Risks, Protectionism and Globalisation and Business Interruption. Whilst we are concerned about the potential impact, we will put our mitigation strategies into action in order to minimise any impact on Vesuvius.

Climate change

The Group's overall risk management processes also incorporate consideration of the potential impact of climate-related risks on the Group. The Group does not regard climate change itself to represent a material stand-alone risk for the Group's operations.

Whilst a significant proportion of the Group's revenue is generated from steel manufacture and automotive castings, industries that are under transition as a result of their focus on improving environmental performance, we believe these changes will be positive for the Group. The opportunities in the Group's business strategy, which is founded on helping our customers to improve their manufacturing efficiency and the quality of their products – and therefore reduce their climate impact – will play a critical part in the development of the Group going forward. The Group recognises that climate change could present further uncertainty for the Group in terms of increased regulation, evolution of the geographical distribution of our customer base and the costs of meeting more onerous disclosure requirements. Further information about the Group's consideration of climate-related risks and opportunities can be found in the Our planet section on pages 60–66.

The risks we associate with our sustainability performance and our end customers' sustainability transition – badged as ESG – are identified as a separate element of the Group risk register, recognising the work Vesuvius can do to mitigate the environmental impact of our customers' processes. Other elements of this risk are incorporated into the appropriate Principal Risk and Uncertainties that the Group has identified. The Group continues to focus internally on the action we can take to drive our business' sustainability. In 2021, the Group made further progress on its sustainability KPIs and continued work on the Sustainability initiative announced in 2020. Under this initiative the Group will seek to drive a lower CO_2 intensity, reduce energy usage, and take the steps necessary to meet the target set of being emissions net zero by 2050. Further information can be found in the Our planet section on pages 60–77.

Risk mitigation

The principal risks identified are actively managed in order to mitigate exposure. Senior management 'owners' have been identified for each principal risk, and they manage the mitigations of that specific risk and contribute to the analysis of its likelihood and materiality. This analysis is reported to the Board. The risks are analysed in the context of our business structure which gives protection against a number of principal risks we face with diversified currencies, a widespread customer base, local production matching the diversity of our markets and intensive training of our employees. Additionally, we seek to mitigate risk through contractual measures. Where cost-effective, the risk is transferred to insurers. Our processes are not designed to eliminate risk, but to identify our principal risks and seek to reduce them to a reasonable level in the context of the delivery of the Group's strategy.

Business continuity

In partnership with our risk management advisers and our insurers, we seek to identify the most effective means of reducing or eliminating insurable risks, through a combination of risk management and the placing of insurance cover.

Our insurer property loss control programme is based upon insurer loss modelling and focuses on insured losses. The insurer's loss control engineers undertake a series of on-site inspections focused on machinery breakdown, fire, natural catastrophe and other property damage and business interruption risks. These surveys yield a series of loss-reduction recommendations. The execution of these recommendations is agreed with site management and then followed through to completion.

In parallel, Vesuvius' own loss management programme focuses on strategic sites and sites not covered by insurers. Assisted by an independent consultant, we undertake property loss control and business continuity surveys using Vesuvius' bespoke risk and exposure-based protocol.

These reports yield further risk reduction recommendations, and improvement actions and timescales are agreed and followed through by site management. To support the Group's loss control activities, risk management workshops are conducted covering loss prevention, emergency planning, crisis management and business recovery. As the footprint of the Group develops and, in certain cases, production concentrates in a smaller number of flagship sites, business continuity planning is conducted to ensure that sufficient resilience remains in the manufacturing network to address projected supply interruptions.

With regard to fire safety, the Group monitors all fire-related near misses or minor dangerous occurrences. Any fires, including overheating, are reported and analysed both locally and by senior HSE management in order that safety improvement initiatives can be prioritised and communicated throughout the Group. Underlying causes are established with detailed analysis undertaken as a means of proposing improvement priorities in order that safety and process safety initiatives can be targeted on a risk-assessed basis.

The Group also focuses on cyber security issues in terms of business continuity. This is overseen by the Group's IT Committee which meets on a regular basis to review and progress the Group's plans for tackling cyber issues. The Audit Committee and Board receive regular updates on the Group's activities in this area including general developments and specific actions and activities within the Vesuvius business. A comprehensive plan was established in 2020 to further strengthen Vesuvius' overall IT security, which is well progressed. During 2021, we worked further to strengthen our IT security seeking to protect against the risks presented by developments in external cyber threats. A holistic approach is taken to addressing cyber challenges, focusing on the improvement of the Group's overall IT infrastructure, procedures and framework. The Group continues to run regular training programmes on cyber/IT security. See page 121 of the Audit Committee Report for further information.

Internal control

The Group's internal control system is designed to manage, rather than eliminate, the financial risks facing the Group and safeguard its assets. No system of internal control can provide absolute assurance against material misstatement or loss. The Group's system is designed to provide the Directors with reasonable assurance that problems are identified on a timely basis and are dealt with appropriately.

The Audit Committee assists the Board in reviewing the effectiveness of the Group's system of internal control, including financial, operational and compliance controls, and risk management systems. The key features of the Group's system of internal control are set out in the table on page 32.

Reviewing the effectiveness of risk management and internal control

The internal control system covers the Group as a whole and is monitored and supported by the Group's Internal Audit function, which conducts reviews of Vesuvius' businesses and reports objectively both on the adequacy and effectiveness of the system of internal control and on those businesses' compliance with Group policies and procedures. The Audit Committee receives reports from the Group Head of Internal Audit and reports to the Board on the results of its review.

The Group also conducts a self-certification exercise by which senior financial, operational and functional management certify the compliance throughout the year of the areas under their responsibility with the Group's policies and procedures and highlight any material issues that have occurred during the year.

As part of the Board's process for reviewing the effectiveness of the system of internal control, it delegates certain matters to the Audit Committee. Following the Audit Committee's review of internal financial controls and of the processes covering other controls, the Board annually evaluates the results of the internal control and risk management procedures conducted by senior management.

Since the date of this evaluation, there have been no significant changes in internal controls or other matters identified which could significantly affect them.

In accordance with the provisions of the UK Corporate Governance Code, the Directors confirm that they have carried out a robust assessment of the principal risks facing the Company, including those that threaten its business model, future performance, solvency or liquidity. They have also reviewed the effectiveness of the Group's system of internal control and confirm that the necessary actions have been taken to remedy any control weaknesses identified during the year and to the date of this report.

Further detail regarding the Audit Committee's review of the effectiveness of the Group's risk management and internal control systems is contained in the Audit Committee report on pages 120 and 121.

Risk, viability and going concern continued

Key features of risk management and internal control

Strategy and financial reporting	Comprehensive strategic planning and forecasting process Annual budget approved by the Board Monthly operating financial information reported against budget Key trends and variances analysed and action taken as appropriate
Vesuvius GAAP	Accounting policies and procedures formulated and disseminated to all Group operations Covers the application of accounting standards, the maintenance of accounting records and key financial control procedures
Operational controls	Operating companies and corporate offices maintain internal controls and procedures appropriate to their structure and business environment Compliance with Group policies on items such as authorisation of capital expenditure, treasury transactions, the management of intellectual property and legal/regulatory issues Use of common accounting policies and procedures and financial reporting software used in financial reporting and consolidation Significant financing and investment decisions reserved to the Board Monitoring of policy and control mechanisms for managing treasury risk by the Board Clearly delegated authority for capital expenditure, purchasing, customer contracts and hiring
Risk assessment and management	Continuous process for identifying, evaluating and managing any significant risks Risk management process designed to identify the key risks facing each business Reports made to the Board on how those risks are managed Each major Group business unit produces a risk map to identify key risks, and assess the likelihood of risks occurring, as well as their impact and mitigating actions Top-down risk identification undertaken at Group Executive Committee and Board meetings Board review of insurance and other measures used in managing risks across the Group The Board is notified of major issues and makes an annual assessment of whether risks have changed Ongoing assurance processes by the legal function and Internal Audit including the annual self-certification process Externally supported 'Speak Up' whistleblowing line
Internal Audit	Reviews Vesuvius' businesses and reports on the adequacy and effectiveness of their systems of internal control and compliance with Group policies and procedures Agrees action plans for the resolution of any improvement actions identified by their audits, and monitors with local management and the business unit Presidents, progression with their completion Reports to the Audit Committee on the results of each audit and provides regular updates on high-priority action items The Audit Committee discusses the key risks identified by Internal Audit

Principal risks

The risks identified on pages 34 and 35 are those the Board considers to be the most relevant to the Group in relation to their potential impact on the achievement of its Strategic Objectives. All of the risks set out on these pages could materially affect the Group, its businesses, future operations and financial condition, and could cause actual results to differ materially from expected or historical results. The Group continues to focus on risk mitigation, and whilst, as identified above, certain elements of the Group's risks have manifested in 2021 as a result of the continuing COVID-19 pandemic, the principal risks remain the same. These risks are not the only ones that the Group will face. Some risks are not yet known and some currently not deemed to be material could become so.

Viability Statement

In accordance with the UK Corporate Governance Code, the Directors have assessed the viability of the Group over a three-year period to 31 December 2024, taking into account the Group's current position and the potential impact of the principal risks and uncertainties. The Directors have determined that three years is an appropriate period over which to provide the Viability Statement because this is the Company's planning cycle and it is sufficiently funded by financing facilities with average maturity terms of approximately six years. The projected cash flows for the next three years have been based on the latest Board-approved budgets and strategic plans.

In making this statement, the Directors have carried out a robust assessment of the principal risks that may threaten the business model, future performance, solvency and liquidity of the Group. This is embodied in the annual review of a three-year business plan which includes a review of sensitivity to 'business as usual' risks, such as profit growth and working capital variances, severe but plausible events and the impact these could have on the Group's debt covenants and available liquidity. The results take account of the availability and likely effectiveness of the mitigating actions that could be taken to avoid or reduce the impact or occurrence of the underlying risks. Whilst the review has considered all the principal risks identified by the Group, the following were selected for enhanced stress testing: an unplanned drop in customer demand; debt recovery risk due to customer default; business interruption due to the unplanned closure of several key plants; and raw material price inflation. The Group's prudent balance sheet management, flexible cost base, ability to react quickly to end-market conditions, access to long-term capital at acceptable financing costs and well diversified international businesses leave it well placed to manage these principal risks.

In performing the stress testing, certain assumptions were made, including that: customer failures result in write-offs of the full value of the receivables with no lost revenue replacement; and cash flow is supported by working capital releases, restricted capital expenditure and operating cost reductions. Under the enhanced stress testing described above, a potential breach of a covenant would only occur in the event of an unforeseen reduction in revenue of greater than 30%. Accordingly, the Directors confirm that they have a reasonable expectation that the Group will be able to continue in operation and meet its liabilities as they fall due over the three-year period to 31 December 2024. Furthermore, the Board believes that the Group continues to be well positioned for success in the longer term because of: our exposure to end-markets that are growing faster through the cycle than underlying global GDP; our market-leading position that is supported by ongoing investment in innovation and R&D; our strong degree of customer intimacy with around a quarter of our employees working at customer facilities; and the focus we have on building quality teams with clear organisational responsibility.

Going Concern Statement

The Directors have prepared cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the 2021 financial statements. These forecasts reflect an assessment of current and future end-market conditions and their impact on the Group's future trading performance.

The analysis undertaken includes a plausible but severe downside scenario, based on an assumed protracted COVID-19 related demand impact, despite emerging confidence that the worst of the pandemic may be behind us. This downside scenario assumes a decline in business activity and profitability in 2022 and 2023 to the level achieved in H2 2020, the period half-year most severely impacted by COVID-19. On a full-year basis relative to 2021, this implies a c.14% decline in sales and a c.34% decline in trading profit. Even in this downside scenario, the forecasts show that the Group's maximum net debt/EBITDA (pre-IFRS 16 in-line with the covenant calculation) does not exceed 1.3x, compared with a leverage covenant of 3.25x.

The forecasts show that the Group will be able to operate within the current committed debt facilities and show continued compliance with the Company's financial covenants. On the basis of the exercise described above and the Group's available committed debt facilities, the Directors consider that the Group and the Company have adequate resources to continue in operational existence for a period of at least 12 months from the date of signing of these financial statements. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

Viability process

Identify
Viability time horizon and risk analysis framework

Assess
Principal risks and stress scenarios

Model
Viability against risk scenarios, examining probabilities and impacts

Report
See Viability Statement

Principal risks and uncertainties

Risk	Potential impact	Mitigation
End-market risks Vesuvius suffers an unplanned drop in demand, revenue and/or margin because of market volatility beyond its control. Strategic alignment	Unplanned drop in demand and/or revenue due to reduced production by our customers Margin reduction Customer failure leading to increased bad debts Loss of market share to competition Cost pressures at customers leading to use of cheaper solutions	Geographic diversification of revenues Product innovation and service offerings securing long-term revenue streams and maintaining performance differential Increase in service and product lines by the development of the Technical Services offering R&D includes assessment of emerging technologies Manufacturing capacity rationalisation and flexible cost base Diversified customer base: no customer is greater than 10% of revenue Robust credit and working capital control to mitigate the risk of default by counterparties
Protectionism and globalisation The Vesuvius business model cannot adapt or respond quickly enough to threats from protectionism and globalisation. Strategic alignment	Restricted access to market due to enforced preference of local suppliers Increased barriers to entry for new businesses or expansion Increased costs from import duties, taxation or tariffs Loss of market share Trade restrictions	Highly diversified manufacturing footprint with manufacturing sites located in 26 countries Strong local management with delegated authority to run their businesses and manage customer relationships Cost flexibility Tax risk management and control framework together with a strong control of inter-company trading
Product quality failure Vesuvius staff/contractors are injured at work or customers, staff or third parties suffer physical injury or financial loss because of failures in Vesuvius products. Strategic alignment	Injury to staff and contractors Product or application failures lead to adverse financial impact or loss of reputation as technology leader Incident at customer plant causes manufacturing downtime or damage to infrastructure Customer claims from product quality issues	Quality management programmes including stringent quality control standards, monitoring and reporting Experienced technical staff knowledgeable in the application of our products and technology Targeted global insurance programme Experienced internal legal function overseeing third-party contracting
Complex and changing regulatory environment Vesuvius experiences a contracting customer base or increased transaction and administrative costs due to compliance with changing regulatory requirements. Strategic alignment	Revenue reduction from reduced end-market access Disruption of supply chain and route to market Increased internal control processes Increased frequency of regulatory investigations Reputational damage	Compliance programmes and training across the Group Independent Internal Audit function Experienced internal legal function including dedicated compliance specialists Global procurement category management of strategic raw materials
Failure to secure innovation Vesuvius fails to achieve continuous improvement in its products, systems and services. Strategic alignment	Product substitution by customers Increased competitive pressure through lack of differentiation of Vesuvius offering Commoditisation of product portfolio through lack of development Lack of response to changing customer needs Loss of intellectual property protection	Enduring and significant investment in R&D, with market-leading research A shared strategy for innovation throughout the Group, deployed via our R&D centres Stage gate process from innovation to commercialisation to foster innovation and increase alignment with strategy Programme of manufacturing and process excellence Quality programme, focused on quality and consistency Stringent intellectual property registration and defence

Risk	Potential impact	Mitigation
Business interruption Vesuvius loses production capacity or experiences supply chain disruption due to physical site damage (accident, fire, natural disaster, terrorism), or other events such as industrial action, cyber attack or global health crises. Strategic alignment	Loss/closure of a major plant temporarily or permanently impairing our ability to serve our customers Damage to or restriction in our ability to use assets Denial of access to critical systems or control processes Disruption of manufacturing processes Inability to source critical raw materials	Diversified manufacturing footprint Disaster recovery planning Business continuity planning with strategic maintenance of excess capacity Physical and IT control systems security, access and training Cyber risks integrated into wider risk-management structure Well-established global insurance programme Group-wide safety management programmes Dual sourcing strategy and development of substitutes
People, culture and performance Vesuvius is unable to attract and retain the right calibre of staff, fails to instil an appropriate culture or fails to embed the right systems to drive personal performance in pursuit of the Group's long-term growth. Strategic alignment	Organisational culture of high performance is not achieved Staff turnover in growing economies and regions Stagnation of ideas and development opportunities Loss of expertise and critical business knowledge Reduced management pipeline for succession to senior positions	Internal focus on talent development and training, with tailored career-stage programmes and clear performance management strategies Contacts with universities to identify and develop talent Career path planning and global opportunities for high-potential staff Internal programmes for the structured transfer of technical and other knowledge Clearly defined Values underpin business culture
Health and safety Vesuvius staff or contractors are injured at work because of failures in Vesuvius' operations, equipment or processes. Strategic alignment	Injury to staff and contractors Health and safety breaches Manufacturing downtime or damage to infrastructure from incident at plant Inability to attract the necessary workforce Reputational damage	Active safety programmes, with ongoing wide-ranging monitoring and safety training Independent safety audit team Quality management programmes including stringent manufacturing process control standards, monitoring and reporting
Environmental, Social and Governance criteria Vesuvius fails to capitalise on the opportunity to help its customers significantly reduce their carbon emissions as environmental pressure grows on the steel industry or Vesuvius fails to meet the expectations of its various stakeholders including employees and investors. Strategic alignment	Loss of opportunity to grow sales Loss of opportunity to increase margin Loss of stakeholder confidence including investors Reputational damage	Development and implementation of a new Sustainability initiative, which includes stretching targets focused on reducing the Group's Energy usage, CO_2 emissions, waste and recycled materials R&D focus on products that assist customers to reduce carbon emissions and improve their own sustainability measures Skilled technical sales force to develop efficient solutions for our customers Globally disseminated Code of Conduct sets out standards of conduct expected and ABC Policy adopted with a zero tolerance regarding bribery and corruption Internal Speak Up mechanisms to allow reporting of concerns Extensive use of due diligence to assess existing and potential business partners and customers

Strategic alignment

- Deliver profitable growth
- Generate value for our shareholders
- Maintain an efficient capital structure
- Always put safety first
- Think beyond in innovation
- Run best-in-class sustainable operations
- Foster talent, skill and motivation in our people

See more about **Our strategy** on **p14** and **15**

Our performance

We think beyond today's industrial processes

and shape the future through research and development

Key Performance Indicators

Financial KPIs*

Strategic alignment	KPI	Purpose	Link to remuneration
Deliver profitable growth	**Underlying revenue growth** % 21: 18.1 20: -12.7 19: -5.7	Provides an important indicator of organic (like-for-like) growth of Group businesses between reporting periods. This measure eliminates the impact of exchange rates, acquisitions, disposals and significant business closures	
Generate value for our shareholders	**Trading profit** £m 21: 142.4 20: 101.4 19: 181.4	Used to assess the trading performance of Group businesses	
	Return on sales % 21: 8.7 20: 7.0 19: 10.6		
	Headline profit before tax £m 21: 137.3 20: 91.6 19: 171.4	Used to assess the financial performance of the Group as a whole	
	Headline EPS p 21: 35.3 20: 23.2 19: 45.1	Used to assess the underlying earnings performance of the Group as a whole	**Annual Incentive Plan and Vesuvius Share Plan** – Read more about these on p145–150
	Return on invested capital % 21: 7.5 20: 4.9 19: 8.6	Used to assess the financial performance of the Group	**Annual Incentive Plan and Vesuvius Share Plan** – Read more about these on p145–150
Maintain an efficient capital structure	**Free cash flow** £m 21: -0.3 20: 113.5 19: 121.5	Used to assess the underlying cash generation of the Group	
	Average working capital to sales % 21: 20.9 20: 23.2 19: 24.0	One of the factors driving the generation of free cash flow is the average working capital to sales ratio, which indicates the level of working capital used in the business	**Annual Incentive Plan** – Read more about this on p145–147
	Interest cover 21: 30.5x 20: 14.5x 19: 22.9x	Interest cover and Net debt to EBITDA are used to assess the financial position of the Group and its ability to fund future growth	
	Net debt to EBITDA 21: 1.4 20: 1.2 19: 1.1		

* For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.

Non-financial KPIs

Strategic alignment	KPI	Target/description	Link to remuneration
Always put safety first	**Lost Time Injury Frequency Rate** 21: 1.06 20: 1.16 19: 1.55	LTIFR of below 1 Work-related illness or injuries which resulted in an employee being absent for at least one day – measured per million hours worked	**Annual Incentive Plan and Vesuvius Share Plan** – Read more about these on p145–150
Think beyond in innovation	**Total R&D spend** £m 21: 30.3 20: 26.7 19: 27.6	At constant 2021 currency	
	New product sales % 21: 15.3 20: 12.4 19: 16.3	Sales of products launched within the last five years as a % of total revenue	**Annual Incentive Plan** – Read more about this on p145–147
Run best-in-class sustainable operations	Total energy consumption kWh per metric tonne of product packed for shipment -9.0%	10% reduction of energy consumption per metric tonne of product packed for shipment by 2025 (vs 2019)	
	Energy CO_2e emissions -16.5%	10% reduction of Scope 1 and Scope 2 Energy CO_2e emissions per metric tonne of product packed for shipment by 2025 (vs 2019)	**Annual Incentive Plan and Vesuvius Share Plan** – Read more about these on p145–150
	Wastewater -2.8%	25% reduction of wastewater per metric tonne of product packed for shipment by 2025 (vs 2019)	
	Solid waste -21.8%	25% reduction of solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment by 2025 (vs 2019)	**Annual Incentive Plan** – Read more about this on p145–147
	Recycled material 6.2%	7% of raw materials used in production to be recycled materials from external sources by 2025	
	Compliance training 100%	At least 90% of targeted staff to complete Anti-Bribery and Corruption training annually	**Annual Incentive Plan** – Read more about this on p145–147
	Supply chain 52%	By the end of 2023, conduct sustainability assessments of suppliers covering at least 50% of Group spend	
Foster talent, skill and motivation in our people	Gender diversity 21%	30% female representation in Top Management by 2025 (Group Executive Committee plus key direct reports)	**Annual Incentive Plan and Vesuvius Share Plan** – Read more about these on p145–150

Financial review

A strong recovery in operating performance despite pricing and logistics challenges

Guy Young
Chief Financial Officer

"Positive trends in our key end-markets of steel and foundry led to an increase in revenue and trading profit"

The following review considers a number of our financial KPIs and sets out other relevant financial information.

Revenue
£1,642.9m
Reported change 12.7% | Underlying[1] change 18.1%

Trading profit[2]
£142.4m
Reported change 40.4% | Underlying[1] change 50.4%

Statutory EPS
37.7p
Reported change 146%

Return on Sales[2]
8.7%
Reported change 170bps | Underlying[1] change 190bps

1. Underlying basis is at constant currency and excludes separately reported items and the impact of acquisitions and disposals.
2. For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.

Basis of preparation

All references in this financial review are to headline performance unless stated otherwise. See Note 4.1 to the Group Financial Statements for the definition of headline performance.

Introduction

The year 2021 was still impacted by the continued global pandemic and while we are not yet free from the effects, we are pleased with the performance of the Group during the year.

The combination of a recovery in our operating performance and focus on working capital management provided the capital for allocation across all of our priority areas. We invested in organic and inorganic growth, while also paying an attractive dividend to our shareholders. This was possible despite a backdrop of challenging raw material price increases and global supply chain disruption.

2021 performance overview

Positive trends in our key end-markets of steel and foundry led to an increase in reported revenue of £184.6m over the prior year and by £251.2m on an underlying basis (+18.1%).

Key challenges this year were the implementation of price increases to offset the significant raw material cost increases and management of temporary supply chain related friction costs. Alongside this we continued to deliver on our planned restructuring programme in support of reducing operating expenses.

Trading profit for the year 2021 was £142.4m, 50.4% higher than the prior year on an underlying basis. Return on sales was 8.7%, higher than the prior year by 190 bps on an underlying basis.

The aforementioned supply chain disruptions led to a conscious build-up of inventory to ensure security of supply but despite this our average trade working capital to sales ratio for the prior 12 months improved further to 20.9% at December 2021.

The Group's cash conversion in 2021 of 32% was lower largely due to the impact of the increase in absolute working capital to sustain revenue growth as well as higher investments in capex.

Dividend

The Board has recommended a final dividend of 15.0 pence per share to be paid, subject to shareholder approval, on 27 May 2022 to shareholders on the register at 19 April 2022. When added to the 2021 interim dividend of 6.2 pence per share paid on 17 September 2021, this represents a full-year dividend of 21.2 pence per share.

Revenue

£m	2021 Revenue As reported	Acquisitions/ (disposals)	Underlying	2020 Revenue As reported	Currency	Acquisitions/ (disposals)	Underlying	% change Reported	Underlying
Steel	1,171.5	(2.1)[3]	1,169.4	1,045.4	(48.9)	–	996.5	12.1%	17.4%
Foundry	471.4	–	471.4	412.9	(19.8)	–	393.1	14.2%	19.9%
Total Group	**1,642.9**	**(2.1)**	**1,640.8**	1,458.3	(68.7)	–	1,389.6	12.7%	18.1%

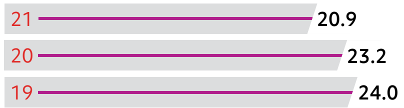
Trading profit

£m	2021 Trading profit As reported	Acquisitions/ (disposals)	Underlying	2020 Trading profit As reported	Currency	Acquisitions/ (disposals)	Underlying	% change Reported	Underlying
Steel	102.0	0.2[3]	102.2	76.4	(4.2)	–	72.2	33.6%	41.6%
Foundry	40.4	–	40.4	25.0	(2.4)	–	22.6	61.3%	78.7%
Total Group	**142.4**	**0.2**	**142.6**	101.4	(6.6)	–	94.8	40.4%	50.4%

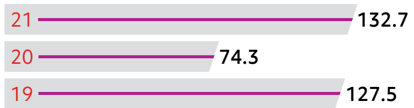
3. Impact of Universal acquisition.

Underlying revenue growth* %
18.1%

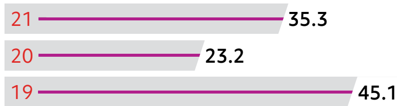
Average working capital to sales* %
20.9%



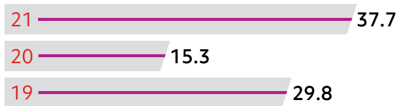
Operating profit £m
£132.7m



Headline earnings per share* pence
35.3p



Statutory earnings per share pence
37.7p



* For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.

It remains the Board's intention to deliver long-term dividend growth, provided this is supported by underlying earnings, cash flows, capital expenditure requirements and the prevailing market outlook.

Key Performance Indicators

We have identified a number of KPIs against which we have consistently reported. As with prior years, we measure our results on an underlying basis, where we adjust to ensure appropriate comparability between periods, irrespective of currency fluctuations and any business acquisitions and disposals.

This is done by:

- Restating the previous period's results at the same foreign exchange (FX) rates used in the current period
- Removing the results of disposed businesses in both the current and prior years
- Removing the results of acquired businesses in both the current and prior years

Therefore, for 2021, we have:

- Retranslated 2020 results at the FX rates used in calculating the 2021 results
- Removed the results of Universal, which was acquired during 2021

Objective: Deliver profitable growth

KPI: Underlying revenue growth

Reported revenue for 2021 was £1,642.9m, which equated to £1,640.8m on an underlying basis. Reported revenue for 2020 was £1,458.3m, which equated to £1,389.6m on an underlying basis. 2021 underlying revenue increased by 18.1% year-on-year. The increase in revenue has been driven by a recovery across most geographies in both steel and foundry end-markets versus 2020, and by price increases.

Objective: Generate value for our shareholders

KPI: Trading profit and Return on Sales

We continue to measure underlying trading profit of the Group as well as trading profit as a percentage of sales, which we refer to as our Return on Sales or RoS.

Trading profit for 2021 was £142.4m and Return on Sales was 8.7%. On an underlying basis, trading profit increased by 50.4% and Return on Sales by 190 bps. The increase in trading profit and Return on Sales is due to higher revenue, ongoing delivery of benefits from the restructuring programme and income from recurring recovery of overpaid taxes to and from the Brazilian entities partially offset by temporary friction costs linked to supply chain disruptions.

The Steel Division recorded Return on Sales of 8.7%, a 150 bps underlying improvement from 2020. Trading profit increased by 41.6% on an underlying basis, to £102.0m during the period. Return on Sales in the Foundry Division increased by 280 bps year-on-year on an underlying basis, to 8.6% in 2021. Trading profit was £40.4m representing a 78.7% increase on an underlying basis versus prior year.

KPI: Headline PBT and Headline EPS

Headline profit before tax (PBT) and headline earnings per share (EPS) are used to measure the underlying financial performance of the Group. The main difference between trading profit and PBT is net finance costs which were £6.4m in 2021, £4.5m lower than 2020.

Our Headline PBT was £137.3m, 49.9% higher than last year on a reported basis. After the inclusion of separately reported expenses of £9.7m (2020: £27.1m) our PBT of £127.6m was 97.8% higher than last year on a reported basis. Headline EPS from continuing operations at 35.3p was 52.3% higher than 2020.

Financial review continued

Return on invested capital* %

7.5%

21	7.5
20	4.9
19	8.6

Net debt* £m

£277.1m

21	277.1
20	175.1
19	245.8

Unutilised committed debt facilities £m

£308.1m

21	308.1
20	246.6
19	174.2

Total R&D spend** £m

£30.3m

21	30.3
20	26.7
19	27.6

Net defined benefit pension deficit £m

£77.0m

21	77.0
20	2.1
19	8.5

* For definitions of alternative performance measures, refer to Note 4 of the Group Financial Statements.

** At constant 2021 currency.

KPI: Return on invested capital (ROIC)

From 2022 onwards, the Group intends to use ROIC as its key measure of return from the Group's invested capital. The RONA performance measure will be replaced with ROIC which provides a more complete measure of Vesuvius' returns. ROIC is calculated as trading profit less amortisation of acquired intangibles, plus share of post-tax profit of joint ventures and associates for the previous 12 months after tax, divided by the average invested capital (total assets excluding cash plus non interest bearing liabilities), at constant currency (being the average over December and the previous year end invested capital).

Our ROIC for 2021 was 7.5% (2020: 4.9%).

Objective: Maintain an efficient capital structure

KPI: Free cash flow and working capital

Fundamental to ensuring that we have adequate capital to execute our corporate strategy is converting our profits into cash, partly through strict management of our working capital. The Group generated adjusted operating cash flow of £45.6m (2020: £172.9m), and a cash conversion rate of 32% (2020: 173%) in the period. 2021 cash conversion was impacted by growing working capital to sustain revenue growth and higher investments in capex. Free cash flow from continuing operations was £(0.3)m in 2021 (2020: £113.5m).

We measure working capital both in terms of actual cash flow movements, and as a percentage of sales revenue. Trade working capital as a percentage of sales in 2021 was 20.9% (2020: 23.2%), measured on a 12-month moving average basis. In absolute terms on a constant currency basis trade working capital increased by £106.0m in 2021.

KPI: Net debt and interest cover

Following the refinancing of the Group's syndicated bank facility on 5 July 2021, the Group had committed borrowing facilities of £706.3m as at 31 December 2021 (2020: £586.6m), of which £308.1m was undrawn (2020: £246.6m).

Net debt at 31 December 2021 was £277.1m, a £102.0m increase from 31 December 2020. The increase is mainly comprised of £45.6m from operations and a favourable foreign exchange impact of £13.8m, offset by payments of income taxes of £30.1m, net finance costs of £7.6m, the acquisition of the business of Universal Refractories, Inc for £43.6m, including related excess working capital, payments of dividends of £55.5m and £17.1m of additional leases.

At the end of 2021, the net debt to EBITDA ratio was 1.4x (2020: 1.2x) and EBITDA to interest was 30.5x (2020: 14.5x). These ratios are monitored regularly to ensure that the Group has sufficient financing available to run the business and fund future growth.

The Group's debt facilities have two financial covenants: the ratios of net debt to EBITDA (maximum 3.25x limit) and EBITDA to interest (minimum 4x limit). Certain adjustments are made to the net debt calculations for bank covenant purposes, the most significant of which is to exclude the impact of IFRS 16.

During 2021, Vesuvius recognised a further £3.5m (2020: £1.7m) of income and interest of £1.9m (2020: £1.2m) in relation to further recoveries of overpaid indirect taxes, and interest, by the Brazilian entities within the Group. The amounts recognised do not represent the full amount of income and interest claimed as we do not yet have clarity on the ability of the Group to fully utilise these credits. The amounts recognised have been presented as headline trading profit and finance income given their recurring nature as the original indirect tax expenses were incurred over a prolonged period and partial recovery has taken place in the past two years.

Objective: Think beyond in innovation

KPI: R&D spend

We believe that our market-leading product technology and services deliver fundamental value to our customers and that the primary mechanism to deliver that value is to invest significantly in research and development. In 2021, we spent £30.3m on R&D activities (2020: £26.7m at constant 2021 currency), which represents 1.8% of our revenue (2020: 1.9%).

Financial risk factors

The Group undertakes regular risk reviews and, as a minimum, a full risk assessment process twice a year. As in previous years this included input from the Board in both the assessment of risk and the proposed mitigation. We consider the main financial risks faced by the Group as being those posed by a decline in our end-markets, leading to reduced revenue and profit as well as potential customer default. We also monitor carefully the challenges that come from broader financial uncertainty, which could bring lack of liquidity and market volatility. Important but lesser risk exists in interest rate movements, foreign exchange rate movements and cost inflation, but these are not expected to have a material impact on the business after considering the controls we have in place. See Note 25 to the Group Financial Statements.

Our key mitigation of end-market risk is to manage the Group's exposure through balancing our portfolio of business geographically and to invest in product innovation. We do so through targeted capital investment in new and growing businesses and a combination of capital and human resource in emerging markets. When considering other financial risks, we mitigate liquidity concerns by financing, using both the bank and private placement markets. The Group also seeks to avoid a concentration of debt maturities in any one period to spread its refinancing risk. Following the refinancing of the Group's syndicated bank facility on 5 July 2021, our liquidity stood at £455.7m at 31 December 2021. We define liquidity as undrawn committed debt facilities plus our cash on balance sheet, less the cash in China which is used as collateral against an equivalent loan from Standard Chartered.

Restructuring

In 2021, we benefited from £4.1m of restructuring savings related to a full period impact of actions taken during 2020. During the year, we reported nil restructuring costs (2020: £6.1m) within separately reported items. We are carrying forward a restructuring provision of £5.0m.

Vacant site remediation

The Group owns a number of disused properties in the US, which do not form part of our trading operations. In 2020, costs of £10.3m (2021: nil) were incurred at one of these sites to address the significant increase in the volume of water run-off occurring in recent years. We engaged waste management specialists and have taken action to reduce the level of water. We are in contact with the relevant regulatory authorities and are currently implementing remediation solutions, including installation of a treatment facility. These non-recurring costs were treated as a separately reported item in 2020. There was no impact upon headline performance.

Taxation

A key measure of tax performance is the Headline Effective Tax Rate (ETR), which is calculated on the income tax associated with headline performance, divided by the headline profit before tax and before the Group's share of post-tax profit of joint ventures. The Group's headline ETR, based on the income tax costs associated with headline performance of £35.9m (2020: £24.4m), was 26.4% (2020: 26.9%).

The Group's total income tax costs for the period include a credit on separately reported items of £16.2m (2020: £5.7m) which primarily relates to a credit of £16.0m (2020: £nil) following the recognition of certain US deferred tax assets.

A tax credit reflected in the Group Statement of Comprehensive Income in the year amounted to £13.0m (2020: £3.2m debit) which primarily comprises a £12.5m credit (2020: £2.8m debit) in respect of tax on net actuarial gains and losses on employee benefits, inclusive of the buy-in of the UK pension scheme and the restatement of UK deferred tax from 19% to 25%.

We expect the Group's headline effective tax rate on headline profit before tax and before the share of post-tax profits from joint ventures to be between 27% and 28% in 2022.

Capital expenditure

Capital expenditure in 2021 was £67.4m (2020: £59.0m) of which £47.2m was in the Steel Division (2020: £45.9m) and £20.2m in the Foundry Division (2020: £13.1m). Capital expenditure on revenue-generating customer installation assets, primarily in Steel, was £5.7m (2020: £8.7m).

Pensions

The Group has a limited number of historical defined benefit plans located mainly in the UK, USA, Germany and Belgium. The main plans in the UK and USA are largely closed to further benefits accrual and all of the liabilities in the UK have now been insured following a buy-in agreement with Pension Insurance Corporation plc (PIC) during December 2021. The Group's net pension liability at 31 December 2021 was £77.0m (2020: £2.1m liability).

The increase in the liability and resulting charge of £80m through other comprehensive income, is largely due to the reduction of the surplus for the UK Plan following the pension insurance buy-in agreement with PIC. This final buy-in agreement secures an insurance asset from PIC that matches the remaining pension liabilities of the UK Plan, with the result that the Company no longer bears any investment, longevity, interest rate or inflation risks in respect of the UK Plan. This increase in liability has been partially offset by an increase in bond yields resulting in a reduction in the value of German and US liabilities.

Corporate activity

In December 2021, the Group acquired the assets and substantially all of the liabilities of Universal Refractories, Inc. ("Universal"), a specialty refractory producer based in Pennsylvania, USA, which is focused on tundish (steel continuous casting) applications as well as consumable products for the foundry industry.

Universal's unaudited revenue and EBITDA in the trailing 12 months to October were US$40.5m and US$8.6m, respectively. The acquisition will generate attractive synergies and will be accretive to Group Returns on Sale even before synergies are considered.

The transaction valued Universal at US$57.1 million (£42.6 million) on a cash and debt free basis and was funded from Vesuvius' internal resources.

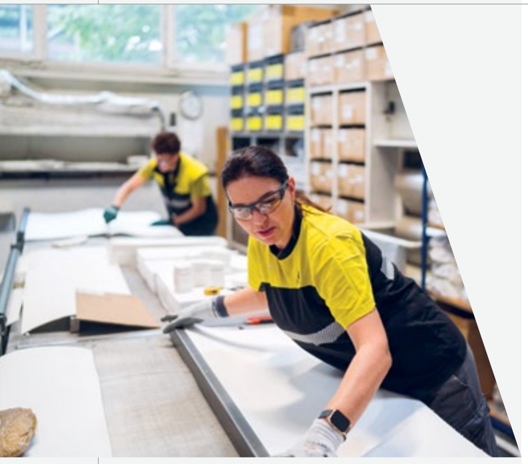
The Group expects the acquisition to be highly synergistic. The acquisition significantly expands Vesuvius' North American presence among electric arc furnace steel producers in the Group's focus area of steel tundish applications, while also further strengthening the Foundry business.

In the period since acquisition, Universal has contributed £2.1m to revenue and £(0.2)m to operating profit. In accordance with IFRS3, the acquired inventory was revalued to fair value less costs to sell, resulting in a reduction to operating profit of £0.6m.

Guy Young
Chief Financial Officer
3 March 2022

Operating reviews

Vesuvius comprises two Divisions, Steel and Foundry. The Steel Division operates as three business lines: Steel Flow Control, Steel Advanced Refractories, and Steel Sensors & Probes.



Steel Division

Revenue
£m
£1,171.5m

Trading profit
£m
£102.0m

Steel production in the world excluding China and Iran, which accounts for approximately 90% of Vesuvius' sales, increased by 13% year-on-year with all geographies recording positive volume growth. Production growth was especially strong in India (+18%), South America (+18%) and NAFTA (+17%).

Vesuvius' Steel Division reported revenues of £1,171.5m in 2021, an increase of 12% compared with 2020. On an underlying basis, Steel Division revenue was up 17%, with particularly strong performance in the growing markets of South America, India, Vietnam and EEMEA (EMEA excluding EU 27+UK), where we grew 55%, 34%, 32% and 18%, respectively.

Flow Control strongly outperformed the steel market in all regions, with underlying sales growth of 21.5% (3.5% price impact), versus global steel production growth of 13% (excluding China and Iran). In Advanced Refractories, we prioritised prices over volumes.

As a whole, Steel Division revenues incorporate a moderate average positive price impact in 2021, as price increases were progressively implemented during the year to compensate for inflation in raw materials and freight costs.

Steel Division trading profit improved 34% to £102.0m, with return on sales expanding 140bps to 8.7%. Raw material and freight inflation were fully compensated for by year-end in both Flow Control and Advanced Refractories.

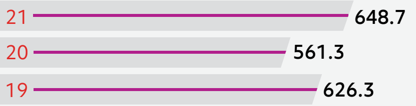
Steel Division	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Steel Flow Control revenue	**648.7**	561.3	15.6%	21.5%
Steel Advanced Refractories revenue	**489.1**	458.6	6.7%	11.0%
Steel Sensors & Probes revenue	**33.7**	25.5	32.0%	42.7%
Total Steel revenue	**1,171.5**	1,045.4	12.1%	17.4%
Total Steel trading profit	**102.0**	76.4	33.6%	41.6%
Total Steel Return on Sales	**8.7%**	7.3%	140 bps	150 bps

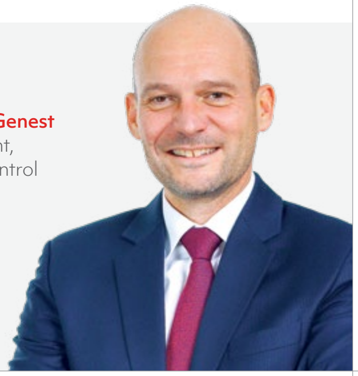
Crude steel production year-on-year change	2021/2020	2021/2019
China	**-3.0%**	3.1%
India	**17.8%**	6.1%
NAFTA	**16.6%**	-1.6%
South America	**17.9%**	9.3%
EMEA ex Iran	**11.8%**	4.2%
EEMEA ex Iran	**9.2%**	6.6%
EU 27+UK	**14.8%**	1.6%
World	**3.7%**	5.6%
World ex China & Iran	**13.0%**	8.5%

Source: World Steel Association (month-to-date totals may include revised data not available on a monthly basis).

Steel Flow Control

Revenue
£m
£648.7m





Pascal Genest
President,
Flow Control

The Flow Control business unit supplies the global steel industry with consumable ceramic products, systems, robotics, digital services and technical services. These products are used to contain, control and monitor the flow of molten steel in the continuous casting process. The consumable ceramic products that Vesuvius supplies have a short service life (often a matter of a few hours) due to the significant wear caused by the extremely demanding environment in which they are used. These products must withstand extreme temperature changes, whilst resisting liquid steel and slag corrosion. In addition, the ceramic parts in contact with the liquid steel must not in any way contaminate it. The quality, reliability and consistency of these products and the associated robotic solutions and digital services we provide are therefore critical to the quality of the finished metal being produced and the productivity, profitability and safety of our customers' processes.

In 2021, underlying revenues in the Group's Steel Flow Control business increased by 21.5% year-on-year to £648.7m, driven by strong market recovery and market share gains in all regions.

In EMEA excluding Iran, revenues grew 26% compared to 2020 on an underlying basis, versus steel production growth of 12%. This outperformance was broad-based, with revenue growth exceeding 20% in both the EU 27+UK and EEMEA (EMEA excluding EU 27+UK).

In the Americas, underlying revenues grew 29%, outperforming steel production growth of 17%. This outperformance was mostly driven by revenue growth of 47% in South America, while revenue growth of 23% in NAFTA also outperformed steel production.

In Asia-Pacific, revenues grew 9% on an underlying basis, versus steel production growth of 1%. Revenues in Vietnam, India and China grew 38%, 31% and 7%, respectively, versus steel production growth of 18%, 18% and -3%.

Steel Flow Control revenue	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Americas	**217.0**	182.9	18.7%	28.8%
Europe, Middle East & Africa (EMEA)	**247.7**	204.7	21.0%	26.2%
Asia-Pacific	**184.0**	173.7	6.0%	8.7%
Total Steel Flow Control revenue	**648.7**	561.3	15.6%	21.5%

Strategic highlights from the year

In 2021, we announced a £28m capacity expansion, to be operational from late 2022, to support future organic growth and market share gains. At our Skawina, Poland plant, we will increase EMEA capacity in VISO* products by 35% and ladle slide-gates by 100%. This is intended to serve EMEA, and in particular fast-growing markets in EEMEA. At our Kolkata, India plant, we will increase capacity in VISO* products by 50%, to serve the fast-growing markets of both India and South East Asia.

We launched nine new products during 2021. Among them, the Air-Shield* technology, a technology that creates a better seal between the two plates of our ladle slide-gate mechanism to increase both the yield and quality of steel produced.

We launched a new Composite Design Technology (CDT) solution, the Surface Layer CDT, which allows us to offer high-performing products with a greater flexibility in design, while also enabling a greater use of recycled materials.

A new generation of tundish shroud was also launched, allowing our customers to improve their productivity, whilst also reducing usage of other consumables, resulting in positive sustainability benefits.

In terms of mechatronics, we continue to develop additional features for our robotic offering, helping customers to reduce the exposure of their operators.

Looking forward

The successful completion of the expansion projects at Skawina and Kolkata will be a key focus in the coming year, with the target that the expanded capacity will be operational from late 2022. This expansion will support our market share gains objectives from 2023.

We will also continue our efforts to develop products with superior sustainability characteristics, to help our customers drive efficiency and reduce their environmental footprint.

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Steel Advanced Refractories

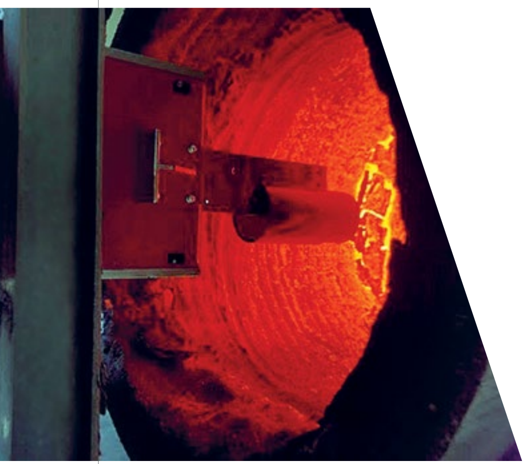
Revenue
£m

£489.1m

21 489.1
20 458.6
19 539.8

Thiago Avelar
President,
Advanced
Refractories

The Steel Advanced Refractories business unit supplies complete value-added solutions to its customers including specialist refractory materials and advanced installation technologies which harness mechatronic solutions, computational fluid dynamics capabilities and lasers. The specialist refractory materials are subject to extreme temperatures, corrosion and abrasion, they are in the form of powder mixes, which are spray-applied or cast onto the vessel to be lined ('monolithics') and refractory shapes (e.g. bricks, pads, dams and other larger precast shapes). The service life of the products that Advanced Refractories supplies into the steel-making process can vary (some a matter of hours and others for a period of years) based upon the type of refractory and the level of wear caused by the demanding environment in which they are used. An integral part of our success depends on our best-in-class installation technologies which improve the consistency and performance of installed Vesuvius refractories, as well as the high level of collaboration with our customers.



Steel Advanced Refractories reported revenues of £489.1m in 2021, an increase of 11% on an underlying basis. In a number of markets our growth lagged steel production increases, as priority was given to price increases over volumes, resulting in a temporary loss of market share.

On an underlying basis, revenues grew 13% in the Americas, with strong outperformance in South America, which grew 68% versus steel production growth of 18%.

In EMEA excluding Iran, revenues grew by only 3% during the period as we continued to exit unprofitable contracts and also led price increases during the first half of the year in product lines that were impacted by higher raw material costs.

In Asia-Pacific, revenues grew 21% on an underlying basis driven by strong outperformance in India (+36%), Vietnam (+30%) and China (+13%).

Volumes in H2 were negatively impacted in NAFTA as we had to declare force majeure as a result of disruptions to raw material supply brought on by Hurricane Ida in the US. Alternative raw material supply and logistics support was obtained and no customer suffered interruption as a result.

Steel Advanced Refractories revenue	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Americas	**165.3**	153.0	8.0%	13.4%
Europe, Middle East & Africa (EMEA)	**187.7**	187.8	-0.1%	3.1%
Asia-Pacific	**136.1**	117.9	15.5%	20.6%
Total Steel Advanced Refractories revenue	**489.1**	458.6	6.7%	11.0%

Strategic highlights from the year

In December 2021, we acquired the assets and substantially all of the liabilities of Universal Refractories, Inc., a specialty refractory producer based in Pennsylvania, USA, which is focused on tundish (steel continuous casting) applications as well as consumable products for the foundry industry. Universal is a strategically important acquisition for Advanced Refractories, which reinforces our core tundish business and expands our North American presence among electric arc furnace (EAF) steel producers.

We made significant progress with the roll-out of our mechatronics products and services across key regions. In Asia, we commissioned a New Generation of Tundish SMART Robots (Next Gen TSR*). We continue to gain traction in marketing our Gunning Robot combined with our leading laser scanner technology in North America (EAF) and Europe.

In 2021, we introduced five new value-added products, including MgO-carbon bricks with an enhanced binder system for better heat-life and new Tundish Spray technology, increasing our customers' productivity and reducing their energy costs and CO_2 emissions.

Looking forward to 2022

In January 2022, we commissioned our new mechatronic Centre of Excellence in Ghlin, Belgium. Our differentiated technology is at the core of our strategy as we continue to develop combined robotic and laser technologies that further enhance the efficiency of our high-performance refractory products.

Integrating Universal into our NAFTA manufacturing footprint will be a key project during the course of 2022.

In R&D, we will increase the focus on delivering new products that improve our customers' environmental footprint.

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Steel Sensors & Probes

Revenue
£m

£33.7m

21 33.7
20 25.5
19 29.52

Davide Guarnieri
Director,
Sensors & Probes

The Steel Sensors & Probes business unit offers products to our customers to enable them to make their underlying processes more efficient and reliable. The business unit focuses on providing a range of products that enhance the control and monitoring of our customers' production processes, complementing Vesuvius' strong presence and expertise in molten metal engineering. This aims to create new technologies that can be integrated into expert process management systems. These products include temperature sensors, oxygen, hydrogen and sublance probes, iron oxide and metal sampling for the steel, aluminium and foundry industries.

By using these technologies, customers can focus on critical parameters within their processes, enabling them to refine their production methods to improve quality, lower production costs and maximise efficiency.

Revenues in Steel Sensors & Probes were £33.7m in 2021, representing an underlying increase of 43% year-on-year. The strong performance in the Americas was driven by new customer wins, especially in South America. In EMEA, we also performed well and continued to gain traction.

Steel Sensors & Probes revenue	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Americas	**23.2**	16.4	41.1%	56.3%
Europe, Middle East & Africa (EMEA)	**10.1**	8.9	13.6%	17.8%
Asia-Pacific	**0.4**	0.2	109.1%	116.5%
Total Steel Sensors & Probes revenue	**33.7**	25.5	32.0%	42.7%

Looking forward to 2022

In 2022, we will continue to execute our revenue growth strategy. In particular, our new facility in Mexico will increase our service level and operational efficiency in the NAFTA market. A reinforced structure in Asia will drive growth in this important region. We will continue to invest in new products and seek to integrate them with robotic solutions to bring greater safety and both operational and sustainability efficiencies to our customers.

Foundry Division

Revenue
£m

£471.4m

Trading profit
£m

£40.4m

The Foundry Division is a world leader in the supply of consumable products, technical advice and application support to the global foundry industry to improve the performance and quality of ferrous and non-ferrous castings. Vesuvius operates under the brand FOSECO in the foundry market.

The foundry process is highly sequential and is critically dependent on consistency of product quality and productivity optimisation. Working alongside customers at their sites, our engineers provide on-site technical expertise in addition to advanced computational fluid dynamics capabilities to develop the best customised solutions. The conditioning of molten metal, the nature of the mould used and, especially, the design of the way metal flows into the mould are key parameters in a foundry, determining both the quality of the finished castings and the labour, energy and metal usage efficiency of the foundry. Vesuvius' products and associated services to foundries improve all of these parameters.

Foundry Division	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Foundry revenue	**471.4**	412.9	14.2%	19.9%
Foundry trading profit	**40.4**	25.0	61.2%	78.7%
Foundry Return on Sales	**8.6%**	6.1%	250 bps	280 bps

Foundry revenue	2021 (£m)	2020 (£m)	Change (%)	Underlying change (%)
Americas	**100.4**	85.6	17.4%	27.1%
Europe, Middle East & Africa (EMEA)	**199.3**	177.0	12.6%	17.3%
Asia-Pacific	**171.7**	150.3	14.2%	19.1%
Total Foundry revenue	**471.4**	412.9	14.2%	19.9%

Non-automotive Foundry end-markets across all regions saw significant growth in 2021, with production in the mining & construction and general engineering end-markets up 19% and 13%, respectively, according to Oxford Economics data. This was in contrast to global production of light vehicles and medium & heavy commercial vehicles which remained weak with growth of only 2% and 0.5%, respectively, according to IHS data. The disappointing automotive markets (representing c.36% of Foundry Division sales) reflect the persistent global shortage of semi-conductors, which constrained the ability of OEMs to ramp-up production.

Compared to 2019, mining & construction and general engineering are both up 12%, while global light vehicle production is down 14% and medium & heavy commercial vehicles is down 4%.

Vesuvius' Foundry Division reported revenues of £471.4m in 2021, an increase of 14% compared to 2020. On an underlying basis, Foundry Division revenue was up 20%.

The Foundry Division also achieved meaningful margin recovery, with trading profit growing 79% on an underlying basis to £40.4m, as Return on Sales increased 250bps to 8.6% in 2021. Profitability was impacted by the time lag we experienced between cost increases and selling price rises, although this was successfully eliminated by year-end.

In H2 our volumes were negatively impacted as automotive production slowed further. In addition, we experienced operational issues at two important plants in Germany and the USA. Both these factors are temporary in nature and are expected to be eliminated during 2022.

Foundry revenues in the Americas grew 27% year-on-year on an underlying basis, driven by 15% growth in NAFTA, and very strong performance in South America, which was up 68%.

In EMEA, underlying revenues increased by 17%, with EEMEA (EMEA excluding EU 27+UK) growing at 18%.

In Asia-Pacific, we benefited from continued strong performance in China, where revenues grew 12% and India where revenues grew 36%.

Revenue
£m

£471.4m

21	471.4
20	412.9
19	515.1

Karena Cancilleri
President, Foundry

Strategic highlights from the year

In 2021, the Foundry Division launched a number of important new products which delivered both product performance improvements as well as sustainability performance improvements for our customers.

The new FEEDEX* FEF sleeve range supports foundries in reducing harmful emissions and hazardous waste while maintaining high thermal and feeding performance. We launched the STELEX* Pureflow filter, a filter for small castings which improves the metal purity for highly demanding casting applications, such as automotive turbochargers. We also launched the SEMCO* formaldehyde-free coating, which helps our customers reduce emissions of harmful substances generated in the casting process.

The Foundry Division continued to focus on digitisation, developing simulation tools to provide further thermal and physical data modelling to optimise casting quality. We also launched an app for our leading aluminium melt treatment equipment and implemented a digital product selection tool, to assist our application engineers.

Looking forward

We expect 2022 to be a record year in terms of new product launches, as a result of our extensive new product development efforts to support the manufacture of lighter-weight, high-performance metals and components. We are focusing on developing products for high growth end markets such as wind turbines, turbo-chargers and electric vehicles. We will further complement our new product development with simulation and equipment solutions to create a complete offering to respond to increasingly complex technical customer requirements. The technical work will be further supported through several meaningful external research partnerships, several of which were initiated in 2021.

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Sustainability

We think beyond today's customer expectations

and shape the future through application expertise

Introduction: Towards a better tomorrow

Progress on our sustainability roadmap

Alexander Laugier-Werth
VP Sustainability, HSE & Quality

Non-financial information statement

This non-financial information statement provides information on the Group's activities and policies in respect of:

The statement also details, where relevant, the due diligence processes implemented by the Company in pursuance of these policies.

Further information, disclosed in other sections of the Strategic Report, is incorporated into this statement by reference, including:

We believe that we can create more value for our customers, our shareholders and our employees by embedding sustainability in all aspects of our business and strategy. Our long-term success is tightly bound to our sustainability initiative, with its primary focus on helping our customers improve their operational performance to enable them to deliver on their own sustainability agenda. At the same time we seek to benefit the communities in which we operate and develop our people to build diverse, engaged and high-performing teams to promote our work.

We launched our formal Sustainability strategy at the end of 2020 to bring together all our environmental, social and governance initiatives into one coordinated programme. We developed a new governance structure to support our objectives and a new set of targets to direct our efforts. The strategy was built on four pillars: our planet, our customers, our people and our communities, identifying ten key areas of focus across these pillars.

In 2021, despite the difficulties created by the COVID-19 pandemic and the operational challenges facing the business, we continued to deliver on our commitments. The progress shown in our key performance indicators illustrates the engagement of our teams around the world.

Key initiatives launched in 2021 included:

- Further embedding sustainability into the Group and business unit strategic plans, via a more detailed analysis of the risks and opportunities presented by climate change and the evaluation of three long-term scenarios
- Building a methodology and tools to evaluate CO_2 emissions avoided at customers by using our products
- Building a scorecard and assessing the sustainability performance of our existing products and new product pipeline
- Launching our Sustainable Procurement Policy and Supplier Assessment programme

Areas of focus

- Reducing Scope 1 and 2 emissions, measuring Scope 3 emissions and creating action plans to minimise these
- Determining CO_2 emissions avoided by customers, and creating further action plans to maximise this
- Switching to carbon-free electricity on our sites wherever possible
- Assessing new product developments and technologies based on their safety and environmental benefits
- Supporting education for women in scientific fields
- Increasing gender diversity in the Group Executive Committee and top management
- Increasing employee engagement
- Undertaking environmental impact analysis of capital expenditure; with the internal price of CO_2 emissions reviewed every year
- Seeking ISO 14001 certification of manufacturing sites
- Undertaking sustainability assessments of suppliers

During the year we were very pleased to see our efforts and progress recognised externally. In particular, our MSCI rating progressed from BBB to A, and our EcoVadis rating progressed from Silver to Gold. Vesuvius was also honoured to be included in the *Financial Times*' European Climate Leaders list.

In December 2021, Vesuvius completed the acquisition of the assets and business of US-based Universal Refractories, Inc. ("Universal"). In 2022, we will integrate these operations into our sustainability programme. All statements and figures in this Sustainability section therefore do not include the Universal business.

2022 will be dedicated to consolidating and strengthening our sustainability plans. We will continue educating and engaging our employees at every level, detailing and implementing action plans to progress our strategy. Emphasis will be placed on further defining our roadmap to net zero and developing the support we provide to our customers in their own sustainability journey.

The content of the Sustainability section is primarily based on our materiality analysis, feedback from our internal and external stakeholders, and requirements of the UN Global Compact. We are committed to transparent and thorough reporting on our sustainability performance. We would welcome any input or feedback to: sustainability@vesuvius.com.

Alexander Laugier-Werth
VP Sustainability, HSE & Quality

Our Sustainability strategy and objectives

Creating a better tomorrow for our planet, our customers, our people and our communities

We create innovative solutions that enable our customers to reduce their manufacturing costs, improve quality and safety performance, and help them to become more efficient in their processes.

We aim to deliver sustainable, profitable growth to provide our shareholders with a superior return on their investment, whilst providing our employees with a safe workplace where they are recognised, developed and properly rewarded.

Our Sustainability initiative embodies this purpose. It sets out the Group's formal objectives and targets for supporting our customers, our employees and our communities, and for protecting our planet for future generations. It is embedded in the Group's overall strategy and informs how we deliver on the Group's Execution Priorities.

The key objectives and priorities of our Sustainability initiative are outlined here.

They were defined following the identification and analysis of the Group's most important and material sustainability risks and opportunities.

Our planet

- To tackle climate change by reducing our CO_2 emissions and help our customers reduce theirs with our products and services. We are committed to reaching a net zero carbon footprint at the latest by 2050.
- To engage in the circular economy by reducing our waste, recovering more of our products after they have been used and increasing the usage of recycled materials.

P60

Our customers

- To support our customers' efforts to improve safety on the shop floor, especially exposure to hot metal.
- To help customers improve their operational performance and thereby reduce their environmental footprint, and especially their CO_2 emissions.

P78

Our people

- To ensure the safety of our people and everyone else who accesses our sites. This is our first priority. We take safety very seriously and are constantly striving to improve.
- To offer growth opportunities to all our employees through training and career progression to develop diverse, engaged and high-performing teams.

P82

Our communities

- To support the communities in which we operate, with a focus on promoting and supporting women's education in scientific fields.
- To ensure ethical business conduct both internally and with our trading partners.
- To extend our sustainability commitment to our suppliers and encourage them to progress.

P97

Our sustainability targets

The Board has identified eleven significant non-financial KPIs for the business. For nine of these we have set stretching targets for the Group to reach within set timeframes, which are set out below. The table below illustrates how achieving each target will contribute to achieving our objectives.

KPI	Measure	Target	2021 progress vs 2019	Our planet	Our customers	Our people	Our communities	UN Sustainable Development Goals
Safety	Lost Time Injury Frequency Rate below 1	<1	1.06		✓	✓	✓	3, 8
Energy consumption	By 2025, reduce energy consumption per metric tonne of product packed for shipment (vs 2019)	-10%	-9.0%	✓				9, 13
Energy CO_2e emissions	By 2025, reduce (Scope 1 and Scope 2) energy CO_2e emissions per metric tonne of product packed for shipment (vs 2019)	-10%	-16.5%	✓				9, 12, 13
Wastewater	By 2025, reduce wastewater per metric tonne of product packed for shipment (vs 2019)	-25%	-2.8%	✓			✓	6, 9, 12
Solid waste	By 2025, reduce solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment (vs 2019)	-25%	-21.8%	✓			✓	9, 12
Recycled material	By 2025, increase the proportion of recycled materials from external sources used in production	7%	6.2%	✓	✓			9, 12
Gender diversity	By 2025, increase female representation in the top management (GEC plus their key direct reports[1])	30%	21%			✓	✓	5
Compliance training	Increase the percentage of targeted staff who complete anti-bribery and corruption training annually	90%	100%			✓	✓	16
Supply chain	By the end of 2023, conduct sustainability assessments of suppliers covering at least 50% of Group spend	50%	52%	✓			✓	8, 10, 17

1. The Board has resolved to expand the Group to which the gender diversity target applies for 2022, to focus on the Senior Leadership Group of the Company which comprises c. 160 individuals.

United Nations Global Compact

In October 2020, Vesuvius became a signatory to the United Nations Global Compact. We have committed to base our business approach on its ten Principles on human rights, labour, environment, and anti-corruption, and to engage in activities which advance the development of the UN Sustainable Development Goals (SDGs).

Communication on progress

Vesuvius reports annually on its sustainability activities, commitments and progress in the Annual Report and also in a separate Sustainability Report published each year.

This covers the environmental, social and governance issues defined in the four dimensions of the Group's Sustainability Charter: Our Planet, Our Customers, Our People, Our Communities. In particular, we include updates on key performance indicators and progress against targets.

Human rights

Principle 1 Businesses should support and respect the protection of internationally proclaimed human rights within the scope of their influence

Principle 2 Businesses should make sure that they are not complicit in human rights abuse

Labour standards

Principle 3 Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining

Principle 4 Businesses should uphold the elimination of all forms of forced and compulsory labour

Principle 5 Businesses should uphold the abolition of child labour

Principle 6 Businesses should uphold the elimination of discrimination in respect of employment and occupation

Environment

Principle 7 Businesses should support a precautionary approach to environmental challenges

Principle 8 Businesses should undertake initiatives to promote greater environmental responsibility

Principle 9 Businesses should encourage the development and diffusion of environmentally friendly technologies

Anti-corruption

Principle 10 Businesses should work against corruption in all its forms, including extortion and bribery

Sustainable Development Goals

Vesuvius has identified the practices within its operations that can directly or indirectly contribute to the SDGs. We will focus our efforts on the following seven SDGs – four priority goals and three supporting goals – which are particularly relevant to our business and where we believe we can make the most meaningful contribution.

Priority SDGs

8 DECENT WORK AND ECONOMIC GROWTH – Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

12 RESPONSIBLE CONSUMPTION AND PRODUCTION – Ensure sustainable consumption and production patterns

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE – Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

13 CLIMATE ACTION – Take urgent action to combat climate change and its impacts

Supporting SDGs

3 GOOD HEALTH AND WELL-BEING – Ensure healthy lives and promote well-being for all at all ages

6 CLEAN WATER AND SANITATION – Ensure availability and sustainable management of water and sanitation for all

5 GENDER EQUALITY – Achieve gender equality and empower all women and girls

Our principles, approach and governance

Vesuvius is a geographically and culturally diverse group, employing more than 11,000 people in 40 countries.

Our geographical diversity places us close to our customers around the globe. It also highlights the importance of maintaining and applying strong and consistent values and ethical principles in our worldwide approach to business. Our employees' engagement with our Values and culture is vital to our success and the sustainable delivery of the Group's strategy.

Vesuvius has established a framework for explaining and embedding the culture and principles we consider to be fundamental to our success. To do this we communicate openly and transparently within the organisation, through 'town hall' meetings, senior management visits, management feedback, performance evaluation, measuring staff engagement and responding to the feedback we receive. Critically, there is ongoing and consistent communication of our CORE Values and the principles of our Code of Conduct. This is underpinned by engaging staff across the Group in both general and targeted training, to ensure a consistent understanding of our policies and procedures.

This transparency of communication also extends to our stakeholders. We want to increase the knowledge and understanding of our stakeholders, through internal and external reporting and transparent and meaningful disclosure. Our Sustainability Report is a key part of this.

Our CORE Values

The Group's CORE Values – Courage, Ownership, Respect and Energy – are actively supporting the Group's priorities, encouraging consistent behaviours across the Group to sustain our business success in the future.

These Values, and the behaviours underpinning them, convey the mindset and attitudes we expect each employee to show every day. They are at the heart of the culture of the Group, promoting our image to external stakeholders, and underpinning the commercial promise we provide to our customers. The Values are reinforced through our performance management systems and are celebrated each year through our Living the Values Awards which select regional and global winners for each Value.

At each of our sites we display CORE Values posters in local languages and use tools such as screen savers as a constant reminder of the behaviours our people display.

Code of Conduct

Our Code of Conduct sets out the standards of conduct expected, without exception, of everyone who works for Vesuvius in any of our worldwide operations.

The Code of Conduct emphasises our commitment to ethics and compliance with the law, and covers every aspect of our approach to business, from the way that we engage with customers, employees, the markets and other stakeholders, to the safety of our employees and workplaces.

Everyone within Vesuvius is individually accountable for upholding its requirements. We recognise that lasting business success is measured not only in our financial performance, but in the way we deal with our customers, business associates, employees, investors and local communities.

The Code of Conduct is displayed prominently at all our sites and is published in our 29 major functional languages. It is available to view at: www.vesuvius.com.

We continue to enhance the policies that underpin the principles set out in the Code of Conduct. These assist employees to comply with our ethical standards and the legal requirements of the jurisdictions in which we conduct our business. They also give practical guidance on how this can be achieved.

CORE Values

C ourage

- I systematically say, decide and do what is right for Vesuvius including when it is difficult, unpopular, or not consensual
- I express my opinions openly during discussions, but I also defend Group decisions once they've been taken, even if they do not correspond to my initial position
- I proactively take leadership responsibility on difficult projects and topics that are important to the Group's performance, motivated by the perspective of success rather than paralysed by the risk of personal failure

O wnership

- I am personally accountable for the consequences of my actions and for the performance of the Group in my area of responsibility or oversight, without blaming external circumstances or the actions of others
- I demonstrate an entrepreneurial spirit, looking for and seizing business opportunities and I immediately address problems that come up as soon as I become aware of them
- I manage the Group's money and resources as though they were my own

R espect

- I demonstrate respect for other people's ideas and opinions even if I disagree with them
- I welcome open debate
- I listen to others, foster esteem and fairness with customers, suppliers, co-workers, shareholders and the communities where we operate
- I communicate my objectives clearly and take time to explain all decisions. I behave with the highest level of integrity
- I promote diversity at all levels of the Company

E nergy

- I work hard and professionally in pursuit of excellence
- I constantly raise the bar and challenge the status quo. For me, the sky is the limit
- I lead by example, inspiring and motivating my team to go the extra mile. I promote a positive and energising work environment. I continuously deliver outstanding customer experience and innovative solutions
- I never underestimate competitors and permanently strive to reinforce the Group's leadership position

Code of Conduct

The Code covers:

- Health, safety and the environment
- Trading, customers, products and services
- Anti-bribery and corruption
- Employees and human rights
- Disclosure and investors
- Government, society and local communities
- Conflicts of interest
- Competitors

Vesuvius materiality assessment

Our Sustainability initiative focuses on our most significant sustainability issues and opportunities. These are defined by our ongoing materiality assessment, which identifies and prioritises issues based on two criteria: the impact or likely impact on the achievement of Vesuvius' Strategic Objectives; and the impact or potential impact on Vesuvius' stakeholders and their interests. Our materiality assessment is informed by our risk management processes, which not only consider immediate risks to the Group, but also longer-term emerging macro trends such as the electrification of light vehicles, accelerating growth in demand for renewable energies, technological developments in iron and steel making and policy changes impacting the cost of CO_2 emissions, all of which could profoundly affect our markets.

This report has been prepared in accordance with the GRI Standards: Core option.

In preparing our assessment, and developing our Sustainability initiative, we engage with various stakeholders, formally and informally. Details of these engagements and the parties involved are described in our s172 disclosures on pages 22 to 28. We undertake regular surveys of Vesuvius' operational teams to collect data on management approaches, systems, and performance relating to environmental, safety, and human resource management.

The Board of Directors formally reviews all significant sustainability programmes and signs off the content of all sustainability reporting disclosures. Our Sustainability Council and VP Sustainability ensure that we have a clear set of KPIs and targets to track the Group's progress.

Material sustainability topics

The material topics have been validated as material by the Board; they apply in our own operations and to varying degrees in those of our suppliers. No change in the relative prioritisation of topics was recorded in 2021.

The exclusion of topics from this list does not mean that they are not considered important to Vesuvius or are not being managed, but only that we have chosen not to address them in detail in this report. Where appropriate we have incorporated some commentary on these additional topics into our report. Details of water stress and water consumption, biodiversity, conflict minerals and environmental compliance are all included.

Material topics

Climate change	– energy efficiency – CO_2e emissions – renewable energy – sustainable products
Circular economy	– solid waste – recovered and recycled materials
Protection of the environment	– wastewater – solid waste – environmental management – responsible procurement
Human rights	– modern slavery – gender diversity – employee well-being – responsible procurement
Employee work relationships and conditions	– health and safety – employee representation – engagement and development – values
Communities	– education – business practices – supply chain
Governance	– Code of Conduct – anti-bribery and corruption – privacy and data security – responsible procurement

Materiality assessment process

Step 1	Step 2	Step 3	Step 4	Step 5
– Survey of key internal and external stakeholders – Review of external agency ratings – Benchmark of current policies, targets, reporting practices vs peers and customers – Interviews with senior managers and experts	– Evaluation of current activities and reporting – Selection and definition of a broad set of metrics – Assessment of capabilities – Selection of key KPIs covering the most important objectives	– Identification of metrics and setting of targets by Group Executive Committee – Approval by Board of directors	– Strategy launch with Senior Leadership Group – Constitution of Sustainability Council – Deployment throughout the Group	– Ongoing dialogue with internal and external stakeholders – Building action plans and monitoring progress – Reporting of performance against targets and review of objectives

Task Force on Climate-related Financial Disclosures

The Taskforce on Climate-related Financial Disclosures (TCFD) has developed a disclosure framework to help companies improve and increase the understanding of their reporting of climate-related financial information. We have therefore aligned the reporting of our existing Sustainability initiatives to the risk management and reporting recommendations of the TCFD.

The Board is pleased to confirm that, for the year ended 31 December 2021, the Group's environmental disclosures are reported in a TCFD framework. The table below sets out where you can find information on how we have applied each of the recommendations of the TCFD.

For a number of years we have disclosed the metrics and targets we use to assess and manage relevant climate-related risks and opportunities. The core of our Sustainability initiative remains our commitment to continuing our progress to create a better tomorrow for our planet.

Topic		Disclosure summary	Vesuvius disclosure	
Governance	Disclose the organisation's governance around climate-related risks and opportunities.	**a** Describe the board's oversight of climate-related risks and opportunities.	*Sustainability: TCFD*	p59
			Risk, Viability and Going Concern	p29–33
		b Describe management's role in assessing and managing climate-related risks and opportunities.	*Sustainability: TCFD*	p59
			Risk, Viability and Going Concern	p29–33
Strategy	Disclose the actual and potential impacts of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning where such information is material.	**a** Describe the climate-related risks and opportunities the organisation has identified over the short, medium and long term.	*Sustainability: Our planet*	p60–63
		b Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning.	*Sustainability: Our planet*	p60–77
			Our external environment	p16 and 17
			Sustainability: Our customers	p80 and 81
		c Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	*Sustainability: Our planet*	p64–66
Risk management	Disclose how the organisation identifies, assesses and manages climate-related risks.	**a** Describe the organisation's processes for identifying and assessing climate-related risks.	*Sustainability: Our planet*	p60–63
			Risk, Viability and Going Concern	p29–33
		b Describe the organisation's processes for managing climate-related risks.	*Sustainability: Our planet*	p60–63
			Risk, Viability and Going Concern	p30
		c Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organisation's overall risk management.	*Sustainability: Our planet*	p60–63
			Risk, Viability and Going Concern	p29–33
Metrics and targets	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	**a** Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.	*Sustainability*	p54
		b Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions, and the related risks.	*Sustainability: Our planet*	p68, 69 and 71
		c Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.	*Sustainability: Our planet*	p68–75

Governance structure

Board oversight

The Board holds overall accountability for all matters related to sustainability and the management of all risks and opportunities, including the impact of climate change on the Group. The Group's Audit Committee supports the Board in ensuring climate-related issues are integrated into the Group's risk management process and reviewing the Group's TCFD reporting. As the Executive Director with key responsibility for the delivery of the Group's strategy, our Chief Executive, Patrick André, is ultimately responsible for the Sustainability initiative.

The Board's oversight of the Group's response to climate change is integrated both into its monitoring of the Group's broader Sustainability strategy and initiatives, and its approach to significant capital and other investments. The Board formally discusses sustainability, including reviewing the Group's performance and progress against the targets embedded in our Sustainability initiative, particularly those relating to climate, twice per year. In 2021, the Board undertook a more detailed assessment of the Group's climate-related risks and opportunities, including reviewing an analysis of the Group's physical and transition risks. It also considered the formulation of three different climate-related scenarios constructed to assess the potential financial implications of climate change and assessed the impact of climate-related risks and opportunities on the Group's strategy. Every capital expenditure above £5m requiring Board approval includes a sustainability assessment, which includes climate-related parameters.

The Remuneration Committee supports the Group's Sustainability initiative and climate-change-related objectives, through the alignment of the Group's remuneration strategy. All business unit Presidents and each of the regional business unit Vice Presidents have a part of their annual incentive compensation tied to performance targets on CO_2 emissions reduction. In addition, the Remuneration Committee has determined that commencing in 2022 the Group's Long-term Incentive Plan should also include three ESG measures, focused on a reduction in the Group's Scope 1 & 2 CO_2 emissions, a reduction in the Lost Time Incident Frequency Rate and an improvement in the gender representation in senior management.

Management oversight

In 2020, with the launch of the Group's new Sustainability initiative, a new governance structure was established, comprising a Sustainability Council, supported by the new role of VP Sustainability, and a clear set of KPIs and targets delineated. The Vesuvius Sustainability Council is chaired by the Chief Executive, and comprises the Group Executive Committee, VP Sustainability and regional Vice Presidents from each business unit. It meets on a quarterly basis and oversees the Group's sustainability activity, monitors progress against our targets and assists the Group with identifying and assessing the implications of long-term climate-related risks and opportunities. The Council reports to the Board twice per year. In 2021, it was integral in preparing a complete climate change risk and opportunities assessment for the Group, exploring the potential impact of climate change on business strategy and evaluating the associated financial projections.

Scope 1, 2 and 3 CO_2 and CO_2e emissions

Scope 1 covers direct emissions from owned or controlled sources. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the Company. Scope 3 includes all other indirect emissions that occur in the Company's value chain.

To illustrate the strategic alignment of our sustainability agenda at Vesuvius, as of 1 January 2022, the VP Sustainability reports directly to the Chief Executive.

The VP Sustainability leads the Group's sustainability activities, coordinating the work of the Sustainability Council including the Group's assessment of climate-change risks and opportunities and formulation of climate-related scenarios. He is also responsible for the collation of data to assess the Group's performance against its sustainability targets and KPIs, producing quarterly performance reports and managing Group-wide communications.

Responsibility for the progress of the Group against its sustainability objectives lies with the Group Executive Committee and, operationally, each business unit President. These BU Presidents and the Regional business unit Vice Presidents are also responsible for communicating the sustainability targets inside their organisations and for implementing plans – including overseeing capital allocation and the selection of R&D priorities – to achieve these targets and address the climate-related risks and opportunities.

The VP Sustainability is responsible for overseeing reporting on the Group's sustainability matters and metrics. Formal channels for reporting a range of data points are embedded in the organisation. Escalation mechanisms, routine reviews, and internal controls such as auditing and due diligence are in place to ensure transparency, consistency and completeness of information. For certain topics these are supported by independent third-party verification.

Our planet

Vesuvius takes seriously its responsibility for managing the impact of its operations and its supply chain on the environment. We recognise the finite nature of the majority of natural resources and the obligation we have to preserve the environment for future generations.

Tackling climate change

We are committed to reducing the environmental footprint of both our own and our customers' operations and to growing our engagement in the circular economy by reducing the amount of waste we generate, recovering more of our products after they have been used and increasing the usage of recycled materials.

Supporting policy development

To transition to a low-carbon global economy, Vesuvius supports the call for policymakers to:

- Build a level global playing field, including carbon border adjustments and robust and predictable carbon pricing for companies. This will strengthen incentives to invest in sustainable technologies and to change behaviours
- Develop the necessary energy production and distribution infrastructure to provide access to abundant and affordable clean energy

Reducing our impact

Vesuvius actively participates in measures to tackle climate change by reducing our CO_2 emissions and use of raw materials, and helping our customers reduce their own CO_2 footprint thanks to the use of our products and services. We have set ourselves the goal of reaching a net zero carbon footprint at the latest by 2050. Vesuvius embraces society's expectations for greater transparency around climate change, expressed by initiatives such as the recommendations of the TCFD.

Supporting our customers

According to estimates from the World Steel Association (WSA), on average for 2020, 1.89 metric tonnes of CO_2 were emitted for every tonne of steel produced. The WSA also estimated that the steel industry generates between 7% and 9% of global direct emissions from the use of fossil fuels.

The iron and steel industries are taking action to address the decarbonisation challenge. We want to support them and will work in partnership with them to develop more sustainable solutions. With around 10kg of refractory material required per tonne of steel produced, the careful selection and use of energy-saving refractories can beneficially impact on the net emission of CO_2 in the steel manufacturing process. In the foundry process, the amount of metal melted versus the amount sold as finished castings is the critical factor impacting a foundry's environmental efficiency. Vesuvius continuously works with its customers to increase this metal yield.

Climate-related risks and opportunities

The actions being taken by governments and society around the world to mitigate climate change, and the changes in temperature and weather patterns resulting from it, present both opportunities and risks to Vesuvius. In its broadest context, we believe that the need for climate change initiatives will create ever greater opportunities for the Group to support our customers – to improve their efficiency and reduce their environmental impact. Each year the Group undertakes a robust assessment of the principal risks which could have a material impact on the Group. A number of sustainability risks are recorded in this analysis (see the Risk, Viability and Going Concern section on p29–35). In line with the recommendations of the TCFD, Vesuvius also undertakes a review of the key climate-related opportunities and risks that we foresee impacting the Group over the short, medium and long term.

The completed climate-related risk and opportunity register was reviewed and approved by the Audit Committee in 2021 and the significance of climate-related risks was considered in relation to risks identified in the standard risk management process. Climate-related risks are reviewed every six months as part of the Group's standard risk management process, to ensure the register reflects any material changes in the operating environment and business strategy, and to ensure that the management of climate-related risks is integrated into our overall principal risk management framework.

The business units use the analysis of risks and opportunities to inform their business development priorities and focus their R&D project portfolios. They factor climate change risks and opportunities into their business planning processes assessing the long-term impacts on profitability of both the risks and opportunities.

Sustainability has always been at the heart of Vesuvius' business and the Group's analysis concludes that the opportunities for the Group manifested by the global pressure to mitigate climate change outweigh the risks. Our technology helps our customers improve their process efficiency and their environmental footprint.

We describe the Group's strategy for addressing the climate-related opportunities impacting our business in 'Our external environment' p16 and 17

Then, in more detail, we describe how practically we are maximising those opportunities to help our customers in the 'Our customers' section p80 and 81

Physical risks and business continuity

Thanks to significant restructuring efforts carried out since 2017, Vesuvius now operates in a highly optimised global footprint. Proximity with customers limits transportation and associated CO_2 emissions, ensures higher flexibility and reactivity, and reduces working capital. Yet, a significant amount of redundancy for most product lines remains, providing backup in case of local disruption and ensuring continuity of supply for our customers.

Vesuvius operates in 54 manufacturing sites and six R&D centres of excellence located in 40 countries, and from time to time our operations can be subject to physical damage driven by weather events, such as severe storms and flooding, water shortages or wildfires whose frequency and intensity may be exacerbated by climate change. Such events may also impact the manufacturing capabilities of our customers, our tier 1 and lower tier suppliers and our supply chain logistics.

Vesuvius has undertaken a comprehensive analysis of our sites' susceptibility to physical risks arising from climate change. In 2021, we built a weather event risk map covering our 30 most material manufacturing sites and R&D centres of excellence. Of these, 18 were identified as being high risk for at least one type of weather event (flooding, hailstorm, lightning, storms and tornadoes), and three are located in areas of very high water stress.

We anticipate that the occurrence of adverse weather events will continue to increase and we therefore manage our business to prepare for them and mitigate their impact when they do occur.

As the Group has restructured and concentrated its manufacturing footprint on a reduced number of locations, our strategy to address short-term risks has transitioned from a focus on redundant capacity to improved prevention and risk management. Sites are routinely audited by our insurers and our external risk manager. Their reports are combined with water stress analyses (based on the Aqueduct water risk atlas) covering all our manufacturing sites and R&D centres of excellence, to create our physical risks map.

Local and product line business continuity plans are maintained by our manufacturing sites and are regularly reviewed. Vesuvius sites maintain and exercise emergency plans to deal with such events as part of their normal risk management and business continuity processes. Exercises and drills are organised covering IT disaster recovery, fire, explosion, weather and geophysical events, and our processes are improved based on the lessons learned.

In 2021, a Vesuvius manufacturing site in Malaysia suffered damage from flooding due to an abnormally intense rain storm. This disrupted operations for a few days but sound emergency and business recovery planning meant there was no material impact on the Vesuvius business and assets. Customer operations were unaffected.

Transition risks

We believe that the main climate change transition risks facing the Group relate to:

1. the potential for carbon taxing or emissions rights trading schemes to be introduced or increased, without effective border adjustment mechanisms to accompany them, in Europe and the US but not uniformly elsewhere; and
2. the rapid transition from iron to aluminium for light vehicles castings.

An increase in the cost of carbon emissions would affect our manufacturing costs. We are addressing this through our energy efficiency improvement initiatives and conversion to non-fossil fuels wherever possible.

A very rapid transition from iron to aluminium for light vehicle castings would affect our revenue in the iron castings market. We expect this to be compensated for by increased sales for aluminium castings, and growing sales of products for thin-section automotive component iron castings and turbo-charger castings for hybrid vehicles.

Sites with the highest exposure to weather events

Country	Site	Water stress	Flood–water bodies	Flood–precipitation	Hailstorm	Lightning	Wind–tropical storms	Wind–extra tropical storms	Tornado
China	Anshan	●							
	Changshu		●						
Belgium	Ostend							●	
Italy	Muggio				●				
Netherlands	Hengelo		●						
South Africa	Johannesburg				●	●			
India	Kolkata		●	●			●		
	Mehsana	●							
	Puducherry	●							
	Pune	●							
	Vizag						●	●	
USA	Champaign				●				●
	Charleston		●						●
	Chicago Heights				●				●
	Wurtland					●			
Japan	Toyokawa						●	●	
Taiwan	Ping Tung						●		
Brazil	Piedade				●	●			
	Resende		●	●					
	Sao Paulo				●	●			

Tackling climate change

Climate-related risks and opportunities analysis

Vesuvius considers the key climate-related opportunities and risks that we foresee impacting the Group over the following short, medium and long-term time horizons.

Short term (2025)
Our current strategic plans operate within this timeframe. Most of the intermediate sustainability targets approved by the Board were set with 2025 as a deadline. This horizon encompasses our capital expenditure cycle, allowing time to decide, implement and measure the progress of actions.

Medium term (2035)
This is the most likely horizon for the regulatory frameworks (such as the EU Emissions Trading System and Carbon Border Adjustment Mechanism) currently being defined in many regions to reach their full effect. We anticipate that the major adjustments to customers' footprints and technology investments will be in full swing by then.

Long term (2050)
This deadline has been retained by the United Nations and many policy-making bodies to set decarbonisation goals. Vesuvius is committed to reaching net zero by 2050 at the latest.

Impact categories (trading profit)

We have assessed our risks and opportunities, and sorted them according to the following classification:

Opportunities	Risks
Very high (>£25m)	Catastrophic (>£25m)
Major (£15–25m)	Major (£15–25m)
High (£10–15m)	High (£10–15m)
Moderate (£5–10m)	Moderate (£5–10m)
Minor (£1–5m)	Minor (£1–5m)
Insignificant (£0–1m)	Insignificant (£0–1m)

Opportunities

Opportunity	Description	Impact	Potential annual impact on trading profit in the short, medium and long term: Short term 2025	Medium term 2035	Long term 2050
Products and services					
Ability to diversify business activities	Commercialise refractory solutions for low-CO_2 emitting processes in the production of aluminium to replace carbon-based products	Increased revenue and trading profit	Minor	Minor to moderate	Minor to very high
	Commercialise refractory solutions for hydrogen based Direct Reduction Iron production and steel to replace traditional refractory products		Insignificant	Insignificant to minor	Insignificant to high
Markets					
Access to new markets	Accelerated growth of the wind turbine market	Increased revenue and trading profit	Minor	Minor	Minor to high
	Accelerated growth of the aluminium castings market for electric vehicles and light-weighting		Minor	Minor	Minor to high
	Accelerated growth of ferrous castings for hybrid vehicles (turbo-chargers) and thin-section castings for internal combustion engines		Insignificant to minor	Minor to moderate	Minor to moderate
	Accelerated growth of the high technology steel segment		Minor	Minor to high	High to very high

Risks

Risks	Description	Impact	Mitigating actions being undertaken	Potential annual impact on trading profit in the short, medium and long term: Short term 2025	Medium term 2035	Long term 2050
Physical risks						
Increased frequency and severity of extreme weather events (heatwaves, rain and river flooding, cyclones, snow)	Physical damage to Vesuvius locations and people Business disruption due to natural disaster	Increased cost due to physical damage Reduced revenue from business interruption	Mitigating actions for severe weather events and the associated risks are included in the business continuity plans of plants and property, and insurance is purchased	Minor	Minor	Minor
Transition risks – Policy and legal						
Carbon taxing/ emissions rights trading/border adjustment mechanisms introduced or extended	Increase in manufacturing costs	Increased operating costs (main risk in Europe)	Capex to improve energy efficiency and conversion to non-fossil fuels to eliminate CO_2 emissions. Relocation of manufacturing to reflect movements in customer base	Minor	Insignificant to moderate	Insignificant to high
Transition risks – Market						
Rapid transition from iron to aluminium for light vehicle castings	Reduced volume of internal combustion engine castings and so risk of revenue loss for the Foundry Division	Reduced revenue from shrinking market as some iron castings will disappear or be converted to aluminium (due to conversion to electric vehicles)	In ferrous, push to develop sales of feedex and coatings for thin-section automotive components, and products for turbo-charger casting. Invest in R&D, marketing and sales force	Minor	Moderate to high	Moderate to major
Transition from Blast Furnaces – Blast Oxygen Furnaces converted to Direct Reduction Iron or Electric Arc Furnaces (EAF) for iron and steel making	Share of EAF in total steel production increases	Reduced size of market where Vesuvius is strongest, leading to weaker positions in the steel market	Adjust R&D and product development priorities. Redeploy sales force, focusing on EAF market	Insignificant	Minor to moderate	Minor to moderate

Tackling climate change continued

Scenario analysis

Vesuvius has undertaken scenario analysis to seek to quantify the likely impact of climate change on the business and to test the resilience of the Group's strategy to the changes that lie ahead.

We considered three scenarios, modelling the potential financial impact of 2°C, 3°C and 4°C temperature increases on our business.

Best case scenario

In formulating our scenarios, we took as our 'best case' a 2°C scenario. This was based on the premise that despite the tremendous acceleration of public awareness, regulation, technology development and capital allocation in recent years, we doubt that there is sufficient time for the 1.5°C target to be achieved. We therefore identified our most optimistic scenario as 2°C. Our assumption is that any further acceleration which would allow the planet to get back onto a 1.5°C course would reinforce the main characteristics and accelerate the timeline of our 2°C scenario, without fundamentally changing its features.

From assumptions to strategy

The scenarios take as their starting point the regulatory and macro-economic assumptions underpinned by the International Energy Agency's WEO 2020 Stated Policies Scenario and Sustainable Development Scenario. Supplementing this we have identified, for each scenario, the areas of our business in which changes may occur, such as the evolution of end-markets, customer footprint, pace and breadth of technology transition in iron and steel making, pace of conversion from fossil fuels to clean electricity and hydrogen, and evolution of the aluminium market. We then evaluated the potential magnitude of the risks and opportunities in each scenario. We analysed the implications for Vesuvius and considered our strategic response in terms of our manufacturing and our commercial footprint, our portfolio of products and services, the conversion of our manufacturing processes to clean energy and the prospects for our aluminium casting business. With this approach, the impacts on all key areas of the business were covered (sales, R&D, manufacturing and procurement). The outcomes of the scenario analyses have been taken into account in formulating plans for achieving the Group's strategy.

Three long-term scenarios

4°C warming scenario 'Good intentions hampered by fear of economic war'	3°C warming scenario 'Closed doors'	2°C warming scenario 'Global accord'
Incomplete policy and fiscal packages distort competition, slowing down technology development and leading to geographic shifts in steel supply	Regional/national self-interest drives economic policy, competition wins over cooperation, regulatory framework and technologies evolve differently	High cooperation and commitment to limit emissions facilitates technology development and the transition to a low carbon world

	4°C warming scenario – 'Good intentions hampered by fear of economic war'	3°C warming scenario – 'Closed doors'	2°C warming scenario – 'Global accord'
1 Regulatory and macro-economic environment	The European Union and United States implement carbon pricing mechanisms (taxation or cap on trade), but no Carbon Border Adjustment Mechanism or Tariffs (or insufficient to prevent the transfer of manufacturing away from these regions)	The European Union and United States implement carbon pricing mechanisms (taxation or cap on trade), and Carbon Border Adjustment Mechanisms or Tariffs to protect their industries from delocalisation	All major economies implement carbon pricing mechanisms. The cost of CO_2 increases in all regions at a comparable pace
2 Conversion of power generation from fossil fuels to clean electricity and hydrogen	– Fast growth of non-CO_2 emitting electricity sources (nuclear and renewable) in Europe – The cost of fossil fuels increases significantly in Europe – Coal reduces progressively, but does not disappear. Natural gas continues to grow outside Europe – Hydrogen does not become available on a wide scale and economically competitive until well after 2040	– Fast growth of non-CO_2 emitting energy sources in Europe – The cost of fossil fuels increases significantly in Europe. Coal reduces progressively, but does not disappear, natural gas continues to grow outside Europe – Hydrogen becomes available on a wide scale in the USA and Europe and economically competitive between 2030 and 2040	– Fast growth of non-CO_2 emitting energy sources (nuclear and renewable) in all regions – The cost of fossil fuels increases significantly (taxation), coal as a source of energy disappears, natural gas starts to reduce – Hydrogen becomes available on a wide scale and economically competitive between 2030 and 2040 – Fast electrification of the automotive industry
3 Technology transition – iron and steel making	– The transition in blast furnaces to clean processes (e.g. Direct Reduction Iron (DRI), hydrogen, Carbon Capture Storage (CCS), Carbon Capture Utilisation Storage (CCUS)) does not happen on a large scale – US steel producers convert blast furnaces to DRI and Electric Arc Furnaces (EAF) to benefit from the low cost and high availability of natural gas	– European iron making transitions to clean processes (e.g. hydrogen, DRI, CCS, CCUS). The speed of the transition is dictated by the availability of green hydrogen in large quantities – Some US blast furnaces are converted to hydrogen, others to DRI+EAF – Chinese steel plants convert to clean iron and steel making processes, albeit at a slower pace – Little or no transition outside China, the EU and USA	– Fast transition of iron making to clean processes in all regions; blast furnaces are revamped ahead of their normal schedule – European and Chinese integrated steel making will grow primarily in hydrogen-based iron production, implementing CCS and CCUS technologies as well – DRI + EAF will grow in the US (benefiting from the availability of low cost shale gas) and Europe – Customers also invest to increase the performance of furnaces, including downstream of casting
4 High technology steel market	High technology steel market grows at 0.9% per year	High technology steel market grows at 1.2% per year (light weighting and material efficiency efforts by downstream industries accelerate shift from lower to higher performance grades)	High technology steel market grows at 1.6% per year (light weighting and material efficiency efforts by downstream industries accelerate shift from lower to higher performance grades)
5 Aluminium market	Aluminium market grows at 3% per year	Aluminium market grows at 5% per year (driven by the demand for transportation, construction and packaging) until 2035. It accelerates afterwards as the demand for hybrid vehicles shifts to electric vehicles	Aluminium market grows at 7% per year (driven by the demand for transportation, construction and packaging) until 2035. It accelerates afterwards as the demand for hybrid vehicles shifts to electric vehicles
Potential financial impact by 2035 (profit before tax)	**£-5m to £0**	**£5m to £10m**	**£15m to £20m**

Tackling climate change continued

Key factors impacting Vesuvius' three climate change scenarios

1 Regulatory and macro-economic drivers differentiate our scenarios

Firstly, effective border adjustment mechanisms to accompany carbon taxation, or cap and trade systems in regions with ambitious emissions reduction objectives, will greatly support the implementation of technologies required to decarbonise steel making (including the development of hydrogen as the reducing agent). Conversely, the absence or ineffective implementation of border adjustments would lead to significant delocalisation of the steel industry and a displacement of CO_2 emissions to other countries rather than a significant reduction on a worldwide scale. This shift in our customer footprint would lead to the need to adapt our own manufacturing footprint.

Secondly, public policy will significantly affect the relative cost and availability of non-CO_2 emitting energy sources vs fossil fuels and respective infrastructures. These will greatly influence the pace of deployment of various technologies and industries (electric vehicles, green hydrogen, decarbonised steel making). Infrastructure, construction and other downstream markets will also be incentivised to reduce steel consumption, accelerating the shift towards high technology steel.

Finally, the level of international cooperation to encourage and support less developed economies to engage in the technology transition will also affect our customer manufacturing footprint.

2 The future of steel

All three scenarios assume that the strong connection between world GDP and world steel output will continue as there is no significant substitute for steel. The fight against climate change is expected to have a far-reaching impact on many different industries translating into the accelerated growth of the high-technology steel segment in which Vesuvius has a key presence. For example, solar and wind power plants, where investment is growing fast, are far more steel intensive per kWh of installed capacity than their fossil fuel equivalents. Likewise, hydrogen transportation, another area of rapid growth, also requires considerable amounts of special grades of steel for new pipelines and ships.

3 Technology transition

Our scenarios consider the pace and extent of the technology transition in iron and steel making. The Blast Furnace – Basic Oxygen Furnace (BF-BOF) route for steel making is significantly more CO_2 intensive than the Electric Arc Furnace (EAF) route. However, EAFs cannot currently be used to produce all higher quality steel grades and they rely on the availability of scrap steel (itself a function of the level of economic development). Going forward, quality levels produced by EAFs will continue to improve.

Various technologies to decarbonise the BF-BOF route are being developed, including solutions which seek to capture the carbon as it is emitted and either store or use it, or its replacement, by a combination of Direct Reduction of Iron (DRI) and EAF.

Hydrogen-based DRI associated with EAFs has the potential to be nearly carbon-free if carbon-free electricity and hydrogen are available. We anticipate that there will be a gradual reduction in steel production via the BF-BOF route and growth in the EAF route. The extent and pace of this will depend on technologies coming to maturity, the availability of infrastructure (carbon-free electricity and hydrogen), and regulatory frameworks.

Conclusion on strategic resilience

We estimate the financial impact of the opportunities and risks on the Group will be most adverse under a 4° scenario and most positive under a 2° scenario. Under all three scenarios, we expect to benefit from the continuing growth in the production of steel in line with GDP, along with the accelerating shift towards higher performance iron and steel castings, as we support customers to maximise the efficiency and quality of their production. With our technological expertise, strong customer relationships and broad manufacturing footprint, we expect to play a key role in supporting our customers' efforts to decarbonise their operations.

We also believe there is a low downside for Vesuvius in all three scenarios as approximately 75% of our business in Steel is in the steel casting part of the operation which, as a standalone process, is low CO_2 emitting (1% to 3% of a steel plant's CO_2 emissions), and which we do not expect to be affected by technology shifts that the decarbonisation of iron and steel making will require.

Whilst the electrification of light vehicles and ongoing light-weighting efforts are expected to translate into a shrinking of the market for certain iron castings, it is anticipated that this will be more than compensated for by the growth in other markets such as wind turbines and aluminium castings.

Energy conservation and CO_2e emissions reduction

Vesuvius launched its Energy Conservation Plan in 2011 and significant progress has been made. Between 2019 and 2021 the Group achieved an overall reduction in normalised (measured per metric tonne of product packed for shipment) energy consumption of 9% and a 15.5% reduction in normalised CO_2e emissions (Scope 1 and Scope 2, market based), comprising a 16.5% reduction in normalised Energy CO_2e usage and a 12.6% reduction in normalised Process CO_2. Our energy conservation plan is now in its third cycle of improvement.

Managing our energy intensity not only has an environmental benefit but is also part of our long-term strategy to enhance our cost-competitiveness.

2025 energy targets

In 2020, the Board set a new objective targeting a 10% improvement in the Group's normalised energy consumption, measured per metric tonne of product packed for shipment between 2019 and 2025.

2019 was selected as the baseline for all GHG emissions data and targets, absolute and relative, as this was the last year of normal trading prior to the COVID-19 pandemic.

The Board also set a related target for the Group to achieve a 10% reduction in Energy CO_2e emissions per metric tonne of product packed for shipment (Scope 1 and Scope 2) vs 2019. This target covers 100% of Vesuvius' operations and is to be achieved without the use of any offsets. The Group Energy CO_2e emissions reduction 2025 target has been cascaded to all business units, which have built action plans accordingly.

Each site monitors and reports its energy consumption on a quarterly basis. Performance and variation are analysed, and improvement plans built accordingly.

Focus areas

In seeking to meet these new targets and decarbonise our manufacturing processes, the Group is focusing on five main areas:

- Modernising and upgrading installed equipment to reduce our energy consumption
- Investing to renew equipment to the best available technologies and converting to less CO_2 intensive energy sources
- When possible, replacing high CO_2e emission electricity (generated from coal) with greener electricity or other sources of energy
- Reducing our energy wastage, recovering heat to feed processes and hot water
- Generating clean energy

Key Group initiatives for energy conservation and for increasing energy efficiency

1 Carbon-free energy sources

The Group supports the transition towards renewable energy sources and cleaner carbon-free technology when possible. Our energy strategy includes an ongoing effort to convert to carbon-free electricity contracts whenever practical and economically manageable, invest in solar panels, and the conversion of processes to electricity as soon as the technology is cost-effective.

In 2021, nine sites converted to carbon-free electricity contracts, taking the total number to 12, representing 20% of our manufacturing sites and R&D centres of excellence.

We also inaugurated a solar panel installation in our plant in Igorre in 2021 and launched projects in our Kolkata and Vizag plants. 19 manufacturing sites and R&D centres of excellence are also investigating solar panel projects.

In 2021, 51% of the grid electricity consumed in our sites was generated using processes that did not emit CO_2, of which 41% was generated from renewable sources. At the end of 2021, four sites were equipped with renewable energy installations, and one had invested in a combined heat and power installation.

2 Capital commitments and internal CO_2 pricing

In 2020, we took the decision to include an environmental impact analysis in the evaluation of each of our capital expenditure projects as these are the key decisions that drive long-term future sustainability performance, and CO_2 emissions in particular.

Our Environmental policy, which is the responsibility of the Chief Executive and the Group Executive Committee, covers all our operations and states that all our investment decisions will include an analysis of their environmental impact. An internal price for CO_2 emissions (Scope 1 and Scope 2) is included in the calculation of payback for all investments reaching the threshold for approval by the BU Presidents or Chief Executive.

Vesuvius views this shadow pricing mechanism as a key mechanism to ensure that the environmental impact of long-term investment decisions is understood. It seeks to ensure that the best available technology is adopted, even in locations where no external cost for carbon is in place or foreseen.

The internal price of CO_2 was initially set at €30 per tonne of CO_2. This price is reviewed annually and is applicable across all business units and all regions for the full year. It has been increased to €90 per tonne of CO_2 for 2022.

Key progress since 2019

Since 2019, four major projects have helped significantly reduce the Scope 1 CO_2 emissions of the Group by addressing some of its most CO_2e intensive installations – closure of the Skawina bricks plant, elimination of dirty coke oven gas as a fuel in Wuhan with a new natural gas-fired tunnel kiln, transfer of the Tyler plant activity to Monterrey, and replacement of the burner system of the Olifantsfontein rotary kiln.

We endeavour to use the best available technologies to reduce CO_2 emissions in all our major capital expenditure projects.

For example, we are taking advantage of the closure of our Chinese plant at Kuatang and relocation of its activity, to replace all drying ovens and kilns with new ones with an energy efficiency improvement target of 20%.

Many other projects are being undertaken to upgrade or retrofit equipment to improve energy efficiency and reduce CO_2 emissions. These include new refractory furniture and installation of heat recovery systems in ovens and kilns, upgrades of compressors, replacement of light sources with LED lights, solar panel installation and the purchase of electric forklift trucks.

In 2021, the Board approved major capacity expansion capital expenditure projects totalling more than £20m. Available technologies and their impacts in terms of energy efficiency and CO_2e emissions were systematically considered, and the most efficient technologies for the purpose selected. In addition, new capital expenditure worth circa £1.7m dedicated to 25 incremental improvement projects with energy efficiency and CO_2 emissions reduction in their prime objectives was approved in 2021.

In 2021, we analysed our CO_2 emissions in detail (Scope 1 and Scope 2), evaluated our Scope 3 emissions (using the GHG approved Scope 3 Evaluator), initiated a comprehensive survey of technologies in development and of their level of maturity, and started engaging with our suppliers of key raw materials on their CO_2 emissions levels and reduction plans.

Next steps

Our goal in 2022 will be to translate our commitment to net zero into a precise road map including short, medium and long-term milestones. We also intend to submit our first CDP Climate Change questionnaire in 2022.

In the short term (2025), various projects are being studied, including the installation of further solar panels, retrofitting of ovens and kilns or replacement of older and less efficient ones, and burner settings, loading and cycle optimisation. We will also continue the conversion of our electricity supply to carbon-free sources.

In the medium term (2035), we anticipate that further emissions reduction will be possible through further upgrades to our ovens and kilns, and possibly the combination of natural gas and renewable energy such as green hydrogen to fire refractory materials.

In the longer term (2050), various technologies are promising candidates for the near zero emissions curing and firing of refractory products (electricity, green hydrogen, synthetic gas, biomass).

Tackling climate change continued

Energy consumption and Scope 1 and Scope 2 CO_2e emissions

While Vesuvius' products differ significantly in the energy intensity of their manufacture, most of our manufacturing processes are not energy intensive nor do they produce significant quantities of waste and emissions. Two of our 32 main manufacturing processes (VISO and Dolime production) account for 41% of our energy consumption and 58% of our location based CO_2e emissions. (We report in metric tonnes of CO_2 equivalents CO_2e.)

A further five processes consume 34% of the Group's total energy consumption and represent 24% of our location based CO_2e emissions, giving a clear focus for 75% of our energy and 82% of our emissions-reduction initiatives.

The Group has clear targets for energy saving, with ongoing efforts focused on increasing the efficiency of our production processes. Dolime production, which uses coal to calcine dolomite, is our major emitter of CO_2 and, building on the successes of previous years, continues to be a clear focus for our investment to reduce CO_2 emissions.

Vesuvius' 2021 total energy costs of £40.6m are c.2.5% of revenue. Only 1.3% of the total energy requirements across the Group are consumed in the UK, producing less than 0.7% of the Group's CO_2e location based emissions.

South Africa is the only country where we exceed the threshold to be submitted to a Carbon Tax or an Emissions Trading Scheme.

Scope 1 covers emissions from fuels used in our factories and offices, fugitive emissions and non-fuel process emissions.

Scope 2 relates to the indirect emissions resulting from the generation of electricity, heat, steam and hot water we purchase to supply our offices and factories.

Normalised energy consumption and CO_2e emissions decrease

In 2021, the Group's normalised energy consumption decreased by 5.3% to 1,177 kWh per metric tonne (2020: 1,243), and the Group's normalised CO_2e emissions reduced to the lowest level ever recorded:

- Location based: by 5.6% to 0.418 metric tonnes CO_2e per metric tonne product packed for shipment (2020: 0.443)
- Market based by 9.4% to 0.40 metric tonnes CO_2e per metric tonne product packed for shipment (2020: 0.44)

These reductions which countered the effect of the 13% increase in energy consumed were primarily driven by changes in product mix to lower energy intensity products and the significant increase in production volumes (19.3%). Natural gas use increased by 14.7%, electricity consumption by 6.6% and coal (a CO_2 intensive fuel) consumption by 9.8%, to 30.3 thousand metric tonnes in 2021 from 27.6 thousand metric tonnes in 2020 . During 2021, the Group also consumed 352 cubic metres of diesel (+32.2% 2020: 266) primarily in the operation of forklift trucks on its sites and 157 cubic metres of fuel oil, an increase of 26% (2020: 124). In total 509 cubic metres of oils were used as fuel in 2021 (2020:390).

Greenhouse gas reporting

In reporting GHG emissions, we have used the GHG Protocol Corporate Accounting and Reporting Standard (revised edition) methodology to identify our Location based GHG inventory of Scope 1 (direct) and Scope 2 (indirect) CO_2e. We report in metric tonnes of CO_2 equivalent (CO_2e).

Our energy-related greenhouse gas (GHG) emissions, reported as carbon dioxide equivalents (CO_2e), include direct emissions of the three main GHGs (Carbon Dioxide (CO_2), Methane (CH_4) and nitrous oxide N_2O).

Process related emissions of the following in CO_2 equivalent and in metric tonnes are not significant:

- Direct methane CH_4 Emissions
- Direct nitrous oxide N_2O Emissions

Emissions of the following in CO_2 equivalent and in metric tonnes are not significant:

- Direct Sulphur Hexafluoride (SF_6) Emissions
- Direct HFC Emissions
- Direct PFC Emissions

The Group also meets all its obligations in relation to the Producer Responsibility Packaging Waste regulations and the Energy Saving Opportunity Scheme by which the UK implemented the EU Energy Efficiency Directive.

All sites report their energy consumption and GHG emissions on a quarterly basis. Figures are verified for consistency and coherence.

Vesuvius plc long-term energy consumption and normalised energy consumption (aggregate of Scope 1 and Scope 2)

	2021	2020	2019	2018	2017
Total Energy consumption (million kWh)	**1,159**	1,026	1,176	1,339	1,410
Energy consumption per metric tonne of product packed for shipment (kWh/MT)	**1,177**	1,243	1,293	1,294	1,400

Fuel consumption, emissions and normalised emissions for the main fuels consumed across the Group (location based statutory reporting)

Location based statutory reporting of global GHG emissions (metric tonnes CO_2e) and energy consumption ('000 kWh) by type of fuel and emission.

Fuel and emission category	**Energy used '000 kWh 2021**	Energy used '000 kWh 2020	% change	**CO_2e '000 metric tonnes 2021**	CO_2e '000 metric tonnes 2020	% change	**CO_2e metric tonnes per metric tonne of product 2021**	CO_2e metric tonnes per metric tonne of product 2020	% change
Coal	**224,846**	204,693	10%	**73**	66	11%	**0.074**	0.079	-7%
Electricity	**207,238**	194,441	7%	**100**	92	8%	**0.101**	0.112	-10%
Ext.Heat	**3,177**	2,324	37%	**1**	1	40%	**0.001**	0.001	0%
LPG	**77,379**	61,605	26%	**17**	13	26%	**0.017**	0.016	5%
Natural Gas	**641,168**	559,011	15%	**117**	103	14%	**0.119**	0.124	-4%
Other Fuels	**5,643**	4,308	31%	**1**	1	30%	**0.001**	0.001	9%
Total Fuels	**1,159,451**	1,026,382	13%	**309**	276	12%	**0.314**	0.334	-6%
Non-Fuel Process Emissions				**101**	89	14%	**0.103**	0.107	-4%
Fugitive Emissions				**1**	1	30%	**0.001**	0.001	9%
Grand Total	**1,159,451**	1,026,382	13%	**411**	365	13%	**0.418**	0.443	-6%

1. All fuel consumption is converted to '000 kWh for reporting.
2. In 2021, the Group consumed 58,288 thousand m^3 of natural gas.
3. Vesuvius does not use any alternative fuels (% used zero).
4. Heat from biomass 0.01%.
6. Fugitive emissions are leaks of greenhouse gases, for example from refrigeration and air-conditioning units.
7. Location based Statutory Reporting of Global GHG emissions (metric tonnes of CO_2e) and energy consumption ('000 kWh).

Global GHG emissions (kg of CO_2e) and energy consumption ('000 kWh) (Location based statutory reporting)

Emissions and energy sources	**UK and Offshore CO_2e '000 metric tonnes 2021**	**Global CO_2e '000 metric tonnes 2021**	**Proportion relating to the UK and Offshore Area**	UK and Offshore CO_2e '000 metric tonnes 2020	Global CO_2e '000 metric tonnes 2020	Proportion relating to the UK and Offshore Area	**UK and Offshore energy used '000 kWh 2021**	**Global energy used '000 kWh 2021**	**Proportion relating to the UK and Offshore Area**	UK and Offshore energy used '000 kWh 2020	Global energy used '000 kWh 2020	Proportion relating to the UK and Offshore Area
Combustion of fuel and operation of facilities including fugitive emissions (Scope 1)	**2.433**	**311**	**0.8%**	2.196	272	0.8%	**12,688**	**949,036**	**1.3%**	11,442	829,617	1.4%
Electricity, heat, steam and cooling purchased for own use (Scope 2)	**0.480**	**101**	**0.5%**	0.503	93	0.5%	**2,503**	**210,415**	**1.2%**	2,619	196,765	1.3%
Total GHG emissions and energy	**2.914**	**411**	**0.7%**	2.699	365	0.7%	**15,191**	**1,159,451**	**1.3%**	14,061	1,026,382	1.4%
Change	**8.0%**	**12.6%**					**8.0%**	**13.0%**				

Vesuvius' chosen intensity measurement (location based statutory reporting)	Metric tonnes CO_2e per metric tonne of product packed for shipment				kWh of energy per metric tonne of product packed for shipment			
	UK and Offshore 2021	**Global 2021**	UK and Offshore 2020	Global 2020	**UK and Offshore 2021**	**Global 2021**	UK and Offshore 2020	Global 2020
Emissions and energy reported above normalised to metric tonnes CO_2e per metric tonne of product packed for shipment	**3.304**	**0.418**	2.607	0.443	**17,223**	**1,177**	13,586	1,243
Change	**26.7%**	**-5.6%**			**26.8%**	**-5.3%**		

	Metric tonnes of CO_2e per £m revenue			
Total GHG emissions as metric tonnes CO_2e per £m revenue (location based)	**26**	**250**	27	251
Change	**-1.0%**	**-0.1%**		

Methodology

We have reported to the extent reasonably practicable on all the emission sources required under Part 7 of the Accounting Regulations which fall within our Group Financial Statements.

Statutory Reporting is location based according to the GHG Protocol.

Scope 1 covers emissions from fuels used in our factories and offices, fugitive emissions and non-fuel process emissions.

Scope 2 relates to the indirect emissions resulting from the generation of electricity, heat, steam and hot water we purchase to supply our offices and factories.

We have used emission factors from the UK Government's (DBEIS) and the IEA GHG Conversion Factors for Company Reporting 2021 in the calculation of our GHG.

Scope 1 and Scope 2 emissions were verified by Carbon Footprint Ltd.

Tackling climate change continued

Global electricity usage

	2021	2020	2019
Total electricity consumption ('000 kWh)	**207,238**	194,441	214,336
Electricity from non-CO_2 emitting sources ('000 kWh)	**105,258**	75,629	79,910
Electricity from non-CO_2 emitting sources (% of total)	**51%**	39%	37%
Electricity from renewable sources ('000 kWh)	**84,641**	55,873	55,512
Electricity from renewable sources (% of total)	**41%**	29%	26%
Energy from renewable sources ('000 kWh)	**84,796**	56,011	55,688

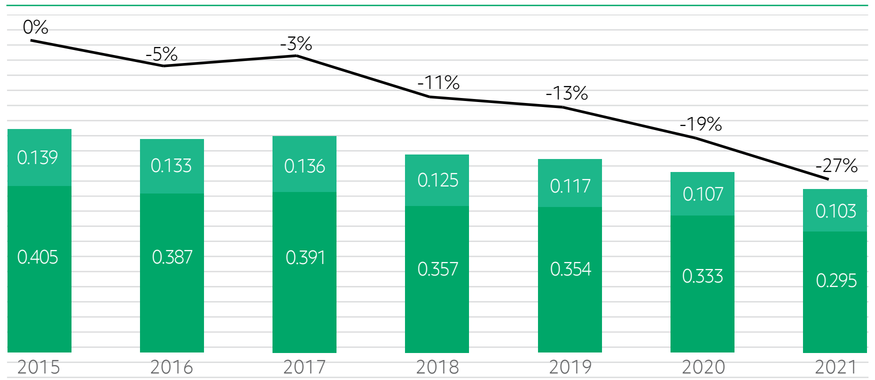
2021 CO_2e emissions per region (market based)

Category	CO_2e '000 metric tonnes	% of total
Europe	260.5	66%
China & NA	59.7	15%
India & SA	19.9	5%
South America	9.4	2%
US, Mexico, Canada	42.4	11%

5-year evolution of Scope 1 and Scope 2 CO_2e emissions (market based)

	2021	2020	2019	2018	2017
CO_2e '000 metric tonnes	**393**	364	429	499	531
CO_2e metric tonnes per metric tonne of product packed for shipment	**0.398**	0.440	0.471	0.482	0.528
CO_2e metric tonnes per million £ revenue (Scope 1 & 2)	**238**	249	250	277	315

Metric tonnes CO_2e per metric tonne of product packed for shipment



Category
- Energy CO_2e
- Process CO_2
- % improvement vs 2015

2021 energy consumption by fuel type %

Category	Energy used '000 kWh	2021
Natural gas	641,168	55.3%
Coal	224,846	19.4%
Electricity	207,238	17.9%
LPG	77,379	6.7%
Other fuels	5,643	0.5%
External heat	3,177	0.3%

Scope 1, Scope 2 and Scope 3 emissions

Metric tonnes CO_2e	2021 Metric tonnes	2021 %	2020 Metric tonnes	2020 %	2019 Metric tonnes	2019 %
Scope 1 Process CO_2e emissions	**101,121**	**5.4%**	88,516	5.9%	106,737	6.0%
Scope 1 Energy CO_2e emissions*	**209,592**	**11.2%**	183,741	12.2%	215,836	12.0%
Scope 1 CO_2e emissions	**310,713**	**16.6%**	272,257	18.0%	322,573	18.0%
Scope 2 CO_2e emissions (market based)	**82,519**	**4.4%**	92,145	6.1%	106,681	5.9%
Scope 3 CO_2e emissions	**1,483,438**	**79.0%**	1,147,557	75.9%	1,363,709	76.1%
Total	**1,876,670**	**100%**	1,511,959	100%	1,792,963	100%

* Includes fugitive emissions.

In 2021, Vesuvius' total Scope 1, Scope 2 and Scope 3 CO_2e emissions were 1,876,670 metric tonnes. This represented 1,140 metric tonnes per million £ revenue.

Scope 3 emissions

Metric tonnes CO_2e	2021 Metric tonnes	2021 %	2020 Metric tonnes	2020 %	2019 Metric tonnes	2019 %
Purchased goods and services	**1,159,810**	**78.2%**	871,993	76.0%	1,039,766	76.3%
Capital goods	**62,004**	**4.2%**	53,736	4.7%	68,461	5.0%
Fuel- and energy-related activities (not included in Scope 1 or 2)	**94,182**	**6.4%**	86,493	7.5%	101,979	7.5%
Upstream transportation and distribution	**48,791**	**3.3%**	30,762	2.7%	31,937	2.3%
Waste generated in operations	**5,833**	**0.4%**	5,660	0.5%	6,312	0.5%
Business travel	**15,488**	**1.0%**	13,574	1.2%	31,373	2.3%
Employee commuting	**20,400**	**1.4%**	20,400	1.8%	20,400	1.5%
Upstream leased assets	**6,375**	**0.4%**	6,375	0.6%	6,375	0.5%
Downstream transportation and distribution	**37,761**	**2.5%**	25,770	2.2%	27,231	2.0%
Processing of sold products	**32,794**	**2.2%**	32,794	2.9%	29,875	2.2%
Total Scope 3 CO_2e emissions	**1,483,438**	**100.0%**	1,147,557	100.0%	1,363,709	100.0%

Scope 3 emissions

Vesuvius' Scope 3 CO_2e emissions, mainly upstream, contribute to a greater part of our total CO_2e emissions than our Scope 1 and Scope 2 emissions. In 2021, we assessed the most relevant and influenceable elements of our Scope 3 emissions, with a goal to set material science-based targets.

Scope 3 CO_2e emissions for 2019, 2020 and 2021 were evaluated using the Quantis Scope 3 Evaluator software, approved by the GHG protocol. The evaluation covered 100% of operations.

The categories in the table above represent more than 95% of Vesuvius' total estimated Scope 3 emissions.

Purchased goods and services represent the largest category of Scope 3 CO_2 emissions. In 2021, we also undertook a more focused evaluation of emissions associated with raw materials using publicly available average CO_2 emissions factors. In addition, we started collecting information on energy source, CO_2 emissions data and reduction plans from our raw materials suppliers as part of the RFQ process. Suppliers representing 25% of the raw material spend have responded to our requests.

Parallel to this, various initiatives have been launched to reduce our Scope 3 CO_2 emissions. A few examples include:

- Returnable packaging solutions being implemented both with suppliers and customers
- Policies aimed at limiting the CO_2 emissions of company fleet vehicles are being deployed in various countries. More than 1,800 Vesuvius employees benefit from bus or other forms of collective transportation for their commute to work

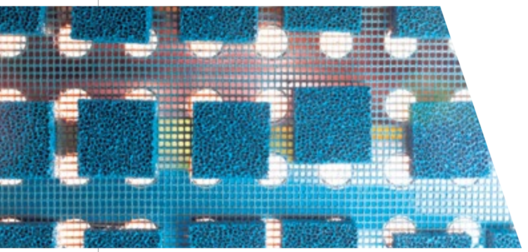
Vesuvius plc statement of verification

Scope 1, Scope 2 and Scope 3 carbon footprint reporting and supporting evidence contained herein for the period 1 January 2019 to 31 December 2021 were verified by Carbon Footprint Ltd in accordance with the 'ISO 14064 Part 3 (2019): Greenhouse Gases: Specification with guidance for the verification and validation of greenhouse gas statements'.

A copy of the full assurance statement can be found on our website: www.vesuvius.com.

carbon footprint standard
CO_2e Reduced Organisation

Growing our engagement in the circular economy



The drive to improve the sustainability performance of Vesuvius and the refractory industry's products was initiated many decades ago. The continuous improvements both in the durability of our products and in their disposal after usage have led to considerable reductions in both the raw materials used and the quantity of product shipped to landfill.

As the amount of refractory material per tonne of steel cast continues to level off, the purpose and value of the use of refractory materials will move from delivering insulation to an even greater emphasis on helping to improve steel quality and process efficiency.

Product durability

Our first, and preferred, strategy to reduce the depletion of resources is the extension of product durability. The amount of refractory material required per tonne of steel cast has been reduced by 80% since 1960, and the average product lifetime multiplied by as much. Approximately 10kg of refractory material are now consumed per tonne of steel cast, with some customers requiring as little as 7kg.

We are continuously working to extend the lifetime of our consumable products. Strategies include the development of advanced materials, the design of shapes that allow dual usage of products, and product repair and remanufacture. For mechanisms and equipment, we also offer wear monitoring and maintenance services to our customers to ensure their optimum performance and extend their lifetime. We have introduced innovative refractory lining monitoring, to enable repairs to be made only where needed. Our i-GVARD* system automates the monitoring of slide-gate wear, providing decision-makers with critical data to choose when to renew refractory plates. We have developed longer life Duraflex* ladle shrouds, and methodologies to reuse bottom slide-gate plates as top plates. Each of these systems and processes drives production efficiency and reduces refractory volumes.

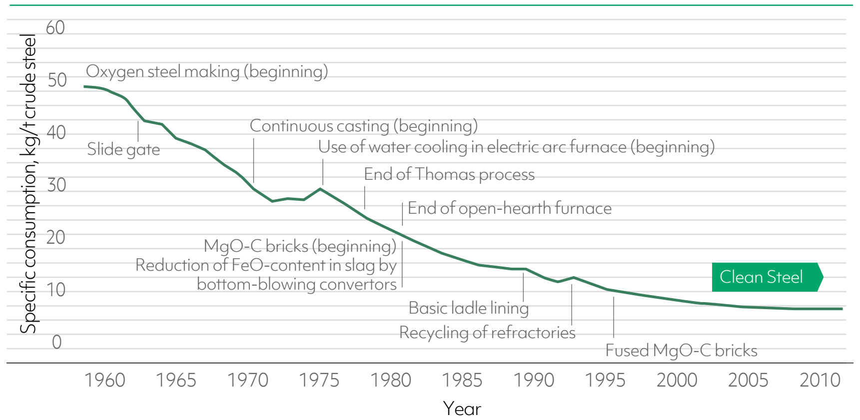
Product recyclability

At the same time as reducing the quantity of raw materials required for each casting, technical solutions and economic cycles have grown to enable the recycling of refractory materials after usage in the production of iron and steel. Whereas in the early 1970s nearly all refractory materials were disposed of after use, it is estimated that more than half is now recycled. In Europe, as little as 5% of refractory materials now go to landfill.

A large portion of this is open loop recycling, with spent refractories used in low value-adding applications such as aggregates for roadbed materials. Closed loop recycling will allow greater substitution of virgin material by secondary material, with a positive impact on Scope 3 CO_2 emissions. It is estimated that only 7% of spent refractories currently enter closed loop recycling.

Many factors such as consistency of material quality, cost of sorting and mineral processing, transportation costs, and the administrative burden associated with the transportation of waste, have prevented the wide adoption and investment in closed loop recycling. We therefore support initiatives being pursued by authorities to improve the regulatory framework for the circulation of waste materials across borders, making it easier for them to be recovered and recycled in different countries.

Amount of refractory consumed per tonne of steel cast in Germany



Source: Statistisches Jahrbuch der Stahlindustrie.

* Trademark of the Vesuvius Group of companies, unregistered or registered in certain countries, used under licence.

Vesuvius' use of recovered and recycled materials

Vesuvius is determined to increase the usage of recovered and recycled materials in its product formulations. A comprehensive quarterly reporting system for the use of recovered and recycled materials by all manufacturing sites was launched in 2019. It includes the reporting of recovered and recycled materials from sources external to Vesuvius and across Vesuvius facilities. In 2020, the Board set a target for 7% of the raw materials used by the Group in production, to be recycled materials from external sources by 2025 (measured by weight of materials).

In 2021, 75,516 metric tonnes of recycled materials were used in our products. The percentage of recovered or recycled materials from external sources used in production was 6.2% (5.6% in 2020). 25.0% of our revenue was generated from products that include recycled materials (23.3% in 2020). We estimate that more than 70,000 metric tonnes of Scope 3 CO_2e emissions were avoided by using recycled materials in lieu of virgin materials.

Increasing the share of recovered and recycled materials in product formulations poses multiple challenges, in terms of availability, consistency of quality, competitiveness versus virgin material whose prices fluctuate, regulatory frameworks for the transportation of end-of-life waste materials, and validations to ensure that product performance and reliability remain unaffected.

Cross-functional teams incorporating experts from R&D, Purchasing, and Manufacturing are working to identify and analyse opportunities in order to increase the share of recovered and recycled materials.

We have implemented programmes with some of our customers to recover and recycle refractory products, with new initiatives being discussed. We also offer our customers various options with regard to mechanisms and equipment, including rental.

Distribution of refractory material after use in the steel industry in Europe

Destination of refractories	Share
Dissolution in hot metal, steel or slags	33%
Internal recycling	25%
External recycling	37%
Landfilling	5%

Source: A review of recycling of refractories for the iron and steel industry, Researchgate November 2017.

	2021	2020	2019
Amount of recycled materials used in Vesuvius products (metric tonnes)	**75,516**	56,599	67,900
Amount of recovered materials that are not recycled used in Vesuvius products (metric tonnes)	**0**	0	0
Percentage of recycled materials in Vesuvius products from total materials	**6.2%**	5.6%	5.9%
Percentage of revenue from products including recycled materials	**25.0%**	23.3%	22.6%

All recovered materials undergo some processing before their usage in our products. Therefore, they are all included in the recycled materials category, and the recovered materials category is empty.

Breakdown of 2021 solid waste

Recycled waste (by-products)	47.6%
Non-hazardous waste	45.6%
Other hazardous waste	6.7%
Toxic waste	0.1%

Material waste

Alongside the monitoring of recovered and recycled materials, a quarterly reporting system for material waste from all manufacturing sites was implemented in 2019. This was enhanced in 2020 by introducing the separate reporting of toxic and other hazardous waste.

Our system now includes the reporting of waste to landfill, toxic and other hazardous waste, waste for recycling, waste to sewers and by-products (materials recovered and recycled outside the site where they were generated). 100% of our manufacturing sites report the various categories of waste and by-products they generate.

The Board has set a target of a 25% reduction of our solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment by 2025 (vs the 2019 baseline).

Action plans were implemented at ten pilot sites in 2020, with an increased sharing of action plans and results. In 2021, the programme was extended, and manufacturing sites started building action plans covering both hazardous and non-hazardous waste to eliminate, reduce and recycle waste.

Our plants in Mülheim and Třinec received Circular Economy Awards from the European Refractory Producers Association (PRE) in recognition of the success of their waste reduction and recycling programmes.

Growing our engagement in the circular economy continued

Hazardous and toxic waste

We are committed to the reduction of toxic and other hazardous waste. In 2021, 13.0% of our solid waste (excluding recycled waste), was classified as hazardous (2020: 14.7%), while toxic waste represents 0.16% of solid waste (excluding recycled waste).

Whenever relevant, action plans to reduce hazardous waste are incorporated by manufacturing sites into their solid waste reduction action plans.

Manufacturing sites ensure that hazardous and toxic materials, and waste, are stored in protected containers and kept in delineated storage areas, with sufficient retention capability to prevent any release in case of accidental spillage.

Out of our manufacturing sites and R&D Centres of Excellence handling hazardous and toxic waste, 89% have defined emergency plans including provisions relating to toxic and hazardous waste and materials. Of these 72% have tested them through simulation exercises in 2021.

Raw materials and waste

Manufacturing site raw materials & waste/(metric tonnes)	2021	2020	Variation
Raw materials			
Recycled materials used (from external sources)	**75,516**	56,599	33.4%
Recovered materials used (from external sources)	**0**	0	0.0%
Raw materials and intermediates used excluding recycled (from external sources)	**1,133,807**	949,615	19.4%
Total raw materials and intermediates used	**1,209,323**	1,006,214	20.2%
% Recycled materials (from external sources)	**6.2%**	5.6%	10.0%
% Recovered materials (from external sources)	**0%**	0%	0.0%
Waste (solid waste, by-products and wastewater)			
Solid waste and by-products	**56,755**	58,524	-3.0%
Ratio of solid waste and by-products in metric tonnes per tonne of product packed for shipment	**0.058**	0.071	-18.7%
Solid waste (hazardous and sent to landfill)	**29,747**	26,607	11.8%
– Non-hazardous waste	**25,894**	22,695	14.1%
– Tailings waste	**0**	0	0
– Hazardous waste	**3,853**	3,912	-1.5%
– Toxic waste	**48**	28	72.6%
– Other hazardous waste	**3,805**	3,885	-2.0%
– Ratio of hazardous waste to total solid waste	**13.0%**	14.7%	-11.9%
Ratio of solid waste per tonne of product packed for shipment (in metric tonnes)	**0.030**	0.032	-6.3%
By-products (recycled waste)	**27,008**	31,917	-15.4%
Ratio of by-products per tonne of product packed for shipment (in metric tonnes)	**0.023**	0.036	-36.0%
Wastewater*	**165,965**	131,366	26.3%
Ratio of wastewater per tonne of product packed for shipment (in metric tonnes)	**0.168**	0.159	5.9%
Total solid waste, by-products and wastewater	**222,720**	189,890	17.3%

* 1 m³ wastewater = 1 metric tonne.

Reducing consumption, waste and emissions

The Board has set a target for the Group to reduce the amount of wastewater per metric tonne of product packed for shipment by 25% by 2025 (vs the 2019 baseline).

Water consumption

Out of 745,000 metric tonnes of fresh water consumed in total, 728,000 metric tonnes (97.7%) were consumed in our manufacturing sites, the remaining 17,000 tonnes (2.3%) in our R&D centres of excellence, offices and warehouses.

28,326 metric tonnes were incorporated into our finished products (3.8% of total fresh water), the balance being consumed as part of our manufacturing processes and social water (96.2%). Our objective is to reduce both the amount of water consumed in our manufacturing process and social water usage. The main area of focus is the reduction of wastewater.

In 2021, our overall fresh water usage per tonne of product packed for shipment decreased by 16.4%. As with energy use, normalised consumption of water varies with product mix. This decrease was driven by an evolution in our product mix towards products that require less water in their processing and was partly offset by the increase in wastewater per tonne of product packed for shipment (5.9%).

Vesuvius works to reduce the consumption of water in its manufacturing operations by recycling and improving water management processes. No salt water or cooling water is abstracted with no related outflow.

Water stress

An assessment of all Vesuvius manufacturing sites was carried out using the Aqueduct Water Risk Atlas. A small number of the areas in which Vesuvius operates are water stressed. In these areas, we make strenuous efforts to reclaim, recycle and minimise the overall use of water.

Wastewater

Our sites with the highest level of water consumption are equipped with wastewater treatment plants. These represent 47% of all manufacturing sites and R&D centres of excellence. Additionally, many types of activity are routinely undertaken by our sites to control and reduce their water consumption, and we have action plans in place to reduce our wastewater generation globally. Some of the most significant examples include:

- Replacing wet scrubbing systems for particulate removal with dry filter systems
- Optimising container cleaning processes
- Installing high pressure stations to improve efficiency and speed of tool cleaning
- Optimising production schedules to reduce the need for cleaning between recipes
- The provision of environmental awareness training to employees

Water stress

Location of manufacturing sites	Number of manufacturing sites	Percentage of revenue 2021	2020	2019	Manufacturing site fresh water use (m³) 2021	2020	2019
Very high-water stress	4	**4%**	4%	4%	**56,393**	48,529	58,507
Moderate to high water stress	19	**42%**	41%	39%	**262,836**	280,314	289,120
Low to moderate water stress	31	**54%**	55%	56%	**374,986**	361,011	420,577

This data covers 100% of our manufacturing sites. Water stress classification based on World Resources Institute Aqueduct Water Risk Atlas.

5-year evolution of fresh water consumption

	% change 2021/2019	2021	2020	2019	2018	2017
Water in m³	**-12.7%**	**745,369**	747,439	853,381	896,785	864,996
Water in m³ used per metric tonne of product packed for shipment	**-19.4%**	**0.757**	0.905	0.939	0.866	0.859
Water in m³ used per £million revenue	**-9.1%**	**454**	513	499	499	514

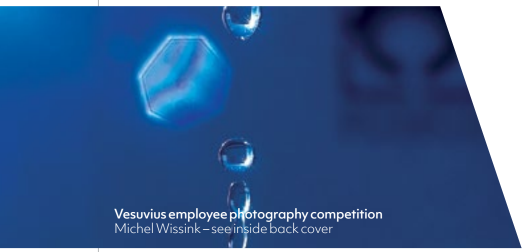
Emissions into the air

Some Vesuvius manufacturing processes can lead to low levels of emissions into the air. These include post thermal treatment residual Volatile Organic Compounds (from the curing and firing of products including solvents and resin binders, or pitch impregnation), residual GHGs from the combustion of fuels and process emissions, and residual dusts post capture and filtration.

Vesuvius' emissions of VOC, residual GHGs, and residual dusts are at levels too low to warrant any form of continuous measurement and reporting of quantities emitted, but all manufacturing plants monitor their levels of emissions into the air through regular sampling, and actively work to reduce them.

Actions to reduce emissions include the upgrade of equipment to the best available technologies, and the implementation of filtration, vapour extraction and regenerative thermal oxidiser systems.

Protecting the environment



Vesuvius employee photography competition
Michel Wissink – see inside back cover

Vesuvius takes seriously its obligations to its local communities and to ecological preservation. Environmental compliance at our sites, reduction in waste, increased recycling and treatment of emissions are key to Vesuvius' operations, and can be a significant differentiator for our business.

Environmental policy

All employees are expected to adhere to the Group's Environmental policy, which is translated into local languages and displayed prominently in all locations. The policy is supported by standards and procedures which are reviewed and updated on an ongoing basis. A copy is available to view on our website at: www.vesuvius.com.

Environmental monitoring and environmental regulation

Vesuvius operates sites in some developing markets where environmental concerns have become politically significant as air quality deteriorates, and residential expansion takes people closer to areas historically reserved for manufacturing.

In addition, some of the sites Vesuvius operates have known ecological sensitivities, being in the vicinity of watercourses or environmentally sensitive areas.

All our factory emissions to air, ground and water, as well as waste are proactively managed in accordance with local regulations. All our manufacturing operations monitor key environmental indicators.

Regular analysis

Regular analysis enables us to act to reduce our emissions where possible and to operate more efficiently. Environmental performance records are kept for the period of time required to comply with local regulations.

Manufacturing plants maintain and test emergency plans to ensure compliance with local regulations and Vesuvius standards in the event of an accidental release.

Reports from external inspections, including those with findings, are centrally stored and shared internally with executive and senior management. Where local authorities carry out routine inspections, observations, recommendations and actions are recorded and acted upon appropriately.

Local compliance

Vesuvius is committed to addressing exceedances and complying with local regulations. All exceedances are reported in a central database. In 2021, Vesuvius recorded 52 minor environmental incidents. Of these, four related to emissions to air, two to emissions to water and 46 to ground.

ISO 14001:2015 certifications

Country	Company name	Site
Australia	Foseco Pty Ltd	Sydney
Belgium	Vesuvius Belgium N.V.	Ostend
Brazil	Foseco Industrial e Comercial Ltda	Sao Paulo
China	Vesuvius Advanced Ceramic (China) Co., Ltd	Suzhou
China	Vesuvius Advanced Ceramics (Anshan) Co., Ltd	Anshan
Czech Republic	Vesuvius Česká Republika, a.s.	Trinec
Germany	SIR Feuerfestprodukte GmbH	Siegen
Germany	SIR Feuerfestprodukte GmbH	Kreuztal
Germany	Vesuvius Europe GmbH & Co.KG., Vesuvius Mülheim GmbH & Co.KG.	Mülheim an der Ruhr
Germany	Vesuvius GmbH	Grossalmerode
Germany	Vesuvius GmbH	Borken
India	Foseco India Limited	Puducherry
India	Foseco India Limited	Pune
Indonesia	P.T. Foseco Indonesia	Jakarta
Japan	Foseco Japan Limited	Toyokawa
Netherlands	Foseco Nederland BV	Hengelo
Poland	Vesuvius Poland Sp. z o.o.	Skawina
South Africa	Vesuvius South Africa (Pty) Limited	Olifantsfontein
South Korea	Foseco Korea Limited	Gyeonggi-do
Sweden	Vesuvius Scandinavia AB	Amal
Taiwan	Foseco Golden Gate Co. Limited	Ping Tung
United Kingdom	Vesuvius UK Limited	Tamworth

Total environmental releases across the Group in 2021 are estimated to have totaled 10 metric tonnes (including 2.9 metric tonnes of water-based materials) and 7.4 m^3 hydrocarbons. All releases to water and to the ground were fully contained apart from one incident in Ostend where an intermediate bulk container leaked c. 15 litres of hydrocarbons in water onto the ground, this was remedied and the result confirmed by analysis.

Where incidents occur, they are managed via Vesuvius' site environmental response plans and reported through the Vesuvius incident reporting system. We comply with local reporting requirements in respect of such incidents. In Germany a slightly increased legionella contamination was detected in showers and remedial action taken. An existing earlier action in relation to a disused US property for wastewater exceedances remains open. Two regulatory actions issued in 2021 against Vesuvius in Belgium remain open. No other action was taken by any authority in relation to an environmental incident in 2021 which resulted in financial penalties against Vesuvius. The Group does not operate any mines and consequently the Group generates zero tailings waste.

Environmental management/ certifications

We have 20 manufacturing sites, one customer location and one warehouse certified to ISO 14001:2015, representing 37% of our 54 manufacturing sites. External annual compliance audits are carried out by the global assurance provider, LRQA. 100% of our ISO 14001:2015 certifications cover the handling of waste and hazardous materials, including regular environmental impact audits and implemented risk prevention procedures (including emergency planning and testing) relating to waste and hazardous materials handling.

Where previously the decision to pursue ISO 14001 certification was taken at a local level, Group policy is now for all production sites to seek ISO 14001 certification. A list of certified sites is available above and may also be viewed on the Vesuvius website: www.vesuvius.com.

Biodiversity and greenery

Whilst risks to biodiversity were not considered as material by the internal and external stakeholders we engaged with, we nonetheless initiated a survey of all manufacturing sites. This did not highlight any risks from our ongoing operations, other than accidental environmental releases and emissions into the air as detailed elsewhere in this report.

The very limited footprint of Vesuvius' sites contributes significantly to limiting our Company's impact on biodiversity and greenery.

Actions have been taken in various manufacturing sites to improve greenery and biodiversity on their grounds and neighbouring communities, including planting trees.

Our customers

Our technology helps our customers improve their processes and their environmental footprint. Advancements in material science, pioneered by Vesuvius, have helped to ensure that the amount of refractory material required to cast one tonne of steel has reduced by 80% in the past 60 years.

Product safety and quality

Our core business is to help our customers protect their employees and improve their operational performance and efficiency. Customers rely on the quality of our products, and their structural integrity, to control the flow of molten metal safely in their facilities.

The reliability and performance of our products are critical to our customers in terms of overall equipment effectiveness, labour productivity and metal yield, and their environmental impact (reducing energy consumption, CO_2 emissions and refractory material waste).

Many of our products allow our customers to achieve improved metallurgical properties in their products, thereby allowing the production of wind turbine components, the light weighting of vehicles and other environmentally friendly products that benefit society.

Building safety into our products

At all times, our goal is to serve customers' needs in the safest, most secure and compliant manner possible.

Many of our products – robotics, systems and consumables – are critical to the safety of our customers' operators. Therefore, product safety is paramount to us. We have implemented a wide range of practices to optimise the performance of our products, reduce failures and increase their lifetime.

We follow a strict stage gate process for the development of new products, ensuring that safety performance objectives are defined from the initial stages and progressively completed up to the product launch. Key deliverables include risk assessments, preparation of user and maintenance documentation, manufacturing control plans, and Vesuvius and customer operator training. We undertake extensive testing through rigorous alpha and beta trials with systematic trial reports to confirm that targeted performance and robustness objectives are met and to allow for fine-tuning before product launch.

Automated systems

Our automated and robotic systems are fully customised and embedded into our customers' processes. Their design and implementation require additional precautions to ensure optimum safety during the project and in operations. Teams working on their development and installation at customers therefore receive targeted safety training focused on the specific risks at various project stages. Development projects follow the ISO 10218-2 norm (Safety requirements for industrial robots). External expert consultancy support is provided along with regular audits, and all follow the rules required for CE conformity or equivalent.

The development of these human-centred robotic solutions for steel shops, reduces the ergonomic strain on our customers' operators together with their exposure to high temperatures.

Compliance today and tomorrow

For the development and production of consumable products, we have implemented R&D screening of raw materials and chemicals to avoid introducing unwanted substances into the recipes and processes. Where potentially hazardous substances are nonetheless required, strict validation checklists have been defined to ensure adequate protection measures are taken at every step of the process. We document regulatory compliance through Safety Data Sheets for all raw materials consumed and all products manufactured, and share these with customers.

REACH regulation

Our objective is to remain fully compliant with our registration obligations under the Registration, Evaluation, Authorization and restriction of Chemicals (REACH) regulation. Since 2007, Vesuvius has appointed REACH managers for its Steel and Foundry Divisions, implementing an ongoing process to identify the REACH impacted raw materials based on their Safety Data Sheets. These substances are then monitored throughout the production process in Vesuvius. This also allows us to track the quantities consumed and verify that these remain within the limits of our registrations. Results are documented in a central database. We routinely organise training sessions for employees in the R&D, Sales, and Purchasing organisations to ensure that any new substance included in a new product recipe or otherwise purchased will be incorporated into our monitoring and registration process.

Updates to the lists of substances under REACH regulation issued by the European Chemicals Agency (ECHA) are continuously reviewed and our internal monitoring adapted whenever necessary. Vesuvius also monitors projected changes to the list of substances under REACH regulation, to proactively take into account future evolutions in our product development processes. Whenever relevant, we also participate in the consultations led by ECHA to define the most appropriate status for substances.

In 2018, we launched a programme of formal assessments of our suppliers, with an objective to assess all relevant suppliers of raw materials by the end of 2022. Following the UK's departure from the EU in 2021, we adapted our registrations and purchasing organisation and systems, to ensure that we remain fully compliant with our obligations both in the United Kingdom and in the European Union.

A learning organisation

After product launch, whenever a safety-related incident (an injury or a dangerous occurrence) occurs at one of our customers, that may have involved a Vesuvius product or service, it is systematically reported and investigated. The outcome of the investigation, including root causes and corrective actions, is shared with the customer. It is also presented to the Group Executive Committee and the Board.

Each of our product managers is tasked with responsibility for collecting feedback on our products and managing improvements. Routine debriefing is organised after projects are completed. Field trial reports and incident reports are routinely reviewed to collect information on failures and improvement opportunities.

Whenever relevant, subsequent changes made to the design of products are deployed to installations in service at other customers and lessons learned are incorporated into the design of following generations of products. We monitor the number of CCARs (Customer Corrective Action Requests), severity 1 CCARs (safety-related incidents or quality issues affecting the customer of our customer), and repeat CCARs.

In 2021, no product failures led to lost time injuries at customers. Two minor injuries (a shoulder strain and a minor finger cut) did occur however, and the sources of the injuries were fully investigated, and corrective actions implemented.

Vesuvius places a high value on ISO 9001:2015 certification and the business assurance that this quality management system brings. We have 66 certified Vesuvius and customer sites, employing quality professionals to maintain and develop quality systems under our quality policy. 100% of the management systems used to make our products are covered by ISO 9001:2015. A list of certified sites is available to view on the Vesuvius website: www.vesuvius.com.

Reliability and performance

Our constant performance monitoring develops deep and lasting relationships with our customers. Issues are dealt with through a rigorous problem-solving methodology and in-depth investigation. This ensures we learn from problems and prevent them recurring, as well as enabling us to constantly evolve and update our services in line with changing customer expectations and technological developments.

All issues raised by the Vesuvius field teams or by customers are systematically reported, documented and classified, based on their nature and severity. They are then investigated, with the following objectives:

- Implementing immediate containment actions to protect customers
- Identifying the root causes
- Implementing corrective actions
- Learning lessons and providing feedback for the development of future products

Regional business unit management teams are responsible for organising problem-solving teams to address issues and lead routine reviews of ongoing quality performance. Quality performance, including the number of customer complaints, the number of repeat complaints for the same issue and their severity is reported to the Board on a regular basis, and reviewed during each Group Executive Committee meeting. The most serious issues and those that affect, or could potentially affect, multiple customers are reviewed in detail during these meetings. Adverse trends result in prompt, clearly defined initiatives to permanently solve issues and prevent repeats.

Along with our focus on the completeness and quality of reporting, a strong emphasis is placed on the effectiveness of our problem-solving. Our cross-functional teams involve sales, research and development, and manufacturing experts, who work collaboratively to address the most challenging technical issues.

Problem-solving

We use the 8D practical problem-solving methodology. In 2021, our teams recorded, reported and investigated 2,756 issues.

In 2020, we undertook a thorough assessment of the problem-solving capabilities and practices in each of our business units regionally, identifying the gaps and required actions to reinforce them where necessary, especially in terms of staffing and training. In 2021, we started implementing these plans despite the difficulties caused by the COVID-19 pandemic.

The 8D methodology is implemented as the primary problem-solving tool across the Group. It is a consistent approach designed to identify root causes and ensure appropriate corrective action is taken.

8D – The eight Disciplines of Practical Problem Solving

D1	Clarify the problem
D2	Grasp the current situation
D3	Contain & set target
D4	Analyse causes
D5	Define countermeasures
D6	Execute & track progress
D7	Check results
D8	Standardise & establish controls

Recognition

An annual 8D Awards Competition is organised to recognise the best teams and projects. This competition is organised across all business units, in each region, with a jury composed of senior managers and sponsored by members of the Group Executive Committee. In 2021, more than 125 projects were presented in the Regional 8D Competitions. In addition to recognising the best problem-solving and projects, these events are an opportunity to recognise talent and disseminate knowledge.

Supporting our customers' journey to net zero

Sustainable solutions

Vesuvius is committed to growing its contribution to a sustainable world, through products and services that improve safety, maximise environmental performance, reduce greenhouse gas emissions, and contribute to the circular economy.

Our products have the potential to help customers reduce and avoid greenhouse gas emissions when compared with their current practices by amounts that far exceed the emissions required to manufacture and distribute them.

How our products help reduce and avoid greenhouse gas emissions, they:

- Increase metal yield in castings
- Reduce downgrading, re-melting of scrap and repair of defects
- Minimise casting temperature
- Reduce heat losses
- Maximise casting speed and throughput
- Extend production sequence length, reduce downtime
- Improve metal performance

Reduce and avoid greenhouse gas emissions

We actively cooperate with customers to help them evaluate the CO_2 emissions reduction our products bring to their complete value chain.

Our customers in the iron, steel and aluminium industries are embracing the challenge of dramatically reducing their CO_2 emissions. Many have pledged to reach net zero by 2050. They are investing significantly to transform their manufacturing technologies for the long term, working on a range of initiatives including the direct reduction of iron with green hydrogen and the replacement of carbon anodes in aluminium smelting. We contribute to their efforts through technology partnerships and developing new products for the next generation zero emissions aluminium, iron and steel-making processes.

Assessing our product portfolio

We have created a comprehensive scorecard to evaluate our products over their full product life cycle. We rate our products in comparison with the standard offering in the market considering their performance in terms of health and safety, environmental impact, greenhouse gas emissions, and end-of-life processing. All criteria are assigned a weighting. In line with our objectives to reduce both our own CO_2 emissions and help our customers reduce their CO_2 emissions, we give these criteria a significantly higher weighting.

Performing this analysis supports our objective to develop and supply products that provide our customers with a superior overall sustainability performance against the market standard.

In 2021, we commenced the roll-out of the scorecard across our product portfolio and assessed more than 90% of our revenue. Of our 2021 sales 16% were generated from market-leading sustainable products. Our objective is to continue growing their share of our product portfolio year after year.

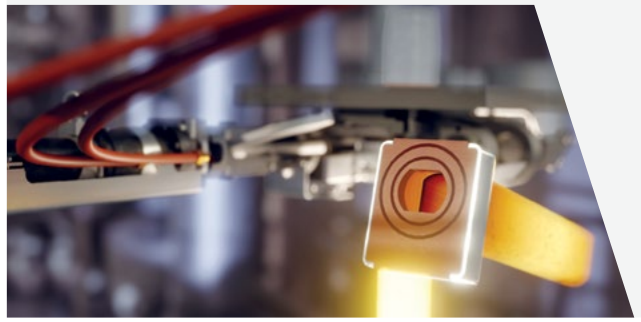
Sustainability in new product development

Vesuvius invests significantly in new product development, working closely with our customers to offer optimised solutions for their specific needs. We have a unique combination of expertise covering a wide range of fields including metallurgy, refractory ceramics, robotics and mechatronics, and IT. This is combined with close contact with customers through our network of account managers and service teams, and through regular technical and R&D meetings with our key customers to drive innovation.

Market-leading sustainable products

Our Clean Steel submerged entry nozzle (SEN) – a product that acts as a conduit for molten metal from the tundish to the mould in the continuous casting process – minimises the formation of inclusion clusters on the SEN wall that can detach and cause defects in the final cast steel slab. The high-purity material of the SEN does not react with the inclusions in the steel to form these clusters. As a result, our customers' yield of high-quality steel will increase.

Another recent innovation, Vesuvius Air-Shield* technology, was developed after requests from customers to improve the seal between the surface of our monoblock tundish shroud plate (MTSP) plate surface and the bottom plate of the tundish gate. The connection between these two surfaces is the most probable place for air ingress during casting, which can cause quality downgrades in the steel produced and limits refractory life. This product has improved steel quality significantly for several customers.



* Trademark of the Vesuvius Group of companies, unregistered or registered in certain countries, used under licence.

When designing new products, the Marketing and Technology teams in our six R&D centres of excellence listen to our customers, closely observing their processes to understand their current and future challenges, needs and expectations.

We combine this learning with the information we have collected from our analysis of past issues, and seek to achieve both incremental improvements and breakthrough innovations in safety, robustness, reliability and performance, to steer the development of next-generation products and services.

We have formally integrated sustainability considerations into product R&D. Using the same criteria and scorecard as we use in the assessment of the existing product portfolio, we have begun a complete assessment of the pipeline of R&D and new product development projects, to check that their contribution is aligned with our sustainability ambitions, adjust priorities and allocation of resources, and fine-tune the selection of new projects entering the pipeline.

R&D covers a wide range of activities ranging from fundamental research and front end innovation to the evaluation of alternative material sources and support to operations. In 2021, our R&D spend was £30.3m, of which c.£10.8m (36%) was dedicated to the development of products which outperformed existing marketed products in terms of sustainability outcomes.These constituted well over 80% of our New Product Development projects. Our objective is to reach 100% of such products in the development pipeline.

In 2022, we plan to launch 40 new products (2021: 27), of which 28 will allow customers to achieve superior sustainability performance (2021: 17).

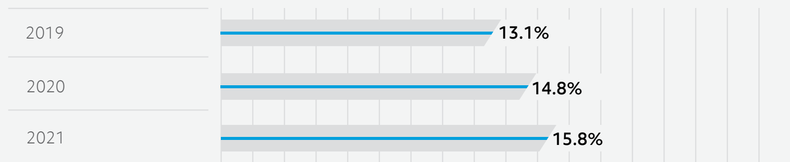
The challenge of decarbonising iron making or aluminium smelting requires the development and industrialisation of radically new technologies. We complement our internal efforts with partnerships with over a dozen research institutions, universities and strategic customers, working to develop the refractory solutions that will support these novel processes.

Product sustainability benefits scorecard

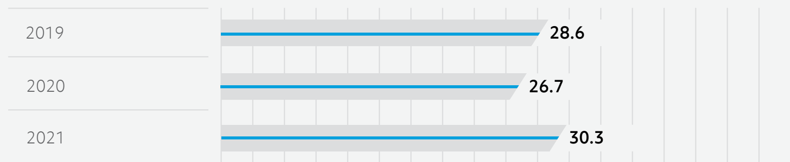
Improves users' comfort, health and safety	Safety in manufacturing and transportation
	Safety during usage
	Exposure to health hazards
Limits our impact on natural resources	Product weight
	Product lifetime
	Recycled materials
Minimises energy consumption and emissions	Cradle to grave greenhouse gas emissions
	Reduced and avoided CO_2 emissions for the customer
	Volatile compounds emissions
Reduces waste, avoids landfill and increases recycling	Waste generation during manufacturing and usage
	Recyclability after usage

Vesuvius' investment in innovation and sustainability

% of sales generated by market-leading sustainable products*



R&D spend (£m)



* Using Vesuvius' internal scorecard.

Our people

The safety, diversity, personal growth and job satisfaction of our people are key to the success and growth of our business.

Health, safety and well-being at work

Our strategic ambition is to provide a safe working environment for all our people and to deliver value to them by providing development opportunities. This section details our performance and initiatives in both Health and Safety and Human Resources.

Safety is our top priority and our overriding commitment to health and safety is embedded throughout the organisation. Our approach is to identify, eliminate, reduce or control all workplace risks, and an ongoing system of training, assessment and improvement is in place to focus on achieving this. We remain fundamentally committed to protecting the health and safety of employees, contractors, visitors, customers and any other persons affected by our activities.

We want to become a zero-accident company and are striving to become a best-in-class organisation for safety performance and leadership.

Our principles

1. Good health and safety is good business
2. Safety is everybody's responsibility
3. Working safely is a condition of employment
4. All work-related injuries and work-related ill health are preventable

COVID-19

In 2021, the ongoing COVID-19 pandemic continued to affect Vesuvius in a wide variety of ways. In 2021 we lost 11 colleagues to this dreadful disease, and share the grief of the families and friends of those who passed away.

As many parts of the world were hit by third and fourth waves of infection, we continued to focus on protecting our employees whilst at the same time supporting our customers. Due to the outstanding efforts of our colleagues around the world we were able to maintain our operations and supplies during these difficult times.

With vaccines becoming widely available, we encouraged our colleagues to protect themselves and their families, whilst at the same time acknowledging that this is a matter of personal choice. In a number of countries, including India, Poland and South Africa, we were able to work with local health authorities to offer free vaccinations to our employees.

Safety leadership

Safety performance remains the priority item on the agenda at all our Group Executive Committee and management meetings, and safety performance is reported to the Board by the Chief Executive as a matter of priority at each Board meeting. In addition, as part of management reporting, the Board receives a detailed monthly update on all Lost Time Injuries (LTIs). The Group Executive Committee reviews all of the more serious incidents, including all LTIs, and the responses to these from local management. The Group remains fully committed to continuing safety improvement with a Group Health and Safety Policy stating a clear goal of:

- No Lost Time Injuries
- No repeat injuries
- No harm to our people or contractors

Health and safety governance

The Board has overall responsibility for health and safety-related matters and delegates authority for the management of the health and safety performance of the business to the Chief Executive. The Health and Safety Policy is signed by all members of the Group Executive Committee and the business unit Presidents are responsible for its deployment, with the support of the President of Operations.

The Board receives monthly information on every Lost Time Injury and key safety performance indicator. In addition, the Board carries out a biannual review of health and safety performance and overall Company safety strategy. Annual presentations of business unit strategy also include health and safety strategy. The results of our Group Safety Audits are presented to the Board twice per year.

Business accountability

The Group VP Sustainability, HSE & Quality is responsible for setting the Group's policies for health and safety and controlling their application.

The business units are responsible for the implementation of these policies and are directly accountable for the health and safety performance of their operations, with each business unit determining its own priorities and resource allocations, aligned with Group-wide targets on safety performance.

A majority of senior managers has a portion of their variable compensation tied to the achievement of safety performance targets.

Health and Safety governance

The Board
Overall responsibility for health and safety related matters, approves targets

Chief Executive
Takes responsibility and is accountable for the safety performance of the Company, sets targets

Vice President Health and Safety
Defines standards, organises Group safety audits and benchmarks and guides strategy

Business Unit Presidents
Are responsible for resources, training, action plans and performance

Executive Safety Tours

This tone from the top is also demonstrated by the requirement for all senior managers, irrespective of discipline, to perform Executive Safety Tours, report on their findings to local operations management and follow up on improvement requirements. In this structure, all employees understand that they have a responsibility to take care of themselves and others whilst at work. Through this process, we expect everyone to participate positively in the task of preserving workplace health and safety. The tours encourage dialogue with staff, setting action points for discussion and implementation. In this way, these tours provide visible safety leadership on the shop floor in our sites and at our customer locations. Along with our daily safety audits, they are a central pillar of our Safety Breakthrough initiative.

In 2021, 80 Executive Safety Tours were carried out by members of the Group Executive Committee and their direct reports. This represented a decline from the 103 conducted in 2020, primarily because of continuing travel restrictions imposed by the COVID-19 pandemic.

Unfortunately, no Safety Tours were able to be conducted at customer locations in 2021. Whilst COVID-19 travel restrictions limited the number of Executive Safety Tours conducted in 2021, the number of Safety Tours conducted by middle management increased, assisted by the introduction of a mobile app to enhance the process.

Review, assess and implement

Every business facility has an appointed health and safety manager, who works with management and all employees to review site health and safety, assess training needs and develop and implement site safety improvement plans. These local health and safety managers are assisted by central experts who not only identify adverse trends and respond to them, but also enable the sharing of best practice across Vesuvius.

We continue to work hard to reduce incident severity and generate actionable insights from the performance indicators we capture. The LTI frequency charts prepared monthly for each business unit and site, show where injuries have been reduced and where further effort is required, through a combination of a behaviour-based approach to safety and the implementation of physical safeguards. We focus on the safety of all personnel, whether they are employees, third-party contractors or visitors.

Based on the analysis of the kind of accident, type of injury and parts of the body affected, the businesses develop risk-based action plans that consider both the frequency and severity of incidents and track progress. Every site management team receives a monthly dashboard of health and safety-related performance indicators, covering both lagging and leading metrics.

Safety leadership

All site management teams must develop and implement site safety improvement plans, incorporating the identification and reduction of the site's main risks, compliance with the Group safety standards, deployment of shop floor safety leadership practices and resolution of issues highlighted during Group safety audits. Improvement plans are now in place for all production sites, with implementation being the direct responsibility of local managers.

Any site experiencing a severe incident, an LTI, a medically treated injury, or a serious dangerous occurrence is required to investigate the incident. Vesuvius' investigation procedures are based on the 8D practical problem-solving tool, which aims to identify the true root causes of incidents to prevent a repeat. Results are formally presented to management, with details of the 8D-based root causes. The site then incorporates the findings into their site safety improvement plans and shares their incident investigation so that improvement actions can be cascaded throughout the organisation.

Our employees are highly supportive of the Group's efforts to improve workplace safety and acknowledge how seriously we take this issue. In the 2021 I-Engage employee engagement survey, 83% agreed that the Company will address safety concerns if they are raised.

Health, safety and well-being at work

Health and Safety Policy and Standards

All employees are required to adhere to the Group's Health and Safety Policy and Alcohol and Drug Policy. Copies of the policies are translated into local languages and displayed prominently in all locations. The Health and Safety Policy is supported with standards, procedures and ISO certifications, which are reviewed and updated on an ongoing basis. The findings and lessons learned from incident investigations are incorporated into updates to prevent any recurrence and new or improved standards are issued for implementation across the Group.

Group Safety Standards

Over the years, Vesuvius has developed a set of 28 Safety Policies and Standards. These are regularly reviewed and updated, based on the best practices implemented in sites and learnings from incidents in particular. The Group Safety Audit checklist is designed to cover the essential points of the Group Safety Policies and Standards.

Vesuvius also maintains a working hours policy and monthly reporting of headcount and hours worked. This allows us to identify if maximum working hours are being exceeded which can then be investigated by management.

Health and Safety Standards

Accident & Incident Reporting	Reviewed 2021
5S Colour Standard	Issued 2021
Business Continuity	
Control of Contractors	
Customer Location	Reviewed 2021
Crisis Management & Crisis Communication	
Drug and Alcohol	
Ergonomics	
Executive Safety Tour	
Gas Safety	
High-Risk Activities	
Inspection, Maintenance and Testing of Fixed Electrical Installations	
Isolated and Lone Working	
Isostatic Presses	
Legionella	Reviewed 2021
Lifting and Handling	
Lock, Tag and Try	
Machine Safety	
Overtime Policy	
Permit to Work	
Personal Protective Equipment	Reviewed 2021
Process Safety	
On Site Vehicle operations	
Road Safety	
Risk Assessment	
Safe Storage of Bulk Bags and Pallets of 25kg Bags	
Warehousing Racking	
Working Safely with Fibres	

Pillars of health and safety

Risk assessments

We routinely carry out risk assessments to identify and rate hazards and implement protective measures to minimise exposure.

These include:

- Engineering solutions to eliminate or minimise risks
- Procedural measures, such as training and auditing
- Work instructions, written with the involvement of the employees who carry out the tasks, with illustrations and in local languages
- Providing personal protective equipment to employees free of charge

Training employees to work safely

Our proprietary TurboS training pulls together all of our safety management practices. Using a train-the-trainer approach, TurboS training sessions are tailored to the audience and their activities. For example, there is a special training course developed for employees at customer locations that focuses on the specific risks faced by these individuals. We conduct Permit to Work training in all Group facilities, including customer locations, which ensures that all non-standard work conducted in our facilities, whether by our employees or contractors, is the subject of a pre-commencement risk assessment and a formal permission to commence the activity, with the safety requirements set out. We have developed machinery safety training with an outside industry leader, Pilz GmbH & Co, a company specialising in safe automation technology. Recognised best practices are extended throughout the Group through a series of machinery assessments and training programmes, with each site identifying and addressing the top five issues by severity as a matter of priority.

TurboS is a part of the Group's Safety Breakthrough initiative, which was instigated in 2008. It includes a strong focus on the standardisation of all of our repetitive activities. TurboS also integrates good management practices in the workplace, with a strong emphasis on developing an organisation that enables everybody to work to the same high standards in safety performance.

As part of the continuing TurboS initiative:

- Senior executives regularly lead safety tours at all locations
- Severe accidents are formally reviewed by the Group Executive Committee
- Employees are routinely engaged in safety audits
- Employees receive regular communication (toolbox talks at the beginning of each shift, 'town hall' meetings, safety briefings after LTIs)
- We invest significantly in safety training for all employees, irrespective of their role and function within our business
- All employees are expected to routinely raise and implement safety improvement opportunities; we focus on the number of implemented ideas
- Safety standards are continually updated, translated and deployed throughout the Group
- All injuries and dangerous occurrences are analysed locally, with a formal presentation of findings, root causes and improvement actions cascaded through management

Working in tidy plants – 5S

The continuing use of 5S, the workplace organisation method, throughout the Group has driven significant improvements in our workplace environment. Employees are encouraged to develop ownership of their working areas and take pride in their cleanliness and organisation. The added support of our lean specialists has been key to improving plant safety by removing hazards for employees and offering a clean, bright and safe working environment. Regular 5S audits led by team leaders ensure continuous improvement of working conditions and promote a safer workplace.

Take 2

Our Take 2 initiative ensures that employees think again before performing any unusual or non-standard activity. Simply stated, the employees take two minutes to discuss the task, any hazards and how to prevent accidents before any work is started. This process allows the team to consider and reflect on hazards and the controls required before work commences.

Contractor management

Contractor management is a particularly important area of attention, as it involves employees of third-party companies working on our premises to perform various types of project work. Vesuvius has defined strict rules which are outlined in the Control of Contractors standard. These rules include a pre-screening for safety performance and risks before a contract is signed, a commitment to respecting the same safety standards as Vesuvius employees and a safety induction for all contractor employees on Vesuvius sites. All activities subject to a Permit to Work are audited on a daily basis.

Contractor safety management and performance is monitored. Safety performance targets for contractors are set at the same level as for Vesuvius employees.

Investing in technology for safety

Safety can be improved through the evolution of procedures and better behaviours, but technology offers new opportunities to continue to make our workplaces safer. Vesuvius is therefore investing in a range of technologies with the goal to automate strenuous or dangerous tasks and improve ergonomics. We are also exploring a range of new technologies including exoskeletons, wearable sensors and autonomous guided vehicles.

In 2021, we tested the Brightmile mobile phone driver safe behaviour app. We carried out pilot projects in four countries recognised for the high level of road traffic fatalities and with a large number of Vesuvius employees (Brazil, India, Mexico and South Africa).

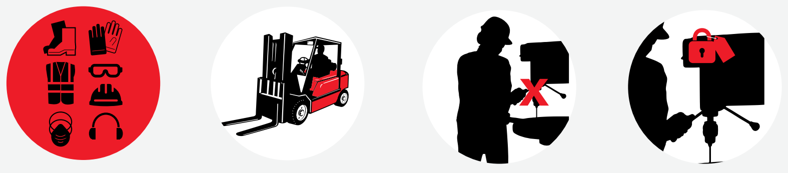
Monitoring work conditions and employee health

Vesuvius has developed and implemented a variety of programmes to ensure that we provide our employees with work conditions that are not detrimental to their health. These include the routine monitoring of noise, dust levels, and volatile organic compounds emissions.

Routine health check-ups are also required for employees in positions that could present certain specific risks (e.g. forklift drivers).

Health, safety and well-being at work continued

8 Core Safety Rules

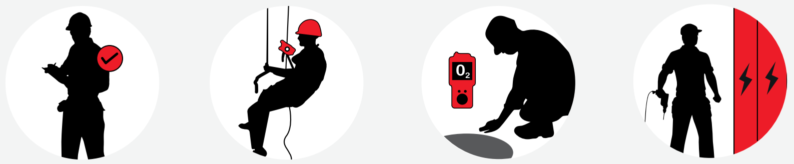


1. I always wear mandated personal protective equipment

2. I only operate equipment or vehicles if trained and authorised

3. I do not remove, bypass or tamper with machine guarding and safety devices

4. I lock, tag and try before any intervention on a machine



5. I make sure all high-risk activities are covered by a daily Permit to Work

6. I always ensure my fall protection is secure before working at height

7. Before entering a confined space, I check I will be able to breathe and to escape

8. I only perform electrical work if certified and authorised

Core Safety Rules

In 2019, we launched the Vesuvius 8 Core Safety Rules that outline our colleagues' basic safety responsibilities. These were rolled out across the organisation as the mandated practices for employee and manager conduct. In conjunction with this, the Group has implemented procedures to ensure the rules are followed. The rules were incorporated into the contractual terms of all employees, and all employees are expected to report breaches and violations of the rules, with appropriate sanctions imposed whenever required. Failure to do so is a disciplinary issue.

Customer Location Standard

In line with our safety priority, we have spent decades improving systems, processes and technology at our sites to protect our people at work. We also apply the same safety standards for our teams working at customer locations.

Our Customer Location Standard addresses the specific risks faced by our employees whilst operating in customer locations and applies to approximately 2,500 Vesuvius employees worldwide. The standard focuses on structuring cooperation between our customers' management teams and our own to ensure health and safety issues are jointly identified and addressed.

For new contracts in customer locations, we use a formal risk assessment which aims to identify significant risks to our employees and contractors. This enables appropriate control measures to be agreed and implemented with the support of our customers in advance of work commencing. These are then formally included in the contractual conditions we impose when working at a customer site.

Process Safety initiative

In 2020, Vesuvius launched a new Process Safety initiative, starting with an analysis of the high-risk processes in the Company, the elaboration of a global process safety framework and a first technical standard covering high-pressure isostatic presses.

In 2021, we developed our second process safety standard, covering dust and explosive powders.

The deployment plans for these standards include training, the development of a centralised database and the implementation of a routine reporting process.

Safety training

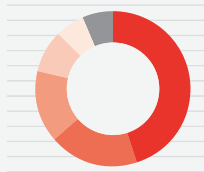
We regard the understanding and application of the Group Safety Standards by management and all employees as essential to ensure their proper implementation on the shop floor and ongoing adherence. We therefore expect our managers to carry out compliance self-assessments for their sites based on the Group Safety Audit checklist and invest in the training of employees on the HSE standards. In 2021, we delivered more than 169,000 hours of training on safety standards and safety leadership (TurboS), to our employees in Manufacturing, R&D, and Customer Locations representing on average, more than 15 hours per person.

In addition to the training on Group Safety Standards and TurboS, business units and sites develop and offer programmes addressing the specific processes and risks. Communication and training on hand safety and ergonomic practices have been major areas of recent focus.

Training activities routinely undertaken for our employees and contractors include:

- Arc Flash Hazard
- Bike Safety
- Control of Contractors
- Crane Operation
- Defensive Driving
- Electrical Testing
- Environmental Waste Reporting
- Ergonomics
- Executive Safety Tour Leader
- Exoskeleton
- Fire Fighting
- First Aid
- Forklift Truck
- Gas Safety
- General Health & Safety and refresher training
- Hand Hazard and Protection
- Hazard Perception
- Hazardous Goods
- Health and Safety Representatives
- ISO 45001:2018
- Legionella
- Lock, Tag and Try
- Incident and Performance reporting
- Machine Safety
- Permit to Work
- PPE Safety
- Practical Safety in Steel Customers
- Radiation
- Road Safety
- Safe Stacking
- Safety and Environmental Auditing
- Steel Mill Orientation
- TurboS Safety and Safety Leadership
- Warehouse Material Stacking and Handling
- Welding Certification
- Working at Height

Unique Executive Safety Tours 2021



Europe	36
NAFTA	15
China	12
Australia-New Zealand	7
North Asia	5
South America	5

Health and safety auditing

Group safety audits

The Group operates a central safety auditing team of three auditors, each with more than 10 years' experience, who report to the VP Sustainability, HSE & Quality. The team's main purpose is to verify the deployment and ongoing application of the Group's standards and policies in our locations, including our manufacturing sites, R&D facilities and the customer locations in which a significant number of our employees operate daily. Each audit also includes an assessment of the site's HSE leadership.

Following each audit, action plans are created by the site management teams to address any issues identified and work on completing these is assessed on a regular basis. The observations made during audits have been used to improve the Group's training programmes and to enhance the Group's health and safety standards. The results of the Group HSE audits, as well as the progress of action plans addressing the most critical issues, are reported to the Board twice a year.

During 2021, the team conducted 22 audits, visiting manufacturing locations, R&D centres of excellence and customer locations with 40 employees or more, as part of a programme of systematic audits of all Group locations worldwide.

Travel restrictions due to the COVID-19 crisis prevented the team from completing the full 2021 audit plan of inspection visits. Instead, the remote assessment programme developed in 2020 was used to reach sites that could not be physically audited. These assessments were carried out via videoconferences, during which the site management team presented the progress made in the implementation of Group safety standards, and improvement plans for the coming months. In 2021, we carried out 138 remote assessments.

Sites are encouraged to carry out self-assessments, based on the Group safety audit compliance checklist, to monitor their progress.

Safety audits and improvement opportunities

In our plants in 2021, more than 78% of our working population performed routine safety audits every month. This generated an average of more than seven implemented safety improvement opportunities per person from almost 10,000 employees, resulting in an improvement in worker safety. This audit programme involves employees at all levels – from the Group Executive Committee and safety specialists through to local site management, employees and directly supervised contractors.

Health and safety certifications

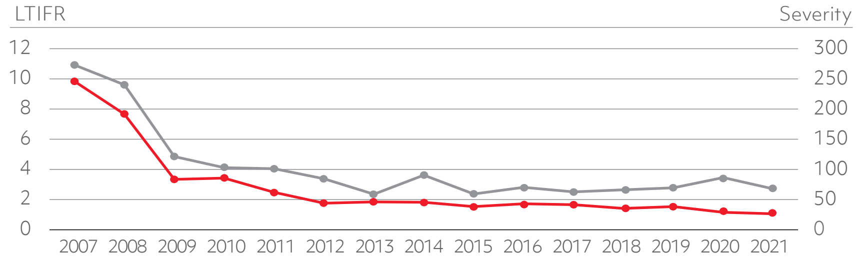
We have five manufacturing sites (representing 9% of our manufacturing sites), one warehouse and three Vesuvius operations in customers certified to ISO 45001:2018. Vesuvius sites choose to certify based on local regulatory and customer requirements. A list of certified sites is available to view on our website: www.vesuvius.com.

Health, safety and well-being at work continued

Safety performance in 2021

Lost Time Injuries per million hours worked
Lost Time Injuries Severity Rate in lost days per million hours worked

LTIFR 12 months rolling
LTI Severity Rate 12 months rolling



Safety performance 5-year table with main performance indicators

Performance indicators	2021	2020	2019	2018	2017
	All employees, contractors and visitors				
Work Related Death	**0**	0	0	1	0
Severe Injuries	**3**	4	0	2	1
Lost Time Injuries (LTI)	**29**	28	40	39	46
LTI Frequency Rate (LTIFR) per million hours	**1.06**	1.16	1.54	1.42	1.66
Recordable Injuries	**123**	126	144	125	147
RFR per million hours	**4.51**	5.20	5.53	4.54	5.31
Medically Treated Injuries (MTI)	**201**	164	198	202	214
MTIFR per million hours	**7.38**	6.77	7.60	7.34	7.73
Total Number of Injuries	**627**	419	520	492	563
Injury FR per million hours	**23.01**	17.31	19.96	17.87	20.33
LTI Lost Days	**1,851**	2,094	1,811	1,824	1,738
LTI Severity Frequency Rate (Lost Days) per million hours	**68**	86	70	66	63
Dangerous Occurrences (DO)	**1,180**	779	736	649	409
DOFR	**43.30**	32.18	28.25	23.57	14.77
Safety Audits Number	**108,895**	95,290	113,428	121,117	120,266
Safety Audits per 20 Employees per month	**14**	14	16	16	15
Employees Participating in monthly Safety Audits	**9,994**	8,559	8,804	9,973	10,086
Employees Participating in monthly Safety Audits %	**78%**	73%	75%	80%	77%
Safety Improvement Opportunities with a Permanent Action (SIOPA)	**95,322**	81,075	92,038	92,778	91,725
Other Improvement Opportunities with a Permanent Action (IOPA)	**27,235**	29,236	30,611	36,436	34,663
IOPA Total	**122,557**	110,311	122,649	129,214	126,388
SIOPA per Employee	**7**	7	8	7	7
Other IOPA per Employee	**2**	2	3	3	3
IOPA Total per Employee	**10**	9	10	10	10
Hours Worked (thousands)	**27,254**	24,211	26,053	27,533	27,688

All frequency rates (FR) are per million hours worked.
Excludes Universal acquisition.
There were two minor injuries involving third-party truck drivers on Vesuvius' operations in 2017, with none in 2018 to 2021.
Average third-party contractors and visitors in 2021: 414.

Safety performance in 2021 is detailed below:

Performance indicators	Employees and directly supervised contractors 2021	Third-party contractors and visitors 2021	All employees, contractors and visitors 2021
Work Related Death	**0**	**0**	**0**
Severe Injuries	**3**	**0**	**3**
Lost Time Injuries (LTI)	**26**	**3**	**29**
LTI Frequency Rate (LTIFR) per million hours	**0.99**	**2.94**	**1.06**
Recordable Injuries	**117**	**6**	**123**
Recordable FR per million hours	**4.46**	**5.89**	**4.51**
Medically Treated Injuries (MTI)	**195**	**6**	**201**
MTIFR per million hours	**7.43**	**5.89**	**7.38**
Total Number of Injuries	**618**	**9**	**627**
Injury FR per million hours	**23.56**	**8.83**	**23.01**
LTI Lost Days	**1,851**	**0**	**1,851**
LTI Severity FR (Lost Days) per million hours	**71**	**0**	**68**
Dangerous Occurrences (DO)	**1,177**	**3**	**1,180**
DOFR	**44.86**	**2.94**	**43.30**
Safety Audits Number	**108,895**	**n/a**	**108,895**
Safety Audits per 20 Employees per month	**14**	**n/a**	**14**
Employees Participating in monthly Safety Audits	**9,994**	**n/a**	**9,994**
Employees Participating in monthly Safety Audits %	**78%**	**n/a**	**78%**
Safety Improvement Opportunities with Permanent Action (SIOPA)	**95,322**	**n/a**	**95,322**
Other Improvement Opportunities with Permanent Action (IOPA)	**27,235**	**n/a**	**27,235**
IOPA Total	**122,557**	**n/a**	**122,557**
SIOPA per Employee	**7**	**n/a**	**7**
Other IOPA per Employee	**2**	**n/a**	**2**
IOPA Total per Employee	**10**	**n/a**	**10**
Hours Worked (thousands)	**26,235**	**1,019**	**27,254**

2021 safety performance

With the aim of becoming 'best in class', the Group has re-energised its safety agenda to further enhance efforts to achieve its safety goals.

With a Lost Time Injury Frequency Rate (LTIFR) of 1.06 per million hours worked in 2021, we recorded our lowest frequency rate ever. Excluding third-party contractors the LTIFR was less than 1.0.

Fatalities and severe injuries

Sadly, in 2021, two of our colleagues were killed in road traffic accidents while commuting to work. Vesuvius is providing financial and social support to their families and has actively taken steps to reduce commuting related risks. Regrettably, two of our colleagues and a contractor also suffered severe injuries: deep hand lacerations requiring hospitalisation in Australia, an eye injury while changing a bit on a pneumatic tool in China, and a foot amputation after being run over by a customer engine in a customer location in Vietnam. Following full root cause analyses, robust preventative measures were implemented across Vesuvius with changes made to our HSE standards to reduce the risk of recurrences.

Lost time and medically treated injuries

Vesuvius operates a robust and comprehensive process for the timely reporting of incidents. In our internal standards, third-party contractors are included, and we use more stringent definitions for Lost Time Injuries (LTIs) and 'severe accidents' than the definitions used by many regulatory bodies. All sites are required to report on all Medically Treated Injuries (MTIs), broader than recordables, to maintain the focus on safety. As an illustration of the precautionary preventative approach taken by Vesuvius in accident investigation, all LTIs and MTIs required a full 8D report.

In 2021, 29 LTIs were reported which resulted in 1,851 lost days giving the LTI frequency rate for the year of 1.06 per million hours. This was a significant improvement versus the 1.16 recorded in 2020. 201 MTIs were reported in 2021 (versus 164 in 2020) out of a total of 627 injuries reported (versus 419 in 2020), resulting in an MTI frequency rate of 7.38, (versus 6.77 in 2020). Whilst both 2021 and 2020 were unusual years because of the COVID-19 pandemic and associated changes in working, we believe that the significant improvements in Lost Time Injury rates reflect a broader trend of underlying improvement for the Group and result from a strong management commitment to change.

Health, safety and well-being at work continued

Main types of work-related injury

In 2021, the main causes of work-related injuries were, in descending order of frequency: handling, lifting or carrying; being struck by moving objects; striking against something fixed or stationary; and slips, trips and falls. The main injuries suffered were contusions, lacerations, sprains and strains, fractures and abrasions to the eye. The main body parts affected were hands, wrists and fingers, backs, feet, knees and eyes. Based on this incident data, targeted campaigns are launched by the business units.

Dangerous Occurrences

Vesuvius Dangerous Occurrences include all non-lost time and non-medically treated injury incidents and incidents with and without actual damage whether work related or not). There was renewed emphasis on the reporting of dangerous occurrences and injuries in 2021 so that root cause analysis could be undertaken, and preventative action plans implemented to prevent future occurrences. Consequently, there was an increase in the number of Dangerous Occurrences reported in 2021 to 1,180 (2020: 779). Out of the Dangerous Occurrences occurring in 2021, the more serious 27% that could have resulted in a severe accident also required a full 8D report, the remainder being dealt with via line PPS (Practical Problem Solving).

Safety awards and recognition

In addition to our efforts to keep our employees and contractors safe, we take pride in sharing our safety management practices with our customers. We are very proud of the external recognition received by our teams for their safety leadership and achievements. Some of the awards received in 2021 included:

Awards

WRA Safety awards

The Pune plant and JSW Vijaynagar customer location, both located in India, received safety awards from the World Refractories Association and more than 50 Vesuvius locations (manufacturing sites and customer locations) received safety certificates.

ERPA Safety award

The Hengelo plant in the Netherlands received a safety award from the European Refractories Producers Association.

TATA 4-star ratings

Vesuvius teams in three TATA Steel locations in Thailand achieved a 4-star rating recognising their excellence in contractor safety.

Ternium Safe Supplier

Vesuvius was recognised as a 'Safe Supplier' by Ternium in Mexico and received a Safety Award in Brazil.

Usiminas Safety innovation award

We received the highest safety award granted by Usiminas in the innovation category for reducing the exposure of people to hot metal.

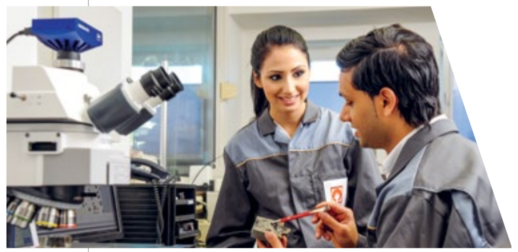
Shougang Jingtang Iron & Steel Outstanding Supplier

Shougang Jingtang Iron & Steel recognised Vesuvius as an outstanding supplier.

Vesuvius Safety Awards

Vesuvius has also created internal Safety Awards, to recognise its best performing locations. In 2021, we distributed Safety Awards to 11 regions, as recognition of their outstanding performance in the previous year. These regions each completed 2020 without recording a Lost Time Injury, recorded a participation of more than 80% of employees in monthly Safety Audits and implemented more than ten improvement opportunities per person per year.

People and Culture Strategy



In 2021, the implementation of our People and Culture Strategy which we launched in 2020 continued. This aims to build an outstanding business by ensuring we have the people, skills and capabilities critical to the delivery of our strategy.

We aim to grow outstanding people: we ensure our people managers have what they need to lead their diverse, engaged and high-performing teams for business and personal growth. These goals are strongly underpinned by a values-driven, winning culture that embraces diversity of thinking and continuous innovation to achieve high levels of performance and growth.

We create this culture by building broad organisational understanding of our strategy, goals and accountability, supported by our CORE Values and positive management behaviours. We seek to foster a working environment that is inclusive and diverse, where people can be themselves without fear of harassment, bullying or discrimination. True to our decentralised business model, each of our business units has their own strategic HR agenda supporting delivery of their business strategies.

As a result of ongoing COVID-19 challenges in 2021, we continued to adapt our working practices to ensure the safety and well-being of all our employees. In addition, our recruitment and talent sourcing strategy was adjusted to accommodate working remotely.

Currently 422 employees participate in the global Annual Incentive Plan (AIP). Eligibility for participation is based on job grade and is subject to approval by the Chief HR Officer. The AIP structure is based 80% on Company performance and 20% on performance against employees' personal objectives. In addition, 209 of these employees participate in various forms of share-based incentives.

Another 57% of our permanent employees worldwide, both salaried and hourly, participate in various local incentive schemes. The BU Presidents and Regional VPs are responsible for the target setting and the pay-out approval of these local plans.

Non-compensation benefits including pension and retirement benefits are managed locally in accordance with local laws.

Employee engagement

Companies with highly engaged staff deliver better business outcomes. They have lower absenteeism, lower staff turnover, fewer safety incidents, better product quality, and higher productivity, sales and profitability.

At Vesuvius, we regard engagement as critical to our ongoing success and we work hard to listen to our people and act when issues impacting engagement are identified.

Engagement is a collective responsibility, particularly among our management community. We conduct an annual employee engagement survey to measure our employees' attitudes to Vesuvius and their work. The survey generates reports of team responses to the survey. Managers then share the results openly with their teams and, working together, develop Action Plans to address issues.

The survey has been conducted since 2019 in partnership with Mercer. The results are clustered in eight strategic categories and benchmarked externally against global and manufacturing industry results.

Permanent employee turnover per region

Region	2021 turnover (%)	2021 voluntary turnover (%)	2020 turnover (%)	2020 voluntary turnover (%)
Americas	20%	10%	18%	6%
Asia-Pacific	16%	14%	12%	10%
EMEA	12%	9%	14%	6%
Total	16%	11%	14%	7%

Distribution of Vesuvius employees by category

	2021	2021 (%)	2020	2020 (%)
Direct employees	10,657	96%	10,016	97%
Agency employees	419	4%	338	3%
Total	11,076	100%	10,354	100%

1. Employee numbers exclude employees joining Vesuvius as a result of the acquisition of the Universal Refractories business.
2. In addition to the headcount above, Vesuvius employed the services of 191 contractors and consultants in 2020 and 134 in 2021, to work on specific short-term projects.

Distribution of Vesuvius employees – full-time versus part-time

	2021 Full-time employees	2021 Full-time employees (%)	2021 Part-time employees	2021 Part-time employees (%)	2020 Full-time employees	2020 Full-time employees (%)	2020 Part-time employees	2020 Part-time employees (%)
Permanent salaried	4,086	99.0%	43	1.0%	3,905	98.7%	53	1.3%
Permanent hourly	5,878	99.9%	6	0.1%	5,647	99.9%	7	0.1%
Temporary salaried	90	98.9%	1	1.1%	64	97.0%	2	3.0%
Temporary hourly	966	99.4%	6	0.6%	674	99.7%	2	0.3%
Total	11,020	99.5%	56	0.5%	10,290	99.4%	64	0.6%

Note: Employee numbers exclude employees joining Vesuvius as a result of the acquisition of the Universal Refractories business.

People and Culture Strategy continued

Employee engagement action plans

We focus action plans not on the pure statistics, but on seeking to bring about meaningful change in line with our CORE Values of Courage, Ownership, Respect and Energy. For example, much of the action taken to date has resulted in improved communications between managers and their teams and on greater cross-functional understanding and collaboration, all of which are key to the principles of our CORE Values.

In 2021, despite the ongoing challenges caused by the COVID-19 pandemic, and thanks to a tremendous effort by local management, supported by an effective communication campaign, we again achieved a very high participation level in our engagement survey with 92% of all employees completing it, the same level of participation as we achieved in 2020.

Following improvements across all survey categories in 2020, the overall engagement score remained stable, with further improvement across six of the eight categories of questions and no change in the remaining two categories.

For the third consecutive year, safety remained our top strength with employees confident in the Company's approach to safety. Other highlights included positive attitudes towards immediate managers and employees feeling that they are treated with respect.

While there was an increase in the belief that action plans from the 2020 survey had a positive impact, it continues to remain an area for improvement.

Living The Values Awards 2021

Our CORE Values are central to the culture we are building at Vesuvius. By living these values, we will create a truly entrepreneurial culture that focuses on the needs of our customers. One of the ways we encourage and recognise colleagues who display our values is our annual regional and global Living The Values Awards.

Winners of each of the categories of these Awards were nominated for the Global Awards, the results of which were announced at a special online ceremony in December 2021. Chief Executive Patrick André paid tribute to all finalists, noting that they each provide a remarkable example of what can be achieved by being true to the CORE Values.

People and strategy

Outstanding business — Critical skills and capabilities to win

Outstanding people — Capable managers leading diverse, engaged and high-performing teams

Outstanding function — Teaming up with the business to solve their biggest people issues

Winning culture

Embracing diversity of thinking and continuous innovation to achieve high levels of performance and growth

Global Living The Values Awards winner:

Courage

Audrey Pradhita
Commercial Sales Engineer, Advanced Refractories, Pelabuhan Klang, Indonesia

Audrey works in Advanced Refractories sales in South East Asia. Her hard work and commitment to finding better ways of working has enabled her to deliver huge increases in sales volumes and earned her the respect of everyone she works with.

Global Living The Values Awards winner:

Ownership

Darla Coulter
Master Data Manager, Central Operations, Champaign

In the highly diversified Vesuvius environment, Darla demonstrated real ownership in successfully establishing the global Master Data Management practice. She showed unbelievable drive to deliver something she considers essential for Vesuvius' success.

Global Living The Values Awards winner:

Respect

Jhuma Chowdhury
Assistant HR Manager, Flow Control, Kolkata

As part of her role, Jhuma manages the administration of Vesuvius India's travel requirements, both domestic and international. Jhuma treats everyone's needs with the utmost importance, acting with universal dedication and seriousness. Jhuma is a credit to our Company.

Global Living The Values Awards winner:

Energy

Balla Murugesh
Assistant Manager – Mechatronics, Advanced Refractories, Kolkata

After supporting the first ever Tundish Spray Robot installation in the region, Balla was asked to support a second installation in Vietnam. Balla lived in one room of a closed hotel near the steel plant for five months relying on the help and cooperation of the local Vesuvius team for food and travel. The commissioning was successful and Balla finally returned home to India at the end of September 2021.

Internal communications

In 2021, we continued to develop our internal communications programme, to ensure we have a strong mix of channels to reach our diverse population. The Chief Executive regularly addresses the whole Group via Company-wide email and video and strategic messages, and Company news and announcements are regularly shared on the Group intranet and staff app. 2021 saw an active use of screen savers to communicate major news, and we continued to utilise posters and site 'town hall' meetings for on-site communications. Whenever possible, face-to-face communication is conducted at different levels of the organisation providing the necessary opportunities for interactive Q&A sessions with business leaders.

During 2021, the Group Executive Committee held 14 interactive virtual sessions with the Senior Leadership Group to share regular business updates and answer questions. We also held our annual leadership conference, SPARK. With COVID-19 travel restrictions still in place in some countries, the 2021 SPARK was a hybrid event, with close to 100 colleagues attending in person and 60 colleagues attending online.

Growth opportunities with training and career progression

Talent management

The Group Executive Committee holds direct responsibility for the roles and development of our senior leaders, jointly reviewing capability needs and deciding on succession and cross-organisational moves for the leadership group. This illustrates the strong commitment at the highest level of our organisation towards growing the Group using its Company-wide resources.

We employ individuals with an entrepreneurial mindset and an international outlook. Whether they are recent graduates or seasoned professionals, everybody who wants to leave their mark in a dynamic rapidly developing business environment has a chance to succeed. Special attention is paid to building strong, diverse teams that bring different backgrounds and experiences to our daily work.

Leadership pipeline

Strengthening the leadership pipeline and facilitating people development throughout the organisation remain key areas of focus for Vesuvius. We continue to work hard to ensure that we have the right capability in every part of the organisation to drive our strategy and realise market opportunities. As a result, we have built high-calibre leadership teams, many of whom are relatively new to their roles and to Vesuvius. We empower our people to drive the business with an entrepreneurial spirit, and to develop a performance-oriented culture.

In 2021, Vesuvius expanded its mentoring programme focused on leadership and talent development. There are currently 50 mentees taking part in the 12-month programme. Mentees learn from the experience and perspectives of a more senior person in Vesuvius, creating an individual personal development plan to enhance their careers and leadership capabilities. The programme ensures internal knowledge transfer and builds a broader, deeper and more ready talent pool.

We aim to adopt an ideal balance between external hires and internal promotion, fuelled by a strong process of backup and succession planning, especially for management positions. In 2021, for middle management and Top Management roles, 72% of open positions were filled by external candidates, reflecting a period of transformation and capability building from external hires. In 2021, the percentage of Senior Management (comprising the key leadership roles reporting directly to members of the Group Executive Committee) with more than three years of service was 42%.

In 2021, Vesuvius launched a new global onboarding framework, in order to provide maximum support to new joiners in their first three months with the Company. The new material includes a comprehensive presentation about our business, our history, CORE Values and main processes and procedures, together with technical training on Vesuvius' products for all roles. It is designed to be adapted to each employee, depending on the responsibilities of the role and level in the organisation. It supports the employee in four main steps of the onboarding phase: before arrival, first day, first month and first three months.

Vesuvius onboarding framework

Before arrival	First day	First month	First three months
Documents shared to be signed on first day	Welcome package	Vesuvius Foundations	Complete career information registered on 'myVesuvius'
Equipment and systems accesses	Mandatory trainings	Knowing the business and our industry	Objectives setting
Prepare the onboarding agenda	Announcement	Knowing the team and shareholders	Meeting/Q&A session with senior leaders
Line manager welcome email	Understanding the organisation	Knowledge transfer	People leader training
Announcement preparation			Probation period feedback

People and Culture Strategy continued

Mandatory online training courses	Number of employees trained	% of targeted audience completing course	Total training hours
Anti-Bribery and Corruption	4,388	100%	2,194
Gifts, Hospitality and Entertainment	929	98%	465
Modern Slavery	61	100%	20
Anti-Tax Evasion	749	100%	375
Data Protection	4,466	99%	2,233
Cyber Security	5,109	74%[1]	5,962

1. Cyber security awareness training consists of five modules. 74% of employees have already successfully completed all five modules.

Training and development

Our leaders take responsibility for managing and developing their teams. They are provided with access to a central resource, offering expertise in Global Rewards and Mobility, Talent and Performance Management, Culture and Learning, and supported by Group-wide processes and information systems.

We encourage and reward high performance, foster talent and aim to create an environment where all can realise their individual potential. To meet the demands of the business and add rigour to our employee value proposition, we have launched training programmes to assist our employees to develop their skills and progress their careers.

In 2021, the main training focus areas included health and safety, compliance, technical skills, and commercial excellence. Some of the key initiatives are highlighted below.

In Q4 2021, we implemented a new Learning Management System (LMS) on 'myVesuvius', our online people management platform, in order to provide a global hub for Vesuvius online training courses. Mandatory training courses are automatically assigned to new joiners and completion statistics are easily reportable. Targeted training courses can also be allocated to employees in specific roles, e.g. Modern Slavery training for specific people in purchasing. Compliance, Data Protection and Cyber Security training are all accessible via the LMS.

During the course of our activities, we may collect, store and process personal data about our staff, customers, suppliers and other third parties and our Data Protection Policy recognises our commitment to treating this data in an appropriate and compliant manner. Specific data protection training through e-learning is a mandatory training course for all employees with email access. At the end of 2021, the completion rate was 99%. It is regularly audited for non-completion.

In 2021, further training was undertaken relating to the Brazilian General Data Protection Law and the Data Security Law in China which came into force on 1 September 2021. Vesuvius continues to develop information technology and the use of apps, internet and other sites, in particular relating to marketing. Specific e-marketing training was prepared and delivered to business unit marketing teams in 2021.

Technical training

HeaTt training is aimed at the continuous technical development of Vesuvius employees. Courses range from entry to expert levels and are continuously updated to keep pace with developing technology and delivery methods, thereby guaranteeing that Vesuvius experts are at the forefront of technical innovation. They are a great way for our hugely experienced technical experts to pass on their knowledge to the next generation and ensure the sustainability of our know-how. The first introductory module is mandatory for all new employees and is available on the LMS, allowing participants to access learning at anytime, anywhere.

Expert levels of HeaTt training are still held face-to-face, as the course content is not suitable for web-based training. In 2021, 695 employees completed the first module online and 45 employees completed face-to-face HeaTt training sessions.

In addition, in 2021 Vesuvius launched a Commercial Excellence transformation programme, known as 'ComPro', for account managers in our steel business units, addressing specific skills gaps. 222 employees have completed the nine-month programme, which is a mix of theory, e-learning, workshops, coaching and on-job application to ensure new habits are embedded and commercial capability strengthened.

During the year, we continued to develop our training programme on the principles contained in the Vesuvius Code of Conduct and associated anti-bribery, corruption and other compliance policies and procedures. Training gives our employees a clearer understanding of the scope of risks that exist as we conduct our business and gives context to how the Group expects each employee to respond to those risks.

Compliance training provided during 2021 included:

- An annual mandatory e-learning module for Anti-Bribery and Corruption, available in 22 of our functional languages.
- Webinar and videoconference training hosted by the Compliance team to staff at several sites covering Anti-Bribery and Corruption, Speak Up and trade sanctions.
- Updated face-to-face training for senior management on the overall compliance framework and process for policy and procedure implementation and monitoring.
- New Senior Manager compliance induction training – all new senior leaders receive dedicated training from the Compliance Director. This induction contains training and guidance on all relevant Compliance policies and procedures.

The Board has set a target of at least 90% of targeted staff completing the Anti-Bribery and Corruption training annually. 100% of the targeted staff (4,388 employees) completed the 2021 Anti-Bribery and Corruption training.

Workforce by gender[1]

As at 31 December 2021	Women	Men	Women	Men
Board	3	5	38%	62%
Group Executive Committee	2	6	25%	75%
Senior Management[2]	10	39	20%	80%
Middle Managers	63	427	13%	87%
All other employees	1,540	8,989	15%	85%
All employees	**1,615**	**9,461**	**15%**	**85%**

1. Employee numbers exclude employees joining Vesuvius as a result of the acquisition of the Universal Refractories business.
2. Senior Management comprises key leadership roles reporting directly to members of the Group Executive Committee.

	Women	Men	Women	Men
Americas	517	2,721	16%	84%
Asia-Pacific	324	3,161	9%	91%
EMEA	774	3,579	18%	82%
Total	**1,615**	**9,461**	**15%**	**85%**

Diversity and inclusion

Vesuvius operates in 40 countries around the world, employing people with 69 nationalities, making us a truly diverse business. We regard this diversity as a critical aspect of our success and future growth as it allows us to access the widest range of skills and experience. At the end of 2021, the Senior Leadership team (comprising c.160 senior managers) consisted of 21 nationalities located in 22 countries. 15% of our overall workforce were women, which was an increase of 1% versus 2020. Over the past three years we have made visible progress in gender diversity. Females now represent 21% in our top management (members of the GEC and their Senior Management direct reports), a level that we consider is still too low, but which represents a significant improvement as compared with the level of 12.5% in 2019. Our ambition remains to reach 30% women in this tier by the end of 2025.

Copies of the Board Diversity Policy and Group Policy on Diversity and Equality are available to view on the Vesuvius website: www.vesuvius.com.

Employee consultation and industrial relations

In all of the countries in which we operate, the Group informs and consults local works councils and trade unions in matters concerning the Vesuvius business as required. These processes and procedures are regulated by local law and generate constructive dialogue between employee representatives and management, which provides benefit to our business. In 2021, 72% of permanent employees were represented by local works councils, trade unions or other bodies.

In addition to local employee representation, the Group has operated a European Works Council (EWC) containing representatives from each of the EU countries in which Vesuvius has employees. The existing EWC Agreement terminated in 2020, following notice given by management and the departure of the UK from the European Union. The Group is in the process of negotiating the agreement for the formation of a new EWC with a Special Negotiating Body made up of representatives from the 13 European countries in which we operate. The new EWC Agreement will be registered in and operated under Polish law, as the representative country of Vesuvius plc, following the departure of the United Kingdom from the European Union.

When a new EWC Agreement is signed, and the Council constituted, European management will expect to meet the EWC formally at least once a year. At this meeting, management will provide an update on the performance of the business, with a focus on the developments likely to impact European employees.

Global reward

Reward and recognition are integral components of our employee value proposition, enabling us to attract, engage and retain key talent and highly qualified employees. Our reward systems are designed to create a market-competitive and fair pay environment for all our employees and to reinforce the vision, strategy and expectations set by the Board.

We seek to create a culture that champions performance, building a strong link between individual performance and pay. Supported by our online people management platform, 'myVesuvius', performance reviews and subsequent reward decisions are based not only on how employees have performed against their individual objectives but also on assessments of behaviour and commitment to our CORE Values.

Our global job grading framework, based on a structured assessment methodology, enables us to compare roles and ensure internal consistency throughout the organisation. We are committed to creating reward and performance management systems which are transparent and objective, where employees receive equal pay for work of equal value, regardless of their age, race, disability, sexual orientation, gender, marital, civil partnership or parental status, religion or beliefs. Our management Annual Incentive Plans are measured against both Vesuvius' financial targets and personal performance, an incentive structure consistent with that of our Executive Directors. The Vesuvius Share Plan for Executive Directors and Group Executive Committee members encourages decisions based on long-term goals rather than short-term gains and works to align the interests of participants and shareholders.

In 2021, 93% of our salaried permanent employees undertook a performance review with their line management. This compared with 95% in 2020 and 92% in 2019.

People and Culture Strategy continued

Global mobility

Vesuvius operates worldwide. We believe that our companies should be managed and staffed by local personnel. However, we also provide selected groups of employees with a range of international assignments. These assignments are usually for a limited period, most often three years.

Vesuvius expatriates do not come from one or two countries alone. We have a truly international mix of nationalities in our expatriate population. Individuals move not only within a region, but also between regions, with existing assignments including China to USA, France to Japan, UK to USA, Japan to Thailand, Germany to UK and Belgium to UK. Our mobility programme shows that our expatriate population is as diverse as our Group.

Vesuvius operates several international assignment policies to provide for the different circumstances of these assignments – whether they be short-term, longer-term or require extended commuting. These policies are supplemented with clearly identified benefits, delivering support appropriate to the nature of the assignment. By accessing this broad range of policies, we can manage our international assignments with greater flexibility, thus catering for changing expectations and demands from employees, whilst at the same time meeting the needs of the business.

Key rationale behind international assignments

Vesuvius considers individuals for international assignment for three primary reasons:

- Providing Vesuvius companies with skills that are not locally available and that are required at short notice. This typically occurs in countries where we are establishing or developing our presence. The number of expatriates working on this basis diminishes over time as the organisation matures and we recruit and train local talent to take over.
- Career development. We believe that the personal development plan of any employee being developed for a senior management or senior expert position should include a posting outside their home country. This encourages them to develop the skills necessary to function successfully in an international environment. These postings are tailored to the needs of the organisation and the needs of the individual.
- Enhancing diversity. Management teams benefit from having a mix of gender and cultures. In specific cases, we use international assignments to achieve this goal.

Our communities

We seek to establish strong relationships with all our key stakeholders, founded on mutual benefit and respect.

Our principles – a responsible company

Vesuvius is committed to making a positive contribution to society. As part of this, we focus on operating an ethical business with appropriate policies in place to ensure compliance with the regulations and laws in all our markets.

We are particularly conscious of the need to support the communities in which we operate.

Governance and policies

The Board is responsible for setting the culture and values of the organisation. The Group Executive Committee is responsible for implementing the culture and values, including ethics-related matters.

Vesuvius' operating policies underpin the principles set out in our Code of Conduct. They are the practical representation of our status as a good corporate citizen and they assist employees to understand and comply with our ethical standards and the legal requirements of the jurisdictions in which we conduct our business. They also give practical guidance on how this can be achieved.

Human rights

The Group Human Rights Policy reflects the principles contained within the UN Universal Declaration of Human Rights, the International Labour Organization's Fundamental Conventions on Labour Standards and the UN Global Compact, to which the Group is a signatory. The Policy applies to all Group employees. It sets out the principles for our actions and behaviour in conducting our business and provides guidance to those working for us on how we approach human rights issues. The Group commits not to discriminate in any of our employment practices and to offer equal opportunities to all. The Group respects the principles of freedom of association and the effective recognition of the right to collective bargaining, and opposes the use of, and will not use, forced, compulsory or child labour. These principles have been integrated into the work of our procurement teams as we assess our suppliers and their business practices.

Prevention of slavery and human trafficking

During 2021, we published our sixth transparency statement outlining the Group's approach to the prevention of slavery and human trafficking in our business and supply chain. A copy of our latest statement is available to view on our website: www.vesuvius.com.

Since the publication of our first statement we have conducted a risk assessment of our purchasing activities, seeking to identify, by location and industry, where the potential risks of modern slavery are highest. Our assessment identified the following four industries that pose a higher risk of modern slavery for Vesuvius:

1. Mining and extractive industries (raw materials)
2. Textiles (personal protective equipment (PPE) and work clothing)
3. Transport and packaging
4. Maintenance, cleaning, agricultural work and food preparation (contracted workers)

Following our modern slavery risk assessment, we provided webinar training to our key purchasing staff and we continue to use an online e-learning module to upgrade the training given to all supplier-facing staff. This provides key guidance on the red flags associated with modern slavery to assist them in identifying these during supplier visits and accreditation. Since the launch of the Modern Slavery red flag training we have trained 100% of the targeted staff.

Supporting our communities continued

Conflict minerals

We actively and routinely review our purchasing portfolio to check for conflict minerals. In 2021 we did not purchase any conflict minerals.

Mica and child labour

Vesuvius is committed to working only with suppliers that respect the UN Global Compact's 10 principles, and in particular do not employ child labour. As the mica industry has been widely recognised as a risk in this respect, we have engaged in a process of verifying our supplier base. In 2021, we contacted all our suppliers of mica, asking for written confirmation that they are not using child labour. Upon analysis of their replies, we asked suppliers to undergo sustainability assessments, including a strong focus on human rights. By year end, suppliers representing 96.6% of our mica spend had already confirmed not employing any child labour and had completed or were in the process of undergoing a Sustainability Assessment. We have since exited our relationships with those suppliers not willing to undergo a Sustainability Assessment.

Working with trade associations, lobbying and political expenses

Vesuvius and its employees on behalf of Vesuvius, do not make contributions to political candidates or political parties. Similarly, Vesuvius does not make any direct lobbying expenditure or spend any corporate funds on political advocacy.

Around the world, we participate in government and industry working groups, are members of industry associations, and engage in direct contact with independent bodies on key business issues. This ensures that we can help in shaping new policies, regulations and standards, and ensure compliance with existing requirements.

Vesuvius has established long-term relationships, either directly, or through some of its employees with several national and international trade associations directly related to our activities and to those of our customers. These trade associations cover all those major public policy issues of importance to Vesuvius, and are helpful for networking, building industry skills, civic participation and monitoring of industry policies and trends. They also provide information and perspectives on legislative matters of significance to the Group and our lines of business. Vesuvius' participation as a member of these associations comes with the understanding that we may not always agree with all the positions of an association or its other members.

Vesuvius is a member of the World Refractory Association, CerameUnie, the European Refractory Association, the Association for Iron & Steel Technology, the Confederation of Indian Industries, and the British Ceramics Association. These trade associations have all made climate change a clear focus area, with a variety of resulting actions such as engaging with regulators and policymakers, awareness and capability building within the industry, promotion of best available practices and technologies, and management of collaborative research projects.

Business ethics/anti-bribery and corruption and working with third parties

Vesuvius' Code of Conduct affirms our commitment to competing vigorously, but honestly, and not seeking competitive advantage through unlawful means. We conduct ourselves ethically in all public affairs activities, in alignment with local laws and regulations. We do not engage in unfair competition, exchange commercially sensitive information with competitors, or acquire information regarding a competitor by inappropriate means. When received for business purposes, we safeguard third-party confidential information and use it only for the purpose for which it was provided.

We engage with various third-party representatives and intermediaries in our business. We recognise that they can present an increased anti-bribery and corruption risk. Our procedure on working with third parties clearly outlines our zero-tolerance approach to bribery and provides practical guidance for our employees in identifying concerns and how to report them.

Vesuvius engages with third-party sales agents, many of whom operate in countries where we do not have a physical presence. Our employees' use of, and interaction with, sales agents is supported by an ongoing training programme for those who have specific responsibility for these relationships.

4,388
employees received Anti-Bribery and Corruption training in 2021

As part of communication around anti-bribery and ethics, employees are actively encouraged to consult on ethical issues. They have open access to the Compliance Director and Legal function who provide support on a regular basis.

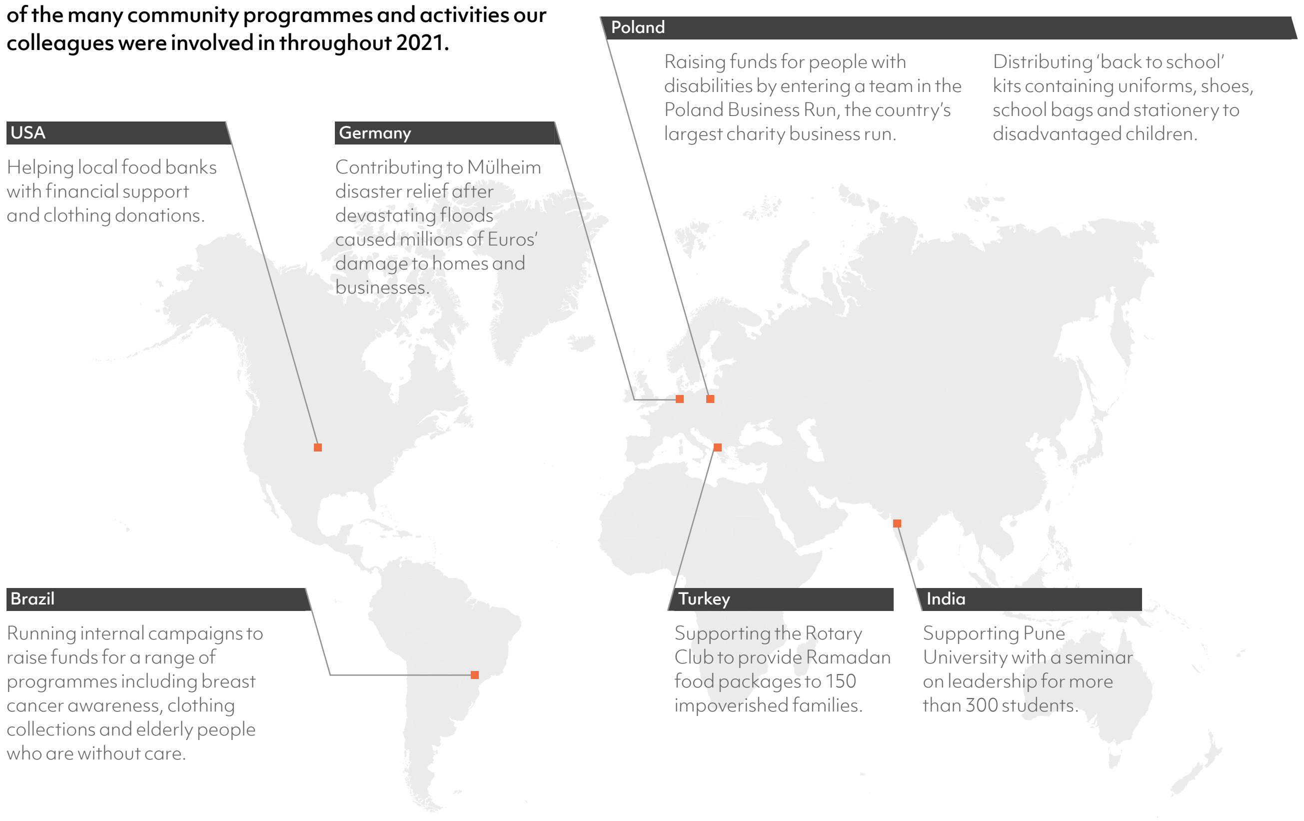
Working with third parties

During 2021, the Group continued the due diligence review of our third-party representatives and intermediaries. Following the previous years' enhanced review of sales agents, custom clearance agents, distributors and logistics providers, we conducted repeat due diligence on specific third parties operating in higher risk jurisdictions or providing specific services. This included a detailed review of our due diligence activities on active distributors across the Group. This process covers public information searches, regulatory searches and activity reviews. During the year, we also continued our ongoing monitoring of the sales agents used across the Group.This included a review of the agent reporting, invoice data and commission calculation.

Our due diligence processes will continue to be extended using a risk-based approach during 2022 and beyond.

Community engagement

Vesuvius wants to make a positive contribution to the communities in which we work by supporting a wide variety of fundraising and community-based programmes around the world. Below are some examples of the many community programmes and activities our colleagues were involved in throughout 2021.



Opening up Vesuvius to colleagues of the future

Giving young and talented students opportunities to see, experience and become interested in manufacturing and engineering is important for the future of our business. At the Wurtland plant in Kentucky, USA, we welcome around 100 students from Marshall University and Ashland Community and Technical College every year. The visits last around two hours on-site, and the students have an opportunity to speak to staff from across the plant to learn more about the types of career path available to them.

This builds on a long-established partnership with Ashland Community and Technical College, which allows us to offer internships and hands-on experience working in manufacturing. Students at Ashland are studying Advanced Integration Technology, a two-year manufacturing-based programme and undergraduates at Marshall University are on a Supply Chain Logistics programme.

Our Wurtland team also attends job and career fairs at the university and the college, helping make our team and the manufacturing industry more widely accessible to students. By taking this open and accessible approach to welcoming students, the Wurtland plant has benefited from some amazing success stories. In 2021, nine students were hired from the programmes and are now working in production and maintenance roles.

Another benefit of hiring local university graduates is that talented young professionals can stay local to the area and build successful careers. This brings us closer to the wider community and helps the area to prosper.

Responsible sourcing

Vesuvius recognizes the crucial role that its Suppliers play in creating value in the products and services that Vesuvius ultimately provides to its customers. In addition to the consistent and timely supply of materials, products, and services which are of the highest quality, we expect our suppliers to operate in a manner that is appropriate, in terms of their ethical, legal, environmental, and social responsibilities.

Principles

The satisfaction of our customers, the safety and reliability of Vesuvius' products, and the efficiency of Vesuvius' internal processes are dependent on the reliability of its network of suppliers. Vesuvius is committed to ensuring that we utilise high-quality raw materials, secured through reliable and well-developed raw material suppliers. The principles of sustainable procurement are prescribed within the Vesuvius Sustainable Procurement Policy and supported by supplementary processes.

Long-term goals

Overall, our objective is to encourage suppliers to implement a meaningful sustainability programme, embrace the UN Global Compact principles, evaluate and reduce our upstream CO_2 emissions and identify potential risks (and if necessary, address them) in our supply chain.

Sustainable Procurement Policy

During 2021, a specific Sustainability Procurement Policy which outlines key criteria for suppliers was approved and deployed. The policy uses the Group Procurement's 'Request for Quotation' (RFQ) process to engage a significant number of Vesuvius suppliers, and is provided in conjunction with the Vesuvius Terms and Conditions of Purchase. For suppliers to participate in the RFQ, they are obliged to accept and agree to the terms of the Sustainability Procurement Policy, as it forms an addendum to Vesuvius' standard contract clauses. This policy is available on the Vesuvius website. 164 suppliers representing a spend of £71.5m have already formally agreed to comply with the policy.

The policy applies to all suppliers of goods and/or services either used in our manufacturing processes and/or sold directly by us to customers, including Tolling and Resale suppliers. It applies to suppliers, their agents and their sub-contractors. Once accepted, it is the responsibility of the supplier to verify and monitor compliance against this policy – both for their operations and those of any sub-contractors. Compliance with the requirements in the policy is a key consideration in the selection of suppliers.

The major elements of the policy are:

- Employees and human rights
- Ethical and compliant business practices
- Environment
- Quality
- Business continuity
- Documentation and Verification encompassing Supplier due diligence and Supplier assessments

Supplier sustainability assessments

As part of our sustainability agenda, Vesuvius has implemented a Supplier Sustainability Assessment programme, setting targets for the proportion of the total raw material spend value covered by the assessment.

Vesuvius has partnered with an independent third-party service provider – EcoVadis – to rate our raw materials suppliers using a detailed set of criteria. These cover four themes and 21 criteria based on international standards: Labour & Human Rights; Ethics; Environment; and Sustainable Procurement.

Group procurement and regional procurement teams are heavily involved in the programme. 84 employees from these teams have already received specific training on supplier sustainability assessments (72% of the target group).

Supplier sustainability assessment criteria

Environment	Labour & Human Rights	Ethics	Sustainable Procurement
Energy Consumption & GHGs	Employee Health & Safety	Corruption	Supplier Environmental Practices
Water	Working Conditions	Anticompetitive Practices	Supplier Social Practices
Biodiversity	Social Dialogue	Responsible Information Management	
Local & Accidental Pollution	Career Management & Training		
Materials, Chemicals & Waste	Child Labour, Forced Labour & Human Trafficking		
Product Use	Diversity, Discrimination & Harassment		
Product End-of-Life	External Stakeholder Human Rights		
Customer Health & Safety			
Environmental Services & Advocacy			

21 criteria based on international standards

We aim to assess at least 50% of our raw material spend by the end of 2023 – a target approved by the Board – using criteria such as supplier size and risk metrics (including country, category of raw material, availability of alternative sources, delivery and quality performance) to identify participants.

Since its launch in January 2021, 131 suppliers have joined the programme, representing a spend value of £188 million, being approx. 52% of the Group's raw material spend. We have initiated a process of corrective and preventative actions to support our suppliers' Corporate Social Responsibility (CSR) capacity building and assessment scores. Of the rated suppliers, 16% did not meet the minimum score defined by Vesuvius, and were asked to implement improvement actions within a three-year timeline. Routine reviews and an annual reassessment will enable progress to be measured. The average overall score of Vesuvius suppliers was 46.8 against an industry benchmark of 43.8 across the critical themes.

Supplier sustainability programme monitoring

The Vesuvius supplier sustainability programme is coordinated and monitored via an independent third-party platform which consolidates information, manages and tracks actions, and provides feedback to our suppliers. We work closely with the independent third-party service provider through scheduled engagements fortnightly and monthly. The Group Executive Committee reviews updates on Procurement Sustainability at its regular meetings.

Supplier CO_2 emissions

It was estimated that the CO_2 emissions from purchased goods and services represented 1,160 thousand metric tonnes of CO_2 in 2021 (78.2% of Vesuvius Scope 3 emissions and 61.8% of Vesuvius' total CO_2e emissions, see page 71). A more precise knowledge of these emissions, including data per raw material and supplier, will be required to properly establish and drive improvement plans. As noted above, we are using our RFQ process to gain a better understanding of these upstream CO_2 emissions and collect supporting data. This requires participating raw material suppliers to provide information on their energy sources, CO_2 emissions and improvement plans.

Of the 138 suppliers (representing a total spend of £71.5m) who responded to the request for information on their energy sources and CO_2 emissions, 50 (representing a total spend of £48m) reported that they had set emissions reductions targets and established action plans.

Supplier quality development

Vesuvius is very proud of the close relationships we have with our suppliers around the world. We work with them to ensure that the highest-quality materials and products enter our supply chain. The process entails an extremely comprehensive review including research and development to ascertain compatibility of supplier products.

Supplier audits

Vesuvius also conducts an annual Supplier Audit programme targeting product quality and security of supply. The programme is led by the Group's Purchasing and Quality teams, located across all regions. The goal of the audits is to reduce the number of quality issues that may affect our raw materials, and consequently our operations and those of our customers. As part of this, we carry out on-site inspections, share expectations with our suppliers, identify risks, and adapt our internal controls accordingly. We encourage our suppliers to improve their own processes and help them prioritise actions to achieve this.

Areas of focus include:

a) Quality management rules: final inspection, controls at important process steps, management of incoming materials, data tracking, customer feedback and communication.

b) Management of non-conformities: reaction to non-conformities, protection of customer, problem resolution and application of lessons learned.

c) Sustainability criteria: this has been newly introduced to align the supplier audits as a second platform to drive and visibly verify supplier sustainability efforts and programmes, complementing the assessments carried out by our third-party partner. The main areas of attention are environmental and social practices. A particular emphasis is being placed on child and forced labour. Any observation of such practice would be immediately escalated to the Group's senior management, and the supplier barred from doing business with Vesuvius.

In 2021, despite the impact of COVID-19 travel restrictions, 138 (2020: 98) audits were conducted at 138 supplier facilities. Seven suppliers (5% of suppliers audited) received grades below threshold. Actions were taken either to support them or to terminate our relationship with them.

Supplier corrective actions requests

To ensure the integrity of our products, we have a rigorous approach to issues relating to the quality of raw materials and other inputs to our processes.

When a supplier does not meet expectations, we issue a formal Supplier Corrective Action Request. Our proven 8D methodology is then used to investigate the root cause of the issues and define corrective actions. A web-based portal is available for suppliers to document the containment actions implemented and outcome of the investigation, to enable review by us.

In most cases, issues are identified and resolved quickly. Suppliers with repeat issues and poor problem-solving are required to undergo a Supplier Quality Audit. Whilst COVID-19 impacted on the ability to progress supplier audits during 2021, every effort has been made to sustain our critical internal control processes through virtual means.

The Strategic Report set out on pages 1–101 contains a fair review of our businesses, strategy and business model, and the associated principal risks and uncertainties. We also deliver a review of our 2021 performance and set out an overview of our markets and our stakeholders. Details of our principles, and our people and community engagement, together with our focus on safety, are also contained in the Strategic Report.

Approved by the Board on 3 March 2022 and signed on its behalf by

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

Governance

We think beyond today's production outcomes

and shape the future with sustainable solutions

Board of Directors

John McDonough CBE

Chairman

Appointed to the Board 31 October 2012
Nine years on the Board

- Proven strategic and leadership skills gained in a complex multinational business
- Strong engineering background and global commercial experience
- Clear leadership understanding of safety issues
- Operational and strategic understanding of a range of business environments gained from working in Asia-Pacific, EMEA and the UK
- Experience as CEO with an international listed company

Current external appointments

John is Chairman of Sunbird Business Services Limited and a Non-executive Director of Cornerstone Property Assets Limited and Inceptum2 Solutions Limited.

Career experience

John spent 11 years as Group Chief Executive Officer of Carillion plc until he retired in 2011. Prior to this, he spent nine years working for Johnson Controls. He served as Chairman of The Vitec Group plc for seven years, retiring from the board in 2019. He has also previously served as a Non-executive Director and Chairman of the Remuneration Committee of Tomkins plc, as a Non-executive Director of Exel plc and as a Trustee of Team Rubicon UK.

John was awarded a CBE in 2011 for services to industry.

Patrick André

Chief Executive

Appointed to the Board 1 September 2017
Four years on the Board

- Global career serving the steel industry
- Strong background in strategic development and implementation
- Customer focus and proven record of delivery, with strong commercial acumen
- Drive and energy in promoting his strategic vision

Current external appointments

None

Career experience

Patrick joined the Group as President of the Vesuvius Flow Control business unit in 2016, until his appointment as Chief Executive in September 2017.

Before joining the Group, Patrick served as Executive Vice President Strategic Growth, CEO Europe and CEO for Asia, CIS and Africa for Lhoist company, the world leader in lime production. Prior to this, he was CEO of the Nickel division, then CEO of the Manganese division of ERAMET group, a global manufacturer of nickel and special alloys.

Guy Young

Chief Financial Officer

Appointed to the Board 1 November 2015
Six years on the Board

- Extensive international experience gained in the mining and industrial sectors
- Qualified Chartered Accountant, with significant financial and business development experience
- Drive and energy in managing people and teams
- Focus on strategic execution and business optimisation

Current external appointments

None

Career experience

Guy was Chief Financial Officer of Tarmac and latterly Lafarge Tarmac, the British building materials company, between 2011 and 2015. Prior to this he spent 13 years working at Anglo American plc in various senior financial and business development positions, including as Chief Financial Officer of Scaw Metals Group, the South African steel products manufacturer.

Guy is qualified with the South African Institute of Chartered Accountants.

Changes to the Board during the year

The Directors named were in office during the year and up to the date of this Annual Report, with the exception of Dinggui Gao who was appointed to the Board on 1 April 2021.

Hock Goh and Holly Koeppel stepped down as Non-executive Directors at the close of the 2021 AGM, held on 12 May 2021. Kath Durrant took over as Chair of the Remuneration Committee when Jane Hinkley stepped down from that role at the close of the 2021 AGM. Jane remains a Non-executive Director.

Douglas Hurt

Senior Independent Director (SID)

Appointed to the Board 2 April 2015
Six years on the Board

- Qualified Chartered Accountant, with recent and relevant financial experience
- Highly knowledgeable in operational and corporate financial matters, with significant US and European experience
- Proven management and leadership skills

Current external appointments

SID and Chair of the Audit Committee of Countryside Partnerships PLC, and a Non-executive Director and Chair of the Audit Committees of Hikma Pharmaceuticals PLC and the British Standards Institution.

Career experience

Douglas was Finance Director of IMI plc, a UK listed company, until 2015. He spent 23 years at GlaxoSmithKline plc where he held senior finance and general management positions. Douglas served as SID and Chair of the Audit Committee of Tate & Lyle plc until 2019.

Kath Durrant

Non-executive Independent Director

Appointed to the Board 1 December 2020
One year on the Board

- 30 years' experience of people management
- Strong operational and strategic track record, gained working at a number of large global manufacturing companies
- Experienced UK governance professional

Current external appointments

Non-executive Director and Chair of the Remuneration Committee of SIG plc.

Career experience

Kath held various operational and specialist HR roles at GlaxoSmithKline plc and AstraZeneca plc and was Group HR Director of Rolls-Royce plc. She was most recently Group HR Director of Ferguson plc and Chief HR Officer of CRH plc. Kath served as a Non-executive Director and Chair of the Remuneration Committee of Renishaw plc from 2015 to 2018 and as a Non-executive Director and Chair of the Remuneration Committee of Calisen plc from 2020 to 2021.

Dinggui Gao

Non-executive Independent Director

Appointed to the Board 1 April 2021
Eleven months on the Board

- Strong operational experience driving performance at a range of multinational companies
- Proven track record of leadership and international commercial experience
- Strong focus on technology and in-depth knowledge of Asian markets

Current external appointments

Non-executive Director Intramco Europe B.V and Operating Partner CITIC Capital Holdings Ltd.

Career experience

Dinggui has nearly 40 years of operational experience having worked in a range of multinational companies including Bosch, Honeywell, Eagle Ottawa and Sandvik AB. He latterly served as Managing Director, China of Formel D Group, the German global service provider to the automotive and components supply industry, joining the company in 2017 and stepping down at the end of October 2021.

Friederike Helfer

Non-executive Director

Appointed to the Board 4 December 2019
Two years on the Board

- An experienced strategist, with strong analytic capability
- Commercial acumen and a strong track record of working with a portfolio of companies to identify scope for operational and strategic improvement

Current external appointments

Partner of Cevian Capital* and a Non-executive director of the Supervisory Board of thyssenkrupp AG.

Career experience

Friederike is a Partner of Cevian Capital. She joined Cevian in 2008 and from 2013 to 2017, served on the Board of Directors and the Audit Committee of Valmet, a Finnish engineering company, in which Cevian was also invested. Prior to joining Cevian, Friederike worked at McKinsey & Company. She is a CFA Charterholder.

Jane Hinkley

Non-executive Independent Director

Appointed to the Board 3 December 2012
Nine years on the Board

- Proven track record of managing complex global trading businesses
- Qualified Chartered Accountant, with significant financial and operational experience in large multinational companies
- Leadership and global management skills

Current external appointments

None

Career experience

Jane is a Chartered Accountant and was Managing Director of Navion Shipping AS for three years until 2001. Prior to this, she spent her executive career as Chief Financial Officer and Managing Director of Gotaas-Larsen Shipping Corporation. She was previously Chairman of Teekay GP LLC, a Non-executive Director and Chairman of the Remuneration Committee of Premier Oil plc, and a Non-executive Director of Revus Energy ASA.

Key to Board Committee membership

A Audit Committee
N Nomination Committee
R Remuneration Committee
N Committee Chair

Engagement with the workforce

E Jane Hinkley serves as the designated Non-executive Director responsible for overseeing engagement with the workforce.

* Cevian Capital is a shareholder of Vesuvius plc and, at 3 March 2022, held 21.11% of Vesuvius' issued share capital.

Group Executive Committee

Patrick André

Chief Executive

Six years with the Group

For biographical details, please see the Board of Directors on page 104.

Thiago Avelar

President, Advanced Refractories

Three years with the Group

Appointed President, Advanced Refractories on 1 January 2020. Thiago joined Vesuvius in February 2019 as Regional VP Steel, South America, where he was responsible for Vesuvius' Steel Operations in South America. Prior to joining the Group, he worked for RHI Magnesita and ArcelorMittal in various technical and marketing roles based in Europe and Brazil.

Thiago is based in London, UK.

Patrick Bikard

President, Operations and Technology

14 years with the Group

Appointed President, Operations in January 2014, with responsibility for Technology since 2019. He was previously Vice President for Manufacturing, QHSE, Engineering and Purchasing and, prior to joining Vesuvius, he held senior operational roles at Renault, Alstom and Faurecia.

Patrick is based in Ghlin, Belgium.

Karena Cancilleri

President, Foundry

Two years with the Group

Appointed President, Foundry in October 2019. Karena joined the Group from Beaulieu International Group, where she served for six years as VP Engineered Products and latterly President Engineered Products. She has a broad breadth of managerial experience spanning various international leadership roles in companies such as FiberVisions, Kraton Corporation and Shell.

Karena is based in London, UK.

Pascal Genest

President, Flow Control

One year with the Group

Appointed President, Flow Control in January 2021. Pascal joined the Group from GFG Alliance where he held the position of CEO Liberty Ostrava in the Czech Republic. Prior to this he was CEO of SULB in Bahrain. Pascal has more than 15 years' experience working in the steel industry, mainly with ArcelorMittal. He has also worked in consulting, in private equity and in the aluminium industry.

Pascal is based in London, UK.

Henry Knowles

General Counsel and Company Secretary

Eight years with the Group

Appointed as General Counsel and Company Secretary in September 2013. Prior to joining Vesuvius, Henry spent eight years at Hikma Pharmaceuticals PLC, a generic pharmaceutical manufacturer with significant operations in the Middle East, North Africa and the US where he held the roles of General Counsel and Company Secretary. Henry is also responsible for the Group's Intellectual Property function.

Henry is based in London, UK.

Agnieszka Tomczak

Chief HR Officer

Three years with the Group

Appointed as Chief HR Officer in October 2018. Agnieszka has over 25 years of senior leadership experience in multinational companies spanning various business sectors and industries. Prior to joining Vesuvius, she spent 12 years at ICI, which was subsequently acquired by AkzoNobel, in regional and global HR roles.

Agnieszka is based in London, UK.

Guy Young

Chief Financial Officer

Six years with the Group

For biographical details please see the Board of Directors on page 104.

Corporate Governance Statement

Dear Shareholder,

On behalf of the Board, I am delighted to present the 2021 Corporate Governance Statement. The Board of Vesuvius plc is committed to maintaining high standards of governance and to continuous improvement to reflect best practice. This Statement provides investors and other stakeholders with an annual insight into the governance activities of the Board and its Committees. It describes how the Group has complied with the Principles of the UK Corporate Governance Code during 2021, except where we considered it more natural for us to describe the application of a Principle elsewhere in this Annual Report. The table on page 108 signposts where detailed information on each section of the Code (and associated Principles) can be found.

During 2021, the Nomination Committee gave significant focus to Board succession planning, overseeing the further strengthening of the Board with the appointment of Dinggui Gao as a new Non-executive Director on 1 April 2021. In addition, and led by the Senior Independent Director, Douglas Hurt, the Committee commenced the process to identify my successor. I am pleased to report that this process is progressing well.

During the year, the Nomination Committee also continued its work reviewing the pipeline of talent below Board level, to ensure that we maintain a pipeline of talented individuals to fill future leadership positions.

In 2021, the Remuneration Committee welcomed Kath Durrant as the new Chair, replacing Jane Hinkley who remains on the Board as an independent Non-executive Director. Kath commenced her tenure with a review of the Group's executive remuneration arrangements. She met with Board members as well as members of the senior management team to gather their perspectives on remuneration at Vesuvius. She undertook a detailed analysis of whether pay and performance at Vesuvius have been aligned over recent years and how executive pay levels compare to the market. The findings of this review will aid preparations for our 2023 Remuneration Policy submission. In the meantime, the Remuneration Committee resolved to make modest changes to the incentive structure in 2022, primarily focused on updating the performance conditions for the Annual Incentive and Vesuvius Share Plan. More details about these changes and the other work undertaken by the Committee in 2021 can be found in the Directors' Remuneration Report.

After handing over her stewardship of the Remuneration Committee, the Directors were very pleased that Jane Hinkley undertook to remain on the Board. Given her tenure, the Board considered whether she continued to display the independence of thought and constructive challenge to management required from her role. After careful review, we resolved that Jane continues to satisfy the criteria for independence.

In light of the ongoing impact of the COVID-19 pandemic, the Audit Committee continued to carefully monitor the Group's financial situation throughout 2021, undertaking particularly detailed analysis of the Group's impairment assessments and the going concern and viability statements. In addition, the Committee again spent time focusing on the Group's TCFD compliance, and cyber security measures, as well as receiving updates throughout the year on the implementation of changes to the Group's finance operating model and internal controls.

As detailed elsewhere in this report, the Directors take their responsibility to engage with the workforce seriously as a key part of their role. A number of site visits were conducted by the Board during 2021, enabling the Board to meet management and staff face-to-face, conduct 'town hall' meetings to receive direct feedback from our people, and explain the alignment of executive remuneration with wider Company pay policies. As COVID-19 travel restrictions hopefully recede further in 2022, the Board will continue with this critical part of its role.

The Board's formal evaluation process for 2021 was externally facilitated by the corporate advisory firm, Lintstock. Overall, the Board was considered to be diverse and seen to operate effectively with an open culture. The Non-executive Directors were deemed to have provided effective support and constructive challenge in their interactions with management and Board relationships were rated positively overall. The evaluation highlighted a number of ongoing Board priorities, including a continued focus on the development of the Group's Sustainability strategy and its integration into business planning, and ongoing work to develop robust succession plans for the Executive Directors and GEC members. The Board is progressing these in 2022.

Yours sincerely

John McDonough CBE
Chairman
3 March 2022

In this section

Corporate Governance Statement continued

Board Report

2018 UK Corporate Governance Code – Information Availability

Board Leadership and Company Purpose	The Corporate Governance statement (CG Statement) on pages 107–153 gives information on the Group's compliance with the Principles relating to the Board's Leadership and Company Purpose. More detailed information on: – the Group's statement of purpose can be found on page 1 – the Group's strategy, resources and the indicators it uses to measure performance can be found on pages 14 and 15, 20 and 21, and 38 and 39, respectively – the Group's engagement with stakeholders and the Group's Section 172(1) Statement is contained in the Section 172(1) Statement and Stakeholder Engagement section on pages 22–28 – the Group's approach to workforce matters can be found in the 'Our people' section on pages 82–96, with further details of the Group's approach to employee involvement and engagement contained in the Section 172(1) Statement on page 28 Details of the Group's framework of controls is contained in the Audit Committee report on pages 120–122 of the CG Statement and in the Risk, viability and going concern section on pages 31 and 32.
Division of Responsibilities	The CG Statement describes the structure and operation of the Board. The Nomination Committee report, describes on pages 128 and 129, the process the Company conducts to evaluate the Board, to ensure that it continues to operate effectively, that individual Directors' contributions are appropriate and that the oversight of the Chairman promotes a culture of openness and constructive yet challenging debate.
Composition, Succession and Evaluation	Details of the skills, experience and knowledge of the existing Board members can be found in the Board biographies contained on pages 104 and 105. Information on the Board's appointment process and approach to succession planning and Board evaluation is contained in the Nomination Committee report on pages 125–129 of the CG Statement.
Audit, Risk and Internal Control	Information on the policies and procedures the Group has in place to monitor the effectiveness of the Group's Internal and External Audit functions, and the integrity of the Group's financial statements is contained in the Audit Committee report on pages 117–124 of the CG Statement, along with an overview of the procedures in place to manage risk and oversee the internal control framework. Further information on the Group's approach to risk management is contained in the Risk, viability and going concern section of the Strategic Review on pages 29–35. The Board believes the 2021 Annual Report to be a fair, balanced and understandable assessment of the Company's position and prospects. A description of the Audit Committee's work in enabling the Board to reach this conclusion is contained in the Audit Committee report on page 120.
Remuneration	The Directors' Remuneration Report section of the CG Statement describes the Group's approach to Directors' remuneration, including the procedure for developing policy and the Remuneration Committee's discretion for authorising remuneration outcomes. Details of linkage of the Directors' Remuneration Policy with long-term strategy is contained on pages 131 and 132 and also highlighted on pages 38 and 39 in the section on Key Performance Indicators.

Board Leadership and Company Purpose

The Board is responsible for leading the Group in an efficient and entrepreneurial manner, establishing the Group's purpose, values and strategy and satisfying itself that these and the Group's culture are aligned. It focuses primarily on strategic and policy issues and is responsible for ensuring the long-term sustainable success of the Group. It sets the Group's strategy, oversees the allocation of resources and monitors the performance of the Group. It is responsible for effective risk assessment and management. In performance of these duties, the Board has regard to the interests of the Group's key stakeholders and is cognisant of the potential impact of the decisions it makes on wider society.

Purpose

Vesuvius' purpose is to be a global leader in molten metal flow engineering and technology, servicing process industries operating in challenging high-temperature conditions. We think beyond today to create the innovative solutions that will shape the future for everyone. We help our customers make their industrial processes safer, more efficient and sustainable. The Group aims to deliver sustainable, profitable growth, providing its shareholders with a superior return on their investment, whilst providing each of its employees with a safe workplace where they are recognised, developed and properly rewarded.

The Board has identified seven Strategic Objectives for achieving long-term sustainable success. It is currently pursuing five shorter-term key execution priorities, which encapsulate the Group's immediate aims, including its strategic focus on sustainability. Further information on these can be found on pages 14 and 15. The Board regularly reviews the Group's performance against a number of Key Performance Indicators (KPIs) which provide information on key aspects of the Group's financial and non-financial performance. This information assists the Board to assess progress with the execution of the Group's strategy and to determine any remedial action that needs to be taken. Detailed information on the Group's KPIs can be found on pages 38 and 39.

The Group has established a framework of controls to enable risk to be assessed and managed, and further information on this can be found in the Audit, risk and internal control section on page 116 of this Board Report.

Sustainability

Vesuvius recognises that lasting business success is measured not only in financial performance but in the way in which the Group deals with its customers, business associates, employees, investors and local communities. Our Sustainability strategy was launched in 2020. This supports the Group's key Strategic Objectives which are focused on creating a better tomorrow in a profitable and sustainable way. To drive change throughout the Group, the Board has set specific targets focused on ways in which the Group can improve its impact on our planet, our communities, our people and our customers. The Board monitors these and oversees the work of the Sustainability Council in spearheading new activities to enhance our performance. Further information can be found in the Sustainability section on pages 52–101.

Culture

The Board takes seriously its responsibility for shaping and monitoring the corporate culture of the Group. The Group's CORE Values – Courage, Ownership, Respect and Energy – define our behaviours across the business and are the practical representation of the culture we seek to foster, aligning with the Company's purpose and strategy, and supporting our governance and control processes. These Values are prominently displayed at all sites. Our CORE Values are reinforced in our performance management systems, which ensures that they are firmly embedded in our day-to-day conversations and behaviours. Further detail can be found on page 56.

The CORE Values are supported by the Group's Code of Conduct which sets out the standards of conduct expected, without exception, of everyone who works for Vesuvius in any of its worldwide operations. The Code of Conduct emphasises the Group's commitment to ethical behaviour and compliance with the law. It also covers every aspect of Vesuvius' approach to business, from the way that the Group engages with customers, employees, its markets and each of its other stakeholders, to the safety of its employees and places of work. Everyone within Vesuvius is individually accountable for upholding these requirements.

The Board seeks to ensure that the Group's workforce policies and practices are consistent with the Group's long-term sustainable success. Further information about the Group's remuneration practices for senior managers can be found in the Directors' Remuneration Report on pages 130–153, the Group's approach to diversity in the Nomination Committee report on page 127, the Group's approach to HR matters in the Our people section on pages 82–96. Information on the Group's Speak Up confidential employee concern helpline is set out below.

Whistleblowing policy

Speak Up

All Vesuvius employees can speak up without fear of retaliation, either to Vesuvius management or via independent channels. We have implemented a Speak Up whistleblowing policy, which is under the responsibility of our Board, and included in our Code of Conduct. It is available on the internal Vesuvius website, and communicated by local language posters in all our locations. A third-party operated confidential Speak Up Helpline is available 365 days per year, 24 hours per day, to all employees wishing to raise concerns anonymously or in situations where they feel unable to report internally. This independent facility supports online reporting through a web portal or reporting by phone or by voicemail. Ensuring global accessibility, employees can speak with operators in any of our 29 functional languages.

All reports received are reviewed and, where appropriate, investigated and feedback is provided to the reporter via the helpline portal. Vesuvius' Speak Up helpline is highlighted during internal compliance training and new joiner inductions.

No Vesuvius employee will ever be penalised or disadvantaged for reporting a legitimate concern in good faith.

Reports received via Speak Up channels are managed by the General Counsel and Compliance Director. When received, reports are assessed for risk and category of concern. All reports are considered in line with a protocol for review, investigation, action, closure and feedback, independent of management where necessary, but involving senior business unit or HR management as appropriate. For complex issues, formal investigation plans are drawn up, and support from external experts is engaged where necessary. Feedback is recognised as an important element of the Speak Up process and we aim to provide an update on all reports within 28 days of receipt.

In line with good practice, details of the Group's Speak Up channels, and the Group's approach to addressing such issues, was recommunicated in 2020. This relaunch included a recommunication on the channels available to employees including nominated individuals at each site who received training in relation to concerns raised in person at local sites. We continue to monitor the volume, geographic distribution and range of reports made to the Speak Up facility to ascertain not only whether there are significant regional compliance concerns, but also whether there are countries where access to this facility is less well understood or publicised. During 2021, the Board monitored and oversaw the Group's procedures for reporting allegations of improper behaviour, and throughout the year received updates on the nature and volume of reports received from the confidential Speak Up Helpline, key themes emerging from these reports and the results of any investigations undertaken. In 2021, we received 93 reports (2020: 95) through the Speak Up facility and 94 walk-in reports (2020: 32). Each one of these was reviewed and, where appropriate, investigated. Similar to 2020, a substantial majority of reports received in 2021 related to HR issues which indicated no compliance concerns, nor serious breaches of the Code of Conduct. Of the small number of reports received that contained allegations of a breach of our Code of Conduct, thorough investigations were performed and, where appropriate, disciplinary action was taken, including individuals leaving the Group as a result.

Corporate Governance Statement continued

During the year, the Board's assessment of the Group's culture focused on the Group's:

(1) Adherence to the CORE Values – The Board focused on ensuring that there was a consistent culture across the Group, underpinned by the CORE Values. The Board continued to receive regular feedback on the Group's response to the COVID-19 pandemic, and the efforts being made to support employees, customers and communities throughout the Group. During site visits, the Directors focused on the extent to which the Values are published, understood and motivate employee behaviour, and reported on their individual findings to the Board. Towards the end of the year, nominations were once again sought for the Group's Living The Values Awards. The Board was delighted that there were almost 1,000 nominations, showcasing examples of individuals and teams going the 'extra mile' to live the CORE Values. Members of the Group Executive Committee presented both regional and global awards as part of the process.

(2) Commitment to safety – At each meeting during the year, the Board received an update on the health and well-being of the Group's employees. The Board received regular updates on the Group's performance against safety targets, and a thorough analysis of all Lost Time Incidents – all of which were reported in detail at the next Board meeting. In addition, the Board received biannual reports on the progress of the Group's safety programmes. The Directors used individual site visits to assess each site's commitment to safety, and the Remuneration Committee set the Chief Executive a specific safety target as part of his personal objectives for the Annual Incentive Plan. A core tenet of the Group's Sustainability initiative is a focus on ensuring the Group affords a safe working environment for all its employees. A more challenging Group safety target of fewer than one lost time injury per million hours worked was implemented for 2021. This is equivalent to an average of less than two lost time work-related injuries or illnesses per month.

(3) Entrepreneurship – As part of the Board's rolling agenda, the Board received reports from each of the business unit Presidents on their business's strategy, new commercial initiatives and future technology trends. These were complemented by a presentation from the President, Operations and Technology on R&D activities throughout the Group, including the process of new product launches. The Board also received reports on the Group's progress on innovation as part of the quarterly reporting on strategic progress.

(4) Transparency – During the early part of the year, the Board was cognisant of the impact that severely reduced travel had on opportunities in the organisation for face-to-face interactions, with Board meetings again taking place online. As travel restrictions eased, the Board was once again able to undertake individual and collective site visits to meet employees face-to-face. The engagement and openness of the employees the Board met, both in person and virtually over the course of the year, was assessed in terms of the Group's culture. These first-hand reviews were supported by the Directors' review of the output of the Group's Speak Up processes. The Audit Committee sought qualitative feedback from External and Internal Audit on how transparent/engaged managers had been during audit interactions.

(5) Customer focus – The Chief Executive undertook customer visits where this was possible, and also held virtual meetings with customers in 2021. As travel restrictions eased the Board was able to incorporate a customer visit into its Vesuvius site visit programme during the latter part of the year. A continued critical focus of the Group's response to the pandemic and associated supply chain impacts, has been on continuity of supply to customers. The Board received regular reports on the impact of the pandemic on customer service and the state of the Group's markets. The Board also received regular updates on quality performance; these were supported by a full annual presentation on the Group's ongoing initiatives on quality and a review at each Board meeting of specific quality issues. At each Board meeting, the Board also considered the state of the Group's markets and the associated customer developments.

(6) Diversity and respect for local cultures – During 2021, the Board, through the work of the Nomination Committee, focused on progress with the achievement of the Group's gender diversity target seeking 30% female representation in Top Management (Group Executive Committee plus key direct reports) by 2025. Going forward, the Board has resolved to expand the Group to which the gender diversity target applies for 2022, to focus on the Senior Leadership Group of the Company which comprises c. 160 individuals.

In 2021, the Board also reviewed the results of the employee engagement survey and subsequent management actions to support its diversity initiatives.

The usual extensive schedule of individual site visits undertaken by the Executive and Non-executive Directors was again somewhat curtailed in 2021 by COVID-19-related travel restrictions. Towards the latter part of the year, the Chairman and each of the Non-executive Directors were able to visit a number of sites including Charlotte, Cleveland and Pittsburgh in the US, Krakow and Skawina in Poland, Borken in Germany, Ghlin in Belgium and Suzhou in China. The Non-executive Directors also held a 'virtual' Board visit with senior managers in China, India and the US during the year to hear more about the activities of the Group there. The visits and calls provided the Board with greater clarity on local organisation and management, along with providing updates on business performance. During the visits the Directors were able to interact with a cross-section of employees, from various functions and organisational levels. At most sites 'town hall' meetings were held, providing the Non-executive Directors with the opportunity to engage with the workforce to explain the function of the Board and also to explain how executive remuneration aligns with wider Company pay policies. These meetings also gave the Non-executive Directors the opportunity to hear the views of employees and answer their questions about the Company. The Directors engaged in first-hand discussions on culture and purpose, providing direct feedback to the Board on their perceptions of each site and potential areas for improvement, alongside highlighting examples of best practice that could be shared more widely.

Section 172 duties

The Directors are cognisant of the duty they have under Section 172 of the Companies Act 2006, to promote the success of the Company over the long term for the benefit of shareholders as a whole, having regard to a range of other key stakeholders. In performance of its duties throughout the year, the Board has had regard to the interests of the Group's key stakeholders and remained cognisant of the potential impact on these stakeholders of the Group's activities. The effects of business decisions on the broader stakeholder group continued to be brought into sharp focus by the impact of the pandemic. Details of the Board and the Company's engagement with stakeholders during the year can be found in the Section 172(1) Statement on pages 22–28.

The Board is committed to communicating with shareholders and other stakeholders in a clear and open manner and seeks to ensure effective engagement through the Company's regular activities.

The Company undertakes an ongoing programme of meetings with investors, which is managed by the Investor Relations team. The majority of meetings with investors are led by the Chief Executive and the Chief Financial Officer. In advance of the 2021 AGM, we wrote to our largest shareholders inviting discussion on any questions they might like to raise and making the Chairs of the Board, the Audit Committee and the Remuneration Committee available to meet them should they so wish. In addition, the Chair of the Remuneration Committee wrote to our largest shareholders and key governance agencies early this year, to provide additional detail on the Group's executive remuneration proposals for 2022 and invite further engagement. Responses were received from the majority of shareholders and governance agencies, and further information provided as requested. As a result of this dialogue, the Remuneration Committee concluded that their proposals were well supported and proceeded to implement them. Further detail is contained in the Directors' Remuneration Report on page 133.

Statement on compliance with the UK Corporate Governance Code

Save as set out for Provisions 19 and 38 below, the Company was fully compliant with the Principles and Provisions of the 2018 UK Corporate Governance Code (the 'Code') for the year ended 31 December 2021. A copy of the Code can be found on the FRC website at: https://www.frc.org.uk/directors/corporate-governance-and-stewardship/uk-corporate-governance-code.

Provision 19: John McDonough CBE completed nine years' service as Chairman of the Board on 31 October 2021. During the year the Nomination Committee commenced the process to search for a new Chairman. The search is well advanced. On appointment of a new Chair, John McDonough will step down from the Board.

Provision 38: The Company has implemented plans to align the level of pension allowance for Executive Directors with that applicable to the majority of the workforce. Our incumbent Directors' pension contributions were frozen at the 1 January 2020 amount and will be reduced to 17% at the end of 2022, being the level of the majority of the workforce. Further details can be found on page 145.

Corporate Governance Statement continued

Division of responsibilities

The Board currently comprises eight Directors – the Non-executive Chairman, John McDonough CBE; the Chief Executive, Patrick André; the Chief Financial Officer, Guy Young; and five Non-executive Directors, Kath Durrant, Dinggui Gao, Friederike Helfer, Jane Hinkley and Douglas Hurt. Douglas Hurt is the Senior Independent Director. Henry Knowles is the Company Secretary. Dinggui Gao joined the Board on 1 April 2021. Holly Koeppel and Hock Goh also served as Non-executive Directors until they stepped down from the Board on 12 May 2021, at the close of the AGM.

The Board considers that, for the purposes of the UK Corporate Governance Code, 57% of the Board – four of the current Non-executive Directors (excluding the Non-executive Chairman), namely Kath Durrant, Dinggui Gao, Jane Hinkley and Douglas Hurt, are independent of management and free from any business or other relationship which could affect the exercise of their independent judgement. Jane Hinkley continues to be regarded as independent despite having completed nine years of service on the Board on 3 December 2021, as she continues to operate with an independent spirit and exhibits robust challenge at Board and Committee meetings.

Friederike Helfer is a Partner of Cevian Capital, which continues to hold 21.11% of Vesuvius' issued ordinary share capital. As a result Friederike Helfer is not considered to be independent. The Chairman satisfied the independence criteria on his appointment to the Board. The Board and its Committees have a wide range of skills, experience and knowledge, and further details of each Director's individual contribution in this regard can be found in their biographical details on pages 104 and 105.

The Chairman and Chief Executive

The division of responsibilities between the Chairman and the Chief Executive is set out in writing. These were reviewed during the year as part of the Company's annual corporate governance review. They are available to view on the Company's website: www.vesuvius.com.

Division of responsibilities

The Board
Responsible for Group strategy, risk management, succession and policy issues. Sets the purpose, Values and culture for the Group. Monitors the Group's progress against the targets set

Chairman
Provides leadership and guidance for the Board, promoting a high standard of corporate governance. Sets the Board agenda and chairs and manages meetings. Independent on appointment, he is the link between the Executive and Non-executive Directors

Chief Executive
Develops strategy for review and approval by the Board. Directs, monitors and manages the operational performance of the Company. Responsible for the application of Group policies, implementation of Group strategy and the resources for their delivery. Accountable to the Board for Group performance

Senior Independent Director
Acts as a sounding board for the Chairman, an alternative contact for shareholders and an intermediary for other Non-executive Directors. Leads the annual evaluation of the Chairman and recruitment process for the Chairman's replacement, when required

Non-executive Directors
Exercise a strong, independent voice, constructively challenging and supporting the Executive Directors. Scrutinise performance against objectives and monitor financial reporting. Monitor and oversee risks and controls, determine Executive Director remuneration and manage Board succession through their Committee responsibilities

The Non-executive Directors meet at least twice a year without the Executive Directors being present

Company Secretary
Advises the Chairman on governance, together with updates on regulatory and compliance matters. Supports the Board agenda with clear information flow. Acts as a link between the Board and its Committees and between Non-executive Directors and senior management

The Board

The Board has a formal schedule of matters reserved to it and delegates certain matters to its Committees. It is anticipated that the Board will convene on seven occasions during 2022, holding ad hoc meetings to consider non-scheduled business if required.

Board Committees

The principal governance Committees of the Board are the Audit, Nomination and Remuneration Committees. Each Committee has written terms of reference which were reviewed during the year. These terms of reference are available to view on the Company's website: www.vesuvius.com.

Committee composition is set out in the relevant Committee reports. No one, other than the Committee Chairman and members of the Committee, is entitled to participate in meetings of the Audit, Nomination and Remuneration Committees. However, as detailed in the Committee reports, where the agenda permits, other Directors and senior management regularly attend by invitation, supporting the operation of each of the Committees in an open and consensual manner.

The interactions in the governance process are shown in the schematic below.

Group Executive Committee

The Group also operates a Group Executive Committee (GEC), which is convened and chaired by the Chief Executive and assists him in discharging his responsibilities. The GEC comprises the Chief Executive, Chief Financial Officer, the business unit Presidents, the Chief HR Officer, the President Operations and Technology and the General Counsel/Company Secretary. The GEC continued its formal schedule of five meetings and two R&D reviews during 2021, and also, in response to the demands of the pandemic held weekly, or later in the year bi-weekly, virtual meetings to discuss the Group's business activities.

Board

Governance Committees

Audit Committee
To monitor the integrity of financial reporting and to assist the Board in its review of the effectiveness of the Group's internal controls and risk management systems
Chair: Douglas Hurt
Membership: All independent Non-executive Directors

Remuneration Committee
To determine the remuneration policy for the Executive Directors and set the appropriate remuneration for the Chairman, Executive Directors and senior management
Chair: Kath Durrant
Membership: All independent Non-executive Directors

Nomination Committee
To advise the Board on appointments, retirements and resignations from the Board and its Committees and to review succession planning and talent development for the Board and senior management
Chair: John McDonough, Chairman (except when considering his own succession, in which case the Committee is chaired by the Senior Independent Director)
Membership: Chairman and the Non-executive Directors

Administrative Committees

In addition, the Board delegates certain responsibilities to a Finance Committee and Share Scheme Committee, which operate in accordance with the delegated authority agreed by the Board

Finance Committee
To approve specific funding and treasury-related matters in accordance with the Group's delegated authorities or as delegated by the Board
Chair: John McDonough, Chairman
Membership: Chairman, Chief Executive, Chief Financial Officer and Group Head of Corporate Finance

Share Scheme Committee
To facilitate the administration of the Company's share schemes
Chair: Any Board member
Membership: Any two Directors or any two Directors and the Company Secretary

Corporate Governance Statement continued

2021 Board programme

The Board discharges its responsibilities through an annual programme of meetings.

At each of the regularly scheduled meetings, a number of standard items were considered.

These included:

- Directors' duties, including those in respect of s172, and conflicts of interest
- Minutes of the previous meeting and matters arising
- Reports from the Chief Executive, the Chief Financial Officer and the General Counsel and Company Secretary on key aspects of the business

In 2021, the Board focused on key areas of strategy, performance and governance, including the matters outlined below:

Strategy

- Reviewing M&A opportunities and overseeing the negotiation of the acquisition terms for the assets of Universal Refractories, Inc.
- Receiving and reviewing reports on strategy from the Flow Control, Advanced Refractories, Sensors & Probes and Foundry business units
- Reviewing and approving significant items of capital expenditure
- Receiving and reviewing regular reports from the Chief Executive (CEO) on business highlights and the implementation of the Group's strategic objectives
- Reviewing the progress of the Group's Sustainability strategy, including receiving regular updates on the Group's quality, health, safety and environmental objectives and progress with the preparation of the Group's TCFD compliance
- Participation in a two-day off-site review of strategy presented by the CEO, CFO and the three main business unit Presidents and the Company's key financial advisers
- Receiving and considering reports on the Group's HR, Purchasing, IT, tax and treasury strategies, legal and compliance activities and the management of the Group's key pension liabilities
- Receiving and considering a progress report on the Group's R&D strategy and objectives
- Reviewing the Group's financing structure

Performance

- Receiving regular business reports from the CEO, including information on the ongoing impact of COVID-19 on the Group, its employees and customers
- Reviewing the measures being taken to mitigate the impact of raw material cost increases and supply chain disruption
- Receiving regular reports on the Group's financial performance against key indicators, including each of the Group's KPIs
- Receiving regular reports on progress against the Group's sustainability targets and regular updates from the CEO on the performance of the Group's businesses
- Receiving regular safety reports setting out performance against key indicators and summaries of the investigations conducted after any serious safety incident
- Receiving regular reports on performance against product quality targets
- Scrutinising the Group's financial performance and forecasts
- Reviewing and agreeing the annual budget and financial plans
- Approving trading updates, and preliminary and half-year results

Governance

- Receiving regular reports from the Board Committees
- Approving the Annual Report and Notice of AGM
- Approving the payment of the interim dividend, and approving the recommendation of the payment of the final dividend subject to shareholder approval
- Approving the appointment of Dinggui Gao as a new Non-executive Director and overseeing the process to identify a new Board chair
- Completing an evaluation of the Board and Committees' performance and regularly reviewing progress against the improvement actions identified in the 2020 evaluation
- Reviewing the Group's internal controls, risk management practices and risk appetite, monitoring the Group's key risks and approving the Group's risk register
- Reviewing and approving the Group's Modern Slavery Statement
- Receiving regular updates on corporate governance and regulatory developments
- Completing a formal annual review of the Group's governance arrangements
- Reviewing information received through the Group's Speak Up reporting processes
- Renewing the Group's delegated authorities
- Receiving reports from the Company's brokers on market issues and from the CEO and CFO on all investor meetings and feedback

Information and support

The Board ensures that it receives, in a timely manner, information of an appropriate quality to enable it adequately to discharge its responsibilities. Papers are provided to the Directors in advance of the relevant Board or Committee meeting to enable them to make further enquiries about any matters prior to the meeting should they so wish. This also allows Directors who are unable to attend to submit views to the relevant Chairperson in advance of the meeting.

In addition to the formal Board processes, the Chief Executive provides written updates on important Company business issues between meetings, and the Board is provided with a regular monthly report of key financial and management information, including information on safety and quality performance. Regular updates on shareholder matters are provided to the Directors, who also receive copies of analysts' notes issued on the Company. For the distribution of all information, Directors have access to a secure online portal, which contains a reference section containing relevant background information.

All Directors have access to the advice and services of the Company Secretary.

There is also an agreed procedure in place for Non-executive Directors, in the furtherance of their duties, to take independent legal advice at the Company's expense. The procedure was not utilised during the year under review.

Directors' conflicts of interest

The Board has established a formal system to authorise situations where a Director has an interest that conflicts, or may possibly conflict, with the interests of the Company (situational conflicts). Directors declare situational conflicts so that they can be considered for authorisation by the non-conflicted Directors.

In considering a situational conflict, these Directors act in the way they consider would be most likely to promote the success of the Company and may impose limits or conditions when giving authorisation, or subsequently, if they think this is appropriate.

The Company Secretary records the consideration of any conflict and any authorisations granted. The Board believes that the approach it has in place for reporting situational conflicts continues to operate effectively. No situational conflicts were presented to the Board for authorisation during the year under review.

Board and Committee attendance

The attendance of Directors at the Board meetings and at meetings of the principal Committees of which they are members held during 2021 is shown in the table below. The maximum number of meetings in the period during which the individual was a Board or Committee member is shown in brackets.

	Board	Audit Committee	Remuneration Committee	Nomination Committee	% attendance
Chairman					
John McDonough CBE	9 (9)	–	–	5 (5)	100%
Executive Directors					
Patrick André	9 (9)	–	–	–	100%
Guy Young	9 (9)	–	–	–	100%
Non-executive Directors					
Kath Durrant	9 (9)	4 (5)	5 (5)	5 (5)	96%
Dinggui Gao[1]	7 (7)	3 (3)	4 (4)	4 (4)	100%
Hock Goh[2]	3 (3)	2 (2)	1 (1)	1 (2)	88%
Friederike Helfer	9 (9)	–	–	5 (5)	100%
Jane Hinkley	9 (9)	5 (5)	5 (5)	5 (5)	100%
Douglas Hurt	9 (9)	5 (5)	5 (5)	5 (5)	100%
Holly Koeppel[2]	3 (3)	2 (2)	1 (1)	1 (2)	88%

1. Dinggui Gao was appointed to the Board on 1 April 2021 and the table reflects the number of Board and Committee meetings that he could attend following his appointment.
2. Hock Goh and Holly Koeppel stood down from the Board at the close of the 2021 AGM on 12 May 2021. The table reflects the number of Board and Committee meetings that they could attend prior to their departures.

Kath Durrant was unable to attend one Audit Committee meeting, and Hock Goh and Holly Koeppel one Nomination Committee meeting during the year due to clashes with other professional responsibilities that had been previously notified to the Chairman. Dinggui Gao, Hock Goh and Holly Koeppel attended meetings virtually as they were precluded from participating in person due to travel restrictions between the UK and their countries of residence, being China, Australia and the US, respectively.

To the extent that Directors were unable to attend scheduled meetings, they received the papers in advance and relayed their comments to the Chairman of the relevant Committee for communication at the meeting. The Committee Chairs followed up after the meeting in relation to the decisions taken.

The Chairman and Non-executive Directors each have a letter of appointment which sets out the terms and conditions of their directorship.

An indication of the anticipated time commitment is provided in recruitment role specifications, and each Non-executive Director's letter of appointment provides details of the meetings that they are expected to attend, along with the need to accommodate travelling time. Non-executive Directors are required to set aside sufficient time to prepare for meetings, and regularly to refresh and update their skills and knowledge. Copies of all contracts of service or, where applicable, letters of appointment of the Directors are available for inspection during business hours at the registered office of the Company and are available for inspection at the location of the Annual General Meeting (AGM) for 15 minutes prior to and during each AGM.

Corporate Governance Statement continued

All Non-executive Directors have agreed to commit sufficient time for the proper performance of their responsibilities, acknowledging that this will vary from year to year depending on the Group's activities, and will involve visiting operational and customer sites around the Group. The Chairman in particular dedicates a significant amount of time to Vesuvius in discharging his duties.

Directors are expected to attend all scheduled Board and Committee meetings and any additional meetings as required. Each Director's other significant commitments are disclosed to the Board during the process prior to their appointment and they are required to notify the Board of any subsequent changes.

The Company has reviewed the availability of the Chairman and the Non-executive Directors to perform their duties and considers that each of them can, and in practice does, devote the necessary amount of time to the Company's business.

Composition, evaluation and succession

Appointment and replacement of Directors

The Company's Articles of Association specify that Board membership should not be fewer than five nor more than 15 Directors, save that the Company may, by ordinary resolution, from time to time, vary this minimum and/or maximum number of Directors. Directors may be appointed by ordinary resolution or by the Board. The Board may appoint one or more Directors to any executive office, on such terms and for such period as it thinks fit, and it can also terminate or vary such an appointment at any time. The Articles specify that, at every AGM, any Director who has been appointed by the Vesuvius Board since the last AGM and any Director who held office at the time of the two preceding AGMs, and who did not retire at either of them, shall retire from office. However, in accordance with the requirements of the Code, all the Directors who wish to continue to serve on the Board, will offer themselves for re-election at the 2022 AGM. The Board believes that each of the current Directors is effective and demonstrates commitment to his or her respective role. Accordingly, the Board recommends that shareholders approve the resolutions to be proposed at the 2022 AGM relating to the re-election of the Directors. The biographical details of the Directors offering themselves for re-election, including details of their other directorships and relevant skills and experience, will be set out in the 2022 Notice of AGM. The biographical details of the Directors are also set out on pages 104 and 105.

Recommendations for appointments to the Board and rotation of the Board are made by the Nomination Committee. The Nomination Committee is also responsible for overseeing the maintenance of an effective succession plan for the Board and senior management. Further information on the activities of the Nomination Committee is set out in the Nomination Committee report on pages 125–129.

A comprehensive induction programme is available to new Directors. The induction programme is tailored to meet the requirements of the individual appointee and explains the dynamics and operations of the Group, and its markets and technology. The induction includes, as a minimum, a series of meetings with key Group executives and advisers, along with site visits to the Group's key strategic sites. During the COVID-19 travel restrictions, Dinggui Gao's induction has been limited to site visits in China, virtual meetings with the Group's executives and senior management, and a 'virtual' site visit to Vesuvius India. A more comprehensive plan of personal site visits is planned for 2022.

The Chairman, through the Company Secretary, continues to ensure that there is an ongoing process to review training and development needs. Directors are provided with details of seminars and training courses relevant to their role and are encouraged and supported by the Company to attend them. In 2021, regulatory updates were provided as a standing item at each Board meeting in a Secretary's Report. External input on legal and regulatory developments impacting the business was also given, with specialist advisers invited to the Board and Committee meetings to provide briefings on topics such as the changing landscape of Corporate Governance, particularly the latest FRC consultations and guidance, and material developments in the legal environment, including trends in M&A, changes in UK pension legislation and ESG disclosure requirements.

Performance evaluation

The Board carries out an evaluation of its performance and that of its Committees and individual Directors, including the Chairman, every year. Details of the evaluation conducted in 2021 can be found in the Nomination Committee report.

Audit, risk and internal control

The Board is responsible for ensuring that policies and procedures are in place to ensure the independence and effectiveness of the Internal and External Audit functions. The Audit Committee assists the Board in reviewing the effectiveness of the Group's Internal and External Audit functions, in addition to monitoring the integrity of the Group's financial and narrative statements. Further information about the work of the Audit Committee can be found in the Audit Committee report on pages 117–124.

The Board is also responsible for setting the Group's risk appetite and ensuring that appropriate risk management systems are in place. The Audit Committee assists the Board in reviewing the effectiveness of the system of internal control, including financial, operational and compliance controls, and risk management systems. The Group's approach to risk management and internal control is discussed in greater detail on pages 29–33 and the Group's principal risks and how they are being managed or mitigated are detailed on pages 34 and 35. The Viability Statement which considers the Group's future prospects is included on page 33. Risk management and internal control are also discussed in greater detail in the Audit Committee report.

All of the independent Non-executive Directors serve on both the Audit and Remuneration Committees. They therefore bring their experience and knowledge of the activities of each Committee to bear when considering critical areas of judgement. This means that, for example, the Directors are able to consider carefully the impact of incentive arrangements on the Group's risk profile and to ensure that the Group's Remuneration Policy and programme are structured to align with the long-term objectives and risk appetite of the Company.

Remuneration

The Directors' Remuneration Report on pages 130–153 describes the work of the Remuneration Committee in developing the Group's policy on executive remuneration, determining Director and senior management remuneration, reviewing workforce remuneration and related policies – including ensuring that these align with the Group's Strategic Objectives and culture, and overseeing the operation of the executive share incentive plans.

Audit Committee

Douglas Hurt – Committee Chairman

Kath Durrant

Dinggui Gao
Joined the Committee on his appointment to the Board on 1 April 2021

Hock Goh
Served on the Committee until his retirement from the Board on 12 May 2021

Jane Hinkley

Holly Koeppel
Served on the Committee until her retirement from the Board on 12 May 2021

The Company Secretary is Secretary to the Committee

Dear Shareholder,

On behalf of the Audit Committee, I am pleased to present the Audit Committee Report for 2021. The foundation of the Committee's work each year is a recurring and structured programme of activities which are defined in an annual rolling Audit Committee timetable. The Audit Committee then considers additional items as matters arise and priorities change. During 2021, the Committee continued to monitor the impact of the COVID-19 pandemic on the Group's activities, undertaking particularly detailed analysis of the Group's impairment assessments and the going concern and viability statements, along with the Group's TCFD reporting. In addition, the Committee again spent some time focusing on the Group's cyber security measures, as well as receiving updates throughout the year on the implementation of changes to the Group's Finance Operating Model.

The Audit Committee Report describes the work of the Committee during the year, including its role in monitoring the integrity of the Company's financial statements and the effectiveness of the internal and external audit processes. It provides an overview of the significant issues the Committee has considered during the year and its material judgements. It also describes how the Committee fulfilled its responsibilities to assist the Board in reviewing the effectiveness of the Group's system of internal financial controls and its internal control and risk management systems.

Yours sincerely

Douglas Hurt
Chairman, Audit Committee
3 March 2022

The Audit Committee

The Audit Committee comprises all the independent Non-executive Directors of the Company, who bring a wide range of financial and commercial expertise to the Committee's decision-making processes. Douglas Hurt is the Senior Independent Director and Chairman of the Audit Committee. He was the Finance Director of IMI plc for nine years prior to his appointment and has worked in various financial roles throughout his career. Douglas currently serves as the Chairman of the Audit Committees of Countryside Partnerships PLC, Hikma Pharmaceuticals PLC and the British Standards Institution. He is a Chartered Accountant. This background provides him with the 'recent and relevant financial experience' required under the Code.

The Code and Financial Conduct Authority Disclosure Guidance and Transparency Rules also contain requirements for the Audit Committee as a whole to have competence relevant to the sector in which the Company operates. Vesuvius' Non-executive Directors have significant breadth of experience and depth of knowledge on matters related to Vesuvius' operations, both from their previous roles and from their induction and other activities since joining the Vesuvius Board. The Directors' biographies on pages 104 and 105 outline their range of multinational business-to-business experience and expertise in fields such as engineering, manufacturing, services, logistics and human resources, as well as financial and commercial acumen. Biographies for Hock Goh and Holly Koeppel are available in the Company's 2020 Annual Report which can be viewed on our website: www.vesuvius.com. The Board considers that the Audit Committee as a whole has competence relevant to Vesuvius' business sector.

Meetings

The Committee met five times during 2021. The Committee has also met twice since the end of the financial year and prior to the signing of this Annual Report. The Board Chairman, the non-independent Non-executive Director, the Chief Executive, the Chief Financial Officer, the Head of Finance, the Group Head of Internal Audit and the External Auditors were all invited to each meeting. Other management staff were also invited to attend as appropriate.

Audit Committee meetings are conducted to promote an open debate, they enable the Committee to provide constructive challenge of significant accounting judgements, and guidance and oversight to management, to ensure that the business maintains an appropriately robust control environment. Between Audit Committee meetings, the Chairman of the Audit Committee encourages open dialogue between the External Auditors, the management team and the Group Head of Internal Audit to ensure that emerging issues are addressed in a timely manner.

Audit Committee continued

Activities in 2021

1. During 2021, the Committee's activities were once again focused on the impact of COVID-19 on the Group, as well as on the impact on raw material and freight availability, and inflation. The work of Internal Audit was adapted to accommodate the travel restrictions, and the Group's liquidity and cash generation remained under particular scrutiny. The Committee ensured that despite the continued changes in working patterns, critical resources in internal control and compliance functions worked effectively. The work of the External Auditors was carefully monitored given the continued use of virtual tools and where appropriate and possible, audit work was accelerated to reflect the potentially longer time frames for completion.
2. The Committee's agenda covered the usual standing items – the review of financial results, the effectiveness of the Group's internal financial controls, and the review of the internal control and risk management systems – as well as additional topics, including updates on cyber security and an in-depth review of the Group's European Shared Services function.
3. The Committee continued to receive feedback throughout the year on the implementation of the new finance operating model. This continued the transition of the business unit finance functions from purely accounting to forward-looking business support, with clearer accountabilities for controlling functions and a focus on further standardising core processes. The Committee monitored changes to the structure of finance roles and the roll-out of the new model.
4. The Audit Committee continued to devote time to ensure that initiatives to mitigate potential risks and financial exposure remained robust and appropriate.
5. The Committee challenged the assumed growth rates and discount rates used for asset impairment assessments.
6. The Committee considered the Company's going concern statement and challenged the nature, quantum and assessment of the significant risks to the business model, future performance, solvency and liquidity of the Group that were modelled as part of the scenarios and stress testing undertaken to support the viability statement made by the Company in the Annual Report and Financial Statements. In particular the Committee examined the criteria selected for enhanced stress testing, which included an unplanned drop in customer demand, debt recovery risk due to customer default, business interruption due to unplanned closure of several key plants and raw material cost inflation. The Committee also considered the potential effect of a combination of risk factors occurring at the same time. At the half year the Committee undertook another detailed look at the Company's going concern statement. The going concern and viability statements, which were also critically reviewed, are contained within the Strategic Report on page 33.
7. The Committee reviewed the resourcing and delivery of the 2021 Internal Audit plan, monitoring the effect of ongoing COVID-19 travel restrictions and approved the 2022 Internal Audit plan. The Committee monitored both the responses from and follow-up by management to Internal Audit recommendations arising during the year. The Committee discussed at length the significant issues raised, the root causes for those issues and the actions being taken to resolve the issues.
8. The Committee conducted regular, detailed reviews of provisions, challenging the reasonableness of underlying assumptions and estimates of costs and the quantum of any related insurance assets.
9. The Committee reviewed the accounting, disclosures and resulting impacts of the final buy-in for the UK pension plan. The buy-in did not impact the underlying terms on which the remaining surplus asset is deemed recoverable and recognised.
10. The Committee reviewed the accounting for the acquisition of the business of Universal Refractories, Inc. including determining the allocation of the purchase price and the identification and valuation of intangible assets.
11. The Committee reviewed the Group's work on TCFD reporting and the assurance received regarding the sustainability KPI data.
12. The Committee reviewed the effectiveness of the Internal and External Audit processes.
13. The Committee met with Internal and External Audit without management present and received valuable feedback on a range of topics.
14. The Committee reviewed the activities being undertaken to prepare for filing the 2021 annual financial report in European Single Electronic Format (ESEF). A dry run tagging the 2020 Annual Report was undertaken during the year to ensure the Company was ready to comply with its obligation in 2022.
15. The Committee conducted an evaluation of its performance and effectiveness, concluding that the Committee continued to work effectively across all key areas, with meetings remaining well managed and appropriately resourced.
16. The Committee reviewed and updated its terms of reference.

During the year, as is the Audit Committee's established practice, the Committee members met and discussed business and control matters with senior management during Board presentations. The Committee also met privately with the Group Head of Internal Audit and the External Auditors without any executives present.

The outcomes of Audit Committee meetings were reported to the Board, and all members of the Board received the agenda, papers and minutes of the Committee.

Statement of compliance with the Competition and Markets Authority (CMA) Order

The Committee considers that the Company has complied with the Statutory Audit Services for Large Companies Market Investigation (Mandatory Use of Competitive Tender Processes and Audit Committee Responsibilities) Order 2014 (Article 7.1), published by the CMA on 26 September 2014, including with respect to the Audit Committee's responsibilities for agreeing the audit scope and fees and authorising non-audit services.

Role and responsibilities

During 2021, the main role and responsibilities of the Committee continued to be to:

– Monitor the integrity of the Financial Statements of the Company and the Group, and any formal announcements relating to the Group's financial performance, reviewing significant financial reporting judgements contained in them
– Provide advice, as requested by the Board, on whether the Annual Report and Financial Statements, taken as a whole, are fair, balanced and understandable and provide the information necessary for the shareholders to assess the Group's position and performance, business model and strategy
– Review and monitor the effectiveness of the Company's internal financial controls, and internal control and risk management systems
– Review procedures for detecting fraud, and systems and controls for the prevention of bribery and ensure that a thorough review is carried out of all alleged instances of fraud notified to the Committee
– Monitor and review the role and effectiveness of the Company's Internal Audit function and audit programme, ensuring that the function is adequately resourced and operates free from management or other restrictions
– Make recommendations to the Board on the appointment, reappointment and removal of the External Auditors and negotiate and agree the fees and terms of engagement of the External Auditors
– Monitor and review with the External Auditors the findings of their work, including key accounting and audit judgements, how any risks to audit quality were addressed and the External Auditors' views of their interactions with senior management
– Review and monitor the External Auditors' independence, objectivity and effectiveness, taking into consideration relevant law, regulation, the Ethical Standard, other professional requirements and any FRC audit inspection findings
– Oversee the operation of the policy on the engagement of the External Auditors to supply non-audit services
– Report to the Board on how the Committee has discharged its responsibilities

The Committee operates under formal terms of reference approved by the Board. These were reviewed during the year and a minor amendment made to update a legislative reference. They are available to view in the Investors/Corporate Governance/Board Committees section of the Company's website: www.vesuvius.com. Within these terms, the Committee and its individual members are empowered to obtain outside legal or other independent professional advice at the cost of the Company. These powers were not utilised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties with relevant experience and expertise should it be considered necessary.

The Committee members believe that they received sufficient, relevant and reliable information throughout the year from management and the Internal and External Auditors to enable the Committee to fully discharge its responsibilities. The work of the Audit Committee is further elaborated in the remainder of this report.

Financial reporting

The Committee fulfilled its primary responsibility to review the integrity of the half year and annual Financial Statements and recommended their approval to the Board.

In forming its views, the Committee assessed:

– The quality, acceptability and consistency of the accounting policies and practices
– The clarity and consistency of the disclosures, including compliance with relevant financial reporting standards and other reporting requirements
– Significant issues where management judgements and/or estimates had been made that were material to the reporting or where discussions had taken place with the External Auditors in arriving at the judgement or estimate
– In relation to the overall Annual Report, whether the Annual Report and Financial Statements taken as a whole were fair, balanced and understandable, taking into consideration all the information available to the Committee
– The Group's compliance with the new requirements in respect of TCFD Reporting, including the assurance received regarding the sustainability KPI data. The Committee also reviewed and approved the completed climate-related risk and opportunities register and the work undertaken by the Group to formulate the scenario analyses
– The application of the FRC's guidance on clear and concise reporting and the key takeaways from the Thematic Reviews issued by the FRC throughout the year on themes such as Interim Results, Going Concern and Viability Statements, Streamlined Energy and Carbon Reporting and IAS 37 – Provisions, Contingent Liabilities and Contingent Assets
– The disclosure and presentation of alternative performance measures, in view of the guidelines issued by the FRC

The Committee actively deliberated and challenged reports from the Chief Financial Officer and the Head of Finance. These were well prepared and, for areas of judgement and/or estimation, set out the rationale for the accounting treatment and disclosures, and the pertinent assumptions and the sensitivities of the estimates to changes in the assumptions. The External Auditors also delivered memoranda for the half-year and year-end, stating its views on the treatment of significant issues. The External Auditors provided a summary for each issue, including its assessment of the appropriateness of management's judgements or estimates.

Significant issues and material judgements

The Committee considered the following significant issues in the context of the 2021 Financial Statements. It identified these areas to be significant, taking into account the level of materiality and the degree of judgement exercised by management.

The Committee resolved that the judgements and estimates made on each of the significant issues detailed below were appropriate and acceptable.

Impairment of intangible assets

The 2021 year-end carrying value of goodwill of £614.2m was tested against the current and planned performance of the Steel Flow Control, Steel Advanced Refractories, Steel Sensors & Probes and Foundry CGUs. The Committee considered the

Audit Committee continued

Board-approved medium-term business plans, medium-term and terminal growth assumptions, as well as the discount rates used in the assessments. Relevant sensitivities using reasonably possible changes to key assumptions were evaluated. The detailed assumptions are provided in Note 17 to the Group Financial Statements.

Given that the models indicated, even with the application of reasonable sensitivities to the assumptions, that there remains significant headroom between the value in use and the carrying value, the Committee concurred that no goodwill impairment charges were required.

Other provisions

The Committee continues to monitor the implications of a number of potential exposures and claims arising from ongoing litigation, product quality issues, employee disputes, restructuring, vacant sites, environmental matters, legacy matter lawsuits, indirect tax disputes and indemnities or warranties outstanding for disposed businesses. Due to the long gestation period before settlement for a number of these issues can be reached, provisioning for these items requires careful judgement in order to establish a reasonable estimate of future liabilities. The Committee also assessed the strength of any insurance coverage for certain of these liabilities and challenged the accounting treatment for any amounts deemed to be recoverable from insurers. After due consideration and challenge, and having considered legal advice obtained by the Company, the Committee is satisfied that there are appropriate levels of provisions set aside to settle third-party claims and disputes (Note 30 to the Group Financial Statements) and that adequate disclosure has been made. Where no reliable estimate of the potential liability can be made for the outcome of an existing issue, no provision has been made and appropriate disclosure is included under contingent liabilities (Note 32 to the Group Financial Statements).

Operating segments for continuing operations

The Committee considered the aggregation of the Steel Flow Control, Steel Advanced Refractories, and Steel Sensors & Probes operating segments into the Steel reportable segment, noting the economic characteristics of these operating segments which include a similar nature of products, customers, production processes and margins. The Committee concluded that this segmentation remained appropriate.

Impairment of investment in subsidiaries

The Committee has also reviewed management's impairment analysis of the parent company's investment in subsidiaries. Following this review it concurred that no impairment was required.

Defined benefit pensions

The Committee carefully reviewed the accounting for, and valuation of, the UK pension assets, following the purchase by the Trustees of an insurance contract to match the remaining pension liabilities.

Fair, balanced and understandable reporting

The Committee considered all the information available to it in reviewing the overall content of the Annual Report and Financial Statements and the process by which it was compiled and reviewed, to enable it to provide advice to the Board that the Annual Report and Financial Statements are fair, balanced and understandable. In doing so, the Committee ensured that time was again dedicated to the drafting and review process so that internal linkages were identified and consistency was tested. Drafts of the Annual Report and Financial Statements were also reviewed by a senior executive not directly involved in the year-end process who reported to the Committee on his impressions of their clarity, comprehensiveness, and the balance of disclosure in the document. On completion of the process, the Committee was satisfied that it could recommend to the Board that the Annual Report and Financial Statements are fair, balanced and understandable.

Risk management and internal controls

As highlighted in the reviews of strategy and principal risks in the Strategic Report, risk management is inherent in management's thinking and is embedded in the business planning processes of the Group. The Board has overall responsibility for establishing and maintaining a system of risk management and internal control, and for reviewing its effectiveness. The Audit Committee assists the Board in reviewing the effectiveness of the Group's system of internal control, including financial, operational and compliance controls, and risk management systems. This framework is consistent with the Code.

In 2021, Committee members fully participated in the Board review of existing risks and ongoing mitigating actions, further details of which are given on pages 34 and 35. The Committee believes that the Group's process for identifying and understanding its principal risks and uncertainties remains robust and appropriate.

The Committee considered the Company's going concern statement and challenged the nature, quantum and effects of the combination of the unlikely but significant risks to the business model, future performance, solvency and liquidity of the Group. These were all modelled as part of the scenarios and stress testing undertaken to support the viability statement. As part of this review, the Committee considered the Group's forecast funding requirements over the next three years and analysed the impact of key risks faced by the Group with reference to the Group's debt covenants; these included stress testing for an unplanned drop in customer demand, debt recovery risk due to customer default, business interruption due to unplanned closure of several key plants and raw material cost inflation. The scenarios considered the impact of multiple risks occurring simultaneously and the additional mitigating actions that the Group could take. The Committee noted that the Group's debt headroom was sufficient to accommodate the modelled stress scenarios. As a result of its review, the Committee was satisfied that the going concern statement and viability statement had been prepared on an appropriate basis. The 2021 going concern statement and the 2021 viability statement are contained within the Risk, viability and going concern section on page 33.

The key features of the Group's internal control system, which provides assurance on the accuracy and reliability of the Group's financial reporting, are detailed in the Risk, viability and going concern section on pages 29–35. During 2021, the Committee considered the process by which management evaluates internal controls across the Group. The Group Head of Internal Audit provided the Committee with a summary overview of the assurance provided by the Group's control framework and the testing of these controls. PwC also reports if there are any significant control deficiencies identified during the course of their audit.

The Group is made up of several large operating units, but also many small units in geographically diverse locations. Consequently, segregation of duties, overlapping access controls on systems and remote management oversight can give rise to control vulnerabilities and fraud opportunities. The Group has not adopted a common Enterprise Resource Planning system as a Group-wide standard. Over time, the Group is moving towards a shared services model, enabled by control, process and systems standardisation between businesses. This is expected to enhance the overall internal control environment in the smaller operating units.

The Group undertakes a range of activities to mitigate the risk of fraud. This framework is regularly reviewed to determine areas for improvement. Eliminating the risk of fraud remains one of the key areas of focus for Internal Audit, forming a fundamental part of 'full scope' and financial audits. These assess the quality of the balance sheet reconciliations, review key judgement matters, consider ERP access rights, review tenders and quotations, review the entity's controls over master data changes, and review controls over payments, journals and associated applications, along with travel and expense reimbursements.

Any control issues identified by management locally or as a result of the work performed by Internal Audit are escalated as appropriate. Internal Audit rate all control issues they identify in terms of their significance and agree remediation plans with the auditee and an action owner, establishing a target date for remediation. For significant issues, management at all levels within the business are engaged to agree the actions and remediation dates. The status of the remediation is monitored and overdue issues are escalated appropriately with management, and reported at Audit Committee meetings. The Audit Committee continues to challenge management on the root cause where issues arise on the progress of remediation activities.

Cyber risks continue to be a significant area of focus for the Group, with Vesuvius like most other companies, receiving a large number of 'phishing' emails presenting fake credentials and subject to repeated attempts at social engineering fraud. The Group has an IT Committee that meets on a regular basis to review and progress the Group's plans for tackling cyber issues, and the Audit Committee receives regular updates on the Group's activities in this area.

During 2021, the Group continued to enhance its infrastructure and networks to improve its IT security. A holistic approach is taken to addressing cyber challenges, focusing on the improvement of the Group's overall IT procedures and framework. The Group continues to run regular training programmes on cyber/IT security.

During 2021, the Group continued its review of third-party representatives and intermediaries. This included detailed due diligence for new third parties and ongoing monitoring of our sales agents. The Committee also continued its assessment of the Group's potential exposure to bribery and corruption risks, noting the ongoing work conducted by the Group in this context. The face-to-face visits to operations usually conducted to assist with the work were curtailed by the COVID-19 pandemic. In 2020 we undertook a detailed review of the existing compliance programme and resources, and in 2021 the output of this review, combined with previous risk assessments, was used to further develop the Group's framework, policies and procedures for the management of anti-bribery and corruption risk, to ensure they reflect a continued appropriate level of control for the business.

In line with the requirements of the Code, responsibility for the oversight and monitoring of the Group's Speak Up helpline, which collates allegations of improper behaviour and employee concerns, has passed from the Audit Committee to the full Board. The Committee is kept apprised of any complaints received by the Company regarding fraud, accounting, internal accounting controls and auditing matters. Further details of the operation of the Group's Speak Up policy and helpline can be found on page 109.

Each year, the senior financial, operational and functional management of the businesses self-certify compliance with Group policies and procedures for the areas of the business under their responsibility and confirm the existence of adequate internal control systems throughout the year. The Committee reviews any exceptions noted in this bottom-up exercise.

Cyber security

The Board places significant emphasis on operational security, of which Information and Communication Technology and Cyber awareness are a vital part. Cyber resilience continues to be a significant area of focus for the Group.

Cyber risks are integrated into our wider risk-management, including forming part of the Business Continuity Plan (BCP) undertaken to counteract business interruption – either in loss of production capacity or supply chain disruption due to physical site damage (accidents, fires, natural disasters, terrorism), industrial action, cyber attack or global health crises.

Integration between BCP and cyber security is done in several areas. We constantly conduct cyber security risk assessments, analysing business impact to mitigate potential downtime. We have an Incident Handling and Response Policy, which sets out how we improve visibility and monitoring of all network infrastructure. These processes give us an effective way to proactively manage risk and mitigate business continuity concerns. Furthermore, IT has developed a Disaster Recovery Plan for inclusion in wider business continuity plans to address network, data centre and infrastructure issues.

Vesuvius has a multi-year strategy for maintaining and developing cyber security based on best practices and standards, and monitoring trends and cyber threats against appropriate indicators. This also encompasses in-house vulnerability testing and analysis, using external reports and benchmarks to develop our processes. Our cyber security work therefore supports and protects our production capacity, and invests in appropriate resources in this fast-changing environment. The Group's IT Security Strategy and Roadmap is based on the ISO 27001 standard and NIST frameworks, implementing best practices in the area, but currently without ISO accreditation.

In 2021, against the increasing trend in phishing emails and ransomware attacks affecting operational capabilities, we carried out disaster recovery tests to assess the resilience of our systems and continuity both for suppliers and customers. In 2021, Vesuvius experienced no such interruptions or service denials.

During the year, the Group worked to strengthen IT security, through the development of operational technologies, the optimisation of the Group's overall IT procedures and framework, and the continuation of regular cyber security training programmes. We also focused on staff development to increase operational capacity. We continued to improve our Incident Handling and Response Policy, which was used successfully to handle minor incidents as they occurred. This demonstrates that we have the correct building blocks for responding to cyber incidents.

Audit Committee continued

The work undertaken during the year indicated the existence of an appropriate control environment, albeit with some areas for improvement, for which clearly defined improvement actions have been identified, particularly in respect of the Group's cyber risks. No significant control issues were raised by our External Auditors, PwC and Mazars, and no material issues were identified in 2021. After considering these various inputs, the Committee was able to provide assurance to the Board on the effectiveness of internal financial control within the Group, and on the adequacy of the Group's broader internal control systems.

Internal Audit

The Group's Internal Audit function operates on a global basis through professionally qualified and experienced individual members located in the UK and Poland. They report to the Group Head of Internal Audit, based in London, who in turn reports directly to the Chairman of the Audit Committee.

Throughout 2021, Internal Audit continued to perform a programme of audits focusing on internal financial controls and key Board compliance issues.

The Committee received, considered and approved the 2021 Internal Audit plan which was constructed using a risk-based approach to cover the Group's control environment. The plan was based on the premise that all operating units are audited at least once every three to four years, including the smaller operating units. Internal Audit annually audits each of the large operating entities located in Germany, the US, China, Mexico and Brazil. Due to the travel restrictions arising from the COVID-19 pandemic, the 2021 plan focused on European financial controls audits and remote desktop audits in the first half, with no long haul international travel before June 2021. Some on-site long haul audits were performed in the second half of the year but these continued to be severely limited due to COVID-19 restrictions. As a result, the remainder were performed remotely.

Whilst the scope of the audit work was modified to facilitate remote testing, the entities tested remained aligned with the original risk-based plan. On-site controls-based testing was replaced with remote financial controls health check audits supplemented by the continued use of trial balance deep dive testing which involved a detailed review of the trial balance and its underlying transactions. The health check audits required entities to submit evidence of the operation of key balance sheet reconciliations and key financial controls which were then reviewed remotely. This approach continued to allow the identification of areas for control improvement. The actions being taken to address these issues have been discussed at length at the Audit Committee with regular updates on the progress made. Internal Audit reported significant progress made against issues reported in previous years.

In 2021, a total of 34 audit assignments were undertaken (27 in 2020). The Committee received a report from the Group Head of Internal Audit at each of its meetings detailing progress against the agreed plan. Key trends and findings and an update on the progress made towards resolving open issues was also given. Common themes emerging from Internal Audit reports coupled with Internal Audit and management's assessment of risk have informed the development of the 2022 Internal Audit plan.

When necessary, Internal Audit contracts auditors from other audit firms to supplement internal resources on an ad hoc basis. This process provides valuable learning opportunities and we expect to continue to use external resources in specialist areas and geographies in the future.

Control issues continue to be recorded in a live web-based database into which management is required to report progress towards addressing any open issues. Internal Audit monitors the progress made and frequent meetings continue to be held with each business unit President to ensure that engagement on the resolution of issues is clearly understood at all levels of the business and responsibility for remediation has been appropriately assigned. The results are communicated to the Audit Committee which also involves senior management as necessary to provide an update against any high-priority actions. Internal Audit undertakes follow-up reviews as required. In situations where audit findings require longer-term solutions, the Committee oversees the process for ensuring that adequate mitigating controls are in place.

An internal review was undertaken of the effectiveness of the Internal Audit function in 2021, canvassing the views of the divisional finance Vice Presidents, business unit Presidents and other key stakeholders. This concluded that the function remains effective in adding value to the organisation and provides appropriate challenge to the Group's businesses and functions. Going forward the need for the more timely escalation and reporting of findings were noted as key areas for improvement.

Having considered the work of the Internal Audit function during 2021, including progress against the 2021 Internal Audit plan, the quality of reports provided to the Committee, and the results of the review of the function's effectiveness, the Committee concluded that the Internal Audit function operated effectively during 2021.

External Audit

Auditors' appointment

In 2017, the Company appointed PricewaterhouseCoopers LLP (PwC) as External Auditors to the Company and the Group, and Mazars LLP (Mazars) to audit the non-material entities within the Group. PwC has nominated Darryl Phillips as the audit partner responsible for the Group audit. Darryl assumed this role following the completion of the 2020 half year review.

Under the Statutory Audit Services for Large Companies Market Investigation (Mandatory Use of Competitive Tender Processes and Audit Committee Responsibilities) Order, the Audit Committee is required to report in which year the Company proposes to complete a competitive tender process in respect of the statutory external auditor, and the reasons why the proposed year for the competitive tender process is in the best interests of the shareholders. In compliance with the Order, the Audit Committee confirms that a competitive tender process for the appointment of a statutory auditor will, subject to satisfactory annual reviews of the effectiveness of the External Auditors and its costs in the intervening period, be conducted during 2026 with a view to recommending the appointment of a new statutory auditor or the reappointment of the incumbent auditor, for the financial year ending December 2027. The Audit Committee believes that conducting a competitive tender process during 2026 for the appointment of a new statutory auditor for the financial year ending December 2027 is appropriate, and in the best interests of the shareholders.

2021 Audit plan

PwC's 2021 year-end audit plan was based on agreed objectives. The audit focused on areas identified as representing significant risk and requiring significant judgement. PwC maintained an ongoing dialogue with the Audit Committee throughout the year providing regular updates, including commentaries on significant issues and its assessment of consistency and appropriateness in the judgements and estimates made by management. Private sessions were held with PwC without management being present. PwC confirmed that its work had not been constrained in any way and that it was able to exercise appropriate professional scepticism and challenge throughout the audit process. The Chairman of the Audit Committee met on a number of occasions with PwC to monitor the progress of the audit and discuss questions as they arose.

The Independent Auditors' Report provided by PwC on pages 161–169 includes PwC's assessment of the key audit matters. These key audit matters are discussed in the significant issues and material judgements comments above. The report also summarises the scope, coverage and materiality levels applied by PwC in its audit. As part of the audit planning process and based on a detailed risk assessment, the Committee agreed a materiality figure of £6.3m for Group financial reporting purposes which is 10% lower than last year (£7.0m) and is set at 4.6% of headline profit before tax of £137.3m. Importantly, much lower levels of materiality are used in the audit fieldwork on the individual businesses across the Group and these lower figures drive the scope and depth of audit work. Any misstatement at or above £0.35m was reported to the Committee.

There were no significant changes this year to the coverage of the audit which stood at 70% of the Group's revenue, 67% of profit before tax and 69% of headline profit before tax. This coverage was considered to be sufficient by the Committee. The audit coverage is reflective of the long tail of smaller businesses within the Group that individually are not 'material' to the Group result.

The Committee also received a report from Mazars during the year which noted that there were no findings or recommendations in respect of its statutory audits of the non-material Group subsidiaries for the year ended 31 December 2020, that Mazars deemed sufficiently material or significant to bring to the attention of the Audit Committee.

During the year the Committee evaluated the PwC Group audit scope for 2021. This included additional components audited by Mazars. Along with responsibility for the statutory audits of the non-material Group subsidiaries for the year ended 31 December 2021 Mazars were also tasked with undertaking specific audit procedures for certain component entities that were within PwC's Group audit scope. This latter work was directed, supervised and reviewed by PwC. The PwC audit fee approved by the Audit Committee was £1.8m. This was constructed bottom up on a local currency basis and was assessed in light of the audit work required by the agreed materiality level and scope. The fee agreed with Mazars for the audit of the non-material entities and three material entities was £0.8m, resulting in a combined audit fee for 2021 of £2.6m, compared with £2.4m in 2020.

Independence and objectivity

The Committee is responsible for safeguarding the independence and objectivity of the External Auditors in order to ensure the integrity of the external audit process. In discharging this responsibility during 2021, the Committee:

- Sought regular confirmation from the incumbent External Auditors that they considered themselves to be independent of the Company in their own professional judgement, and within the context of applicable professional standards
- Assessed the work of the External Auditors and considered whether they were exercising an appropriate level of professional scepticism
- Evaluated all the relationships between the External Auditors and the Group, including compliance with the Group's policy on the employment of former employees of the External Auditors, to determine whether these impaired, or appeared to impair, the Auditors' independence
- Reviewed compliance against the policy on the provision of non-audit services by the External Auditors
- Reviewed details of the non-audit services provided by the External Auditors and associated fees

As a result of its review, the Committee concluded that the External Auditors remained appropriately independent.

Non-audit services

Vesuvius operates a policy for the approval of non-audit services. A copy of the current policy is available to view in the Audit Committee section of the 'Investors/Corporate Governance' pages of the Company's website: www.vesuvius.com.

The use of the External Auditors for the provision of non-audit services is strictly prohibited except for specific permitted audit related services. These comprise: Category 1 services which the External Auditors are obliged to perform due to law or regulation, such as regulatory and solvency reports; and Category 2 services which could be provided by others (albeit there are typically significant efficiencies to be had when done in combination with the audit such as interim reporting). An annual budget for the additional Category 2 service fees proposed to be paid to the External Auditors in the following year is presented for pre-approval to the Audit Committee each year. Audit Committee approval is required for expenditure in excess of this approved budget.

All audit-related and permissible non-audit services proposed to be carried out for any Group company worldwide by the External Auditors must be pre-approved before an engagement is agreed. Pre-approval must be obtained from the Head of Finance or the Chief Financial Officer, who will confirm that the Audit Committee has approved the engagement. Any assignment proposed to be carried out by the External Auditors must also have been cleared by the External Auditors' own internal pre-approval process, to assess the firm's ethical ability to do the work.

In 2021, the fees for non-audit services payable to PwC amounted to £0.1m (2020: £0.1m). The 2021 fees represent payment for assurance services related to the review of the Group's half-year financial statements, quarterly reviews and tax form audits in India (as required by regulation), and assistance with an R&D certificate in Italy. In each of the past four years the non-audit related fees have represented <6% of the statutory audit fees.

Audit Committee continued

Effectiveness of the External Audit process

The Committee and the Board are committed to maintaining the high quality of the external audit process. Each year the Committee carries out a formal assessment of the performance of the External Auditors in carrying out their work and of the audit process in general. Input into the evaluation in 2021 was obtained from management and other key Company personnel, members of the Audit Committee and the External Audit team. The review focused on the External Auditors' mindset and culture, skills, character and knowledge, and the quality of its controls, as set out in the guidance for audit committees prepared by the FRC.

The evaluation of the External Auditors included the following steps:

- A survey of key finance and non-finance stakeholders in Head Office and in-scope countries
- A commentary-based survey of Audit Committee members focused on their experience of working with PwC
- Consideration of PwC's approach to assessing the risks to its audit quality and an evaluation of the actions it had taken to mitigate these
- A review of other external evidence on PwC audit quality (e.g. report on PwC by the FRC)
- An assessment against the objectives outlined in PwC's Audit Objectives report
- Discussions with PwC and key finance and non-finance personnel

The evaluation concluded that the audit process had been suitably rigorous, with PwC providing an effective, objective and challenging audit process for the 2020 financial year. The learnings from previous audits and the resultant actions taken had had a positive impact on the overall efficiency and effectiveness of the audit. The continuity of PwC team members had greatly enhanced the audit. PwC had further improved their audit approach and communications, challenging the team in the right areas and providing strong technical expertise. The PwC team was also seen as independent by the Audit Committee and management. To further improve the process it was agreed that update meetings continue to be held in 2021. Debrief meetings were held at a local level to discuss the 2020 audit and to constructively share feedback that would facilitate further improvements to the audit planning for the 2021 audit and an improved understanding of the audit approach and requirements.

Reappointment of PwC for 2022

The Committee is responsible for making recommendations to the Board in relation to the appointment, reappointment and removal of the External Auditors. In undertaking this duty, the Committee takes into consideration a number of factors concerning the External Auditors and the Group's current activity, including:

- The results of its most recent review of the effectiveness of the Auditors
- The results of its review of the independence and objectivity of the Auditors, particularly in light of the provision of non-audit services
- Its ability to coordinate a global audit, working to tight deadlines
- The cost-competitiveness of the Auditors in relation to the audit costs of comparable UK companies
- The tenure of the incumbent Auditors
- The periodic rotation of the senior audit management assigned to the audit of the Company
- External reviews of the performance and quality of the Auditors, including:
  - The annual report issued by the Audit Quality Review team of the Financial Reporting Council on the work of the Auditors
  - The Auditors' own annual Transparency Report

Having considered the aforementioned factors, the Committee recommended to the Board that PwC be reappointed for 2022. It confirms that its recommendation is free from the influence of any third party and that there are no contractual restrictions on the choice of auditor. A resolution proposing the reappointment of PwC will be included in the notice of AGM for 2022.

The Committee has noted the ruling by the Securities Exchange Board of India (SEBI) regarding the prohibition placed on PwC network companies performing audits of listed entities in India for two years from 1 January 2018. PwC subsequently won the appeal at the Securities Appellate Tribunal (SAT) allowing PwC to continue with existing audits of listed companies. SEBI appealed against the SAT order in November 2019 and this was stayed by the Supreme Court pending final disposal of the appeal. For the rest of the order, dealing with the ban, there has not been any hearing and no date has been fixed. The Committee continues to monitor developments on this matter in the context of the Group's two listed Indian subsidiaries, Foseco India Limited and Vesuvius India Limited.

Audit Committee evaluation

The Audit Committee's performance was evaluated as part of the overall externally facilitated Board and Committee performance evaluation, which is described in depth on pages 128 and 129. The review concluded that the Committee continued to function well, with the Committee judged to effectively monitor the work of the internal and external auditors. The level of engagement between the Audit Committee and the Chief Financial Officer and his team, the Head of Internal Audit and the External Audit Partner was considered to be appropriate, open and candid. The Committee noted that work continued to improve the Group's internal control systems through further standardisation of processes.

A number of priorities were identified for the Audit Committee over the coming year, including supporting the internal audit function as it re-focused its work to align with the lifting of Covid-19 travel restrictions, continuing the focus on the implementation of the financial operating model, maintaining oversight of the Group's cyber risk mitigation actions and monitoring the outcome of the BEIS consultation and any resultant actions that needed to be taken by the Group.

On behalf of the Audit Committee

Douglas Hurt
Chairman, Audit Committee
3 March 2022

Nomination Committee

John McDonough CBE – Committee Chairman

Kath Durrant

Dinggui Gao
Joined the Committee on his appointment to the Board on 1 April 2021

Hock Goh
Served on the Committee until his retirement from the Board on 12 May 2021

Friederike Helfer

Jane Hinkley

Douglas Hurt

Holly Koeppel
Served on the Committee until her retirement from the Board on 12 May 2021

Dear Shareholder,

On behalf of the Nomination Committee, I am pleased to present the Nomination Committee Report for 2021. The primary responsibility of the Nomination Committee is to focus on Board composition and succession planning, to ensure that the Board is composed of individuals with the appropriate drive, abilities, diversity and experience to lead the Company in the delivery of its strategy. As part of this work, the Committee is also responsible for overseeing succession plans for senior management to ensure that the Group has a consistent pool and pipeline of diverse talent for future potential progression to the Board.

In early 2021, the Committee progressed with the appointment of new non-executive expertise on the Board, with the appointment of Dinggui Gao to the Board on 1 April 2021. This followed the announcement of the departures of Hock Goh and Holly Koeppel, who stepped down at the close of the 2021 AGM. Subsequently, the Committee, led by the Senior Independent Director, Douglas Hurt, commenced the process for the appointment of a new Chair. The Committee is well advanced in this process.

Alongside this focus on Board recruitment, the Committee also spent a considerable amount of time during the year reviewing senior management succession. This included the recruitment and development of additional talent in our business unit executive committees, as well as further progress on the Group's diversity strategy.

Yours sincerely

John McDonough CBE
Chairman, Nomination Committee
3 March 2022

Meetings

The Committee met five times during the year.

Key activities during the year

Board composition: The Committee reviewed the structure, size and composition of the Board, including the skills, knowledge and experience required for the Board to continue to function effectively and support the delivery of our strategy. This analysis took into consideration the need to ensure an appropriate balance of independence and diversity among Board members. The Committee then evaluated the current Board composition against an assessment of future business needs.

Board succession: The Committee considered the anticipated rotation of Directors from the Board and future requirements for Board composition, with a focus on ensuring that the Board continues to be resourced by a group of Directors with the skills, diversity and experience necessary to support the future accomplishment of the Group's Strategic Objectives. As part of this review the Committee considered the Company's ongoing compliance with the Board Diversity Policy. The Committee engaged recruitment consultants to assist in the search for new Board members and oversaw the successful recruitment process to identify Dinggui Gao, as a Non-executive Director. During the year Jane Hinkley succeeded Holly Koeppel as the designated Non-executive Director responsible for overseeing engagement with the workforce.

Senior management development and succession: The Committee reviewed the Group's succession processes and candidates for the Group Executive Committee and the management cadre below this level, focusing particularly on the recruitment and retention of talent in the business unit executive committees. It also examined how the Group's talent management processes were developing, how the senior management cadre was performing and how the mentoring programme established for the development of individuals flagged as 'high potential' was proceeding – all aimed at providing a pipeline of experienced and talented managers to succeed to roles at the highest level of the business. In this process, the Committee focused both on the bench strength in key skills and expertise as well as the talent pipeline in critical geographies.

Diversity: The Committee reviewed the Group's progress in achieving its diversity targets, with a particular focus on the recruitment of women to the senior management tiers.

Directors' elections: The Committee considered the Directors' annual elections and re-elections at the AGM.

Nomination Committee continued

Committee evaluation: The Committee reviewed its performance and effectiveness during 2021, including evaluating whether each Non-executive Director was spending sufficient time fulfilling their duties.

Committee terms of reference: The Committee reviewed its terms of reference.

The Nomination Committee

The Nomination Committee is made up of me, as Chairman of the Company, and the Non-executive Directors. During the year, I was Chairman of the Committee, though I did not act as Chairman when the Committee was discussing issues surrounding my succession, in these instances Douglas Hurt our Senior Independent Director served as Chairman in my place. The Company Secretary is Secretary to the Committee. Members' biographies are set out on pages 104 and 105.

Role and responsibilities

The Nomination Committee's foremost priorities are to ensure that the Company has the best possible leadership, to oversee the process for Board appointments, to ensure that plans are in place for orderly succession to both the Board and Group Executive Committee positions, and to oversee the development of a diverse pipeline for succession. The Committee ensures that the procedure for the selection of potential candidates for Board appointments – either as an Executive Director or independent Non-executive Director – is formal, rigorous and transparent and undertaken in a manner consistent with best practice. It also ensures that appointments to the Board are made on merit, against objective criteria and with due regard for the benefits of diversity of gender, social and ethnic backgrounds, and cognitive and personal strengths. The Nomination Committee advises the Board on appointments, retirements and resignations from the Board and its Committees.

The Committee operates under formal terms of reference. A copy of these terms of reference, which were reviewed during the year, is available on the Group's website:www.vesuvius.com.

The Committee and its members are empowered to obtain outside legal or other independent professional advice at the cost of the Company in relation to its deliberations. These rights were not exercised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties it considers necessary.

Process for Board appointments

The Committee follows formal, rigorous and transparent procedures for the appointment of new Directors. When considering a Board appointment, the Nomination Committee draws up a specification for the role, taking into consideration the balance of skills, knowledge and experience of its existing members, the diversity of the Board, the independence of continuing Board members, and the ongoing requirements and anticipated strategic developments of the Group. The search process is then able to focus on appointing a candidate with the necessary attributes to enhance the Board's performance.

During 2021, the Committee oversaw the selection process to identify and recruit a new independent Non-executive Director, as part of the Group's planned Director rotation and also commenced the process to identify a new Chair for the Board. The Senior Independent Director chaired the Committee for all matters pertaining to the recruitment of the new Chair. The Committee reviewed the skills and attributes required for the roles and agreed individual job specifications. The Committee approached three agencies to submit applications to assist the Company with the recruitment of a new Chair. After careful consideration, the global specialist recruitment agency, Spencer Stuart, was retained to undertake the brief, having also assisted with the successful search for Dinggui Gao during the year. Spencer Stuart has adopted the Voluntary Code of Conduct addressing gender diversity and best practice in search assignments. It does not have any other connection with the Group, other than in respect of management recruitment work undertaken during normal trading activities. It was selected for these assignments following a review of potentially qualified agencies, based on its skills and expertise.

The searches for these new Directors were conducted globally and long-lists of potential appointees were produced by Spencer Stuart. For each appointment, the Committee reviewed a long-list of candidates, from which a short-list of candidates for interview was drawn up, based upon the objective criteria identified at the inception of each process.

In the case of the appointment of Dinggui Gao, members of the Committee conducted initial interviews with the short-listed candidates. He then met with all other Board members by videoconference, given that travel restrictions from China prohibited face-to-face meetings. Detailed external references were taken up and, following this, the Committee made formal recommendations to the Board for the appointment of Dinggui Gao as a new Non-executive Director. Dinggui was required to demonstrate that he had sufficient time available to devote to his role and to identify any potential conflicts of interest. No conflicts were identified.

A similar process is well advanced for the identification of a new Chair under the guidance of Douglas Hurt our Senior Independent Director.

A comprehensive induction programme was put in place for Dinggui Gao, although the Committee's desire that he should be able to visit a selection of our global manufacturing sites has been hampered by travel restrictions. Nonetheless, Dinggui has visited several of the Group's sites in China and he has visits planned to many of our other global sites in 2022.

Board composition

On an ongoing basis, the Committee reviews the current and future needs of the Board and its Committees – reflecting on the balance of skills, knowledge and experience of the current Directors and comparing this against the Board's list of key skills needed to support the delivery of the Company's strategy. The independence and diversity of the Board and the balance of skills, experience and development needs of Board members are also examined as part of the Group's annual corporate governance review. The Committee's key skills matrix is reviewed annually and the Committee considers the existing tenure and the prospective rotation and retirement of Board members, so that it can plan succession accordingly. Alongside the recruitment of a new Non-executive Director in 2021, and the progression of plans for a new Chair, the Committee considered the tenure of all members of the Board, noting that, on 3 December 2021, Jane Hinkley had served nine years on the Board. Following detailed discussions Jane has agreed to remain on the Board and has undertaken to continue to support the Group, including acting as the Board Non-executive Director responsible for overseeing workforce engagement, until a successor is recruited following the appointment of the new Chair, at which point she will step down from the Board. In the meantime, the Board undertook a thorough and robust review of Jane's independence. It considered her skills and contribution to the Board, noting that she now no longer serves on any other external boards and does not have any business or relationships that could materially influence or interfere with her ability to exercise objective or independent judgement or her ability to act in the best interests of the Group. The Board concluded that she continues to be independent of management and a strong and valuable contributor to the Board's work.

Diversity

The Group Diversity and Equality Policy outlines Vesuvius' commitment to encouraging a supportive and inclusive culture among its global workforce, promoting diversity and eliminating any potential discrimination in our work environment. Vesuvius' Board Diversity Policy explains how this commitment manifests in relation to the Board. Vesuvius recognises the value of a diverse and skilled workforce and is committed to creating and maintaining an inclusive and collaborative workplace culture that will provide sustainability for the organisation into the future. We believe that the dedication and professionalism of our people is the most significant contributor to our success. Having a balance of cultures, ethnicities and genders helps to promote innovation, creativity and engagement. The diversity of our employees is one of the core strengths of the Group. Copies of the Group's Diversity policies can be found on the Group's website: www.vesuvius.com.

As an organisation, Vesuvius has a global, multicultural operational and customer base, which we wish to reflect inside our organisation with a multicultural, diverse community of excellent professionals from all backgrounds. This starts by focusing on broad diversity of gender and nationality, with an aim to ensure that all employees and job applicants are given equal opportunity and that our organisation is representative of all sections of society where we operate. Each employee is respected and valued and as a result they are all able to give their best. All employees are given help, training and encouragement to develop their full potential and utilise their unique talents.

In line with the Group's global commitment to diversity, the Nomination Committee focuses on ensuring that the Board and its Committees also have the appropriate range of diversity, skills, experience, independence and knowledge of the Company and the markets in which it operates, to discharge their duties and responsibilities effectively. We continue to look at diversity in its broadest sense – reflected in the range of backgrounds and experience of Board members who are drawn from different nationalities and have managed a variety of complex global businesses. The Nomination Committee recognises that diversity is a key ingredient in creating a balanced culture for open discussions at Board level and in minimising 'groupthink'.

The Board's overall skills and experience, as well as the Non-executive Directors' independence, were reviewed during the year. The Board's composition also formed part of the Board evaluation process. The Board considers its diversity, size and composition to be appropriate for the requirements of the business. In 2019, it achieved its target of at least 33% female Board membership, and at the end of 2021, 38% of the Directors were women. Three Directors are non-UK citizens and two of the Directors (25%) identify as having BAME heritage.

The Board Diversity Policy confirms the Group's commitment to maintaining a Board comprising at least 33% female membership, while continuing to appoint candidates based on merit and recognising that over time the proportion of female Directors will fluctuate naturally as Board members retire and new Directors are appointed.

In 2021, 14% (2020: 14%) of our workforce were women, which was stable versus 2020. The Group previously set a target of ensuring that 30% of the Top Management (members of the Group Executive Committee plus their key direct reports) are female by 2025. The number of women in the Top Management team increased by 1 percentage point in 2021 to 21%. Looking forward, the Board has resolved to expand the scope of this gender diversity target to encompass the broader Senior Leadership Group of the Company, which comprises c. 160 individuals. This KPI has also been incorporated into the long-term incentives of our senior management. The Committee will continue to monitor the Group's ongoing progress towards achieving its diversity targets. Each of the Group's four business units has put in place strategies to address gender diversity.

Further information on the Group's approach to promoting diversity can be found on page 95.

As at 31 December 2021, the gender balance of the Group's employees was as follows:

	Female	Male	Total	Female	Male
Group Executive Committee member	2	6	8	25%	75%
Senior Management	10	39	49	20%	80%
Top Management[1]	**12**	**45**	**57**	**21%**	**79%**
Middle Management	63	427	490	13%	87%
All other employees	1,544	9,113	10,657	14%	86%
Grand total	**1,619**	**9,585**	**11,204**	**14%**	**86%**
Directors of subsidiaries included in consolidation[2]	35	371	406	9%	91%

1. Top Management comprises key leadership roles reporting directly to members of the Group Executive Committee.
2. There are 406 directors of Group subsidiaries, 9% of whom are women. This disclosure is made to comply with regulatory requirements. It includes directors of dormant companies. Some individuals hold multiple directorships.

Nomination Committee continued

Board evaluation

The Board carries out an evaluation of its performance and that of its Committees every year. This year's evaluation was again externally facilitated by the corporate advisory firm, Lintstock. The Group uses Lintstock's Insider List database tool but has no other connection with the organisation and Lintstock does not have a connection with any of the Directors.

Each evaluation was conducted via a series of targeted questionnaires. As with previous years, the evaluation process not only covered the performance of the Board but also that of its Committees, along with individual reviews of each Director and an analysis of the performance of the Chairman. Narrative reports were prepared for the Board, the Audit, Nomination and Remuneration Committees, and in respect of the Chairman.

In 2021, rather than targeting a specific action or processes, the Board evaluation was focused on providing an overall 'health-check' for the Board's performance, so that this could act as a baseline for an incoming Chair. Thus, the Board assessment focused on seven core areas: Board composition, oversight of stakeholders, Board dynamics, Board support and focus of meetings, Board oversight, risk management, and priorities for change. It also covered the conduct of the Board's strategy meetings.

Overall, the Board was seen to operate effectively with an appropriate composition. It was noted that the recent Board changes had affected the Board dynamics but that Board relationships were rated positively overall. The Non-executive Directors' engagement with management in providing effective support and constructive challenge also received high ratings. Meetings were considered to be well managed and the use of virtual meetings as appropriate, was considered beneficial. The balance of the Board's focus was generally viewed favourably although the continued tension between completing a broad agenda and spending more time concentrating on key issues and discussion, was highlighted. The Board's understanding of the views and requirements of stakeholders was rated highly with regard to investors and positively with regard to customers and employees, but scope for improving the Board's understanding of our supply chain was identified. The Board's effectiveness in setting and monitoring culture throughout the organisation was rated positively, although the opportunities for engagement with the workforce had been hampered in 2021 by the COVID-19 pandemic.

In terms of longer-term strategy, Vesuvius' capacity to deliver on this was rated highly overall, with emphasis placed on the need to ensure that the Group continued to recruit and retain sufficient high calibre talent to support such delivery in the future. This would be an area of focus in 2022, along with the continued roll-out of the Group's Sustainability strategy agenda. In addition, the Board resolved to again further its understanding of competitor dynamics in 2022 and gain further insights on specific customer and supplier dynamics. With the forthcoming changes in Non-executive Directors, succession planning and induction were again highlighted as an area of focus.

The Group's off-site strategy session was positively regarded with a high quality of debate and good level of participation. The top priority for the Board's next strategy session was identified as sustainability and the continuing need to ensure this was fully integrated into the business strategy and operations.

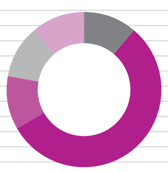
In addition to the primary focus on safety, and the issues highlighted above, the top priorities for Vesuvius as a business over the coming year were identified by the Board as being improving margins, capturing organic and where possible inorganic growth, and managing market volatility.

The individual assessment of Directors concluded that all of the Directors continued to contribute effectively, providing expert and strategic advice as appropriate and holding management to account in an open and constructive manner. They were considered to devote adequate time to their duties and to be engaged and proactive in debate at all meetings. The Chairman was viewed to operate with objective judgement, and his approach to chairing meetings was deemed to be inclusive and to facilitate debate. Each of the Committees was also considered to have operated effectively during the year.

As in previous years, a set of action points was compiled from the output of the evaluation to ensure that its findings are included in the Board's activities. These will be implemented by the Board in 2022, with progress reviewed by the Board throughout the year.

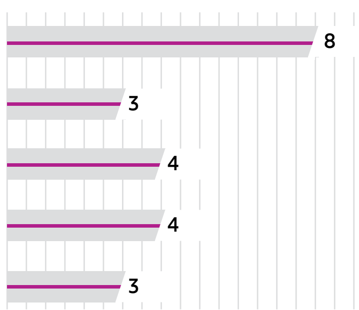
Board nationalities

1 Austrian
5 British
1 French
1 South African
1 Chinese



Further information on the Group's approach to promoting diversity 95

Board composition



The 2020 evaluation identified the following Board priorities for future Board attention; these were addressed during 2021 as follows:

Area	Issue	Action taken in 2021
Strategy	Oversee the implementation of the Group's sustainability initiative ensuring it is fully embedded in the Group's strategy	Throughout the year the Board received briefings from the Chief Executive and VP Sustainability on the activities of the Group's Sustainability Council, which is tasked with immediate oversight of the Group's sustainability activity. The Board monitored progress against the Group's targets and noted the more detailed work that had been undertaken to identify and assess the implications of long-term climate-related risks and opportunities, as well as the Group's assumptions on the potential impact of those changes.
	Enhance the Board's awareness of competitors' activities	More detailed information on the Group's key global competitors, Vesuvius' differentiation and comparative strengths and weaknesses was included during the Strategy meeting.
	Maintain the Board's understanding of customers' requirements	The Board received updates at each Board meeting on the issues impacting our customers and Vesuvius' response. A comprehensive presentation covering long-term customer trends was presented at the October Board meeting. The Board visited a customer of our Steel business in 2021.
People and organisation	Group Executive Committee succession	Throughout the year the Nomination Committee received updates on the actions being taken to recruit, develop and retain individuals in the senior management cadres, and the impact of these actions on the talent pipeline for Group Executive Committee roles in the Group.
	Enhance the Board's understanding of senior talent throughout the organisation	Although opportunities to visit the Group's sites were curtailed by the COVID-19 pandemic in the first half of 2021, during the latter part of the year, the Chairman and Non-executive Directors were able to visit eight Vesuvius sites in person along with a number of 'virtual' Board visits. The visits enabled the Board to interact with senior managers and 'high potential' staff at each of these sites, with social functions arranged to provide the opportunity for informal discussions.

Senior management succession

The Committee's succession planning activities do not exclusively relate to the Board but encompass the senior management levels immediately below the Board, aiming to support and encourage the growth of a pool of talent able to step up to the top roles in future years. The Committee considers succession plans for all the senior functional and business unit positions, assessing the availability of candidates who could cover the roles on a short-term contingency basis should the need arise, along with the pool of medium-term and long-term talent available for future development into specific roles. The Committee continued to focus on the Group's talent development and succession planning processes in 2021, with a continuing emphasis on the recruitment, development and retention of candidates within this senior management cadre. The Committee considered the activities being undertaken to fill the gaps in this talent pool, and to develop and recruit new executives.

Committee evaluation

The Committee's activities were part of the externally facilitated evaluation of Board effectiveness during the year, with Committee members completing individual questionnaires. The results of these submissions were collated and a written report tabled and discussed by the Committee. The management of Nomination Committee meetings was highly rated overall, with the quality of information provided also rated positively. The process for the recruitment of a new Non-executive Director was considered to have been conducted appropriately with all necessary rigour, despite the challenging circumstances posed by international travel restrictions.

In 2021, the evaluation rated highly the information provided to the Committee, noting a significant improvement in the quality of discussions and information on Executive Director and senior management succession, with greater transparency on bench strength and the activities under way to support further development. The evaluation noted that the succession planning process for the Non-executive Directors was functioning well but that work was still needed to ensure that there were sufficient internal candidates to adequately resource the pool of talent needed to ensure internal succession for all Group Executive Committee roles.

On behalf of the Nomination Committee

John McDonough CBE
Chairman, Nomination Committee
3 March 2022

Directors' Remuneration Report

Remuneration overview

Kath Durrant – Committee Chair

Dinggui Gao
Joined the Committee on his appointment to the Board on 1 April 2021

Hock Goh
Served on the Committee until his retirement from the Board on 12 May 2021

Jane Hinkley

Douglas Hurt

Holly Koeppel
Served on the Committee until her retirement from the Board on 12 May 2021

Dear Shareholder,

I was delighted to be appointed as Chair of the Remuneration Committee following the 2021 AGM and I would like to express my gratitude to my predecessor, Jane Hinkley, for her leadership of the Committee over many years.

I am pleased to present our Directors' Remuneration Report (Remuneration Report) for 2021 which is divided into two sections:

- Our Directors' Remuneration Policy (Policy) which was approved by shareholders at our 2020 AGM.
- The Annual Report on Directors' Remuneration. This outlines how we implemented the Policy in 2021 and how we intend to apply it in 2022.

The Remuneration Report (excluding the Policy) will be subject to an advisory vote by shareholders at the 2022 AGM.

2021 saw a busy agenda for the Remuneration Committee. Aside from fulfilling our statutory obligations, we have undertaken a comprehensive review of executive remuneration to further align it with our shareholders' expectations. We also welcomed Dinggui Gao to the Committee and thanked Hock Goh and Holly Koeppel who stepped down at the 2021 AGM, for their services to the Committee.

The key matters the Remuneration Committee considered during its five meetings in 2021 included:

- Reviewing and approving achievement against performance targets for the 2020 Annual Incentive arrangements
- Setting performance targets and approving the structure of the 2021 Annual Incentive arrangements
- Reviewing and assessing the Company's attainment of performance conditions applicable to the Vesuvius Performance Share awards made in 2018
- Setting the performance measures and targets, and authorising the grant of new awards in 2021 under the Vesuvius Share Plan (VSP), the Deferred Share Bonus Plan and the Medium-Term Incentive Plan
- Considering the Company's ongoing share sourcing requirements to meet obligations under the Company's share plans, and funding of the Employee Benefit Trust (EBT)
- Reviewing the Annual Incentive Plan structure applicable to the Group and approving changes to this structure for executives below the Board to incorporate regional trading performance at business unit level into the bonus plan structure
- Approving the 2020 Directors' Remuneration Report and reviewing the 2021 Directors' Remuneration Report
- Reviewing the Committee's Terms of Reference
- Reviewing the overall structure of annual incentive plans and long-term incentive plans, and consulting with the Company's top 20 shareholders
- Approving the 2022 salaries for the Chairman, Chief Executive, Chief Financial Officer and senior management

Performance

Health & Safety

As the Chairman and Chief Executive outlined in their statements, the Company again operated a range of safety protocols to protect our teams against the transmission of COVID-19 in 2021, as we continued to place the highest priority on health and safety. We are pleased that our businesses continued to operate effectively, serving our customers despite the continuing pandemic. The Company received no financial support from the UK government during the year.

Operational

Revenue for the year increased to £1,642.9m (+18.1% on an underlying basis vs 2020), marking the bounce back in key markets. Trading profit at £142.4m was 50.4% greater than 2020 (on an underlying basis) and return on sales increased by 190bps, on an underlying basis, to 8.7%. These results exceeded expectations in what has been a challenging year for Vesuvius and many industrial businesses. Extensive supply chain disruptions for raw materials and logistics services, added significant challenge and complexity to each area of our operations. The management of pricing and the ability to pass on frequent price increases has been a critical area of focus both centrally and in our decentralised operations requiring extensive customer interaction.

The Flow Control, Foundry and Sensors & Probes business units all outperformed their underlying markets and grew market share. Deliberate decisions were taken in Advanced Refractories to protect pricing over volumes, and as a result some market share erosion occurred.

The continued focus on operational effectiveness enabled our trade working capital to sales ratio to improve further to 20.9%, an improvement of 230 bps vs 2020. These results demonstrate disciplined leadership at multiple levels of the organisation. Product quality metrics also continued to improve.

Strategic

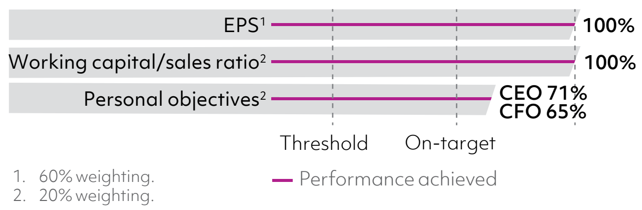
The focus on R&D continued in the period with further investment in mechatronics and product development, and a focus on supporting our customers to reduce their CO_2 emissions. 27 new products were launched in 2021, with revenue from new products launched in the past five years now at 15.3% (vs 12.4% in 2020).

Significant focus on the Sustainability initiative launched in 2020 has enabled a continued improvement in Scope 1 & 2 emissions reduction, with 2021 emissions 16.5% lower than the 2019 base year, improvements in diversity with women now representing 21% of Top Management (vs 12.5% in 2019), and succession candidates identified for the majority of critical roles. Health and Safety performance improved further towards our zero accident goal with a Lost Time Injury Frequency Rate (LTIFR) of 1.06 per million hours worked, the best performance achieved to date.

The Chief Executive led the Board through extensive strategy discussions exploring options for both organic and inorganic growth. Significant investments in both Poland and India were approved in 2021 and at the end of the year the acquisition of the business of Universal Refractories, Inc in the United States was announced. The Company's debt position remains well controlled at 1.4x EBITDA.

Incentive outturns

In 2021, the Annual Incentive Plan (AIP) was based 60% on Group headline earnings per share (EPS), 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on specified personal objectives. Performance against these measures is illustrated below and full detail of the targets are detailed on page 146.



Our adjusted headline earnings per share of 38.8 pence was above the maximum annual incentive plan target of 36.9 pence and above the 2020 outturn of 27.6 pence.

The Group's working capital to sales ratio of 20.9% also exceeded the maximum annual incentive plan target of 21.7%, and was above the 2020 outturn of 23.2%.

The Committee agreed personal objectives for the Chief Executive and CFO at the start of 2021 and assessed their performance to merit 71% and 65% of maximum targets respectively.

The overall formulaic outcome of the bonus scorecard was 94.2% of maximum for the Chief Executive and 93.0% of maximum for the CFO. The Committee gave careful consideration to these outcomes and was satisfied that they were consistent with the strong financial and operational performance and strategic progress outlined above. The Committee noted that similar and complementary KPIs exist in the incentive programmes for managers and employees and was mindful of the outturns for the wider workforce in confirming its decisions for Executive Directors and the Executive Committee. Consequently, the Committee concluded that no discretionary adjustment was required.

Strategic alignment

- Deliver profitable growth
- Generate value for our shareholders
- Maintain an efficient capital structure
- Always put safety first
- Think beyond in innovation
- Run best-in-class sustainable operations
- Foster talent, skill and motivation in our people

See more about **Our strategy** on **p14** and **p15**

Remuneration overview continued

The performance period for the awards made under the Vesuvius Share Plan (VSP) in 2019 was completed at the end of 2021. Performance was measured equally by reference to total shareholder return (TSR) relative to the FTSE 250 (excluding investment trusts) and headline EPS growth over the three-year period. This has been a particularly challenging period for the global economy and, by extension, a cyclical business like Vesuvius. Consequently, relative TSR performance (measured against the constituents of the FTSE 250 and so including companies operating in many different sectors and impacted by different macro-economic drivers to Vesuvius) was below median and headline EPS growth was below the threshold target of a range set prior to the COVID-19 pandemic. These results mean that none of the shares potentially available to the Chief Executive and CFO under this award will vest. The Committee has not applied any discretion with respect to this nil vesting of the 2019 VSP awards, mindful of the experience of shareholders and other stakeholders in what has been a difficult period for many.

Review of executive remuneration arrangements

Following my appointment as Committee Chair, the Committee and I decided it was an opportune moment to undertake a review of executive remuneration arrangements to understand our competitive positioning, the alignment of pay and performance over time, recent feedback from shareholders and the views of all Board and Executive Committee members.

In relation to incentives, central themes emerging from the review were:

- The challenge of setting long-term EPS targets in a cyclical business, as highlighted by the second consecutive cycle of VSP awards delivering zero vesting as outlined above.
- That alignment with strategy may be improved through the selection of alternative KPIs; in this we noted the request from several shareholders to consider a returns metric.
- A desire to incorporate ESG KPIs more explicitly into incentive arrangements. In this we noted the support of the executive team and the broad investor sentiment expressed by a range of shareholders regarding ESG and pay.
- A desire to ensure both the incentivisation and retention of an executive team that is now fully formed and focused.

Reshaped 2022 performance measures

In light of these findings, we have made some modest changes to the performance measures in our incentive structure for 2022 whilst maintaining our focus on key financial metrics.

1 The introduction of a returns measure

A returns measure has been introduced into the AIP and VSP in 2022. This change is in response to shareholder feedback and is designed to provide fairer and better alignment between delivery of our strategic and financial goals, and the incentive outturns. Its introduction into the VSP in place of EPS allows us to maintain focus on long-term profitability whilst removing the historic difficulty in setting robust three-year EPS targets.

A range of returns measures were considered and post-tax ROIC was selected as the most complete measure during both steady state and periods of inorganic growth. Post-tax ROIC targets will be set by reference to a number of relevant factors including: our strategy, market conditions and anticipated cost of capital, which is less volatile and easier to forecast than other financial metrics. It is also consistent with a philosophy of management being rewarded for value generating activity. As an important driver of post-tax ROIC is the return generated on our capital base, delivering sustainable profits will continue to be an important element in our remuneration arrangements.

2 The introduction of ESG measures of most importance to the Company and aligned with our Sustainability strategy

Energy: Reduction in Scope 1 & 2 CO_2e emissions per metric tonne of product packed and shipped. Energy intensity is a key measure for the Group and validation of data over time provides confidence to set targets aligned with our goal to achieve net zero status at the latest by 2050.

Safety: A reduction in the Lost Time Incident Frequency Rate. The industry in which we work poses significant risks, not least due to the large numbers of staff working at customer locations around the world. Safety remains a priority and continued improvement towards zero accidents remains management's top operational priority.

Diversity: An improvement in the gender representation in our senior management population; whilst improvements have been made in the number of women serving amongst our Top Management of c. 60 individuals in recent years, there remains a significant task to continue this progress further down the organisation.

The resulting structure of performance measures in 2022 is summarised in the table below.

KPI	2021	2022	Strategic rationale
Annual Incentive Plan: one-year performance			
EPS	60%	**40%**	Consistent with our strategic aim of sustainable, profitable growth. Maintains the primary focus on a profit measure in short-term incentivisation
Working capital/sales	20%	**20%**	Consistent with our strategic aim of maintaining strong cash generation and an efficient capital structure
Post-tax ROIC	–	**20%**	Consistent with our strategic aim of generating sustainable profitability and creating shareholder value
Personal measures	20%	**20%**	Enables a focus on specific personal deliverables, managed through the performance management system
Vesuvius Share Plan: three-year performance			
Relative TSR	50%	**40%**	Consistent with our strategic aim of delivering shareholders a superior return on their investment
EPS	50%	**–**	Removal of EPS reflects the difficulty in setting long-term targets for a cyclical business
Post-tax ROIC	–	**40%**	Consistent with our strategic aim of generating sustainable profitability and creating shareholder value
ESG	–	**20%**	Provides a specific focus on the three priority long-term ESG measures for the Group. CO_2 intensity (10%), Safety (5%) and Diversity (5%)

Other changes in 2022 executive remuneration

Another theme that emerged from our review was the importance of retaining key senior executives and ensuring that their remuneration appropriately reflected their performance, development in the role and importance to the business.

In that context, the Remuneration Committee has particularly focused on the remuneration of our CFO, Guy Young. When Guy joined Vesuvius in 2015, his salary was set well below that of his predecessor given his then lack of experience as a Group CFO and Executive Director. After six years in the role, he is now an experienced FTSE plc CFO. The Committee believes that his current remuneration package still positions him below market compared to less experienced sector peers, and does not accurately reflect his value to the business. It is also inconsistent with his sustained performance and role criticality. Accordingly, Guy's salary has been increased in 2022 by 9% to £420,000 which we believe more fairly reflects his level of experience and importance to the Group.

The Committee has also reviewed the salary of our Chief Executive, Patrick André, and agreed an increase of 4% in 2022 to £643,000. This is a lower increase than our budgeted Group global workforce salary increase for 2022 of 5.2%.

There will be no change in 2022 in AIP opportunity (150% of salary) or VSP award level (CE: 200% of salary; CFO: 150% of salary) for either Executive Director. As outlined in last year's Remuneration Report, these Directors' pension allowances are frozen at the 1 January 2020 amount and will be reduced to 17% of salary from the end of 2022 in line with the average of that received by the majority of the workforce.

Chairman and Non-Executive Directors' fees

During the year, the Committee reviewed the Chairman's annual fee, taking account of factors including the time commitment associated with the role and the need to continue to attract talented candidates as the Board plans for an orderly succession once John completes his term as Chairman. Following that review, the Committee set the Chairman's fee for 2022 at £240,000. Separately, the Board considered Non-executive Director fees, taking into account similar factors and made a number of consequent adjustments to the fee structure that are detailed on page 145. Those adjustments include the introduction of a new supplementary fee for the Non-executive Director responsible for workforce engagement which reflects the significant time commitment associated with this role. These are the first increases in fee levels since 2019.

Workforce remuneration and employee engagement

The Group's operations are geographically diverse in nature. The Group does not operate a central workforce engagement mechanism. However, in spite of travel restrictions brought about by COVID-19, visits to operations by the Non-executive Directors enabled all Committee members to host discussions explaining corporate governance and specifically the area of executive remuneration with large groups of employees in Poland, Germany, India, China and Belgium. Copies of the Company's Annual Report detailing the Executive Directors' remuneration are also widely disseminated throughout the Group and available for employees to view on the Company's website.

In 2021, despite the ongoing challenges caused by the COVID-19 pandemic, and thanks to a tremendous effort by local management, supported by an effective communication campaign, we again achieved a very high participation level in the Company's employee engagement survey with 92% participation, the same participation as in 2020. Following improvements across all survey categories in 2020, the overall engagement score remained stable.

Shareholder engagement

At the 2021 AGM, the Directors' Remuneration Report was supported by 99.32% of voting shareholders and I am very grateful for this demonstration of broad-based support for our executive remuneration arrangements.

The Company's top 20 shareholders were consulted on the changes to the KPIs for the AIP and VSP, and on the proposed salary increase for our CFO. We are grateful for the responses received and discussions had, and appreciate the support expressed by many of our shareholders.

I welcome feedback at any point in time from our entire shareholder base regarding our remuneration arrangements and I hope that we will earn your support at the forthcoming AGM.

Kath Durrant
Chair of the Remuneration Committee
3 March 2022

Directors' Remuneration Report

2020 Remuneration Policy

At the 2020 AGM, held on 13 May 2020, the Company obtained shareholder support for a new Remuneration Policy which took effect from the close of that meeting. The previous policy has been applied in its entirety up until this date. A copy of it is contained within the 2019 Annual Report which can be viewed in the Investors section (Results, Reports and Presentations) of the Vesuvius website: www.vesuvius.com. The elements of the previous policy that relate to remuneration that remained extant on this date (such as outstanding share awards) continue to apply until these commitments cease. The Policy operated as intended in 2021. For the benefit of shareholders, we have reprinted the Policy below.

To ensure that the Policy is relevant to the 2022 financial year, we have made minor textual changes to refer to the applicable financial year in the following sections: 'Illustration of the Application of the Remuneration Policy for 2022' (which also contains, as described, 2022 data); 'Consideration of conditions elsewhere in the Group in developing policy'; and 'Consideration of Shareholder Views'. The Policy notes that vesting of awards under the Vesuvius Share Plan will be subject to performance conditions as determined by the Remuneration Committee ahead of each award. The performance conditions for awards made in 2020 and 2021 were based on Group EPS and relative TSR. In 2022 these are based on relative TSR, post-tax ROIC and ESG measures. The 'VSP section' of the Policy table and the section on 'Performance measures' note this application of the Policy in 2022. Finally, the 'Terms of service' section refers to the dates of appointment of the current Non-executive Directors.

The Remuneration Committee reserves the right to make any remuneration payments and payments for loss of office (including exercising any discretions available to it in connection with such payments), notwithstanding that they are not in line with the Policy set out here, where the terms of the payment were agreed: (i) before the date the Company's first Remuneration Policy approved by shareholders in accordance with Section 439A of the Companies Act came into effect; (ii) before the Policy set out here came into effect, provided that the terms of the payment were consistent with the shareholder-approved Remuneration Policy in force at the time they were agreed; or (iii) at a time when the relevant individual was not a Director of the Company and, in the opinion of the Remuneration Committee, the payment was not in consideration for the individual becoming a Director of the Company. For these purposes, 'payments' include the Remuneration Committee satisfying awards of variable remuneration and, in relation to an award over shares, the terms of the payment are 'agreed' at the time the award is granted.

Remuneration Policy Table for Executive Directors

Alignment/purpose	Operation	Opportunity	Performance
Base salary Helps to recruit and retain key employees. Reflects the individual's experience, role and contribution within the Company	Base salary is normally reviewed annually, with changes effective from 1 January. Base salary is positioned to be market competitive when considered against other global industrial companies, and relevant international and FTSE 250 companies (excluding Investment Trusts). Paid in cash, subject to local tax and social security regulations.	Salary increases will normally be in line with the average increase awarded to other employees in the Group, although increases may be made above this level at the Committee's discretion in appropriate circumstances. In considering any increase in base salary, the Committee will also take into account: (i) the role and value of the individual (ii) changes in job scope or responsibility (iii) progression in the role (e.g. for a new appointee) (iv) a significant increase in the scale of role and/or size, value or complexity of the Group (v) the need to maintain market competitiveness. No absolute maximum has been set for Executive Director base salaries. Current Executive Directors' salaries are set out in the Annual Report on Directors' Remuneration section of this Remuneration Report.	Any increase will take into account the individual's performance, contribution and increasing experience.
Other benefits Provides normal market practice benefits	A range of benefits including, but not limited to: car allowance, private medical care (including spouse and dependent children), life insurance, disability and health insurance, expense reimbursement (including costs if a spouse accompanies an Executive Director on Vesuvius business), together with relocation allowances and expatriate benefits, in some instances grossed up for tax, in accordance with the Group's policies, and participation in any employee share scheme operated by the Group.	There is no formal maximum as benefit costs can fluctuate depending on changes in provider, cost and individual circumstances.	None.
Pension Helps to recruit and retain key employees. Ensures income in retirement	An allowance is given as a percentage of base salary. This may be used to participate in Vesuvius' pension arrangements, invested in own pension arrangements or taken as a cash supplement (or any combination of the above options).	Maximum of 25% of base salary for incumbent Executive Directors at the date that this policy is adopted. This was frozen at the 1 January 2020 amount and will be reduced to 17% from the end of 2022 in line with the average of that received by the majority of the workforce. The level of allowance for Executive Directors appointed following the adoption of this policy will be aligned with the post-retirement benefits applicable to the majority of the workforce or, where appropriate, to the majority of the workforce of the relevant geography.	None.
Annual Incentive Incentivises Executive Directors to achieve key short-term financial and strategic targets of the Group Additional alignment with shareholders' interests through the operation of bonus deferral	Normally 33% of any Annual Incentive earned by Executive Directors will be deferred into awards over shares under the Vesuvius Deferred Share Bonus Plan which normally vest after at least three years, other than in specified circumstances outlined elsewhere in this Policy. These may be cash or share settled. The Committee has the discretion to determine that actual incentive payments should be lower than levels calculated by reference to achievement against targets if it considers this to be appropriate. The Committee has the discretion to award participants the equivalent value of dividends accrued during the vesting period on any shares that vest. Subject to malus and clawback.	Below threshold: 0%. On-target: 50% of the applicable maximum opportunity in any year. Maximum: Up to 150% of base salary. The Remuneration Committee will set the level of maximum bonus opportunity for each Executive Director at the start of each year, with 50% of the applicable maximum payable for on-target performance. Payments start to accrue on meeting the threshold level of performance, with payments between threshold and on-target and between on-target and maximum made on a pro rata basis.	The Annual Incentive is measured on targets set at the beginning of each year. The Committee establishes threshold and maximum performance targets for each financial year. The majority of the Annual Incentive will be determined by measure(s) of Group financial performance. The remainder of the Annual Incentive will be based on financial, strategic or operational measures appropriate to the individual Director. Performance is measured over a one-year period. Actual performance targets will be disclosed after the performance period has ended. They are not disclosed in advance due to their commercial sensitivity.
Vesuvius Share Plan (VSP) Aligns Executive Directors' interests with those of shareholders through the delivery of shares. Rewards Executive Directors for achieving the strategic objectives of growth in shareholder value and earnings Assists retention of Executive Directors over a three-year performance period	VSP awards to Executive Directors are granted as Performance Share awards. These may be cash or share settled. Awards vest three years after their award date, other than in specified circumstances outlined elsewhere in this Policy, subject to the achievement of specified conditions. All vested shares, net of any tax liabilities, are then subject to a further two-year holding period after the vesting date, which will continue to apply notwithstanding the termination of employment of the participants during this holding period, except at the Committee's discretion in exceptional circumstances, including a change of control or where the participant dies or has left employment due to ill health, injury or disability. The Committee has the discretion to award participants the equivalent value of dividends accrued during the vesting period and further two-year holding period on any shares that vest. Subject to malus and clawback.	Executive Directors are eligible to receive an annual award with a face value of up to 200% of base salary in Performance Share awards. Vesting at threshold performance is at 25% of the award, rising to vesting of the full award at maximum.	Vesting will be subject to performance conditions as determined by the Remuneration Committee ahead of each award. Those conditions will be disclosed in the Annual Report on Directors' Remuneration section of the Remuneration Report. The performance conditions for awards made in 2020 and 2021 were Group EPS and relative TSR, and in 2022 will change to Relative TSR, post-tax ROIC and ESG measures as discussed elsewhere in this report. The Remuneration Committee will retain discretion for future awards to include additional or alternative performance conditions which are aligned with the corporate strategy. At its discretion, the Committee may elect to add additional underpinning performance conditions. The Company reserves the right only to disclose certain of the performance targets after the performance period has ended, due to their commercial sensitivity. Prior to any vesting, the Remuneration Committee reviews the underlying financial performance of the Group over the performance period, and the non-financial performance of the Group and participants, to ensure that the vesting is justified. Following this review, the Committee has the discretion to amend the final vesting level if it does not consider that it is justified.

2020 Remuneration Policy continued

Malus/clawback arrangements

The Executive Directors' variable remuneration is subject to malus and clawback provisions. These provide the Committee with the flexibility, if required, to withhold or recover payments made to Executive Directors under the Annual Incentive Plan (including deferred awards) and/or to withhold or recover share awards granted to Executive Directors under the Vesuvius Share Plan, including any dividends granted on such awards. The circumstances in which the Committee could potentially elect to apply malus and clawback provisions include: a material misstatement in the Group's financial results; an error in the calculation of the extent of payment or vesting of an incentive; gross misconduct by an individual; or significant financial loss or serious reputational damage to Vesuvius plc resulting from an individual's conduct, a material failure of risk management or a serious breach of health and safety. These malus and clawback provisions apply for a period of up to three years after the end of a performance period (or end of the deferral period in respect of awards made under the Vesuvius Deferred Share Bonus Plan).

Performance measures

In selecting performance measures for the Annual Incentive, the Committee seeks to reflect key strategic aims and the need for a rigorous focus on financial performance. Each year, the Committee agrees challenging targets to ensure that underperformance is not rewarded. The Company will not be disclosing the specific financial or personal objectives set until after the relevant performance period has ended because of commercial sensitivities. The personal objectives are all job-specific in nature and track performance against key strategic, organisational and operational goals.

In selecting performance measures for the Vesuvius Share Plan, the Committee seeks to focus Executive Directors on the execution of long-term strategy and also align their rewards with value created for shareholders. On this basis, the performance conditions for the Vesuvius Performance Share awards initially included measures based on TSR and EPS performance and for 2022 will include measures based on TSR and Return on Invested Capital (post-tax ROIC) and ESG.

Remuneration Policy Design

The Committee is satisfied that the Remuneration Policy is designed to promote the long-term success of the Company in accordance with the requirements of the Code with regard to:

Clarity

There is complete transparency on the executive remuneration arrangements with full disclosure in the Annual Report. The Annual Incentive bonus structure for the Executive Directors is based on the same structure utilised for annual bonus arrangements for senior executives throughout the Group. The focus of incentive arrangements on long-term sustainable growth clearly aligns the interests of executives with those of the Group's shareholders. The Vesuvius Share Plan, with its emphasis on the retention of shares for a period of at least five years, clearly aligns the long-term objectives of the Directors with that of its investors.

Simplicity

The new Policy with its focus on three core elements: fixed pay, Annual Incentive and Long-Term Incentive is clear, simple and easy to understand.

Risk

The Committee has carefully analysed the range of possible outcomes of awards and believes the Policy to be fair and proportionate, with the clear linkage to Group profitability mitigating the potential for excessive rewards and the reliance on audited profit numbers and externally verified TSR targets serving to mitigate behavioural risk. The Committee has discretion under the Vesuvius Share Plan to determine the vesting of awards in accordance with the Code requirement and malus and clawback provisions also apply.

Predictability

The charts on page 137 provide estimates of the total remuneration for the Executive Directors for 2022 for minimum, on-target and maximum performance, showing the split between fixed and variable remuneration. The charts also indicate the maximum potential remuneration assuming 50% share price appreciation. Prior to any vesting under the Vesuvius Share Plan the Committee reviews the underlying financial performance of the Company over the performance period, and the non-financial performance of the Group and participants, to ensure that the vesting is justified. Following this review, the Committee has the discretion to amend the final vesting level if it does not consider that it is justified.

Proportionality

The Committee believes that the performance-related elements of remuneration have financial targets which are transparent, stretching and clearly align the Executive Directors' remuneration with the delivery of the Group's strategy. The Vesuvius Share Plan rewards long-term performance directly linked with the Group's strategy and results, ensuring that only strong performance is rewarded.

Alignment to culture

The Executive Directors' incentive arrangements are consistent with the Group's core strategic objective of delivering long-term sustainable and profitable growth and support our performance-orientated culture. The inclusion of personal objectives in the Annual Incentive Plan affords the opportunity for attention to be focused on key non-financial strategic objectives each year.

Within the Policy period, the Committee will continually review the performance measures used to ensure that awards are made on the basis of challenging targets that clearly support the achievement of the Group's strategic aims.

The Committee may vary or waive any performance condition(s) if circumstances occur which cause it to determine that the original condition(s) have ceased to be appropriate, provided that any such variation or waiver is fair, reasonable and not materially less difficult to satisfy than the original condition (in its opinion). In the event that the Committee were to make an adjustment of this sort, a full explanation would be provided in the next Remuneration Report.

The Committee may: (a) in the event of a variation of the Company's share capital, demerger, special dividend or any other corporate event which it reasonably determines justifies such an adjustment, adjust; and (b) amend the terms of awards granted under the share schemes referred to above in accordance with the rules of the relevant plans.

Share awards may be settled by the issue of new shares or by the transfer of existing shares. In line with prevailing best practice at the time this Policy was approved, any issuance of new shares is limited to 5% of share capital over a rolling ten-year period in relation to discretionary employee share schemes and 10% of share capital over a rolling ten-year period in relation to all employee share schemes.

Illustration of the application of the Remuneration Policy for 2022

The charts below show the total remuneration for Executive Directors for 2022 for minimum, on-target and maximum performance. The fixed elements of remuneration comprise base salary, pension and other benefits, using 2022 salary data. The assumptions on which they are calculated are as follows:

Minimum: Fixed remuneration only.

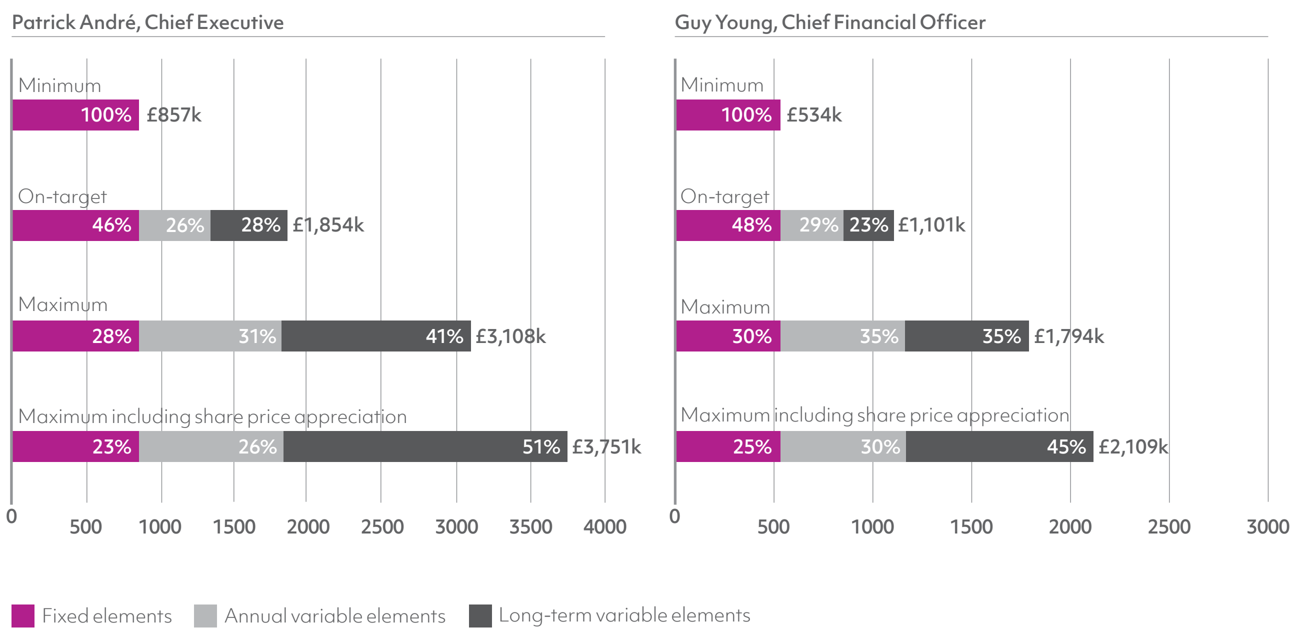
On-target: Fixed remuneration plus on-target Annual Incentive (made at 75% of base salary for Patrick André and Guy Young); and for the Performance Share awards (made at 200% of base salary for Patrick André and 150% of base salary for Guy Young) under the Vesuvius Share Plan, median performance for the TSR element and the mid-point between threshold and maximum performance for the post-tax ROIC and ESG performance conditions. No share price appreciation is assumed.

Maximum: Fixed remuneration plus maximum Annual Incentive (being full achievement of financial and personal targets, made at 150% of base salary for Patrick André and Guy Young) and 100% vesting for Performance Share awards (made at 200% of base salary for Patrick André and 150% of base salary for Guy Young) under the Vesuvius Share Plan. No share price appreciation is assumed.

Maximum including assumed 50% share price appreciation: This shows the value of the maximum scenario if 50% share price appreciation is assumed over the three-year performance period of the Performance Share awards.

Note: In addition, the Committee retains the discretion to award dividends (either shares or their cash equivalent) on any shares that vest.

Remuneration illustrations £000



2020 Remuneration Policy continued

Service contracts of Executive Directors

The Committee will periodically review the contractual terms for new Executive Directors to ensure that these reflect best practice. Service contracts currently operate on a rolling basis and are limited to a 12-month notice period.

Patrick André is employed as Chief Executive of Vesuvius plc pursuant to the terms of a service agreement made with the Company dated 17 July 2017. Guy Young is employed as Chief Financial Officer pursuant to the terms of a service agreement with Vesuvius plc dated 16 September 2015. Each Executive Director's appointment is terminable by Vesuvius on not less than 12 months' written notice, and by each Executive Director on not less than six months' written notice.

External appointments of Executive Directors

The Executive Directors do not currently serve as Non-executive Directors of any other quoted company. Subject always to consent being granted by the Company for them to take up such an appointment were they to so serve, the Company would allow them to retain any fees they received for the performance of their duties.

Remuneration Policy for Non-executive Directors

The Company seeks to appoint Non-executive Directors who have relevant professional knowledge and have gained experience in a relevant industry and geographical sector, to support diversity of expertise at the Board and match the wide geographical spread of the Company's activities.

Non-executive Directors attend Board, Committee and other meetings, held mainly in the UK, together with an annual strategy review to debate the Company's strategic direction. All Non-executive Directors are expected to familiarise themselves with the scale and scope of the Company's business and to maintain their specific technical skills and knowledge.

The Board sets the level of fees paid to the Non-executive Directors after considering the role and responsibilities of each Director and the practice of other companies of a similar size and international complexity. The Non-executive Directors do not participate in Board discussions on their own remuneration.

Alignment/purpose	Operation	Opportunity	Performance
Fees To attract and retain Non-executive Directors of the necessary skill and experience by offering market-competitive fees	Fees are usually reviewed every year by the Board. Non-executive Directors are paid a base fee for the performance of their role plus additional fees for roles that involve significant additional time commitment and/or responsibility. Such roles could include, but are not limited to, Committee chairmanship (and, where appropriate, membership) or acting as the Senior Independent Director. Fees are paid in cash. The Chairman is paid a single cash fee and receives administrative support from the Company.	Non-executive Directors and the Chairman will be paid market-appropriate fees, with any increase reflecting changes in the market or adjustments to a specific Non-executive Director's role. No eligibility for bonuses, retirement benefits or to participate in the Group's employee share plans. Base fees paid to Non-executive Directors will in aggregate remain within the aggregate limit stated in our Articles, currently being £500,000.	None.
Benefits and expenses To facilitate execution of responsibilities and duties required by the role	All Non-executive Directors are reimbursed for reasonable expenses incurred in carrying out their duties (including any personal tax owing on such expenses).	Non-executive Directors' expenses are paid in accordance with Vesuvius' expense procedures.	None.

Terms of service of the Chairman and other Non-executive Directors

The terms of service of the Chairman and the Non-executive Directors are contained in letters of appointment. Each Non-executive Director is appointed subject to their election at the Company's first Annual General Meeting following their appointment and re-election at subsequent Annual General Meetings. During the first year of his/her appointment, the Chairman is entitled to 12 months' notice from the Company; thereafter, he/she is entitled to six months' notice from the Company. None of the other Non-executive Directors is entitled to receive compensation for loss of office at any time. All Non-executive Directors are subject to retirement, and election or re-election, in accordance with the Company's Articles of Association. The current policy is for Non-executive Directors to serve on the Board for a maximum of nine years, with review at the end of three and six years, subject always to mutual agreement and annual performance evaluation. The Board retains discretion to extend the tenure of Non-executive Directors beyond this time, subject to the requirements of Board balance and independence being satisfied.

The table below shows the date of appointment for each of the Non-executive Directors:

Non-executive Director	Date of appointment
John McDonough CBE	31 October 2012
Kath Durrant	1 December 2020
Dinggui Gao	1 April 2021
Friederike Helfer	4 December 2019
Jane Hinkley	3 December 2012
Douglas Hurt	2 April 2015

Recruitment policy

On appointment or promotion of a new Executive Director, the Committee will typically use the Remuneration Policy in force at the time of the Committee's decision to determine ongoing remuneration.

Base salary levels will generally be set in accordance with the Remuneration Policy current at the time of the Committee's decision, taking into account the experience and calibre of the appointee. If it is appropriate to appoint an individual on a base salary initially below what is adjudged to be market positioning, contingent on individual performance, the Committee retains the discretion to realign base salary over the one to three years following appointment, which may result in a higher rate of annualised increase than might otherwise be awarded under the Policy. If the Committee intends to rely on this discretion, it will be noted in the first Remuneration Report following an individual's appointment. Other than in exceptional circumstances, other elements of annual remuneration will, typically, be set in line with the Remuneration Policy, including a limit on awards under the Annual Incentive and Vesuvius Share Plan of 350% of salary in aggregate. The Committee retains the discretion to make the following further exceptions:

– In the event that an internal appointment is made, or where a Director is appointed as a result of transfer into the Group on an acquisition of another Company, the Committee may continue with existing remuneration provisions for this individual, where appropriate

– If necessary and appropriate to secure the appointment of a candidate who has to move locations as a result of the appointment, whether internal or external, the Committee may make additional payments linked to relocation, above those outlined in the policy table, and would authorise the payment of a relocation allowance and repatriation, as well as other associated international mobility terms. Such benefits would be set at a level which the Committee considers appropriate for the role and the individual's circumstances

– If appropriate the Committee may apply different performance measures and/or targets to a Director's first incentive awards in his/her year of appointment

Service contracts will be entered into on terms similar to those for the existing Executive Directors, summarised in the service contracts of Executive Directors section above.

In addition to the annual remuneration elements noted above, the Committee may consider buying out terms, incentives and any other compensation arrangements forfeited on leaving a previous employer that an individual forfeits in accepting an appointment with Vesuvius. The Committee will have the authority to rely on Listing Rule 9.4.2R(2) or to apply the existing limits within the Vesuvius Share Plan to make Restricted Share awards on recruitment. In making any such awards, the Committee will review the terms of any forfeited awards, including, but not limited to, vesting periods, the expected value of such awards on vesting and the likelihood of the performance targets applicable to such awards being met, while retaining the discretion to make any buy-out award the Committee determines is necessary and appropriate. The Committee may also require the appointee to purchase shares in Vesuvius to a pre-agreed level prior to vesting of any such awards. The value of any buy-out award will be capped, to ensure its maximum value is no higher than the value of the awards that the individual forfeited on joining Vesuvius. Any such awards will be subject to malus and clawback.

With respect to the appointment of a new Chairman or Non-executive Director, appointment terms will be consistent with those applicable at the time the appointment is agreed. Variable pay will not be considered. With respect to Non-executive Directors, fees will be consistent with the Policy at the time the appointment is agreed. If, in exceptional circumstances, a Non-executive Director was asked to assume an interim executive role, the Company retains the discretion to pay them appropriate executive compensation, in line with the Policy.

2020 Remuneration Policy continued

Exit payment policy

Vesuvius has the option to make a payment in lieu of part or all of the required notice period for Executive Directors. Any such payment in lieu will consist of the base salary, pension contributions and value of benefits to which the Director would have been entitled for the duration of the remaining notice period, net of statutory deductions in each case. Half of any payments in lieu of notice would be made in a lump sum, the remainder in equal monthly instalments commencing in the month in which the midpoint of their foregone notice period falls (and are reduced or extinguished by salary from any role undertaken by the departing Executive in this time). Executive Directors are subject to certain non-compete covenants for a period of nine months, and non-solicitation covenants for a period of 12 months, following the termination of their employment. Their service agreements are governed by English law.

Executive Directors' contracts do not contain any change of control provisions; they do contain a duty to mitigate should the Director find an alternative paid occupation in any period during which the Company must otherwise pay compensation on early termination.

The table below summarises how the awards under the annual bonus and Vesuvius Share Plan are typically treated in different leaver scenarios and on a change of control.

Whilst the Committee retains overall discretion on determining 'good leaver' status, it typically defines a 'good leaver' in circumstances such as retirement with agreement of the Company, ill health, disability, death, redundancy, or part of the business in which the individual is employed or engaged ceasing to be part of the Group. Final treatment is subject to the Committee's discretion.

Event	Timing	Calculation of vesting/payment
Annual Incentive Plan – during period prior to payment		
Good leaver	Paid at the same time as to continuing employees.	Annual bonus is paid only to the extent that any performance conditions have been satisfied and is pro-rated for the proportion of the financial year worked before cessation of employment. In determining the level of bonus to be paid, the Committee may, at its discretion, take into account performance up to the date of cessation or over the financial year as a whole based on appropriate performance measures as determined by the Committee. The bonus may, at the Committee's discretion, be paid entirely in cash.
Bad leaver	Not applicable.	Individuals lose the right to their annual bonus.
Change of control	Paid on the effective date of change of control.	Annual bonus is paid only to the extent that any performance conditions have been satisfied and is pro-rated for the proportion of the financial year worked.
Annual Incentive Plan – in respect of any amount deferred into awards over shares under the Vesuvius Deferred Share Bonus Plan		
Good leaver	On the date of the event.	Deferred awards vest in full.
Bad leaver	On the date of the event.	Other than dismissal for cause, deferred awards will vest in full.
Change of control[2]	Within seven days of the event.	Deferred awards vest in full.
Vesuvius Share Plan		
Good leaver[1]	On normal release date (or earlier at the Committee's discretion).	Unvested awards vest to the extent that any performance conditions have been satisfied and a pro rata reduction applies to the value of the awards to take into account the proportion of vesting period not served, unless the Committee decides that the reduction in the number of vested shares is inappropriate.
Bad leaver	Unvested awards lapse.	Unvested awards lapse on cessation of employment.
Change of control[2]	On the date of the event.	Unvested awards vest to the extent that any performance conditions have been satisfied and a pro rata reduction applies for the proportion of the vesting period not served, unless the Committee decides that the reduction in the number of vested shares is inappropriate.

1. Under the rules of the Vesuvius Share Plan, any vested shares, net of any tax liabilities, are subject to a further two-year holding period after the vesting date. The holding period may be terminated early at the Committee's discretion in exceptional circumstances, including a change of control or where the award holder dies or leaves employment due to ill health, injury or disability.
2. In certain circumstances, the Committee may determine that unvested awards under the Vesuvius Deferred Bonus Plan and Vesuvius Share Plan will not vest on a change of control but will instead be replaced by an equivalent grant of a new award, as determined by the Committee, in the new company.

Benefits normally cease to be provided on the date employment ends. However, the Committee has the discretion to allow some minor benefits (such as health insurance, tax advice and repatriation expenses) to continue to be provided for a period following cessation where this is considered fair and reasonable, or appropriate on the basis of local market practice. In addition, the Committee retains discretion to fund other expenses for the Executive Director; for example, payments to meet legal fees incurred in connection with termination of employment, or to meet the costs of providing outplacement support, and de minimis termination costs up to £5,000 to cover transfer of mobile phone or other administrative expenses.

The Committee reserves the right to make any other payments in connection with a Director's cessation of office or employment where the payments are made in good faith in discharge of an existing legal obligation (or by way of damages for breach of such an obligation) or by way of a compromise or settlement of any claim arising in connection with the cessation of a Director's office or employment.

In certain circumstances, the Committee may approve new contractual arrangements with departing Executive Directors, including (but not limited to) settlement, confidentiality, restrictive covenants and/or consultancy arrangements. These would be used only where the Committee believed it was in the best interests of the Company to do so.

Comparison of Remuneration Policy for Executive Directors with that for other employees

The Remuneration Policy for Executive Directors is designed in line with the remuneration philosophy set out in this report – which also underpins remuneration for the wider Group. Remuneration arrangements for Executive Directors draw on the same elements as those for other employees – base salary, fixed benefits and retirement benefits – with performance-related pay extending to the management cadres and beyond. However, given that remuneration structures for other employees need to reflect both seniority and local market practice, they differ from the policy for Executive Directors. In particular, Executive Directors receive a higher proportion of their remuneration in performance-related pay and share-based payments. Individual percentages of variable versus fixed remuneration and participation in share-based structures increase as seniority increases.

As for Executive Directors, all employees receive an annual performance appraisal, and receive salary reviews on an annual basis. Middle and senior managers participate in the Annual Incentive Plan. For functional members of the Group Executive Committee, the award is predominantly based on Group performance, with the remainder focused upon the achievement of personal objectives. For business unit Presidents and other operational business unit employees, any potential award is based upon four separate measures relating to Group performance, business unit performance, regional performance, where relevant, and achievement of personal objectives.

All members of the Group Executive Committee participate in the Vesuvius Share Plan and receive awards of Performance Shares, which vest on the basis of the same performance targets set for the Executive Directors. The level of awards granted to members of the Group Executive Committee who don't serve on the Board are lower than those payable to the Executive Directors.

For certain senior and middle managers, awards are made under the Vesuvius Medium Term Plan (MTP).

These managers participate in the MTP at varying percentage levels, and awards are based on the same measures and targets as the Annual Incentive Plan. The senior management cadre receives MTP awards made over Vesuvius shares, whilst other managers who participate in the MTP receive their awards in cash. In each case, awards are granted following the end of the relevant financial year. The MTP share awards vest on the second anniversary of the date of grant, subject to continuing employment.

Consideration of conditions elsewhere in the Group in developing policy

The Non-executive Directors participated in a number of 'town hall' meetings during the year which provided the opportunity to engage with the workforce to explain how executive remuneration aligns with wider Company pay policies. The Remuneration Committee takes into account the pay and employment conditions of other Group employees when determining Executive Directors' remuneration, particularly when determining base salary increases, when the Committee will consider the salary increases for other Group employees in the same jurisdiction.

Consideration of shareholder views

Vesuvius is committed to open and transparent dialogue with its shareholders on remuneration as well as other governance matters. As Chair of the Committee, Kath Durrant welcomes shareholder engagement and is available for any discussions investors wish to have on remuneration matters. In early 2022, the Committee wrote to the top 20 shareholders and key governance agencies outlining its proposals for the 2022 incentive structure for the Executive Directors. We have received responses from around 80% of respondents and we responded to all questions that were raised.

Shareholding guidelines

The Remuneration Committee encourages Executive Directors to build and hold a shareholding in the Company equivalent in value to at least 200% of base salary.

Compliance with the shareholding policy is tested at the end of each year for application in the following year, with the valuation of any holding being taken at the higher of: (1) the share price on the date of vesting of any shares derived from a share award, in respect of those shares only; and (2) the average of the closing prices of a Vesuvius ordinary share for the trading days in that December.

Unless exceptionally the Committee determines otherwise, under the post-employment shareholding guideline the Executive Directors will remain subject to their shareholding requirement in the first year after their cessation as an Executive Director and to 50% of the shares retained in the first year during the second year after such cessation, recognising that there is no requirement to purchase additional shares if the shares held when they cease to be an Executive Director are less than the applicable shareholding guideline.

General

The Committee may make minor amendments to the Policy set out in this Policy Report (for regulatory, exchange control, tax or administrative purposes or to take account of a change in legislation) without obtaining shareholder approval for that amendment.

Directors' Remuneration Report

Annual Report on Directors' Remuneration

Directors' Remuneration at a glance

Our remuneration for Executive Directors

The table below sets out the phasing of receipt of the various elements of Executive Director remuneration for 2022.

	2022	2023	2024	2025	2026	2027	Description and link to strategy
Base salary							Salaries are set at an appropriate level to enable the Company to recruit and retain key employees, and reflect the individual's experience, role and contribution within the Company.
Benefits							Provides normal market practice benefits.
Pension							The pension benefit helps to recruit and retain key employees and ensures income in retirement.
Annual Incentive							The Annual Incentive incentivises the Executive Directors to achieve key short-term financial and strategic targets of the Group.
Deferred Annual Incentive							The deferral of a portion of the Annual Incentive increases alignment with shareholders.
Vesuvius Share Plan					Holding period		Awards under the Vesuvius Share Plan align Executive Directors' interests with those of shareholders through the delivery of shares and assist in the retention of the Executive Directors. The VSP rewards the Executive Directors for achieving the strategic objectives of growth in shareholder value and earnings.

2022 Directors' Remuneration

The table below sets out how the Remuneration Policy will be applied to the Executive Directors' remuneration for 2022. Further details about each of the elements of remuneration are set out in the Remuneration Policy and the Annual Report on Directors' Remuneration.

Remuneration element	Remuneration structure
Base salary	Current salaries as follows: – Patrick André – £643,000 (2021: £618,000) – Guy Young – £ 420,000 (2021: £385,000) The CEO was awarded a 4% increase and the CFO a 9% increase, effective 1 January 2022.
Benefits	Benefits for Executive Directors include car allowance, private medical care, relocation expenses, tax advice and tax reimbursement, commuting costs, school fees, Directors' spouse's travel and administrative expenses.
Pension	Pension allowance is frozen at the 1 January 2020 amount (which amounts to 24% of salary for the CEO and 23% of salary for the CFO) and will be reduced to 17% from the end of 2022 in line with the average of that received by the majority of the workforce.
Annual Incentive	For 2022, the maximum Annual Incentive potential for the Executive Directors will be 150% of base salary with target Annual Incentive potential being 75% of base salary. Their incentives are based 40% on Group headline earnings per share, 20% on the Group's working capital to sales ratio (based on the 12-month moving average), 20% on post-tax Return on Invested Capital (ROIC) and 20% on specified personal objectives. 33% of any Annual Incentive earned will be deferred into awards over shares, which will vest after a holding period of three years.
Vesuvius Share Plan (VSP)	Performance Share awards with a maximum value of 200% of salary will be awarded to Patrick André and 150% for Guy Young. Vesting of 40% of shares awarded will be based upon the Company's TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts), and 40% on post-tax Return on Invested Capital (ROIC) and 20% ESG. Performance will be measured over three years with awards vesting after three years. There will then be a further two-year holding period applicable to the awards.

Remuneration Committee structure

The current members of the Remuneration Committee are all the independent Non-executive Directors of the Company.

The Committee Chair is Kath Durrant, who assumed the role when Jane Hinkley stepped down from the position at the 2021 AGM. Kath Durrant, Jane Hinkley and Douglas Hurt have served on the Committee throughout 2021. Hock Goh and Holly Koeppel stepped down from the Committee at the 2021 AGM, the Committee thanks each of them for their service. Dinggui Gao was appointed as a member of the Remuneration Committee on 1 April 2021. The Committee complies with the requirements of the UK Corporate Governance Code for the composition of remuneration committees. Each of the members brings a broad experience of international businesses and an understanding of their challenges to the work of the Committee. The Company Secretary is Secretary to the Committee. Members' biographies are on pages 104 and 105.

Meetings

The Committee met five times during the year. The Group's Chairman, Chief Executive and Chief HR Officer were invited to each meeting, together with Friederike Helfer, Vesuvius' non-independent Non-executive Director, though none of them participated in discussions regarding their own remuneration. The Company's Chief Financial Officer was invited as appropriate. In addition, a representative from Deloitte, the Remuneration Committee adviser, attended the meetings. The attendees supported the work of the Committee, giving critical insight into the operational demands of the business and their application to the overall remuneration strategy within the Group. In receiving views on remuneration matters from the Executive Directors and senior management, the Committee recognised the potential for conflicts of interest to arise and considered the advice accordingly. The Chair of the Committee reported the outcomes of all meetings to the Board.

The Committee operates under formal terms of reference which were reviewed during the year. The terms of reference are available on the Group website: www.vesuvius.com. The Committee members are permitted to obtain outside legal advice at the Company's expense in relation to their deliberations. These powers were not exercised during the year. The Committee may also secure the attendance at its meetings of any employee or other parties it considers necessary.

Role and responsibilities

The Committee is responsible for:

- Determining the overall remuneration policy for the Executive Directors, including the terms of their service agreements, pension rights and compensation payments
- Setting the appropriate remuneration for the Chairman, the Executive Directors and Senior Management (being the Group Executive Committee)
- Reviewing workforce remuneration and related policies, and the alignment of incentives and rewards with culture, taking these into account when setting the policy for Executive Director remuneration
- Overseeing the operation of the executive share incentive plans

Advice provided to the Remuneration Committee

Deloitte is appointed directly by the Remuneration Committee to provide advice on executive remuneration matters, including remuneration structure and policy, updates on market practice and trends, and guidance on the implementation and operation of share incentive plans. The Committee appointed Deloitte, a signatory to the Remuneration Consultants Group Code of Conduct in relation to Executive Remuneration Consulting in the UK, following a formal tender process in 2014. Deloitte also provides the Remuneration Committee with ongoing calculations of total shareholder return (TSR) to enable the Committee to monitor the performance of long-term share incentive plans. Deloitte does not have any other connection with any individual Director.

In addition, in 2021, Deloitte provided the Group with IFRS 2 calculations for the purposes of valuing the share plan grants and, within the wider Group, was engaged in various jurisdictions to provide tax and treasury advisory work, and some consultancy services. During 2020, Deloitte's fees for advice to the Remuneration Committee, charged on a time spent basis, amounted to £138,110. These were larger than in previous years reflecting the work Deloitte did to assist the remuneration review conducted during the year. The Committee conducted a review of the performance of Deloitte as remuneration adviser during the year and concluded that Deloitte continued to provide effective, objective and independent advice to the Committee. No conflict of interest arises as a result of other services provided by Deloitte to the Group.

Activities of the Remuneration Committee

In addition to the activities outlined within the Chair's letter, the Committee was the subject of an externally moderated performance evaluation in 2021. The review noted that with the appointment of the new Committee Chair there was an opportunity to redefine the support the Committee required from internal and external sources. The management of the Committee was rated highly with regard to the annual cycle of work, the agenda for meetings and time management in meetings. The Committee members were also positive about the remuneration review undertaken by the new Chair.

Regulatory compliance

The Remuneration Policy, which is set out on pages 134–141, was prepared in accordance with the Companies Act 2006 and the Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008 (as amended). It also meets the requirements of the Financial Conduct Authority's Listing Rules and the Disclosure Guidance and Transparency Rules.

This Remuneration Report sets out how the principles of the Code are applied by the Company in relation to matters of remuneration. Save as set out below, the Company was compliant with the provisions of the Code for the year under review in relation to remuneration matters.

Provision 38: The Company is progressing with its plans to align the level of pension allowance for Executive Directors with that applicable to the majority of the workforce. Our incumbent Directors' pension contributions were frozen at the 1 January 2020 amount and will be reduced to 17% at the end of 2022, being the level of the majority of the workforce.

A statement of the Company's compliance with the Code is set out on page 111.

Annual Report on Directors' Remuneration continued

Share usage

Under the rules of the VSP, the Company has the discretion to satisfy awards either by the transfer of Treasury shares or other existing shares, or by the allotment of newly issued shares. Awards made under the Deferred Share Bonus Plan to satisfy shares awarded to Directors in respect of their Annual Incentive, and awards made to management of the Company over shares pursuant to the Medium-Term Incentive Plan, must be satisfied out of Vesuvius shares held for this purpose by the Company's Employee Benefit Trust (EBT).

The decision on how to satisfy awards is taken by the Remuneration Committee, which considers the most prudent and appropriate sourcing arrangement for the Company.

At 31 December 2021, the Company held 7,271,174 ordinary shares in Treasury and the EBT held 884,856 ordinary shares. Following the EBT's purchase of an additional 332,596 ordinary shares in the market to satisfy future vestings, the EBT now holds 1,217,452 ordinary shares as at the date of this report.

The EBT can be gifted Treasury shares by the Company, can purchase shares in the open market or can subscribe for newly issued shares, as required, to meet obligations to satisfy options and awards that vest.

The VSP complies with the current Investment Association guidelines on headroom which provide that overall dilution under all plans over a rolling ten-year period should not exceed 10% of the Company's issued share capital, with a further limitation over a rolling ten-year period of 5% for discretionary share schemes. More than 9.9% of the 10% limit and more than 4.9% of the 5% limit remains available as headroom for the issue of new shares or the transfer of Treasury shares for the Company. No Treasury shares were transferred, or newly issued shares allotted under the VSP during the year under review.

Policy implementation

The following section provides details of how the Company's current Remuneration Policy was implemented during the financial year 2021 and how it will be implemented in the financial year 2022.

Directors' Remuneration, single total figure table – audited

The table below sets out the total remuneration received by Executive Directors in the financial year under review:

	Patrick André		Guy Young	
	2021 (£000)	2020 (£000)	2021 (£000)	2020 (£000)
Total salary[1]	618	556	385	347
Taxable benefits[2]	60	88	18	17
Pension[1,3]	154	139	96	87
Total fixed pay[4]	832	783	499	451
Annual Incentive[5]	874	153	537	99
Long-Term Incentives[6,7]	0	0	0	0
Total variable pay[8]	874	153	537	99
Total[9]	1,706	936	1,036	550

1. For 2020 this figure included a voluntary 20% reduction in salary and pension benefits for six months due to the impact of COVID-19.
2. Standard benefits for the Executive Directors include car allowance and private medical care. As an expatriate, Patrick André also receives relocation benefits under Vesuvius' applicable expatriate localisation policy, as detailed in the 18 July 2017 RNS announcement of Mr André's appointment. Those relocation benefits (totalling £27,782 in 2021) comprise housing costs, tax advice and school fees.
3. Patrick André and Guy Young currently receive a pension allowance of 25% of base salary capped at the January 2020 level. The figures for 2020 in the table represent the value of all cash allowances and contributions received in respect of pension benefits, at voluntarily reduced rates.
4. The sum of total salary, taxable benefits and pension.
5. This figure includes the Annual Incentive payments to be made to the Executive Directors in relation to the year under review. 33% of these Annual Incentive payments will be deferred into awards over shares, to be held for a period of three years. See pages 145 and 146 for more details.
6. The 2021 figures represent the Performance Share awards granted to Patrick André and Guy Young in 2019 under the VSP that will lapse in 2022.
7. The 2020 figures represent the Performance Share awards granted to Patrick André and Guy Young in 2018 under the VSP that lapsed in 2021.
8. The sum of the value of the Annual Incentive and the Long-Term Incentives where the performance period ended during the financial year.
9. The sum of base salary, benefits, pension, Annual Incentive and Long-Term Incentives where the performance period ended during the financial year.

Directors' Remuneration – audited

The table below sets out the total remuneration received by Non-executive Directors in the financial year under review:

	2021			2020		
	Total fees (£000)	Taxable benefits[2] (£000)	Total (£000)	Total fees[1] (£000)	Taxable benefits[2] (£000)	Total (£000)
John McDonough CBE	205	9	214	185	6	191
Kath Durrant[3]	60	3	63	4	–	4
Dinggui Gao[4]	38	0	38	–	–	–
Hock Goh[5]	18	0	18	45	2	47
Friederike Helfer	50	3	53	45	0	45
Jane Hinkley	56	2	58	59	1	60
Douglas Hurt	70	1	71	63	1	64
Holly Koeppel[5]	18	0	18	45	0	45
Total 2021 Non-executive Director remuneration	515	18	533	446	10	456
Total 2021 Executive Director remuneration	2,742					
Total 2021 Director remuneration[6]	3,257					

1. For 2020 this figure included a voluntary 20% reduction in fees for six months due to the impact of COVID-19.
2. The UK regulations require the inclusion of benefits for Directors where these would be taxable in the UK on the assumption that the Director is tax resident in the UK. The figures in the table therefore include expense reimbursement and associated tax relating to travel, accommodation and subsistence for the Director (and, where appropriate, their spouse) in connection with attendance at Board meetings and other corporate business during the year, which are considered by HMRC to be taxable in the UK.
3. Kath Durrant became Chair following the AGM in 2021 and therefore received additional fees for a proportion of the year.
4. Dinggui Gao joined the Board on 1 April 2021.
5. Hock Goh and Holly Koeppel retired from the Board following the 2021 AGM. The figures listed are the actual fees paid in 2021 until their retirement

Additional note:

6. Total 2020 Directors' Remuneration for the Directors who served during 2020 was £1,942m.

Base salary and fees – audited

As outlined in the Chair's letter and in line with the Group's Remuneration Policy, the base salaries for each of the Executive Directors was reviewed in 2021. It was resolved the Chief Executive's salary would be increased to £643,000 and the Chief Financial Officer's salary would be increased to £420,000, effective 1 January 2022.

The fee for the Chairman was also reviewed by the Committee during the year and the fees for the Non-executive Directors by the Board. Following an assessment of time commitment, roles and responsibilities it was decided that the fees would increase with effect from 1 January 2022. The Chairman's fee was increased to £240,000; the Non-executive Directors' fees were increased to £60,000. The supplementary fee for the Senior Independent Director was increased to £10,000 and the supplementary fee for the Chairs of the Audit and Remuneration Committees remained unchanged at £15,000. The Board also resolved to introduce a fee of £10,000 for the Non-executive Director responsible for workforce engagement.

Pension arrangements – audited

In accordance with their service agreements, Patrick André and Guy Young are entitled to pension allowances of 25% of base salary. This allowance can be used to participate in Vesuvius' pension arrangements, be invested in their own pension arrangements or be taken as a cash supplement (or any combination of these alternatives). The Remuneration Committee has determined that this level of pension allowance be frozen at the 1 January 2020 amount and will be reduced to 17% from the end of 2022, in line with the average pension allowance received by the majority of the workforce.

Annual Incentive – audited

The Executive Directors are eligible to receive an Annual Incentive calculated as a percentage of base salary, based on achievement against specified financial targets and personal objectives. Each year, the Remuneration Committee establishes the performance criteria for the forthcoming year. The financial targets are set by reference to the Company's financial budget. The target range is set to ensure that Annual Incentives are only paid out at maximum for significantly exceeding performance expectations. The Remuneration Committee considers that the setting and attainment of these targets is important in the context of achievement of the Company's longer-term strategic goals.

The Annual Incentive has a threshold level of performance below which no award is paid, a target level at which 50% of the maximum opportunity is payable, and a maximum performance level at which 100% of the maximum opportunity is earned, on a pro rata basis.

2021 Annual Incentive – audited

For 2021, the maximum Annual Incentive potential for the Executive Directors was 150% of base salary and their target Annual Incentive potential was 75% of base salary.

For the financial year 2021, the Executive Directors' Annual Incentives were based 60% on Group headline EPS, 20% on the Group's working capital to sales ratio (based on the 12-month moving average) and 20% on specified personal objectives.

Annual Report on Directors' Remuneration continued

Financial targets in 2021

The 2021 Vesuvius Group headline EPS performance targets set out below were set at the December 2020 full-year average foreign exchange rates, being the rates used for the 2021 budget process:

Threshold:	On-target:	Maximum:
26.4p	31.6p	36.9p

The 2021 Group's working capital to sales ratio targets were set as follows:

Threshold:	On-target:	Maximum:
23.7%	22.7%	21.7%

In assessing the Group's performance against these targets, the Committee uses a constant currency approach. Thus, the 2021 full-year EPS performance was retranslated at December 2020 full-year average foreign exchange rates to establish performance. This is consistent with practice in previous years.

In 2021, Vesuvius' EPS performance at the December 2020 full-year average foreign exchange rates was 38.8 pence and the working capital to sales ratio was 20.9%. Consequently, EPS performance was above the maximum target, and the Group working capital to sales ratio was above the maximum target.

As a result, in respect of the financial performance metrics of the 2021 Annual Incentive, 100% is due on both the EPS and Working Capital targets (related to a maximum bonus opportunity of 90% and 30% of salary respectively).

Personal objectives

In 2021, a proportion (20%) of the Annual Incentive for Executive Directors (representing 30% of salary) was based on the achievement of personal objectives.

Patrick André

Summary of objective	Summary outcome
Drive performance and deliver results	– Robust performance on quality, market share gains and R&D productivity measures
Reinforce talent management and prepare succession plans	– During 2021 there was a significant increase in the identification of suitable successors to key management positions and a further deepening of the talent pool throughout the organisation's leadership
Review and implement the Group strategy	– Delivered a clear strategy to increase profitability both organically and inorganically (closed acquisition of the business of Universal Refractories, Inc)
Improve Vesuvius' sustainability performance	– Delivered strong reductions of CO_2 energy emissions compared to 2019 levels; improvement of gender diversity in Top Management

In summary, after considering performance as outlined above, the Committee approved an Annual Incentive pay-out of 21.36% of contractual base salary, out of the maximum potential 30%, in respect of the personal objectives of Patrick André.

Guy Young

Summary of objective	Summary outcome
Optimise cash management	– Significant improvement in trade creditors and tax management
Optimise the Group's liquidity position	– Successfully concluded renegotiation of Group revolving credit facility and US private debt placement
Drive IT performance	– Significant improvement in IT performance especially in the area of cyber security
Drive Opex reductions	– Delivered reductions in line with the operating plan
Improve Vesuvius' sustainability performance	– Delivered strong reductions of CO_2 energy emissions compared to 2019 levels; improvement in gender diversity in Top Management

In summary, after considering performance as outlined above, the Committee approved an Annual Incentive pay-out of 19.5% of contractual base salary, out of the maximum potential 30%, in respect of the personal objectives of Guy Young.

The total Annual Incentive awards payable to Patrick André and Guy Young in respect of their service as Directors during 2021 are therefore 141.4% and 139.5% of salary, respectively. Of these Annual Incentive payments, 33% will be deferred into awards over shares, to be held for a period of three years.

The Committee considered the appropriateness of these overall AIP payments in the context of the experience of our various stakeholders during 2021 and was satisfied that no discretionary adjustments were required.

2022 Annual Incentive

The Annual Incentive opportunity for the Executive Directors in 2022 will remain unchanged at 150 % of salary, with potential pay-outs of 75% of base salary for the achievement of target performance in all elements. Pay-outs will commence and increase incrementally from 0% once the threshold performance for any of the elements has been met. The structure of the Annual Incentive will change in 2022, with 40% of the Executive Directors' Annual Incentives based on Group headline EPS, 20% on the Group's working capital to sales ratio (based on the 12-month moving average), 20% on post-tax Return on Invested Capital (ROIC) and 20% on the achievement of personal objectives. The Company will not be disclosing the targets set until after the relevant performance period has ended because of commercial sensitivities. The personal objectives for 2022 are focused on long-term strategic objectives, or are job-specific in nature and track performance against the Group's key strategic, organisational and operational goals with a specific focus on ESG outcomes. 33% of any Annual Incentive earned will be deferred into awards over shares, to be held for a period of three years.

Deferred Share Bonus Plan allocations – audited

33% of the Annual Incentives earned by Patrick André and Guy Young in respect of their periods of service as Directors of Vesuvius plc during 2018, 2019 and 2020 were deferred into shares under the Company's Deferred Share Bonus Plan. The following table sets out details of these awards:

Grant and type of award	Total share allocations as at 1 Jan 2021	Additional shares allocated during the year	Allocations lapsed during the year	Shares vested during the year	**Total share allocations as at 31 Dec 2021**	Market price of the shares on the day before award (p)	Earliest vesting/ release date
Patrick André							
15 March 2018[1] Deferred Bonus Shares	10,128	–	–	(10,128)	**0**	605.5	15 Mar 2021
14 March 2019[2] Deferred Bonus Shares	29,646	–	–	–	**29,646**	608	14 Mar 2022
12 March 2020[3] Deferred Bonus Shares	7,044	–	–	–	**7,044**	391.8	12 Mar 2023
18 March 2021[4] Deferred Bonus Shares	–	9,430	–	–	**9,430**	538	18 Mar 2024
Total	46,818	9,430	–	(10,128)	**46,120**		
Guy Young							
15 March 2018[1] Deferred Bonus Shares	18,118	–	–	(18,118)	**0**	605.5	15 Mar 2021
14 March 2019[2] Deferred Bonus Shares	19,028	–	–	–	**19,028**	608	14 Mar 2022
12 March 2020[3] Deferred Bonus Shares	5,345	–	–	–	**5,345**	391.8	12 Mar 2023
18 March 2021[4] Deferred Bonus Shares	–	6,093	–	–	**6,093**	538	18 Mar 2024
Total	42,491	6,093	–	(18,118)	**30,466**		

1. In 2018, Patrick André and Guy Young received Annual Incentive bonuses in respect of their service as Directors of Vesuvius plc in 2017 of £185,544 and £331,906 respectively. 33% of each bonus was awarded in deferred shares (conditional awards) under the Vesuvius Deferred Share Bonus Plan. The shares vested on 15 March 2021.In addition, Messrs André and Young were given cash payments of £4,213 and £7,537 respectively, equivalent to the value of the dividends that would have been paid on the number of shares that vested in respect of dividend record dates occurring during the period between the award date and the date of vesting.
2. In 2019, Patrick André and Guy Young received Annual Incentive bonuses in respect of their service as Directors of Vesuvius plc in 2018 of £546,131 and £350,525 respectively. 33% of each bonus was awarded in deferred shares (conditional awards) under the Vesuvius Deferred Share Bonus Plan. The allocations of shares were made on 14 March 2019 and were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £6.079. The total value of these awards based on this share price was £180,218 and £115,671, respectively. There are no additional performance conditions applicable to these awards, therefore these shares will vest in full on the third anniversary of their award date.
3. In 2020, Patrick André and Guy Young were awarded Annual Incentive bonuses in respect of their service as Directors of Vesuvius plc in 2019 of £83,775 and £63,569 respectively. 33% of each bonus was awarded in deferred shares (conditional awards). The allocations of shares were made on 12 March 2020 and were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £3.9248. The total value of these awards based on this share price was £27,646 and £20,978 respectively. There are no additional performance conditions applicable to these awards, therefore these shares will vest in full on the third anniversary of their award date.
4. In 2021, Patrick André and Guy Young were awarded Annual Incentive bonuses in respect of their service as Directors of Vesuvius plc in 2020 of £153,419 and £99,138 respectively. 33% of each bonus was awarded in deferred shares (conditional awards). The allocations of shares were made on 18 March 2021 and were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £5.3690. The total value of these awards based on this share price was £50,628 and £32,715 respectively. There are no additional performance conditions applicable to these awards, therefore these shares will vest in full on the third anniversary of their award date.

Additional note:

5. The mid-market closing price of Vesuvius' shares during 2021 ranged between 414 pence and 590 pence per share, and on 31 December 2021, the last dealing day of the year, was 450.2 pence per share.

Annual Report on Directors' Remuneration continued

Longer-term Pay (LTIPs) – audited

Performance Share awards are allocated to the Executive Directors under the Vesuvius Share Plan (VSP). In accordance with the Remuneration Policy and the rules of the VSP, they are eligible to receive, on an annual basis, a Performance Share award with a face value of up to 200% of salary. The vesting of awards is subject to performance conditions determined by the Remuneration Committee ahead of each award. For the outstanding 2019, 2020 and 2021 awards, vesting of 50% of shares awarded is based upon the Company's three-year TSR performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts), and 50% on headline EPS performance. For the 2022 awards, the Remuneration Committee has decided to amend the performance conditions with the introduction of a post-tax ROIC target along with ESG targets. As a result vesting of 40% of shares awarded under the 2022 VSP will be based on post-tax ROIC performance, 40% on the longstanding relative TSR targets, and the remaining 20% on ESG targets.

Each of the VSP performance measures operates independently. The use of these measures is intended to align Executive Director remuneration with shareholders' interests. Prior to the vesting of Performance Shares, the Remuneration Committee reviews the underlying financial performance of the Company and non- financial performance of the Company and individuals over the performance period to ensure that the vesting is justified, and to consider whether to exercise its discretion including consideration of any potential windfall gains. UK executives receive awards in the form of nil-cost options with a flexible exercise date and non-UK executives receive conditional awards which are exercised on the date of vesting. Performance Share awards vest after three years and, commencing with awards made in 2019, are then subject to a further two-year holding period.

2022 Performance Share Award

The Remuneration Committee has determined that Patrick André will again receive a Performance Share award in 2022 equivalent in value to 200% of his base salary and Guy Young an award equivalent in value to 150% of his base salary. The Committee considered the risk of windfall gains in making the awards for 2022. The Committee resolved to use a share price for the award which is the higher of:

- the average closing price on the five days prior to the date of the Committee decision (£4.02)
- the average closing price on the five days prior to the grant of the award

thereby mitigating the risk of windfall gains.

2021 Performance Share Award

In 2021, Patrick André and Guy Young received allocations of Performance Shares worth 200% and 150% of their base salaries, respectively.

2019 Performance Share Award (vesting in 2022)

The performance period applicable to the awards made in 2019 ended on 31 December 2021. These awardswill lapse as the threshold performance level was not met for either the TSR or EPS performance conditions.

Targets for the Performance Share Awards for the year 2022 – unaudited

TSR ranking relative to FTSE 250 excluding investment trusts Weighting 40%	Vesting percentage (of total LTIP)
Below median	0%
Median	10%
Between median and upper quintile	Pro rata between 10% and 40%
Upper quintile and above	40%

Post-tax ROIC: Weighting 40%	Vesting percentage (of total LTIP)[1]	Average ROIC over three year performance period
Threshold and below	0%	7.5%
Maximum	40%	10.0%

1. Vesting between these points will be on a straight-line basis.

New post-tax ROIC target

Definitions

ROIC is defined as Net Operating Profit After Tax (NOPAT), divided by invested capital (IC).

NOPAT is defined as Group trading profit, plus post-tax share of JV results, less amortisation of intangible assets calculated as an average over the target period. (The inclusion of amortisation charges serves to reduce the calculation of ROIC returns though we believe this to be the most appropriate definition.)

Invested capital is defined as total assets excluding cash and non-interest bearing liabilities, calculated as the average of IC at the start and the end of the target period.

ROIC target range

A 250bps spread is seen by the Remuneration Committee as a reasonable range for the first award using this metric. The Committee will review targets annually for future awards.

The Committee has considered the Group strategy over the period, market conditions, and historic and current estimates of WACC provided by JP Morgan in determining the target range. To achieve the maximum pay-out representing 40% of the award, the Group would need to improve its ROIC performance over that achieved in any of the prior five years, and by a significant margin over the average achieved in the past five years. Post-tax ROIC in 2021 was calculated as 7.5%, an improvement on 4.9% in 2020.

The target range starts at the ROIC achieved in 2021 and as a result the Committee has determined that threshold payments will change from a starting threshold payment of 25% used under the previous EPS KPI to a 0% threshold payment using ROIC.

The Committee has satisfied itself by looking backwards that the application of this ROIC range would not have resulted in more generous pay-out levels overall, but that the vesting would have been less volatile in nature.

Adjustments to ROIC targets

Adjustments to the ROIC target range may be required should the Board approve certain mergers, acquisitions or disposals. For any such event that requires Board approval then management will assess the potential impact on ROIC as part of their broader submission, and the Committee will determine whether any adjustment to targets should be made. In general, the Committee will have regard to the materiality of the event and the timing in the life of the award cycle. The intention will be to maintain fair, stretching but achievable targets, whilst not providing a disincentive to management to bring forward proposals for mergers, acquisitions or disposals that are in the Company's interest.

Environment, Social, Governance: Weighting: 20%

Safety: Average Lost Time Injury Frequency Rate (LTIFR)[1] 2022–2024	Vesting percentage (of total LTIP)[2]	Range
Threshold and below	0%	1.1
Maximum	5%	0.9

Energy: CO_2e: Reduction Scope 1 and 2 energy CO_2e emissions/tonne (vs 2019 baseline) in 2024[3]	Vesting percentage (of total LTIP)[2]	Range[4]
Threshold and below	0%	-14%
Maximum	10%	-20%

Diversity: Gender diversity in senior leadership group[5] on 31 Dec 2024	Vesting percentage (of total LTIP)[2]	Range
Threshold and below	0%	20%
Maximum	5%	26%

1. LTIFR is the Lost Time Injury Frequency Rate, the number of lost time injuries that occur during the performance period. The calculation rate is LTIFR per million hours worked.
2. Straight line vesting between threshold and maximum.
3. Reduction of energy CO_2e emissions per metric tonne of product packed for shipment.
4. The target range has been determined using a re-stated level of current performance (-13% vs -16.5% in the sustainability report) and has factored in investments approved that will come on stream during the life of the award that have a negative effect on achievements to date.
5. Senior Leadership Group is defined as the Group Executive Committee plus the most senior Vesuvius managers worldwide, in terms of their contribution to the Group's overall results and to the execution of the Group's strategy. This group comprises between 150 and 160 members (number may slightly fluctuate from one year to the next based on organisational changes).

The Environment, Social and Governance targets for the 2022 awards represent key strategic priorities for the management team as well as the Board.

Safety is culturally important and progressive improvement has been made in recent years. The targets are considered stretching in the context of an operationally challenging environment with many employees working remotely at customer sites. Lost Time Injury Frequency Rate is a recognised metric, and is measured per million hours worked.

Energy, the reduction in Scope 1 and 2 emissions is a key feature of the Company's sustainability strategy (see pages 52–77) and a measure of energy intensity is used – CO_2e emissions per tonne of product shipped. Baseline and current emissions have been validated with the assistance of Carbon Footprint Ltd. Vesuvius has committed to achieve a net zero status by 2050 at the latest, and work continues to understand how this can be achieved, and the type of technological advances that will be required. Restated performance of -13% vs the 2019 baseline has been considered reasonable by the Committee in setting the forward target range. This restatement takes into account expansion projects in Skawina, Poland and Kolkata, India which will have a deleterious effect on the -16.5% (vs 2019 baseline) reported elsewhere.

Diversity, a focus on gender diversity has seen improvements in the Top Management of c. 50–60 individuals in recent years. Mindful of the need and desire to develop a diverse pipeline the targets have been extended to cover the top 150–160 leaders in Vesuvius.

Targets for the Performance Share awards for the years 2019 and 2020 – audited

TSR ranking relative to FTSE 250 excluding investment trusts	Vesting percentage
Below median	0%
Median	12.50%
Between median and upper quintile	Pro rata between 12.50% and 50%
Upper quintile and above	50%

Annual compound headline EPS growth	Vesting percentage
Less than 3%	0%
3%	12.50%
Between 3% and 6%	Pro rata between 12.50% and 25%
6%	25%
Between 6% and 15%	Pro rata between 25% and 50%
15% or more	50%

Targets for the Performance Share awards for 2021 – audited

TSR ranking relative to FTSE 250 excluding investment trusts	Vesting percentage
Below median	0%
Median	12.50%
Between median and upper quintile	Pro rata between 12.50% and 50%
Upper quintile and above	50%

Headline EPS for the Financial Year 2023	Vesting percentage
Less than 35 pence	0%
35 pence	12.50%
Between 35 pence and 47.5 pence	Pro rata between 12.50% and 25%
47.5 pence	25%
Between 47.5 pence and 60 pence	Pro rata between 25% and 50%
60 pence or more	50%

The Committee is mindful of the present geopolitical environment and the existing energy crisis. In this context it reserves its discretion to amend targets for both the AIP and VSP should major industrial market disruption prevail.

Annual Report on Directors' Remuneration continued

Vesuvius Performance Share award allocations – audited

The following table sets out the Performance Share awards that were allocated in 2018, 2019, 2020 and 2021 under the VSP:

Grant and type of award	Total share allocations as at 1 Jan 2021	Additional shares allocated during the year	Allocations lapsed during the year	Shares vested during the year	**Total share allocations as at 31 Dec 2021**	Market price of the shares on the day before award (p)	Performance period	Earliest vesting date	End of holding period[1]
Patrick André									
15 March 2018[2] Performance Shares	173,697	–	(173,697)	–	**0**	605.5	1 Jan 18– 31 Dec 20	15 Mar 2021	n/a
14 March 2019[3] Performance Shares	197,400	–	–	–	**197,400**	608	1 Jan 19– 31 Dec 21	14 Mar 2022	14 Mar 2024
12 March 2020[4] Performance Shares	282,772	–	–	–	**282,772**	391.8	1 Jan 20– 31 Dec 22	12 Mar 2023	12 Mar 2025
18 March 2021[5] Performance Shares	–	230,210	–	–	**230,210**	538	1 Jan 21– 31 Dec 23	18 Mar 2024	18 Mar 2026
Total	653,869	230,210	(173,697)	0	**710,382**				
Guy Young									
15 March 2018[2] Performance Shares	86,848	–	(86,848)	–	**0**	605.5	1 Jan 18– 31 Dec 20	15 Mar 2021	n/a
14 March 2019[3] Performance Shares	86,362	–	–	–	**86,362**	608	1 Jan 19– 31 Dec 21	14 Mar 2022	14 Mar 2024
12 March 2020[4] Performance Shares	132,120	–	–	–	**132,120**	391.8	1 Jan 20– 31 Dec 22	12 Mar 2023	12 Mar 2025
18 March 2021[5] Performance Shares	–	107,562	–	–	**107,562**	538	1 Jan 21– 31 Dec 23	18 Mar 2024	18 Mar 2026
Total	305,330	107,562	(86,848)	0	**326,044**				

1. Performance shares granted from 2019 onwards are subject to a further two-year holding period.
2. In 2018, Patrick André and Guy Young received allocations of Performance Shares worth 200% and 150% of their base salaries. Following an assessment of the performance conditions, these awards lapsed in full during 2021.
3. In 2019, Patrick André and Guy Young received allocations of Performance Shares worth 200% and 150% of their base salaries. These allocations were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £6.079. The total value of these awards based on this share price was £1,199,994 and £524,994 respectively. Following an assessment of the performance conditions, these awards will lapse in full during 2022.
4. In 2020, Patrick André and Guy Young were entitled to receive allocations of Performance Shares worth 200% and 150% of their base salaries respectively. In light of the volatile share price, the Committee applied its discretion so that the number of shares in these allocations were capped at a level based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the February 2020 Remuneration Committee meeting of £4.371. As a result, Patrick André received an award of 282,772 shares which, at grant, was equivalent in value to 180% of his base salary (£1,109,823*) and Guy Young received an award of 132,120 shares which, at grant, was equivalent in value to 135% of his base salary (£518,544*).

   * Grant values are based on the average closing mid-market price of Vesuvius' shares on the five dealing days prior to grant (£3.9248).
5. In 2021, Patrick André and Guy Young were entitled to receive allocations of Performance Shares worth 200% and 150% of their base salaries respectively. These allocations were calculated based upon the average closing mid-market price of Vesuvius' shares on the five dealing days before the award was made, being £5.3690. The total value of these awards based on this share price was £1,235,997 and £577,500 respectively.

Additional notes:

6. If the respective performance conditions for Patrick André's and Guy Young's awards are not met, then the awards will lapse. If the threshold level of either of the two performance conditions applicable to the awards is met, then 12.50% of the awards will vest.
7. The Remuneration Committee also has the discretion to award cash or shares equivalent in value to the dividend that would have been paid during the vesting period on the number of shares that vest.
8. The mid-market closing prices of Vesuvius' shares during 2021 ranged between 414 pence and 590 pence per share, and on 31 December 2021, the last dealing day of the year, was 450.2 pence per share.

Malus/clawback arrangements in 2022

Vesuvius has malus and clawback arrangements in respect of Executive Directors' variable remuneration. The structure of those arrangements is outlined in our Remuneration Policy.

Statement of Directors' shareholding – audited

The interests of Directors and their closely associated persons in ordinary shares as at 31 December 2021, including any interests in share options and shares provisionally awarded under the VSP, are set out below:

	Beneficial holding in shares	Beneficial holding %	Outstanding share incentive awards: With performance conditions[1]	Outstanding share incentive awards: Without performance conditions[2]
Executive Directors				
Patrick André	111,160	0.04	710,382	46,120
Guy Young	134,802	0.05	326,044	30,466
Non-executive Directors				
John McDonough CBE (Chairman)	120,000	0.04	–	–
Kath Durrant	–	0.00	–	–
Friederike Helfer[3]	–	0.00	–	–
Dinggui Gao	–	0.00	–	–
Hock Goh[4]	5,000	<0.01	–	–
Jane Hinkley	12,000	<0.01	–	–
Douglas Hurt	18,000	0.01	–	–
Holly Koeppel[5]	27,500	0.01		–

1. These are Performance Shares granted under the VSP. The awards were all granted subject to performance conditions.
2. These are awards granted under the Deferred Share Bonus Plan. These awards are not subject to any additional performance conditions.
3. Friederike Helfer is a Partner of, and has a financial interest in, Cevian Capital which held 21.11% of Vesuvius' issued share capital as at 31 December 2021 and at the date of this report.
4. Hock Goh stepped down from the Board following the 2021 AGM and this was his shareholding at the time of stepping down.
5. Holly Koeppel stepped down from the Board following the 2021 AGM and this was her shareholding at the time of stepping down.

Additional notes:

6. None of the other Directors, nor their spouses, nor their minor children, held non-beneficial interests in the ordinary shares of the Company during the year.
7. There were no changes in the interests of the Directors in the ordinary shares of the Company in the period from 1 January 2022 to the date of this Report.
8. All awards under the VSP are subject to performance conditions and continued employment until the relevant vesting date as set out on pages 148 and 149.
9. Full details of Directors' shareholdings and incentive awards are given in the Company's Register of Directors' Interests, which is open to inspection at the Company's registered office during normal business hours.

Payments to past Directors and loss of office payments – audited

There were no payments made to any Director for loss of office during the year ended 31 December 2021, and no payments were made to any other past Directors of the Company during the year ended 31 December 2021.

Shareholding guidelines

The Remuneration Committee encourages Executive Directors to build and hold a shareholding in the Company. Under the 2020 Remuneration Policy, the required holding is 200% of salary for all Executive Directors. Executive Directors are required to retain at least 50% (measured as the value after tax) of any shares received through the operation of share schemes; in addition, permission to sell shares held – whether acquired through the operation of share schemes or otherwise – will not be given, other than in exceptional circumstances, if, following the disposal, the shareholding requirement is not achieved or is not maintained.

Compliance with the shareholding policy is tested at the end of each year for application in the following year. Under the 2020 Remuneration Policy, the valuation of any holding is taken at the higher of: (1) the share price on the date of vesting of any shares derived from a share award, in respect of those shares only; and (2) the average of the closing prices of a Vesuvius ordinary share for the trading days in that December.

Executive Directors' shareholdings – audited

As at 31 December 2021, the Executive Directors' shareholdings against the shareholding guidelines contained in the Directors' Remuneration Policy in force on that date (using the Company's share price averaged over the trading days of the period 1 December to 31 December 2021, of 432.59 pence per share) were as follows:

Director	Actual share ownership as a percentage of salary at 31 Dec 2021	Policy share ownership as a percentage of salary	Policy met?
Patrick André	78%	200%	In the build-up period
Guy Young	151%	200%	In the build-up period

Annual Report on Directors' Remuneration continued

Annual changes in Executive Directors pay versus employee pay

Executive Directors' pay comparison

The London headquartered salaried employee workforce is presented as a voluntary disclosure of the representative comparator group for the Vesuvius Group parent company as there are only two non-Director employees in the parent company.

Year-on-year change in pay for Directors compared to the London headquartered employee average

	2021 Salary[2,3]	2021 Bonus[3]	2021 Benefits[4]	2020 Salary[2,3]	2020 Bonus[3]	2020 Benefits[4]
London headquartered employee average[1]	19%	236%	120%	0%	165%	18%
Executive Directors						
Patrick André	11%	469%	6%	(7%)	183%	(25%)
Guy Young	11%	442%	9%	(1%)	155%	(14%)
Non-executive Directors[9]						
John McDonough CBE	11%	–	(35%)	(10%)	–	(46%)
Kath Durrant[5]	19%	–	100%	n/a	–	n/a
Friederike Helfer	11%	–	502%	(10%)	–	(60%)
Dinggui Gao[6]	n/a	–	n/a	n/a	–	n/a
Jane Hinkley[7]	(5%)	–	(56%)	(10%)	–	(60%)
Douglas Hurt	11%	–	(22%)	(10%)	–	–
Hock Goh[8]	(60%)	–	(100%)	(10%)	–	(60%)
Holly Koeppel[8]	(60%)	–	(100%)	(10%)	–	(100%)

1. This is the average change calculated by dividing the staff cost related to salaries, median bonus and benefits by the average number of full-time equivalent employees in the Vesuvius headquarters in London, excluding the Executive Directors. Salaries, bonus and benefits relate to the relevant financial reporting year.
2. During 2020 all Executive and Non-executive Directors took a voluntary 20% pay reduction for six months. Other senior employees in London headquarters also took between a 10-20% pay reduction, depending on their level of seniority. Therefore, the total percentage increase for the Executive Directors between 2021 and 2022 will be higher than their agreed salary increases as these increases are based on the salary as at 31 December 2021.
3. Calculated using data from the single figure table in the Annual Report.
4. Calculated using data from the audited Directors' Emoluments. Benefits relate to taxable travel benefits and is calculated as the percentage increase or decrease on the actual figures year-on-year and not annualised or pro-rated for any new starters. Travel was restricted during 2020 due to the COVID-19 pandemic.
5. Kath Durrant joined on 1 December 2020 and then became the Remuneration Committee Chair following the 2021 AGM, it is this change that accounts for the proportionally higher increase on her salary.
6. Dinggui Gao joined on 1 April 2021.
7. Jane Hinkley stood down as the Remuneration Committee Chair following the 2021 AGM, which accounts for her net reduction in year-on-year change.
8. Hock Goh and Holly Koeppel stepped down from the Committee at the 2021 AGM, their salaries have been calculated based on actual earnings in 2020 and 2021.
9. The Non-executive Directors' fees were reviewed and increased in 2015, 2019 and 2022.

CEO pay ratio

The UK salaried employee workforce is the representative comparator group to the Chief Executive, Patrick André, who is based in the UK (albeit with a global role and responsibilities). Levels of pay vary widely across the Group depending on geography and local market conditions.

Year	Method	25th percentile pay ratio	50th percentile (median) pay ratio	75th percentile pay ratio
2019	Option A	35:1	28:1	17:1
2020	Option A	32:1	24:1	13:1
2021	Option A	53:1	41:1	21:1
2021	Total pay and benefits (£)	33,216	43,233	82,829
2021	Salary (£)	29,018	40,363	73,000

The table above shows the Chief Executive pay ratios versus our UK employees for 2019, 2020 and 2021. The pay ratios compare amounts disclosed in the single total figure table for the Group Chief Executive to the annual full-time equivalent remuneration of our UK employees for 2019, 2020 and 2021. The data has been calculated in accordance with 'Option' A in The Companies (Miscellaneous Reporting) Regulations 2018, because it allows the Company to show the total annualised full-time equivalent remuneration (salary, incentives, allowances, fees, taxable benefits) and percentiles across the financial year as at 31 December 2019, 2020 and 2021.

Amounts have been annualised for those who joined part way through the year or who are on part-time arrangements and exclude those who left the organisation during the reporting period.

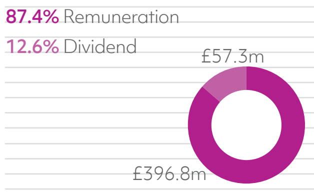
The approach to calculating the pay ratios is consistent with the prior year and there have not been any changes to the compensation models in the reporting period.

The Committee is comfortable that the principles applied and the quantum of compensation are appropriate across the Group's employee base. These are regularly benchmarked to ensure market competitiveness. There is a consistent approach of measuring against both business and personal performance for all those who participate in incentive programmes. The Group continues to monitor the effectiveness of all compensation practices to identify future opportunities to ensure they remain fair, consistent and in line with best practice.

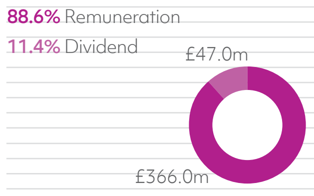
Annual spend on employee pay[1] versus shareholder distributions[2]

The charts below show the annual spend on all employees (including Executive Directors) compared with distributions made and proposed to be made to shareholders for 2020 and 2021:

Relative importance of spend on pay (2021) £m



Relative importance of spend on pay (2020) £m



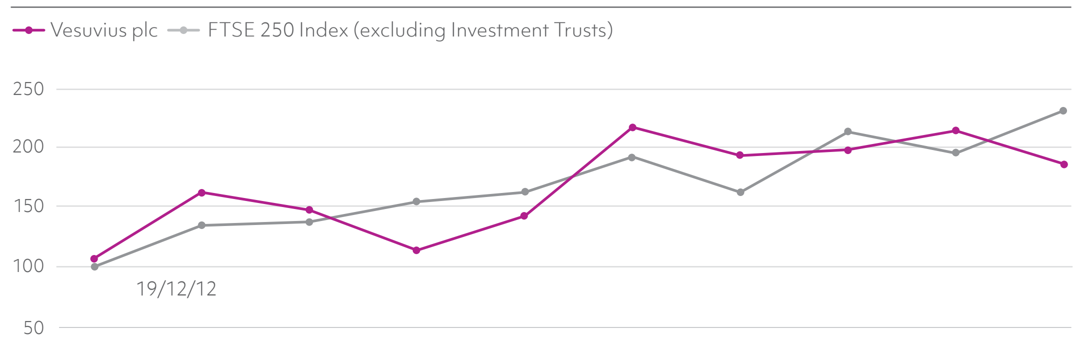
	2021 (£m)	2020 (£m)	Change
Employee pay[1]	**396.8**	366.0	8.5%
Dividends[2] (based on final proposed dividend)	**57.3**	47.0	22.0%

1. Employee pay includes wages and salaries, social security, share-based payments and pension costs, and other post-retirement benefits. See Note 8 to the Group Financial Statements.
2. Shareholder distributions/dividends includes interim and final dividends paid in respect of each financial year. See Note 24 of the Group Financial Statements.

TSR performance and Chief Executive pay

The TSR performance graph compares Vesuvius' TSR performance with that of the same investment in the FTSE 250 Index (excluding investment trusts). This index has been chosen as the comparator index to reflect the size, international scope and diversity of the Company. TSR is the measure of the returns that a company has provided for its shareholders, reflecting share price movements and assuming reinvestment of dividends. The demerger of Vesuvius plc was effective on 19 December 2012 and therefore the graph shows the period from 19 December 2012 to 31 December 2021.

Vesuvius' total shareholder return compared against total shareholder return of the FTSE 250 (excluding investment trusts) index since demerger



Chief Executive pay – financial year ended	31/12/12	31/12/13	31/12/14	31/12/15	31/12/16	31/12/17	31/12/18	31/12/19	31/12/20	31/12/21
	François Wanecq[1]						Patrick André[2]			
Total remuneration (single figure (£000))	£1,227	£2,447	£1,519	£752	£1,173	£1,675[1] £465[2]	£2,022	£1,220	£936	**£1,706**
Annual variable pay (% of maximum)	0%	100%	64%	0%	50%	81%[1] 85%[2]	83%	11%	20%	**94%**
Long-term variable pay (% of maximum)	67%	28%	27%	0%	0%	43.7%[1] n/a[2]	100%	63%	0%	**0%**

1. Amounts shown in respect of François Wanecq for 2017 reflect payments in respect of his service as Chief Executive from 1 January 2017 to 31 August 2017 and the full value of his VSP award in relation to the performance period 2015–2017.
2. Amounts shown in respect of Patrick André for 2017 reflect payments in respect of his service as Chief Executive from 1 September 2017 to 31 December 2017.

Shareholder voting on remuneration resolutions

	Votes for	Votes against	Votes withheld
Approval of the Directors' Remuneration Policy 2020 AGM	244,618,671 (97.2%)	7,105,663 (2.8%)	3,640
Approval of the Annual Report on Remuneration 2021 AGM	244,223,260 (99.32%)	1,673,458 (0.68%)	11,480

The Directors' Remuneration Report has been approved by the Board and is signed on its behalf by

Kath Durrant
Chair of the Remuneration Committee
3 March 2022

Directors' Report

The Directors submit their Annual Report together with the audited financial statements of the Group and of the Company, Vesuvius plc, registered in England and Wales No. 8217766, for the year ended 31 December 2021.

The Companies Act 2006 requires the Company to provide a Directors' Report for Vesuvius plc for the year ended 31 December 2021.

Information incorporated by reference

The information that fulfils this requirement and which is incorporated by reference into, and forms part of, this report is included in the following sections of the Annual Report:

- The Section 172(1) statement
- The Non-financial information statement (the Sustainability section)
- The Governance section, including the Corporate Governance Statement
- Financial instruments: the information on financial risk management objectives and policies contained in Note 25 to the Group Financial Statements

This Directors' Report and the Strategic Report contained on pages 1 to 101 together represent the management report for the purpose of compliance with DTR 4.1.8R of the Financial Conduct Authority's Disclosure and Transparency Rules.

Going concern	Information on the business environment in which the Group operates, including the factors that are likely to impact the future prospects of the Group, is included in the Strategic Report. The principal risks and uncertainties that the Group faces throughout its global operations are shown on pages 34 and 35. The financial position of the Group, its cash flows, liquidity position and debt facilities are also described in the Strategic Report. In addition, the Group's viability statement is set out within the Strategic Report on page 33. Note 25 to the Group Financial Statements sets out the Group's objectives, policies and processes for managing its capital; financial risks; financial instruments and hedging activities; and its exposures to credit, market (both currency and interest rate related) and liquidity risk. Further details of the Group's cash balances and borrowings are included in Notes 13, 14 and 25 to the Group Financial Statements. The Directors have prepared profit and loss, balance sheet and cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the 2021 financial statements. On the basis of the exercise described above, the Directors have prepared a going concern statement which can be found on page 33.
Events since the balance sheet	Since 31 December 2021, there have been no material items to report.
Future developments	A full description of the activities of the Group, including performance, significant events affecting the Group in the year and indicative information in respect of the likely future developments in the Group's business, can be found in the Strategic Report.
Financial instruments	Information on Vesuvius' financial risk management objectives and policies can be found in Note 25 to the Group Financial Statements.
Research and development	The Group's investment in research and development (R&D) during the year under review amounted to £30.3m (representing approximately 1.8% (2020: 1.9%) of Group revenue). Further details of the Group's R&D activities can be found in the Operating Reviews and Sustainability section of the Strategic Report.
Political and charitable donations	In accordance with Vesuvius policy, the Group did not make any political donations or incur any political expenditure in relation to any UK or non-UK political parties during 2021 (2020: nil). The Company made no charitable donations of more than £2,000 in the UK in 2021.
Task Force on Climate-Related Financial Disclosures (TCFD)	The Group has reported its climate-related information in accordance with the TCFD disclosure framework. The majority of this information is included in the Sustainability section of the Strategic Report. A schedule of disclosure is included on page 58.

Energy consumption and efficiency/greenhouse gas emissions	Information on our reporting of greenhouse gas emissions, and the methodology used to record these, is set out on page 69 of the Strategic Report. Details of the Group's energy usage for 2021, and the efficiency initiatives currently being undertaken, can be found in the Sustainability section on pages 68–73.
Branches	A number of the Group's subsidiary undertakings maintain branches; further details of these can be found in Note 33.1 to the Group Financial Statements.
Dividends	An interim dividend of 6.2 pence (2020: 3.1 pence) per Vesuvius ordinary share was paid on 17 September 2021 to shareholders on the register at the close of business on 6 August 2021. The Board is recommending a final dividend in respect of 2021 of 15.0 pence (2020: 14.30 pence) per ordinary share which, if approved, will be paid on 27 May 2022 to shareholders on the register at 19 April 2022.
Accountability and audit	A responsibility statement of the Directors and a statement by the auditor about its reporting responsibilities can be found on pages 160, and 161–169, respectively. The Directors fulfil the responsibilities set out in their statement within the context of an overall control environment of central strategic direction and delegated operating responsibility. As at the date of this report, so far as each Director of the Company is aware, there is no relevant audit information of which the Company's auditors are unaware and each Director hereby confirms that they have taken all the steps that they ought to have taken as a Director in order to make themselves aware of any relevant audit information and to establish that the Company's auditor is aware of that information.
Auditors' reappointment	PricewaterhouseCoopers LLP (PwC) were reappointed as External Auditors for Vesuvius plc for the year ended 31 December 2021, at the 2021 AGM. PwC have been Vesuvius' External Auditors since 2017 and have expressed their willingness to continue in office as Auditors of the Company for the year ending 31 December 2022. Consequently, resolutions for the reappointment of PwC as External Auditors of the Company and to authorise the Directors to determine their remuneration are to be proposed at the 2022 AGM.
Directors	The current Directors of the Company are Patrick André, Kath Durrant, Dinggui Gao, Friederike Helfer, Jane Hinkley, Douglas Hurt, John McDonough CBE and Guy Young. Dinggui Gao joined the Board on 1 April 2021 and Hock Goh and Holly Koeppel served on the Board until they stepped down at close of the AGM on 12 May 2021. All the current Directors will retire at the 2022 AGM and offer themselves for re-election. Biographical information for the Directors is given on pages 104 and 105. Further information on the remuneration of, and contractual arrangements for, the Executive and Non-executive Directors is given on pages 130–153 in the Directors' Remuneration Report. The Non-executive Directors do not have service agreements.
Directors' indemnities	The Directors have been granted qualifying third-party indemnity provisions by the Company and the Directors of the Group's UK Pension Plans Trustee Board (none of whom is a Director of Vesuvius plc) have been granted qualifying pension scheme indemnity provisions by Vesuvius Pension Plans Trustees Limited. The indemnities for Directors of Vesuvius plc have been in force since the date of their appointments. The Pension Trustee indemnities were in force throughout the last financial year and remain in force.

Directors' Report continued

Annual General Meeting

The Annual General Meeting of the Company will be held at the offices of Linklaters LLP, One Silk Street, London EC2Y 8HQ on Wednesday 18 May 2022 at 11.00 am.

Amendments of Articles of Association

The Company may make amendments to the Articles by way of special resolution in accordance with the Companies Act. The Articles were amended at the 2021 AGM, to reflect changes in the law and developments in market practice and technology since the previous Articles had been adopted in November 2012.

Share capital

As at the date of this report, the Company had an issued share capital of 278,485,071 ordinary shares of 10 pence each; 7,271,174 of these ordinary shares are held in Treasury. Therefore, the total number of Vesuvius plc shares with voting rights is 271,213,897.

Further information relating to the Company's issued share capital can be found in Note 9 to the Company Financial Statements.

The Company's Articles specify that, subject to the authorisation of an appropriate resolution passed at a General Meeting of the Company, Directors can allot relevant securities under Section 551 of the Companies Act up to the aggregate nominal amount specified by the relevant resolution. In addition, the Articles state that the Directors can seek the authority of shareholders in a General Meeting to allot equity securities for cash, without first being required to offer such shares to existing ordinary shareholders in proportion to their existing holdings under Section 561 of the Companies Act, in connection with a rights issue and in other circumstances up to the aggregate nominal amount specified by the relevant resolution.

At the AGM on 12 May 2021, the Directors were authorised to issue relevant securities up to an aggregate nominal amount of £9,040,463, and, in connection with a rights issue, to issue relevant securities up to a further nominal value of £9,040,463. In addition, the Directors were empowered to allot equity securities, or sell Treasury Shares, for cash on a non pre-emptive basis up to an aggregate nominal amount of £1,356,069, and for the purposes of financing (or refinancing, if the authority is to be used within six months after the original transaction) a transaction which the Board of the Company determines to be an acquisition or other capital investment, to allot equity securities, or sell Treasury Shares, for cash on a non pre-emptive basis up to an additional nominal amount of £1,356,069. Each of the authorities given in these resolutions expires on 30 June 2022 or the date of the AGM to be held in 2022, whichever is the earlier. The resolutions were all tabled in accordance with the terms of the Pre-Emption Group's Statement of Principles. The Directors propose to renew these authorities at the 2022 AGM for a further year. In the year ahead, other than potentially in respect of Vesuvius' ability to satisfy rights granted to employees under its various share-based incentive arrangements, the Directors have no present intention of issuing any share capital of Vesuvius plc.

Authority for purchase of own shares

Subject to the provisions of company law and any other applicable regulations, the Company may purchase its own shares. At the AGM on 12 May 2021, Vesuvius shareholders gave authority to the Company to make market purchases of up to 27,121,389 Vesuvius ordinary shares, representing 10% of the Company's issued ordinary share capital as at the latest practicable day prior to the publication of the Notice of AGM. This authority expires on 30 June 2022 or the date of the AGM to be held in 2022, whichever is the earlier. The Directors will seek renewal of this authority at the 2022 AGM.

In 2013, the Company acquired 7,271,174 ordinary shares, representing a nominal value of £727,117 and 2.6% of the entire called-up share capital of the Company prior to the purchase. These shares were purchased pursuant to the Board's commitment to return the majority of the net proceeds of the disposal of the Precious Metals Processing Division to shareholders. These shares are currently held as Treasury shares. The Company has not subsequently disposed of any of the repurchased shares. During the year, the Company did not make any further acquisitions of shares nor did it dispose of any shares previously acquired. The Company does not have a lien over any of its shares.

Share plans

Vesuvius operates a number of share-based incentive plans. Under these plans, the Group can satisfy entitlements by the acquisition of existing shares, the transfer of Treasury shares or by the issue of new shares. Existing shares are held in an employee benefit trust (EBT). The Trustee of the EBT purchases shares in the open market as required to enable the Group to meet liabilities for the issue of shares to satisfy awards that vest. The Trustee does not register votes in respect of these shares at the Company's Annual General Meetings and has waived the right to receive any dividends.

At 31 December 2020, the EBT held 1,093,098 ordinary shares of 10p each in the Company. During the year, the EBT sold/transferred 475,646 shares to satisfy the vesting of awards under the Company's share-based incentive plans. It also purchased 267,404 ordinary shares in Vesuvius with a nominal value of £26,740 at a total cost, including transaction costs, of approximately £1.14m, to hold to satisfy the future vesting of awards under the Company's share incentive plans. As at 31 December 2021, the EBT held 884,856 ordinary shares. The total purchases during the year represented <0.5% of the Company's called-up share capital. Since the year end the EBT has purchased an additional 332,596 ordinary shares (<0.2% of called up share capital), with a nominal value of £33,260 at a total cost of £1,587,367. As at the date of this report the EBT held 1,217,452 ordinary shares.

Restrictions on transfer of shares and voting

The Company's Articles do not contain any specific restrictions on the size of a holding or on the transfer of shares. The Directors are not aware of any agreements between holders of the Company's shares that may result in restrictions on the transfer of securities or voting rights.

No person has any special rights with regard to the control of the Company's share capital and all issued shares are fully paid. This is a summary only and the relevant provisions of the Articles should be consulted if further information is required.

Change of control provisions

The terms of the Group's committed bank facility and US Private Placement Loan Notes contain provisions entitling the counterparties to exercise termination or other rights in the event of a change of control on takeover of the Company. A number of the arrangements to which the Company and its subsidiaries are party, such as other debt arrangements and share incentive plans, may also alter or terminate on a change of control in the event of a takeover. In the context of the Group as a whole, these other arrangements are not considered to be significant.

Interests in the Company's shares

The Company has been notified in accordance with DTR 5 of the Disclosure and Transparency Rules of the following interests of 3%, or more, of its issued ordinary shares:

	As at 31 Dec 2021	**As at 3 Mar 2022**
Cevian Capital	21.11%	**21.11%**
abrdn	9.81%	**9.81%**
Martin Currie	below 5%	**5.33%**
Franklin Templeton	5.10%	**below 5%**
Aberforth Partners	4.93%	**4.93%**

The interests of Directors and their connected persons in the ordinary shares of the Company as disclosed in accordance with the Listing Rules of the Financial Conduct Authority are as set out on page 151 of the Directors' Remuneration Report and details of the Directors' Deferred Share Bonus Plan and Long-Term Incentive awards are set out on pages 147 and 150.

Suppliers, customers and others

Information summarising how the Directors have regard to the need to foster the Company's business relationships with suppliers, customers and others is included in the Group's Section 172(1) Statement on pages 22–27. This also details how that regard impacted the principal decisions taken by the Directors during the year.

Our approach to business places a significant number of Vesuvius Steel employees at customer sites on a permanent basis. In the Foundry Division, our success is built on our deep understanding of customer processes and technical requirements, and our ability to assist them in delivering the greatest efficiency from their operations.

During the year, our supplier audit programme covered the operations of 138 suppliers. This approach allows Vesuvius to gain a deep understanding of our suppliers' operations to ensure sustainability and quality of supply.

Vesuvius agrees payment terms with its suppliers and seeks to pay in accordance with those terms.

Directors' Report continued

Equal opportunities employment	Vesuvius is an equal opportunities employer, and decisions on recruitment, development, training and promotion, and other employment-related issues are made solely on the grounds of individual ability, achievement, expertise and conduct. These principles are operated on a non-discriminatory basis, without regard to race, colour, nationality, culture, ethnic origin, religion, belief, gender, sexual orientation, age, disability or any other reason not related to job performance or prohibited by applicable law. In cases where employees are injured or disabled during employment with the Group, support, including appropriate training, is provided to those employees and workplace adjustments are made as appropriate in respect of their duties and working environment, supporting recovery and continued employment.
Employee engagement	Information on the mechanisms through which Vesuvius engages with its workforce is included in the Section 172(1) Statement on pages 22–28 and in the Sustainability section on pages 91–93.
Pensions	In each country in which the Group operates, the pension arrangements in place are considered to be consistent with good employment practice in that particular area. Independent advisers are used to ensure that the plans are operated in accordance with local legislation and the rules of each plan. Group policy prohibits direct investment of pension fund assets in the shares of Vesuvius plc. Outside the UK, the US, Germany and Belgium, the majority of pension plans in the Group are of a defined contribution nature. In 2016, the main German defined benefit plan was closed for new entrants and existing members were offered a buy-out of their benefits under this plan. Those who accepted this buy-out then joined the new defined contribution plan. The Group's UK defined benefits plan (the 'UK Plan') and the main US defined benefits plans are closed to new entrants and have ceased providing future benefits accrual, with all eligible employees instead being provided with benefits through defined contribution arrangements. For the Group's closed UK Plan, a Trustee Board exists comprising employees, former employees and an independent trustee. The Board currently comprises six trustee Directors, of whom two are member-nominated. The administration of the UK Plan is outsourced. The Company is mindful of its obligations under the Pensions Act 2004 and of the need to comply with the guidance issued by the Pensions Regulator. Regular dialogue is maintained between the Company and the Trustee Board of the UK Plan to ensure that both the Company and Trustee Board are apprised of the same financial and other information about the Group and the UK Plan. This is pertinent to each being able to contribute to the effective functioning of the UK Plan. Vesuvius continues to seek ways to de-risk its existing pension plans through a combination of asset matching, buy-in opportunities and, where prudent, voluntary cash contributions. The total gross defined benefit obligations at 31 December 2021 were £565.9m funded (2020: £610.0m funded) and £77.2m unfunded (2020: £88.3m unfunded). After asset funding there was a net deficit of £77.0m (2020: £2.1m) representing an increase of £74.9m. The increase is largely due to a reduction in surplus on the UK pension plan as a result of the final pension insurance buy-in agreement with Pension Insurance Corporation plc (PIC). This buy-in secures an insurance asset from PIC that matches the remaining pension liabilities of the UK Plan, with the result that the Company no longer bears any investment, longevity, interest rate or inflation risks in respect of the UK Plan. The decrease in surplus on the UK plan has been partially offset by a decrease in liabilities due to an increase in bond yields resulting in a reduction in the value of German and US liabilities. The majority of the ongoing pension plans are defined contribution plans, where our only obligation is to make contributions, with no further commitments on the level of post-retirement benefits. During 2021, cash contributions of £10.2m (2020: £9.7m) were made into the defined contribution plans and charged to trading profit.

Listing Rule 9.8.4C R Disclosures

The following disclosures are made in compliance with the Financial Conduct Authority's Listing Rule 9.8.4C R:

Disclosure requirement under LR 9.8.4R	Reference/Location
(1) Interest capitalised by the Group during the year	None
(2) Publication of unaudited financial information	Not applicable
(3) Details of any Long-Term Incentive schemes	Pages 148–150
(4) Director waiver of emoluments	Not applicable
(5) Director waiver of future emoluments	Not applicable
(6) Allotment for cash of equity securities made during the year	Not applicable
(7) Allotment for cash of equity securities made by a major unlisted subsidiary during the year	Not applicable
(8) Details of participation of parent undertaking in any placing made during the year	Not applicable
(9) Details of relevant material contracts in which a Director or controlling shareholder was interested during the year	Not applicable
(10) Contracts for the provision of services by a controlling shareholder during the year	Not applicable
(11) Details of any arrangement under which a shareholder has waived or agreed to waive any dividends	Vesuvius plc holds 7,271,174 of its 10 pence ordinary shares as Treasury shares. No dividends are payable on these shares. The Trustee of the Company's EBT, has agreed to waive, on an ongoing basis, any dividends payable on shares it holds in trust for use under the Company's Employee Share Plans, details of which can be found on pages 144,147, 148,149, 150 and 157
(12) Details of where a shareholder has agreed to waive future dividends	See above
(13) Statements relating to controlling shareholders and ensuring company independence	Not applicable

The Directors' Report has been approved by the Board and is signed, by order of the Board, by the Secretary of the Company.

Henry Knowles
Company Secretary
3 March 2022

Statement of Directors' Responsibilities in respect of the Financial Statements

The Directors are responsible for preparing the Annual Report and Financial Statements in accordance with applicable law and regulation.

Company law requires the Directors to prepare financial statements for each financial year. Under that law, the Directors have prepared the Group financial statements in accordance with UK-adopted international accounting standards and the Company financial statements in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 'Reduced Disclosure Framework', and applicable law).

Under company law, the Directors must not approve the financial statements unless they are satisfied that they give a true and fair view of the state of affairs of the Group and Company and of the profit or loss of the Group for that period. In preparing the financial statements, the Directors are required to:

- Select suitable accounting policies and then apply them consistently
- State whether applicable UK-adopted international accounting standards have been followed for the Group financial statements and United Kingdom Accounting Standards, comprising FRS 101 have been followed for the Company financial statements, subject to any material departures disclosed and explained in the financial statements
- Make judgements and accounting estimates that are reasonable and prudent
- Prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Group and Company will continue in business

The Directors are also responsible for safeguarding the assets of the Group and Company and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

The Directors are responsible for keeping adequate accounting records that are sufficient to show and explain the Group's and Company's transactions and disclose with reasonable accuracy at any time the financial position of the Group and Company and enable them to ensure that the financial statements and the Directors' Remuneration Report comply with the Companies Act 2006.

The Directors are responsible for the maintenance and integrity of the Company's website. Legislation in the United Kingdom governing the preparation and dissemination of financial statements may differ from legislation in other jurisdictions.

Directors' confirmations

The Directors consider that the Annual Report and Financial Statements, taken as a whole, is fair, balanced and understandable and provides the information necessary for shareholders to assess the Group and Company's position and performance, business model and strategy.

Each of the Directors, whose names and functions are listed below, confirm that, to the best of their knowledge:

- The Company financial statements, which have been prepared in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 Reduced Disclosure Framework, and applicable law), give a true and fair view of the assets, liabilities and financial position of the Company
- The Group financial statements, which have been prepared in accordance with UK-adopted international accounting standards, give a true and fair view of the assets, liabilities, financial position and profit of the Group
- The Strategic Report includes a fair review of the development and performance of the business and the position of the Group and Company, together with a description of the principal risks and uncertainties that the Group faces

The names and functions of the Directors of Vesuvius plc who were in office during the year and at the signing of these financial statements were:

John McDonough CBE	Chairman
Patrick André	Chief Executive
Guy Young	Chief Financial Officer
Kath Durrant	Non-executive Director and Chair of the Remuneration Committee
Dinggui Gao	Non-executive Director
Friederike Helfer	Non-executive Director
Jane Hinkley	Non-executive Director
Douglas Hurt	Non-executive Director, Senior Independent Director and Chair of the Audit Committee

On behalf of the Board

Guy Young
Chief Financial Officer
3 March 2022

Independent auditors' report to the members of Vesuvius plc

Report on the audit of the financial statements

Opinion

In our opinion:

- Vesuvius plc's Group financial statements and Company financial statements (the "financial statements") give a true and fair view of the state of the Group's and of the Company's affairs as at 31 December 2021 and of the Group's profit and the Group's cash flows for the year then ended;
- the Group financial statements have been properly prepared in accordance with UK-adopted international accounting standards;
- the Company financial statements have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Accounting Standards, comprising FRS 101 "Reduced Disclosure Framework", and applicable law); and
- the financial statements have been prepared in accordance with the requirements of the Companies Act 2006.

We have audited the financial statements, included within the Annual Report, which comprise: the Group and Company Balance Sheets as at 31 December 2021; the Group Income Statement and the Group Statement of Comprehensive Income, the Group Statement of Cash Flows and the Group and Company Statements of Changes in Equity for the year then ended; and the notes to the financial statements, which include a description of the significant accounting policies.

Our opinion is consistent with our reporting to the Audit Committee.

Basis for opinion

We conducted our audit in accordance with International Standards on Auditing (UK) ("ISAs (UK)") and applicable law. Our responsibilities under ISAs (UK) are further described in the Auditors' responsibilities for the audit of the financial statements section of our report. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Independence

We remained independent of the Group in accordance with the ethical requirements that are relevant to our audit of the financial statements in the UK, which includes the FRC's Ethical Standard, as applicable to listed public interest entities, and we have fulfilled our other ethical responsibilities in accordance with these requirements.

To the best of our knowledge and belief, we declare that non-audit services prohibited by the FRC's Ethical Standard were not provided.

Other than those disclosed in Note 6.2 of the Group Financial Statements, we have provided no non-audit services to the Company or its controlled undertakings in the period under audit.

Independent auditors' report to the members of Vesuvius plc continued

Our audit approach

Context

The Vesuvius Group (Vesuvius plc together with its subsidiaries) has operations in 40 countries, including 75 sales offices and has 54 production sites. In 2021, as set out in the Chairman's statement, despite some recovery across the majority of the Group's end markets, the COVID-19 pandemic continued to result in operational restrictions and promoted wide-spread global supply chain and freight disruption which led to some costs increasing, not all of which were passed on to end customers. The sustainability strategy is important for the Group and includes plans to achieve a net zero carbon footprint by 2050 at the latest.

Overview

Audit scope

- Our audit included full scope audits of 18 components and specific audit procedures on certain balances and transactions for 15 additional components.
- Taken together, the components at which either full scope audit work or specified audit procedures were performed enabled us to get coverage on 70% of revenue, 67% of profit before tax and 69% of profit before tax and separately reported items (Headline profit before tax).

Key audit matters

- Impairment of goodwill and other non-financial assets (Group).
- Provisions for exposures (Group).
- Impairment of investment in subsidiaries (Company).

Materiality

- Overall Group materiality: £6,300,000 (2020: £7,000,000) based on approximately 4.6% of profit before tax and separately reported items ('Headline profit before tax').
- Overall Company materiality: £6,300,000 (2020: £7,000,000) based on 1.0% of total assets, capped at the level of overall Group materiality.
- Performance materiality: £4,730,000 (2020: £5,250,000) (Group) and £4,730,000 (2020: £5,250,000) (Company).

The scope of our audit

As part of designing our audit, we determined materiality and assessed the risks of material misstatement in the financial statements. In particular, we looked at where the directors made subjective judgements, for example in respect of significant accounting estimates that involved making assumptions and considering future events that are inherently uncertain.

This year we also specifically considered the impacts of climate change on the audit. The 'Sustainability' section of the Strategic report sets out the Group's climate change risk assessment, the climate related targets set and an evaluation of the potential financial impacts. In planning and executing our audit we considered this risk assessment and management's analysis of impacts to the financial statements. These, together with discussions with our own climate change experts, provided us with an understanding of the potential impacts of climate change on the financial statements. Based on this we understood the key impacts on the Group could include potential increases in costs from carbon pricing mechanisms, costs and benefits of technology transition in Iron and Steelmaking and the conversion of manufacturing processes to clean energy.

This would most likely impact the financial statement line items and estimates associated with future cash flows because the impact of climate change for Vesuvius is expected to become more notable in the medium to long term. The key areas impacted include valuation of goodwill and other non-financial assets, and useful lives applied to tangible and intangible assets. Management's assessment is that the current impact on Vesuvius is not material. Nevertheless, in our audit of the forecasts used in the valuation, we challenged management on significant assumptions in the cash flows that might be impacted by climate change, including the potential impact of any climate change related commitments. For further details see our Key Audit Matter on impairment of goodwill and other non financial assets. We have not noted any issues as part of this work which contradict the disclosures in the Annual Report or materially impact the financial statements.

Key audit matters

Key audit matters are those matters that, in the auditors' professional judgement, were of most significance in the audit of the financial statements of the current period and include the most significant assessed risks of material misstatement (whether or not due to fraud) identified by the auditors, including those which had the greatest effect on: the overall audit strategy; the allocation of resources in the audit; and directing the efforts of the engagement team. These matters, and any comments we make on the results of our procedures thereon, were addressed in the context of our audit of the financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

This is not a complete list of all risks identified by our audit.

The impact of COVID-19 (Group and Company), which was a key audit matter last year, is no longer included because of in the case of COVID-19, whilst there are continued operating environment disruptions such as to the supply chain, there is improved financial position and performance in 2021. This has mitigated some of the financial statement risks and we are not aware of any significant control deficiencies after another year of working under a hybrid working environment. Otherwise, the key audit matters below are consistent with last year.

Key audit matter

Impairment of goodwill and other non-financial assets (Group)

At 31 December 2021, the carrying value of goodwill is £614.2 million (2020: £617.6 million). Goodwill arising from acquisitions has an indefinite expected useful life and so is not amortised but rather is tested for impairment at least annually at the cash-generating unit ("CGU") level. Management has determined its CGUs to align with the operating segments, which are Steel Advanced Refractories, Steel Flow Control and Foundry. Steel Sensors and Probes goodwill was previously impaired and is fully written down.

The Group also carries Property, Plant and Equipment assets of £352.5 million (2020: £337.5 million) and other intangible assets of £82.6 million (2020: £78.5 million). The carrying value of these assets was assessed for impairment as a part of the impairment test performed in respect of the CGUs, and also separately for indicators of impairment.

Management prepares a Value in Use (VIU) model (discounted cash flow) to test for impairment of the carrying value of the above CGUs. This is based on a Board approved 3 year forecast, on which a terminal value is calculated based on long term growth rates. The VIU model requires estimation of projected future cash flows and involves making key assumptions of revenue growth rates, an appropriate discount rate and long term growth rates for each of the CGUs. In making such future assumptions there is an inherent level of estimation uncertainty to consider.

We focused on the valuation of the CGUs due to the material carrying value of goodwill and other non-financial assets, and with regard to the estimation uncertainties arising from the factors set out above.

Refer to Property, Plant and Equipment (Note 15), Intangible Assets (Note 16), Impairment of Tangible and Intangible Assets (Note 17), Critical Accounting Judgements and Estimates (Note 3) and Significant issues and material judgements in the Audit Committee report.

How our audit addressed the key audit matter

Our audit procedures included:

- For each CGU we obtained management's Value in Use model. We ensured the calculations were mathematically accurate and that the valuation methodology conformed with the requirements of IAS 36 'Impairment of Assets'.
- For key assumptions made by management in respect of forecast revenue and cash flow growth:
  - We obtained management's supporting evidence such as the Board approved budget and 3 year strategic plan and agreed the forecast cash flows and underlying assumptions to these, and assessed historical evidence of CGU growth rates.
  - We also obtained evidence through our own independent research. This included evidence supporting forecast production levels for the CGUs end customer markets, historical evidence of Vesuvius growth rates and of recoveries in cyclical end markets.
  - We further considered market valuation evidence such as current and target share price and understood any material differences.
  - Our audit evidence corroborated trends in the cash flows modelled, although in year 3 and into perpetuity estimation uncertainty increases (see our sensitivities below).
- We utilised internal valuations experts to support our audit procedures over the discount rate and long term growth rate assumptions used in the impairment model and sensitised the impacts of changes in the discount rate within our view of a reasonable range.
- We remained professionally sceptical of the impacts of forecasting uncertainty, particularly where evidence in later years is more judgemental as set out above. We determined alternative sensitivity scenarios to ascertain the extent of changes in projections that would be required for the goodwill and other non-financial assets to be impaired. These included scaling back year 3 forecasts and factoring in historical levels of forecasting inaccuracy. We also evaluated the sensitivity of impairment model cash flows to the impacts of climate change set out in the 'Sustainability' section of the Strategic report, including identified costs of working to 'net zero' and the potential financial impacts of the scenarios for temperature change. We did not identify reasonable sensitivities that would result in impairment of any of the CGUs being tested.

In addition to the above procedures (which comprised our area of focus), we instructed our component audit teams to evaluate the appropriateness of management impairment indicator assessments performed within territory components and to also assess any material impacts of climate change. These assessments focused on individual or groups of assets below the levels of the CGUs. Our component teams, under our supervision, did not identify any additional impairments required or inconsistent findings to our Group level assessment in respect of climate change. From our procedures we concluded that estimates and key assumptions made by management in performing impairment testing, including reasonably possible downside sensitivities which showed no scenarios of impairment, were supported. Appropriate disclosures have been included within the Annual Report. Critical Accounting Judgements and Estimates (Note 3) accordingly highlights this area as a critical accounting estimate although it is not expected to materially impact the financial statements in the next 12 months.
Our findings were discussed with the Audit Committee.

Independent auditors' report to the members of Vesuvius plc continued

Key audit matter	How our audit addressed the key audit matter
Provisions for exposures (Group) The Group holds a provision for 'Disposal, closure and environmental costs' (which includes provisions relating to legacy legal matters for closed businesses) amounting to £41.8 million (2020: £42.2 million). Determining the quantum of this provision involves modelling and estimation of expected future legal claim volumes and amounts. It also requires the directors to use judgement to determine whether associated insurance recoverable amounts should be recognised within assets. We focused on this area due to the material quantum of the provision and associated insurance asset, and the judgement and estimates involved in determining its valuation. Refer to Critical Accounting Judgements and Estimates (Note 3), Trade and Other Receivables (Note 18), Provisions (Note 30), Contingent Liabilities (Note 32) and Significant issues and material judgements in the Audit Committee report.	Our audit procedures included: – Obtaining management's model of the estimated legal costs, associated insurance recoverable and testing the mathematical accuracy and integrity of this model. – We discussed claims arising, settlements made and expected trends with management's in-house and external legal experts. – We tested the accuracy of historical source data which is used to determine estimates of future trends of volumes and amounts of claims, to supporting claim documentation. – We utilised our own auditor's expert to support our audit of the key assumptions and to provide a view of a range of potential outcomes due to the estimation uncertainty involved. We independently sensitised the model for changes in the average cost of claims, increase in the level of larger value claims and duration over which claims are expected to be received. – We inspected evidence of available insurance cover, the routine and consistent collection of this and considered the financial condition of insurance providers to gain evidence over the recognition and recoverability of the insurance asset. We also verified that this was appropriately presented as gross of the associated provisions (within 'Other receivables'). From our procedures, we concluded the amount of the provision held was within our acceptable range, albeit towards the optimistic end of the range. We evaluated the level of disclosures and that these adequately explain estimation uncertainty of key assumptions including over the long term. Critical Accounting Judgements and Estimates (Note 3) highlights this area as a critical accounting estimate although it is not expected to materially impact the financial statements in the next 12 months. Our findings were discussed with the Audit Committee.
Impairment of investment in subsidiaries (Company) The Company holds investments in subsidiaries with a total carrying amount of £1,778.0 million at 31 December 2021 (2020: £1,778.0 million) in addition to amounts owed to Subsidiary undertakings of £977.4 million (2020: £953.5 million). IAS 36 'Impairment of assets' requires management to consider whether there are any indicators of impairment in respect of non-financial assets. Due to the quantum of the carrying amount and levels of estimation uncertainty that exist similar to assumptions used in testing for impairment of goodwill and other non-financial assets (Group) this was an area of focus for the audit of the Company. Consistent with the prior year management performed an impairment test at 31 October 2021. This utilises cash flow forecasts used for testing for impairment of the Group's goodwill together with additional considerations of cash flows relevant to the subsidiaries that the Company owns. The judgements and estimates required to determine the cash flow forecasts are aligned with those set out in 'Impairment of goodwill and other non-financial assets (Group)' above. Refer to Investments (Note 7), Other Creditors including Taxation and Social Security (Note 8), Critical Accounting Judgements and Estimates (Note 3) in the Company financial statements and Significant issues and material judgements in the Audit Committee report.	Our audit procedures included: – We assessed the results of the Value in Use model used for the impairment test for goodwill and other non-financial assets, together with adjustments made to reflect cash inflows to subsidiaries due from the Company. – Our testing of the Group Value in Use model, including procedures performed over management's model and evidence obtained in respect of key assumptions made is set out in Key audit matter 'Impairment of goodwill and other non-financial assets'. We also compared the carrying value of the investment in subsidiaries and the Group Value in Use to the market capitalisation and market valuation expectations. – We performed sensitivity analyses including consideration of historical forecasting inaccuracies which showed there was no reasonably possible scenarios of impairment when taking account of estimation uncertainty in key assumptions. – This indicated headroom in the determined Value in Use and that the investment in subsidiaries balance was not impaired. We reviewed financial statement disclosures and these are consistent with the results of management's testing and our audit evidence Critical Accounting Judgements and Estimates (Note 3) in the Company financial statements highlights this area as a critical accounting estimate although it is not expected to materially impact the financial statements in the next 12 months. Our findings were discussed with the Audit Committee.

How we tailored the audit scope

We tailored the scope of our audit to ensure that we performed enough work to be able to give an opinion on the financial statements as a whole, taking into account the structure of the Group and the Company, the accounting processes and controls, and the industry in which they operate.

The Vesuvius Group (Vesuvius plc together with its subsidiaries) has operations in 40 countries, including 75 sales offices and has 54 production sites. The Group consolidates financial information through reporting from its components which include divisions and functions at these sites.

Our audit scope was determined by considering the significance of the component's contribution to profit before tax and separately reported items (Headline profit before tax). We also evaluated contribution to revenue and to other individual financial statement line items, with specific consideration to obtaining sufficient coverage over areas of heightened risk and locations.

Due to the geographically dispersed nature of the Group's activities we determined there were no financially significant components. The audit scope comprised 18 components for which we determined that full scope audits would need to be performed and 15 components for which specific audit procedures on certain balances and transactions were performed by either component teams or the Group team. This collectively provided audit coverage of 70% of the Group's revenue, 67% of the Group's profit before tax and 69% of the Group's Headline profit before tax. This, together with the additional procedures performed at the Group level, including testing the consolidation process, gave us the evidence we needed for our opinion on the financial statements as a whole.

In establishing the overall approach to the Group audit, we determined the type of work that needed to be performed by us, as the Group audit team, or by component auditors in both PwC network firms and other audit firms. Where the work was performed by component auditors, we determined the level of involvement and oversight we needed to have in the audit work at those reporting units to be able to conclude whether sufficient appropriate audit evidence had been obtained as a basis for our opinion on the financial statements as a whole. This was achieved through:

– Issuance of formal instructions and regular communications with the component auditors throughout the audit;
– Attendance at audit clearance meetings by Group audit senior team members;
– Interactions with local management;
– Our direction and supervision of the audit approach and review of audit findings; and
– For material components, meetings with the Group audit quality review partner and our review of selected audit workpapers of the component auditors'.

The Group audit team also performed the audit of the Company and other procedures over those components of the Group not subject to full scope audits.

Materiality

The scope of our audit was influenced by our application of materiality. We set certain quantitative thresholds for materiality. These, together with qualitative considerations, helped us to determine the scope of our audit and the nature, timing and extent of our audit procedures on the individual financial statement line items and disclosures and in evaluating the effect of misstatements, both individually and in aggregate on the financial statements as a whole.

Based on our professional judgement, we determined materiality for the financial statements as a whole as follows:

	Financial statements – Group	Financial statements – Company
Overall materiality	£6,300,000 (2020: £7,000,000).	£6,300,000 (2020: £7,000,000).
How we determined it	Approximately 4.6% of profit before tax and separately reported items ('Headline profit before tax').	1.0% of total assets, capped at the level of overall Group materiality.
Rationale for benchmark applied	We believe that profit before tax and separately reported items ('Headline profit before tax') provides us with an appropriate basis for determining our overall Group audit materiality given our understanding that it is a key measure for users of the financial statements both internally and externally. Headline profit before tax is an Alternative Performance Measure presented and defined in the Annual Report and Financial Statements. (2020: In the prior year, due to the significant volatility caused in the results by COVID-19, a 3 year average of the Headline profit before tax was used as a benchmark to provide a more normalised threshold for determining materiality. In the current year, we reverted to determining materiality based only on the 2021 performance.)	We believe that total assets is an appropriate basis for determining materiality for the Company, given this entity is an investment holding company and this is an accepted auditing benchmark. The materiality was capped to the level of Group overall materiality. The Company is not an in-scope component for our Group audit. (2020: 1% of total assets, capped at the level of overall Group materiality.)

Independent auditors' report to the members of Vesuvius plc continued

For each component in the scope of our Group audit, we allocated a materiality that is less than our overall Group materiality. The range of materiality allocated across components was £400,000 and £3,900,000. Certain components were audited to a local statutory audit materiality that was also less than our overall Group materiality.

We use performance materiality to reduce to an appropriately low level the probability that the aggregate of uncorrected and undetected misstatements exceeds overall materiality. Specifically, we use performance materiality in determining the scope of our audit and the nature and extent of our testing of account balances, classes of transactions and disclosures, for example in determining sample sizes. Our performance materiality was 75% (2020: 75%) of overall materiality, amounting to £4,730,000 (2020: £5,250,000) for the Group financial statements and £4,730,000 (2020: £5,250,000) for the Company financial statements.

In determining the performance materiality, we considered a number of factors – the history of misstatements, risk assessment and aggregation risk and the effectiveness of controls – and concluded that an amount at the upper end of our normal range was appropriate.

We agreed with the Audit Committee that we would report to them misstatements identified during our audit above £350,000 (Group audit) (2020: £350,000) and £350,000 (Company audit) (2020: £350,000) as well as misstatements below those amounts that, in our view, warranted reporting for qualitative reasons.

Conclusions relating to going concern

Our evaluation of the directors' assessment of the Group's and the Company's ability to continue to adopt the going concern basis of accounting included:

- Evaluating management's base case and severe but plausible downside case for liquidity and available financial resources and obtaining supporting evidence for key assumptions. This included agreeing the underlying cash flow projections to the Board approved forecast, assessing how these forecasts were compiled and assessing the historical accuracy of the forecasts. We also evaluated current performance and available financing facilities and related liquidity headroom.
- Testing the accuracy of cash flow models used to assess available liquidity during the going concern periods disclosed.
- Inspected facility agreements to ensure key terms were considered including covenants, and evaluated covenant compliance during the year.
- Determining alternative sensitivity scenarios to ascertain the impact of changes in assumptions. These included scaling back forecasts and increasing working capital as a percentage of forecast revenue.
- Reading management's disclosures in the financial statements and relevant 'other information' in the Annual Report, and assessing consistency with the financial statements and our knowledge based on our audit.

Based on the work we have performed, we have not identified any material uncertainties relating to events or conditions that, individually or collectively, may cast significant doubt on the Group's and the Company's ability to continue as a going concern for a period of at least twelve months from when the financial statements are authorised for issue.

In auditing the financial statements, we have concluded that the directors' use of the going concern basis of accounting in the preparation of the financial statements is appropriate.

However, because not all future events or conditions can be predicted, this conclusion is not a guarantee as to the Group's and the Company's ability to continue as a going concern.

In relation to the directors' reporting on how they have applied the UK Corporate Governance Code, we have nothing material to add or draw attention to in relation to the directors' statement in the financial statements about whether the directors considered it appropriate to adopt the going concern basis of accounting.

Our responsibilities and the responsibilities of the directors with respect to going concern are described in the relevant sections of this report.

Reporting on other information

The other information comprises all of the information in the Annual Report other than the financial statements and our auditors' report thereon. The directors are responsible for the other information, which includes reporting based on the Task Force on Climate-related Financial Disclosures (TCFD) recommendations. Our opinion on the financial statements does not cover the other information and, accordingly, we do not express an audit opinion or, except to the extent otherwise explicitly stated in this report, any form of assurance thereon.

In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If we identify an apparent material inconsistency or material misstatement, we are required to perform procedures to conclude whether there is a material misstatement of the financial statements or a material misstatement of the other information. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report based on these responsibilities.

With respect to the Strategic report and Directors' Report, we also considered whether the disclosures required by the UK Companies Act 2006 have been included.

Based on our work undertaken in the course of the audit, the Companies Act 2006 requires us also to report certain opinions and matters as described below.

Strategic report and Directors' Report

In our opinion, based on the work undertaken in the course of the audit, the information given in the Strategic report and Directors' Report for the year ended 31 December 2021 is consistent with the financial statements and has been prepared in accordance with applicable legal requirements.

In light of the knowledge and understanding of the Group and Company and their environment obtained in the course of the audit, we did not identify any material misstatements in the Strategic report and Directors' Report.

Directors' Remuneration

In our opinion, the part of the Directors' Remuneration Report to be audited has been properly prepared in accordance with the Companies Act 2006.

Corporate governance statement

The Listing Rules require us to review the directors' statements in relation to going concern, longer-term viability and that part of the corporate governance statement relating to the Company's compliance with the provisions of the UK Corporate Governance Code specified for our review. Our additional responsibilities with respect to the corporate governance statement as other information are described in the Reporting on other information section of this report.

Based on the work undertaken as part of our audit, we have concluded that each of the following elements of the corporate governance statement is materially consistent with the financial statements and our knowledge obtained during the audit, and we have nothing material to add or draw attention to in relation to:

- The directors' confirmation that they have carried out a robust assessment of the emerging and principal risks;
- The disclosures in the Annual Report that describe those principal risks, what procedures are in place to identify emerging risks and an explanation of how these are being managed or mitigated;
- The directors' statement in the financial statements about whether they considered it appropriate to adopt the going concern basis of accounting in preparing them, and their identification of any material uncertainties to the Group's and Company's ability to continue to do so over a period of at least twelve months from the date of approval of the financial statements;
- The directors' explanation as to their assessment of the Group's and Company's prospects, the period this assessment covers and why the period is appropriate; and
- The directors' statement as to whether they have a reasonable expectation that the Company will be able to continue in operation and meet its liabilities as they fall due over the period of its assessment, including any related disclosures drawing attention to any necessary qualifications or assumptions.

Independent auditors' report to the members of Vesuvius plc continued

Our review of the directors' statement regarding the longer-term viability of the Group was substantially less in scope than an audit and only consisted of making inquiries and considering the directors' process supporting their statement; checking that the statement is in alignment with the relevant provisions of the UK Corporate Governance Code; and considering whether the statement is consistent with the financial statements and our knowledge and understanding of the Group and Company and their environment obtained in the course of the audit.

In addition, based on the work undertaken as part of our audit, we have concluded that each of the following elements of the corporate governance statement is materially consistent with the financial statements and our knowledge obtained during the audit:

- The directors' statement that they consider the Annual Report, taken as a whole, is fair, balanced and understandable, and provides the information necessary for the members to assess the Group's and Company's position, performance, business model and strategy;
- The section of the Annual Report that describes the review of effectiveness of risk management and internal control systems; and
- The section of the Annual Report describing the work of the Audit Committee.

We have nothing to report in respect of our responsibility to report when the directors' statement relating to the Company's compliance with the Code does not properly disclose a departure from a relevant provision of the Code specified under the Listing Rules for review by the auditors.

Responsibilities for the financial statements and the audit

Responsibilities of the directors for the financial statements

As explained more fully in the Statement of Directors' Responsibilities in respect of the Financial Statements, the directors are responsible for the preparation of the financial statements in accordance with the applicable framework and for being satisfied that they give a true and fair view. The directors are also responsible for such internal control as they determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the directors are responsible for assessing the Group's and the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Group or the Company or to cease operations, or have no realistic alternative but to do so.

Auditors' responsibilities for the audit of the financial statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs (UK) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

Irregularities, including fraud, are instances of non-compliance with laws and regulations. We design procedures in line with our responsibilities, outlined above, to detect material misstatements in respect of irregularities, including fraud. The extent to which our procedures are capable of detecting irregularities, including fraud, is detailed below.

Based on our understanding of the Group and industry, we identified that the principal risks of non-compliance with laws and regulations related to income and other tax, international trade restrictions, health and safety, environmental and anti-bribery, and we considered the extent to which non-compliance might have a material effect on the financial statements. We also considered those laws and regulations that have a direct impact on the financial statements such as the Companies Act 2006 and Listing Rules of the Financial Conduct Authority (FCA). We evaluated management's incentives and opportunities for fraudulent manipulation of the financial statements (including the risk of override of controls), and determined that the principal risks were related to posting inappropriate journal entries and management bias in accounting estimates. The Group engagement team shared this risk assessment with the component auditors so that they could include appropriate audit procedures in response to such risks in their work.

Audit procedures performed by the Group engagement team and/or component auditors included:

- Enquiries of Group and local management, those charged with governance, internal audit and the Group's legal counsel (internal and, where relevant, external), including consideration of known or suspected instances of non-compliance with laws and regulations and fraud;
- Understanding and evaluation of the design and implementation of management's controls designed to prevent and detect irregularities, including compliance, whistle-blowing arrangements and the results of management's investigation of such matters;
- Inspecting management reports and Board minutes in relation to health and safety and other compliance matters;
- Reading key correspondence with regulatory authorities, including in respect of uncertain tax positions;
- Testing assumptions and judgements made by management in their critical accounting estimates, in particular relating to impairment of goodwill and non-financial assets and provisions for exposures (see related key audit matters section of this report);
- Identifying and testing journal entries, in particular any journal entries posted with unusual account combinations including in respect of journals posted to revenue, cash and other credits to non-revenue accounts in the Group Income Statement; and
- Obtained an understanding of the nature of any trade restrictions and our component auditors tested relevant supporting evidence that exists locally.

There are inherent limitations in the audit procedures described above. We are less likely to become aware of instances of non-compliance with laws and regulations that are not closely related to events and transactions reflected in the financial statements. Also, the risk of not detecting a material misstatement due to fraud is higher than the risk of not detecting one resulting from error, as fraud may involve deliberate concealment by, for example, forgery or intentional misrepresentations, or through collusion.

Our audit testing might include testing complete populations of certain transactions and balances, possibly using data auditing techniques. However, it typically involves selecting a limited number of items for testing, rather than testing complete populations. We will often seek to target particular items for testing based on their size or risk characteristics. In other cases, we will use audit sampling to enable us to draw a conclusion about the population from which the sample is selected.

A further description of our responsibilities for the audit of the financial statements is located on the FRC's website at: www.frc.org.uk/auditorsresponsibilities. This description forms part of our auditors' report.

Use of this report

This report, including the opinions, has been prepared for and only for the Company's members as a body in accordance with Chapter 3 of Part 16 of the Companies Act 2006 and for no other purpose. We do not, in giving these opinions, accept or assume responsibility for any other purpose or to any other person to whom this report is shown or into whose hands it may come save where expressly agreed by our prior consent in writing.

Other required reporting

Companies Act 2006 exception reporting

Under the Companies Act 2006 we are required to report to you if, in our opinion:

- we have not obtained all the information and explanations we require for our audit; or
- adequate accounting records have not been kept by the Company, or returns adequate for our audit have not been received from branches not visited by us; or
- certain disclosures of directors' remuneration specified by law are not made; or
- the Company financial statements and the part of the Directors' Remuneration Report to be audited are not in agreement with the accounting records and returns.

We have no exceptions to report arising from this responsibility.

Appointment

Following the recommendation of the Audit Committee, we were appointed by the members on 10 May 2017 to audit the financial statements for the year ended 31 December 2017 and subsequent financial periods. The period of total uninterrupted engagement is 5 years, covering the years ended 31 December 2017 to 31 December 2021.

Other matter

In due course, as required by the Financial Conduct Authority Disclosure Guidance and Transparency Rule 4.1.14R, these financial statements will form part of the ESEF-prepared annual financial report filed on the National Storage Mechanism of the Financial Conduct Authority in accordance with the ESEF Regulatory Technical Standard ('ESEF RTS'). This auditors' report provides no assurance over whether the annual financial report will be prepared using the single electronic format specified in the ESEF RTS.

Darryl Phillips (Senior Statutory Auditor)
for and on behalf of PricewaterhouseCoopers LLP
Chartered Accountants and Statutory Auditors
London
3 March 2022

Financial Statements

We think beyond today's industrial processes

and shape the future through mechatronics

Group Income Statement

For the year ended 31 December 2021

	Notes	2021 Headline performance[1] £m	2021 Separately reported items[1] £m	2021 Total £m	2020 Headline performance[1] £m	2020 Separately reported items[1] £m	2020 Total £m
Continuing operations							
Revenue	4, 5	1,642.9	–	1,642.9	1,458.3	–	1,458.3
Manufacturing costs		(1,222.8)	–	(1,222.8)	(1,084.7)	–	(1,084.7)
Administration, selling and distribution costs		(277.7)	–	(277.7)	(272.2)	–	(272.2)
Trading profit [2]	5	142.4	–	142.4	101.4	–	101.4
Amortisation of acquired intangible assets	16	–	(9.7)	(9.7)	–	(9.9)	(9.9)
Restructuring charges	7	–	–	–	–	(6.1)	(6.1)
Vacant site remediation costs	7	–	–	–	–	(10.3)	(10.3)
GMP equalisation charge	26	–	–	–	–	(0.8)	(0.8)
Operating profit	6	142.4	(9.7)	132.7	101.4	(27.1)	74.3
Finance expense		(13.7)	–	(13.7)	(18.9)	–	(18.9)
Finance income		7.3	–	7.3	8.0	–	8.0
Net finance costs	9	(6.4)	–	(6.4)	(10.9)	–	(10.9)
Share of post-tax profit of joint ventures and associates	33	1.3	–	1.3	1.1	–	1.1
Profit before tax		137.3	(9.7)	127.6	91.6	(27.1)	64.5
Income tax charge	10	(35.9)	16.2	(19.7)	(24.4)	5.7	(18.7)
Profit		101.4	6.5	107.9	67.2	(21.4)	45.8
Profit attributable to:							
Owners of the Parent	11	95.6	6.5	102.1	62.7	(21.4)	41.3
Non-controlling interests		5.8	–	5.8	4.5	–	4.5
Profit		101.4	6.5	107.9	67.2	(21.4)	45.8
Earnings per share – pence	11						
Total operations – basic				37.7			15.3
– diluted				37.5			15.2

1. Headline performance and Separately reported items are non-GAAP measures. Headline performance is defined in Note 4.1 and Separately reported items is defined in Note 2.5.
2. Trading profit is a non-GAAP measure and is defined in Note 4.4.

The above results were derived from continuing operations. The separately reported items would form part of Administration, selling and distribution costs if classified within Headline performance, which including these amounts would total £287.4m (2020: £299.3m).

Group Statement of Comprehensive Income

For the year ended 31 December 2021

	Notes	2021 £m	2020 £m
Profit		**107.9**	45.8
Items that will not subsequently be reclassified to Income Statement			
Remeasurement of defined benefit liabilities/assets	26.6	**(80.6)**	7.7
Income tax relating to items not reclassified	10.4	**12.5**	(3.2)
Items that may subsequently be reclassified to Income Statement			
Exchange differences on translation of the net assets of foreign operations		**(31.4)**	(14.9)
Exchange differences on translation of net investment hedges	23	**14.4**	(9.7)
Net change in costs of hedging		**(1.2)**	0.4
Change in the fair value of the hedging instrument		**2.2**	(8.1)
Amounts reclassified from the income statement		**(0.7)**	6.3
Other comprehensive loss, net of income tax		**(84.8)**	(21.5)
Total comprehensive income		**23.1**	24.3
Total comprehensive income attributable to:			
Owners of the Parent		**17.7**	22.0
Non-controlling interests		**5.4**	2.3
Total comprehensive income		**23.1**	24.3

The above results were derived from continuing operations.

Group Statement of Cash Flows

For the year ended 31 December 2021

	Notes	2021 £m	2020 £m
Cash flows from operating activities			
Cash generated from operations	12	**82.9**	193.7
Interest paid		**(11.9)**	(18.9)
Interest received		**4.3**	5.2
Income taxes paid		**(30.1)**	(27.5)
Net cash inflow from operating activities		**45.2**	152.5
Cash flows from investing activities			
Capital expenditure		**(45.5)**	(40.5)
Proceeds from the sale of property, plant and equipment		**1.2**	1.1
Acquisition of subsidiaries and joint ventures, net of cash acquired	20	**(43.7)**	(1.4)
Dividends received from joint ventures		**1.0**	2.3
Net cash outflow from investing activities		**(87.0)**	(38.5)
Net cash (outflow)/inflow before financing activities		**(41.8)**	114.0
Cash flows from financing activities			
Proceeds from borrowings	14	**89.4**	320.4
Repayment of borrowings	14	**(31.4)**	(438.6)
Settlement of derivatives	25	**–**	1.4
Purchase of ESOP shares	22	**(1.1)**	–
Dividends paid to equity shareholders	24	**(55.5)**	(8.4)
Dividends paid to non-controlling shareholders		**(2.2)**	(1.9)
Net cash outflow from financing activities		**(0.8)**	(127.1)
Net decrease in cash and cash equivalents	14	**(42.6)**	(13.1)
Cash and cash equivalents at 1 January		**206.8**	222.1
Effect of exchange rate fluctuations on cash and cash equivalents	14	**(1.8)**	(2.2)
Cash and cash equivalents at 31 December	13	**162.4**	206.8

Alternative performance measure (non-statutory):

	Notes	2021 £m	2020 £m
Free cash flow	4.11		
Net cash inflow from operating activities		**45.2**	152.5
Capital expenditure		**(45.5)**	(40.5)
Proceeds from the sale of property, plant and equipment		**1.2**	1.1
Dividends received from joint ventures		**1.0**	2.3
Dividends paid to non-controlling shareholders		**(2.2)**	(1.9)
Free cash flow	4.11	**(0.3)**	113.5

Group Balance Sheet

As at 31 December 2021

	Notes	2021 £m	2020 £m
Assets			
Property, plant and equipment	15	**352.5**	337.5
Intangible assets	16	**696.8**	696.1
Employee benefits – surpluses	26	**25.1**	117.1
Interests in joint ventures and associates	33	**12.8**	12.1
Investments		**0.5**	0.7
Deferred tax assets	10	**104.2**	96.1
Other receivables	18	**16.2**	18.6
Total non-current assets		**1,208.1**	1,278.2
Cash and short-term deposits	13	**169.1**	209.7
Inventories	19	**299.4**	187.3
Trade and other receivables	18	**445.2**	369.9
Income tax receivable	10	**7.6**	3.7
Derivative financial instruments	25	**0.1**	0.2
Assets classified as held for sale		**–**	0.9
Total current assets		**921.4**	771.7
Total assets		**2,129.5**	2,049.9
Equity			
Issued share capital	21	**27.8**	27.8
Retained earnings	22	**2,483.4**	2,502.9
Other reserves	23	**(1,467.6)**	(1,451.3)
Equity attributable to the owners of the Parent		**1,043.6**	1,079.4
Non-controlling interests		**54.6**	51.4
Total equity		**1,098.2**	1,130.8
Liabilities			
Interest-bearing borrowings	25	**329.9**	333.1
Employee benefits – liabilities	26	**102.1**	119.2
Other payables	28	**11.6**	13.2
Provisions	30	**32.6**	34.0
Deferred tax liabilities	10	**29.6**	43.9
Derivative financial instruments	25	**2.5**	7.0
Total non-current liabilities		**508.3**	550.4
Interest-bearing borrowings	25	**113.8**	45.0
Trade and other payables	28	**372.9**	288.7
Income tax payable	10	**18.1**	12.2
Provisions	30	**18.1**	22.8
Derivative financial instruments	25	**0.1**	–
Total current liabilities		**523.0**	368.7
Total liabilities		**1,031.3**	919.1
Total equity and liabilities		**2,129.5**	2,049.9

Company number 8217766

The financial statements on pages 171 to 228 were approved and authorised for issue by the Directors on 3 March 2022 and signed on their behalf by:

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

Group Statement of Changes in Equity

For the year ended 31 December 2021

	Issued share capital £m	Other reserves £m	Retained earnings £m	Owners of the Parent £m	Non-controlling interests £m	Total equity £m
As at 1 January 2020	**27.8**	**(1,427.5)**	**2,463.1**	**1,063.4**	**51.0**	**1,114.4**
Profit	**–**	**–**	**41.3**	**41.3**	**4.5**	**45.8**
Remeasurement of defined benefit liabilities/assets	–	–	7.7	7.7	–	7.7
Income tax relating to items not reclassified	–	–	(3.2)	(3.2)	–	(3.2)
Exchange differences on translation of the net assets of foreign operations	–	(12.7)	–	(12.7)	(2.2)	(14.9)
Exchange differences on translation of net investment hedges	–	(9.7)	–	(9.7)	–	(9.7)
Net change in costs of hedging	–	0.4	–	0.4	–	0.4
Change in the fair value of the hedging instrument	–	(8.1)	–	(8.1)	–	(8.1)
Amounts reclassified from the income statement	–	6.3	–	6.3	–	6.3
Income tax relating to items that may be reclassified	–	–	–	–	–	–
Other comprehensive income/(loss) net of income tax	**–**	**(23.8)**	**4.5**	**(19.3)**	**(2.2)**	**(21.5)**
Total comprehensive income/(loss)	**–**	**(23.8)**	**45.8**	**22.0**	**2.3**	**24.3**
Recognition of share-based payments	–	–	2.4	2.4	–	2.4
Dividends paid (Note 24)	–	–	(8.4)	(8.4)	(1.9)	(10.3)
Total transactions with owners	**–**	**–**	**(6.0)**	**(6.0)**	**(1.9)**	**(7.9)**
As at 31 December 2020	**27.8**	**(1,451.3)**	**2,502.9**	**1,079.4**	**51.4**	**1,130.8**
As at 1 January 2021	**27.8**	**(1,451.3)**	**2,502.9**	**1,079.4**	**51.4**	**1,130.8**
Profit	**–**	**–**	**102.1**	**102.1**	**5.8**	**107.9**
Remeasurement of defined benefit liabilities/assets	–	–	(80.6)	(80.6)	–	(80.6)
Income tax relating to items not reclassified	–	–	12.5	12.5	–	12.5
Exchange differences on translation of the net assets of foreign operations	–	(31.0)	–	(31.0)	(0.4)	(31.4)
Exchange differences on translation of net investment hedges	–	14.4	–	14.4	–	14.4
Net change in costs of hedging	–	(1.2)	–	(1.2)	–	(1.2)
Change in the fair value of the hedging instrument	–	2.2	–	2.2	–	2.2
Amounts reclassified from the income statement	–	(0.7)	–	(0.7)	–	(0.7)
Income tax relating to items that may be reclassified	–	–	–	–	–	–
Other comprehensive (loss) net of income tax	**–**	**(16.3)**	**(68.1)**	**(84.4)**	**(0.4)**	**(84.8)**
Total comprehensive income/(loss)	**–**	**(16.3)**	**34.0**	**17.7**	**5.4**	**23.1**
Recognition of share-based payments	–	–	3.1	3.1	–	3.1
Purchase of ESOP shares	–	–	(1.1)	(1.1)	–	(1.1)
Dividends paid (Note 24)	–	–	(55.5)	(55.5)	(2.2)	(57.7)
Total transactions with owners	**–**	**–**	**(53.5)**	**(53.5)**	**(2.2)**	**(55.7)**
As at 31 December 2021	**27.8**	**(1,467.6)**	**2,483.4**	**1,043.6**	**54.6**	**1,098.2**

Notes to the Group Financial Statements

1. General Information

Vesuvius plc ('Vesuvius' or 'the Company') is a public company limited by shares. It is incorporated and domiciled in England and Wales, United Kingdom, and listed on the London Stock Exchange. The nature of the operations and principal activities of the Company and its subsidiary and joint venture companies ('the Group') is set out in the Strategic Report on pages 1 to 101. The address of its registered office is 165 Fleet Street, London EC4A 2AE.

2. Basis of Preparation

2.1 Basis of accounting

The Group financial statements have been prepared in accordance with UK-adopted international accounting standards (IFRS) and with the requirements of the Companies Act 2006 as applicable to companies reporting under those standards. The financial statements have been prepared under the historical cost convention, with the exception of fair value measurement applied to defined benefit pension plans, investments and derivative financial instruments.

2.2 Basis of consolidation

The Group financial statements incorporate the financial statements of the Company and entities controlled directly and indirectly by the Company (its 'subsidiaries'). Control exists when the Company has the power to direct the relevant activities of an entity that significantly affect the entity's return so as to have rights to the variable return from its activities. In assessing whether control exists, potential voting rights that are currently exercisable are taken into account. The results of subsidiaries acquired or disposed of during the year are included in the Group Income Statement from the effective date of acquisition or up to the effective date of disposal, as appropriate.

The principal accounting policies applied in the preparation of these Group financial statements are set out in the Notes. These policies have been consistently applied to all of the years presented, unless otherwise stated. Where necessary, adjustments are made to the financial statements of subsidiaries to bring their accounting policies into line with those detailed herein to ensure that the Group financial statements are prepared on a consistent basis. All intra-Group transactions, balances, income and expenses are eliminated on consolidation.

Non-controlling interests in the net assets of consolidated subsidiaries are identified separately from the Group's interest therein. Non-controlling interests consist of the amount of those interests at the date of the original business combination together with the non-controlling interests' share of profit or loss, each component of other comprehensive income, less dividends paid since the date of the combination. Total comprehensive income is attributed to the non-controlling interests, even if this results in the non-controlling interests having a deficit balance.

2.3 Going concern

The Group's available committed liquidity stood at £456m at year-end 2021, up from £437m at year-end 2020, as a result of an increase in the Group's committed facilities partially offset by additional borrowings under these facilities. The Directors have prepared cash flow forecasts for the Group for a period in excess of 12 months from the date of approval of the financial statements. These forecasts reflect an assessment of current and future end-market conditions and their impact on the Group's future trading performance.

The analysis undertaken includes a plausible but severe downside scenario, based on an assumed protracted COVID-19 related demand impact, despite emerging confidence that the worst of the pandemic may be behind us. This downside scenario assumes a decline in business activity and profitability in 2022 and 2023 to the level achieved in H2 2020, the period half-year most severely impacted by COVID-19. On a full-year basis relative to 2021, this implies a c.14% decline in sales and a c.34% decline in trading profit. Even in this downside scenario, the forecasts show that the Group's maximum net debt/EBITDA (pre-IFRS 16 in line with the covenant calculation) does not exceed 1.3x, compared to a leverage covenant of 3.25x.

The forecasts show that the Group will be able to operate within the current committed debt facilities and show continued compliance with the Company's financial covenants. On the basis of the exercise described above and the Group's available committed debt facilities, the Directors consider that the Group and the Company have adequate resources to continue in operational existence for a period of at least 12 months from the date of signing of these financial statements. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

2. Basis of Preparation continued

2.4 Functional and presentation currency

The financial statements are presented in millions of pounds sterling, which is the functional currency of the Company, and rounded to one decimal place. Foreign operations are included in accordance with the policies set out in Note 25.1.

2.5 Disclosure of 'separately reported items'

Columnar presentation

The Group has adopted a columnar presentation for its Group Income Statement, to separately identify headline performance results, as the Directors consider that this gives a useful view of the core results of the ongoing business. As part of this presentation format, the Group has adopted a policy of disclosing separately on the face of its Group Income Statement, within the column entitled 'Separately reported items', the effect of any components of financial performance for which the Directors consider separate disclosure would assist users both in a useful understanding of the financial performance achieved for a given year and in making projections of future results.

Separately reported items

Both materiality and the nature of the components of income and expense are considered in deciding upon such presentation. Such items may include, inter alia, the financial effect of exceptional items which occur infrequently, such as major restructuring activity (which may require more than one year to complete), significant movement in the Group's deferred tax balances such as was, for example, caused by the impact of US tax reform in 2017, items reported separately for consistency, such as amortisation charges relating to acquired intangible assets, profits or losses arising on the disposal of continuing or discontinued operations and the taxation impact of the aforementioned items reported separately.

The amortisation charge in respect of intangible assets recognised on business combinations is excluded from the trading results of the Group since they are non-cash charges and are not considered reflective of the core trading performance of the Group.

In its adoption of this policy, the Company applies an even-handed approach to both gains and losses and aims to be both consistent and clear in its accounting and disclosure of such items.

2.6 Consideration of climate change

In preparing the financial statements, we have considered the impact of climate change, particularly in the context of the disclosures included in the Strategic Report this year. There has not been a material impact on the financial reporting judgements and estimates arising from our considerations, consistent with our assessment that climate change is not expected to have a meaningful impact on the viability of the Group in the medium term. Specifically, we note that we have considered the impact of climate change on the carrying value and the estimation of useful lives of property, plant and equipment (see Note 15) and goodwill and intangibles (see Note 16).

2.7 Changes in accounting policies

There have been no changes in accounting policies during the year.

2.8 New and revised IFRS

Certain new accounting standards and interpretations have been published that are not mandatory for 31 December 2021 reporting periods and have not been early adopted by the Group. The Group's assessment of the impact of these new standards and interpretations is that they are not expected to have a significant impact on the Group's financial position, performance, cash flows and disclosures.

Benchmark reform

The replacement of Libor with alternative interest rate benchmarks is now well progressed and the Group has reviewed the impact of this on its financial statements.

The £385m central bank facility signed on 5 July 2021 provides for the use of SONIA and EURIBOR for GBP and EUR drawdowns respectively. USD Libor remains quoted until June 2023; a replacement reference rate for USD drawdowns will be agreed by that date as provided for within the terms of the facility.

The Group's US private placement notes and cross-currency interest rate swaps are not exposed to Libor rates and as a result are unaffected by the benchmark reform. The Group's £19m bilateral loan agreement was amended in October 2021 with GBP Libor replaced by SONIA.

The Group concludes that benchmark reform has no material impact on its financial statements. The Group also confirms it has made no changes to its risk management strategy as a result of benchmark reform.

Notes to the Group Financial Statements continued

3. Critical Accounting Judgements and Estimates

Determining the carrying amount of some assets and liabilities and amounts recognised as reported profit requires judgement and/or estimation of the effect of uncertain future events. The major sources of judgement and estimation uncertainty that have a significant risk of resulting in a material adjustment to the carrying amounts of assets and liabilities and amounts recognised as reported profit are noted below. As part of the evaluation of critical accounting judgements and key sources of estimation uncertainty, the Group has considered the implications of climate change on its operations and activities. All other accounting policies are included within the respective Notes to the Financial Statements.

3.1 Separately reported items (judgement)

In accordance with IAS 1, the Group has adopted a policy of disclosing separately on the face of its Group Income Statement, within the column entitled 'Separately reported items', the effect of any components of financial performance for which the Directors consider separate disclosure would assist both in a useful understanding of the financial performance achieved for a given year and in making projections of future results. Both materiality and the nature of the components of income and expense are considered in deciding upon such presentation. Such items may include, inter alia, the financial effect of exceptional items which occur infrequently, such as major restructuring activity, and items reported separately for consistency, such as amortisation charges relating to acquired intangible assets, profits or losses arising on the disposal of continuing or discontinued operations and the taxation impact of the aforementioned exceptional items and other items reported separately.

3.2 Deferred tax asset recognition (judgement)

The Directors apply judgement in determining whether temporary differences, including historical tax losses, should be recognised as deferred tax assets. The judgement considers the time horizon of expected utilisation and the history of taxable profits generated. See Note 10.4.

3.3 Operating segments for continuing operations (judgement)

The Group's operating segments are determined taking into consideration how the Group's components are reported to the Group's Chief Executive, who makes the key operating decisions and is responsible for allocating resources and assessing performance of the component. Taking into account the Group's management and internal reporting structure, the operating segments are Steel Flow Control, Steel Advanced Refractories, Steel Sensors & Probes, and the Foundry Division. The principal activities of each of these segments are described in the Strategic Report.

Steel Flow Control, Steel Advanced Refractories, and Steel Sensors & Probes operating segments are aggregated into the Steel reportable segment. In determining that aggregation is appropriate, judgement is applied which takes into account the economic characteristics of these operating segments, which include a similar nature of products, customers, production processes and margins.

3.4 Employee benefits (estimate)

The Group's financial statements include the costs and obligations associated with the provision of pension and other post-retirement benefits to current and former employees. It is the Directors' responsibility to set the assumptions used in determining the key elements of the costs of meeting such future obligations. These assumptions are set after consultation with the Group's actuaries and include those used to determine regular service costs and the financing elements related to the plans' assets and liabilities. Whilst the Directors believe that the assumptions used are appropriate, a change in the assumptions could affect the Group's profit and financial position. The pension obligations are most sensitive to a change in the discount rate and therefore could materially change in the next financial year if the discount rate changes significantly. Sensitivity disclosures are included in Note 26.3.

For the estimates below, the Group does not have any key assumptions concerning the future or other key sources of estimation uncertainty in the reporting period that are reasonably expected to have a significant risk of causing a material adjustment to the carrying amounts of assets/liabilities within the next financial year. Nonetheless, these estimates have the potential to materially vary over time and are therefore highlighted.

3. Critical Accounting Judgements and Estimates continued

3.5 Impairment testing of intangible assets (estimate)

Determining whether intangible assets are impaired requires an estimation of the recoverable amount, which is the higher of Value in Use and fair value less cost to sell, of the cash-generating units to which these assets have been allocated. The Value in Use calculation requires estimation of future cash flows expected to arise for the cash-generating unit, the selection of suitable discount rates and the estimation of long-term growth rates. As determining such assumptions is inherently uncertain and subject to future factors, there is the potential these may differ in subsequent periods and therefore materially change the conclusions reached. In light of this, consideration is made each year as to whether sensitivity disclosures are required for reasonably possible changes to assumptions. Sensitivity disclosures are included in Note 17.2.

3.6 Provisions (judgement and estimate)

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters. Some of the Group's subsidiaries are parties to legacy matter and other lawsuits, certain of which are insured claims, which have arisen in the ordinary course of the operations of the company involved. Some of these provisions relate to businesses that are closed or have been disposed of. Provisions are made for the expected amounts payable in respect of known or probable costs resulting both from these third-party lawsuits or other regulatory requirements. To the extent insurance is in place, an asset is recognised in other receivables in respect of associated insurance reimbursements.

As the resolution of many of the potential obligations for which provision is made is subject to legal or other regulatory process, it requires estimation of the timing, quantum and amount of associated outflows, which are subject to some uncertainty. The Directors use their judgement, using historical evidence, current information and expert experience, to determine whether to recognise a provision, and make appropriate estimates of provisions in the financial statements for amounts relating to such matters. Associated assets for insurance recoverable are recognised, which involves assessing the likelihood of insurance being paid, which is a critical judgement. The Directors have considered the available cover and the historical evidence to determine that this is virtually certain. Estimating the amount of provisions and insurance receivable is subject to estimation uncertainty. See Note 30 for further information.

4. Alternative Performance Measures

The Company uses a number of alternative performance measures (APMs) in addition to those reported in accordance with IFRS. The Directors believe that these APMs, listed below, are important when assessing the underlying financial and operating performance of the Group and its divisions, providing management with key insights and metrics in support of the ongoing management of the Group's performance and cash flow. A number of these align with Key Performance Indicators (KPIs) and other key metrics used in the business and therefore are considered useful to also disclose to the users of the financial statements. The following APMs do not have a standard definition prescribed by IFRS and therefore may not be directly comparable with similar measures presented by other companies.

4.1 Headline performance

Headline performance, reported separately on the face of the Group Income Statement, is from continuing operations and before items reported separately on the face of the Group Income Statement.

4.2 Underlying revenue, underlying trading profit and underlying return on sales

Underlying revenue, underlying trading profit and underlying return on sales are the headline equivalents of these measures after adjustments to exclude the effects of changes in exchange rates, business acquisitions and disposals. Reconciliations of underlying revenue and underlying trading profit can be found in the Financial review. Underlying revenue growth is one of the Group's KPIs and provides an important measure of organic growth of Group businesses between reporting periods by eliminating the impact of exchange rates, acquisitions and disposals.

4.3 Return on sales (ROS)

ROS is calculated as trading profit divided by revenue. It is one of the Group's KPIs and is used to assess the trading performance of Group businesses. A reconciliation of ROS is included in Note 5.3.

4.4 Trading profit/adjusted EBITA

Trading profit/adjusted EBITA is defined as operating profit before separately reported items. It is one of the Group's KPIs and is used to assess the trading performance of Group businesses. It is also used as one of the targets against which the annual bonuses of certain employees are measured.

4.5 Headline profit before tax

Headline profit before tax, reported separately on the face of the Group Income Statement, is calculated as the net total of trading profit, plus the Group's share of post-tax profit of joint ventures and total net finance costs associated with headline performance. It is one of the Group's KPIs and is used to assess the financial performance of the Group as a whole.

Notes to the Group Financial Statements continued

4. Alternative Performance Measures continued

4.6 Headline effective tax rate (ETR)

The Group's headline ETR is calculated on the income tax costs associated with headline performance, divided by headline profit before tax and before the Group's share of post-tax profit of joint ventures and associates.

4.7 Headline earnings

Headline earnings is profit after tax before separately reported items attributable to owners of the Parent.

4.8 Headline earnings per share

Headline earnings per share is calculated by dividing headline profit before tax less associated income tax costs, attributable to owners of the Parent by the weighted average number of ordinary shares in issue during the year. It is one of the Group's KPIs and is used to assess the earnings performance of the Group as a whole. It is also used as one of the targets against which the annual bonuses of certain employees are measured. Headline earnings per share is disclosed in Note 11.

4.9 Adjusted operating cash flow

Adjusted operating cash flow is cash generated from operations before restructuring and vacant site remediation costs but after deducting capital expenditure net of asset disposals. It is used in calculating the Group's cash conversion. In the prior year, net retirement benefit obligations were added back in this calculation; this has been discontinued as the management believes that these represent core cash flows of the Group.

	Notes	2021 £m	2020 £m restated
Cash generated from operations	12	**82.9**	193.7
Add: Outflows relating to restructuring charges		**4.0**	16.7
Less: Capital expenditure		**(45.5)**	(40.5)
Add: Vacant site remediation costs		**3.0**	1.9
Add: Proceeds from the sale of property, plant and equipment		**1.2**	1.1
Adjusted operating cash flow		**45.6**	172.9
Trading profit		**142.4**	101.4
Cash conversion		**32%**	171%

4.10 Cash conversion

Cash conversion is calculated as adjusted operating cash flow from continuing operations divided by trading profit. It is useful for measuring the rate at which cash is generated from trading profit. It is also used as one of the targets against which the annual bonuses of certain employees are measured. The calculation of cash conversion is detailed in Note 4.9 above.

4.11 Free cash flow

Free cash flow is defined as net cash flow from operating activities after net outlays for the purchase and sale of property, plant and equipment, dividends from joint ventures and dividends paid to non-controlling shareholders. It is one of the Group's KPIs and is used to assess the underlying cash generation of the Group and is one of the measures used in monitoring the Group's capital. A reconciliation of free cash flow is included underneath the Group Statement of Cash Flows.

4.12 Average trade working capital to sales ratio

The average trade working capital to sales ratio is calculated as the percentage of average trade working capital balances to the total revenue for the previous 12 months, at constant currency. Average trade working capital (comprising inventories, trade receivables and trade payables) is calculated as the average of the 13 previous month-end balances. It is one of the Group's KPIs and is useful for measuring the level of working capital used in the business and is one of the measures used in monitoring the Group's capital.

	2021 £m	2020 £m
Average trade working capital	**344.2**	337.8
Total revenue	**1,642.9**	1,458.3
Average trade working capital to sales ratio	**21.0%**	23.2%

4.13 Adjusted earnings before interest, tax, depreciation and amortisation (adjusted EBITDA)

Adjusted EBITDA is calculated as the total of trading profit before depreciation and amortisation of non-acquired intangible assets. It is used in the calculation of the Group's interest cover and net debt to adjusted EBITDA ratios. A reconciliation of adjusted EBITDA is included in Note 5.

4. Alternative Performance Measures continued

4.14 Net interest payable on borrowings

Net interest payable on borrowings is calculated as total interest payable on borrowings less finance income, excluding interest on net retirement benefit obligations, adjustments to discounts and any item separately reported. It is used in the calculation of the Group's interest cover ratio.

	Notes	2021 £m	2020 £m
Total interest payable on borrowings	9	**13.0**	17.9
Finance income	9	**(6.7)**	(7.4)
Net interest payable on borrowings		**6.3**	10.5

4.15 Interest cover

Interest cover is the ratio of adjusted EBITDA for the last 12 months to net interest payable on borrowings for the last 12 months. It is one of the Group's KPIs and is used to assess the financial position of the Group and its ability to fund future growth.

	Notes	2021 £m	2020 £m
Adjusted EBITDA	5	**192.2**	152.0
Net interest payable on borrowings		**6.3**	10.5
Interest cover		**30.5x**	14.5x

4.16 Net debt

Net debt comprises the net total of current and non-current interest-bearing borrowings (including IFRS 16 lease liabilities), cash and short-term deposits and derivative financial instruments. Net debt is a measure of the Group's net indebtedness to banks and other external financial institutions. A reconciliation of the movement in net debt is included in Note 14.

4.17 Net debt to adjusted EBITDA

Net debt to adjusted EBITDA is the ratio of net debt at the year-end to adjusted EBITDA for that year. It is one of the Group's KPIs and is used to assess the financial position of the Group and its ability to fund future growth and is one of the measures used in monitoring the Group's capital.

	Notes	2021 £m	2020 £m
Net debt	14	**277.1**	175.1
Adjusted EBITDA	5	**192.2**	152.0
Net debt to adjusted EBITDA		**1.4x**	1.2x

4.18 Return on invested capital (ROIC)

From 2022 onwards, the Group intends to use ROIC as its key measure of return from the Group's invested capital. The RONA performance measure will be replaced with ROIC, which provides a more complete measure of Vesuvius' returns. ROIC is calculated as trading profit less amortisation of acquired intangibles plus share of post-tax profit of joint ventures and associates for the previous 12 months after tax, divided by the average invested capital (total assets excluding cash plus non-interest-bearing liabilities), at constant currency (being the average over December and the previous year-end invested capital).

	2021 £m	2020 £m
Average invested capital	**1,329.1**	1,300.3
Trading profit (Note 4.4)	**142.4**	94.8
Amortisation of acquired intangible assets	**(9.7)**	(9.9)
Share of post-tax profit from joint ventures and associates	**1.3**	1.1
Tax on trading profit and amortisation of acquired intangible assets	**(35.1)**	(22.8)
	98.9	63.2
ROIC	**7.5%**	4.9%

4.19 Constant currency

Figures presented at constant currency represent 2020 amounts retranslated at average 2021 exchange rates.

Notes to the Group Financial Statements continued

4. Alternative Performance Measures continued

4.20 Liquidity

Liquidity is the Group's cash and short-term deposits plus undrawn committed debt facilities less cash used as collateral on loans and any gross up of cash in notional cash pools.

	2021 £m	2020 £m
Cash and short-term deposits	**169.1**	209.7
Undrawn committed debt facilities	**308.1**	246.6
Cash used as collateral on loans	**(21.0)**	(19.0)
Gross up of cash in notional pools	**(0.5)**	–
Liquidity	**455.7**	437.3

4.21 Last twelve months (LTM)

Some results are presented or calculated using data from the last 12 months from the reference date.

5. Segment Information

The segment information contained in this Note refers to several alternative performance measures, definitions of which can be found in Note 4. The Group has considered climate change in making segmental and revenue disclosures. Opportunities and risks for the reported segments are further explained in the Sustainability section.

5.1 Business segments

Operating segments for continuing operations

The Group's operating segments are determined taking into consideration how the Group's components are reported to the Group's Chief Executive, who makes the key operating decisions and is responsible for allocating resources and assessing performance of the component. Taking into account the Group's management and internal reporting structure, the operating segments are Steel Flow Control, Steel Advanced Refractories, Steel Sensors & Probes, and the Foundry Division. The principal activities of each of these segments are described in the Strategic Report.

Steel Flow Control, Steel Advanced Refractories, and Steel Sensors & Probes operating segments are aggregated into the Steel reportable segment. In determining that aggregation is appropriate, judgement is applied which takes into account the economic characteristics of these operating segments which include a similar nature of products, customers, production processes and margins.

Segment revenue represents revenue from external customers (inter-segment revenue is not material). Trading profit includes items directly attributable to a segment as well as those items that can be allocated on a reasonable basis.

5.2 Accounting policy – revenue recognition

The Group derives all of its revenue from contracts with customers. The Group enters into contracts to provide one or multiple products to customers in the steel and foundry industries globally.

Revenue recognition at a point in time

Where the Group provides consumable products only, one performance obligation is present. The performance obligation is to deliver consumables to the customer and is satisfied upon delivery of these items. Similarly, where a contract is for the supply of standard equipment, there is one performance obligation and revenue is primarily recognised at a point in time, being upon delivery of these items. The form of a contract is typically a purchase order from a customer.

The Group also enters into some contracts with customers in the steel industry under which they primarily provide consumable items, but also supply equipment and/or technical assistance ('service contracts') to facilitate these customers' steel production processes. The Group applies judgement in assessing whether the performance obligations (i.e. provision of consumables, equipment and technical assistance) are distinct performance obligations or if these may be bundled when assessing the point at which the customer obtains control of or consumes the benefit of promised goods or services. The judgement takes into account that:

- The equipment provided in these contracts remains the property of Vesuvius and is used by Vesuvius technicians at customer sites
- The customer benefits from the combined output of the contract, being the use of Vesuvius consumables, equipment and technicians to support the customer's production of steel
- The value of the equipment and technician support is minimal relative to the total value of the contract to the customer being the benefit from use of Vesuvius consumables.

5. Segment Information continued

5.2 Accounting policy – revenue recognition continued

Revenue recognition at a point in time continued

Based on the above, the individual elements of the contract are not considered distinct and therefore the performance obligations are deemed to be bundled into a single performance obligation. Revenue is therefore recognised at a point in time, every time the customers purchase and consume materials as they produce steel. In the event this judgement was not applied and the performance obligations were not bundled, this would likely result in minor amounts of revenue being recognised earlier primarily in respect of the technician support.

Approximately 89% (2020: 87%) of the aforementioned revenue relates to the sale of consumables and equipment only. Approximately 11% (2020: 13%) of revenue relates to contracts that contain multiple performance obligations, which in the majority of cases are deemed to be bundled into a single performance obligation and revenue recognised over the course of the contract as the customer consumes and benefits from Vesuvius products.

Revenue recognition over time

The Group enters into bespoke equipment design and build (and installation in some cases) contracts with customers. Performance obligations are usually defined by milestones agreed with the customers in the contract. The customer usually does not have a right to a refund as work progresses towards achieving the milestones in the contract. Revenue is recognised over time by measuring the progress of completion or achievement of a milestone for each performance obligation identified within the contract, usually with reference to cost inputs incurred against overall estimated costs for the contract. This does not typically entail significant estimation or judgements as the contracts are usually not material in isolation and do not span more than 12 months. This approach to revenue recognition is considered to reflect faithfully the value and timing of goods or services transferred and the rights of Vesuvius to revenue.

Determining and allocating the transaction price to performance obligations

For revenue recognised at a point in time, the transaction price is determined and allocated with reference to the individual prices of consumables or equipment specified in the contract or customer purchase order. If a standalone selling price is not available, the Group will estimate the selling price with reference to the price that would be charged for the goods or services if they were sold separately. This estimate is not considered complex.

For service contracts the bundled performance obligation is deemed to be the provision of consumables and, in some cases, labour to facilitate production of customer steel. The transaction price is determined and allocated with reference to either an agreed price list for each of the consumables input or, for some contracts, the transaction price is determined and allocated as an amount per unit of customer steel output.

For revenue recognised over time, the transaction price is determined with reference to the prices set out in the contract. For bespoke equipment builds, the transaction price is allocated to performance obligations (milestones) within the contract and the payment schedules agreed with the customer that align to these milestones. For installations, the transaction price is allocated with reference to the progress of completion. Where payment schedules include customer advance payments (i.e. not aligned with a milestone/performance obligation), the amounts received are included within contract liabilities until the performance obligation to which they relate is satisfied.

Contracts are to be settled in cash. They do not typically contain any variable consideration, discounts, refunds, rebates, warranties or significant financing components.

Duration and costs of obtaining contracts

The duration of the Group's contracts with customers is typically less than one year and accordingly the Group has taken the practical expedient within IFRS 15 to not disclose the transaction price allocated to unsatisfied (whole or partially) performance obligations as of the end of the reporting period. Service contracts may span over more than one year as they remain in effect up to a specified level of customer production of steel. However, the choice to purchase from Vesuvius under the contract remains with the customer and therefore there is no commitment for the customer/Vesuvius to purchase/produce up to the specified level.

Costs of obtaining contracts are not considered significant and these are expensed as incurred.

Customer credit risk and payment terms

The Group assesses customer credit risk and recognises revenue when such risk is considered low and the consideration cash flows due are reasonably expected to flow to the Group. Typically, the Group will not transact with customers where credit risk concerns are identified and therefore there is no material unrecognised revenue as a result of credit risk. For trade receivables and contract assets in respect of revenue recognised, an expected credit loss allowance is determined.

Customer payment terms are set out in revenue contracts and do not exceed one year. Customer payments typically follow the satisfaction of performance obligations at which point revenue is recognised and invoiced. Accordingly, trade receivables and contract assets are expected to derive cash inflows for the Group within less than 12 months.

Notes to the Group Financial Statements continued

5. **Segment Information** continued

5.2 **Accounting policy – revenue recognition** continued

Contract assets and contract liabilities

A contract asset is recorded when revenue is recognised but an invoice has not been raised to the customer. Contract assets are short term and typically are invoiced in the following month.

Customer advance payments are included in contract liabilities. These are typically not material and relate to over time revenue projects as set out further above.

Uncertainties

There are no uncertainties involving economic factors, significant estimation or judgements (other than as disclosed above) in respect of revenue recognition. Credit risk relating to the collection of cash inflows from revenue recognised is addressed through an allowance for expected credit losses, as set out in the trade and other receivables accounting policy.

The following table provides information about receivables, contract assets and contract liabilities from contracts with customers.

	2021 £m	2020 £m
Receivables, which are included in 'Trade and other receivables'	**352.2**	302.0
Contract assets, which are included in 'Trade and other receivables'	**1.9**	1.3
Contract liabilities, which are included in 'Trade and other payables'	**3.3**	1.5

Contract liabilities of £3.3m (2020: £1.5m) include advances received from a customer that precede the satisfaction of performance obligations by the Group. £1.5m of the contract liabilities recognised in the prior year was recognised as revenue in 2021.

5.3 **Segmental analysis**

The reportable segment results from continuing operations for 2021 and 2020 are presented below.

		2021					
	Notes	Flow Control £m	Advanced Refractories £m	Sensors & Probes £m	Total Steel £m	Foundry £m	Total £m
Segment revenue		**648.7**	**489.1**	**33.7**	**1,171.5**	**471.4**	**1,642.9**
– at a point in time					***1,169.9***	***471.4***	***1,641.3***
– over time					***1.6***	**–**	***1.6***
Segment adjusted EBITDA					**135.9**	**56.3**	**192.2**
Segment depreciation					**(33.9)**	**(15.9)**	**(49.8)**
Segment trading profit					**102.0**	**40.4**	**142.4**
Return on sales margin					*8.7%*	*8.6%*	*8.7%*
Amortisation of acquired intangible assets							**(9.7)**
Operating profit							**132.7**
Net finance costs							**(6.4)**
Share of post-tax profit of joint ventures							**1.3**
Profit before tax							**127.6**
Capital expenditure additions					47.2	20.2	67.4
Inventory	19				248.1	51.3	299.4
Trade debtors	18				267.5	84.7	352.2
Trade payables	28				(191.3)	(62.5)	(253.8)

5. **Segment Information** continued

5.3 **Segmental analysis** continued

	2020					
	Flow Control £m	Advanced Refractories £m	Sensors & Probes £m	Total Steel £m	Foundry £m	Total £m
Segment revenue	561.3	458.6	25.5	1,045.4	412.9	1,458.3
– at a point in time				*1,035.7*	*412.9*	*1,448.6*
– over time				*9.7*		*9.7*
Segment adjusted EBITDA				**110.6**	**41.4**	**152.0**
Segment depreciation				**(34.2)**	**(16.4)**	**(50.6)**
Segment trading profit				**76.4**	**25.0**	**101.4**
Return on sales margin				*7.3%*	*6.1%*	*7.0%*
Amortisation of acquired intangible assets						**(9.9)**
Restructuring charges						**(6.1)**
Vacant site remediation costs						**(10.3)**
Guaranteed minimum pensions (GMP) equalisation charge						**(0.8)**
Operating profit						**74.3**
Net finance costs						**(10.9)**
Share of post-tax profit of joint ventures						**1.1**
Profit before tax						**64.5**
Capital expenditure additions				45.9	13.1	59.0
Inventory				151.0	36.3	187.3
Trade debtors				225.6	76.4	302.0
Trade creditors				(131.1)	(54.6)	(185.7)

The Chief Operating Decision Maker does not review non-current assets at a segmental level so these disclosures are not included.

5.4 **Geographical analysis**

	External revenue		Non-current assets	
	2021 £m	2020 £m	2021 £m	2020 £m
EMEA	**644.8**	578.5	**452.1**	474.2
Asia	**492.2**	442.0	**223.8**	225.5
North America	**377.7**	346.8	**367.0**	328.6
South America	**128.2**	91.0	**35.9**	36.7
Continuing operations	**1,642.9**	1,458.3	**1,078.8**	1,065.0

External revenue disclosed in the table above is based upon the geographical location of where products and services are delivered from. Non-current assets exclude employee benefits net surpluses and deferred tax assets. Information relating to the Group's products and services is given in the Strategic Report. The Group is not dependent on any single customer for its revenue and no single customer, for either of the years presented in the table above, accounts for more than 10% of the Group's total external revenue. £57.6m (2020: £56.2m) of revenue was generated from the UK, and total non-current assets in the UK amounted to £94.9m (2020: £97.1m).

Notes to the Group Financial Statements continued

6. Operating Profit

6.1 Operating profit is stated after charging

	Notes	2021 £m	2020 £m
Cost of inventories recognised as an expense	19	**658.6**	533.5
Research and development		**30.3**	27.9
Employee expenses	8	**396.8**	366.0
Depreciation	15	**49.8**	50.6
Amortisation	16	**10.1**	9.9
Operating lease charges	29	**2.9**	4.2

6.2 Amounts payable to PricewaterhouseCoopers LLP and their associates

	2021 £m	2020 £m
Fees payable to the Company's auditors and their associates for the audit of the Parent Company and Consolidated Financial Statements	**0.7**	0.7
Fees payable to the Company's auditors and their associates for other services:		
Audit of the Company's subsidiaries	**1.0**	1.0
Audit-related assurance services	**0.1**	0.1
Total auditors' remuneration	**1.8**	1.8

Total auditors' remuneration of £1.8m in 2021 all related to continuing operations, of which £1.7m related to audit fees and £0.1m of non-audit fees, in respect of the Group's half-year financial statements, quarterly reviews and tax form audits in India (as required by regulation) along with review of an R&D claim in Italy (2020: £1.8m, including £1.7m of audit fees and £0.1m of non-audit fees, the latter in respect of the Group's half-year review fee and quarterly reviews and tax form audits in India). It is the Group's policy not to use the Group's auditors for non-audit services other than for audit-related services that are required to be performed by an auditor.

6.3 Amounts payable to Mazars LLP

Mazars LLP acts as external auditor of the non-material entities and three material entities within the Group. Total remuneration for the audit of these entities was £0.8m (2020: £0.6m). This amount is not included in the table above.

7. Restructuring Charges and Vacant Site Remediation Costs

As explained in the Financial review on page 43, there were no restructuring charges in 2021. Restructuring charges of £6.1m in 2020 related to the completion of the programme first announced in March 2018, which was predominantly focused on rationalising our manufacturing footprint, consolidating production and streamlining various back office functions. The charges reflected redundancy costs of £2.7m, plant closure costs of £1.8m, asset write-offs of £1.5m and consultancy fees and travel of £0.1m. The utilisation of costs continues in line with the phased timings for the programmes to be completed.

The net tax credit attributable to the total restructuring charges in 2020 was £1.1m.

Cash costs of £4.0m (2020: £16.7m) (Note 12) were incurred in the year in respect of previously announced restructuring programmes, leaving provisions made but unspent of £5.0m (Note 30) as at 31 December 2021 (2020: £9.2m).

The Group owns a number of disused properties in the US, which do not form part of our trading operations. In 2020, costs of £10.3m (2021: nil) were incurred at one of these sites to address the significant increase in the volume of water run-off occurring in recent years. We engaged waste management specialists and have taken actions to reduce the level of water. We are in contact with the relevant regulatory authorities and are currently implementing remediation solutions, including the installation of a treatment facility. These non-recurring costs were treated as a separately reported item in 2020. There was no impact upon headline performance.

8. Employees

8.1 Employee expenses

	Notes	2021 £m	2020 £m
Wages and salaries		**329.1**	302.9
Social security costs		**48.0**	43.5
Share-based payments	27	**3.1**	2.4
Pension costs – defined contribution pension plans	26	**10.2**	9.7
– defined benefit pension plans	26	**6.0**	7.1
Other post-retirement benefits	26	**0.4**	0.4
Total employee expenses		**396.8**	366.0

Included within wages and salaries is income from governments of £0.4m (2020: £3.0m) in respect of staff who have been furloughed due to the COVID-19 pandemic. This income falls within IAS 20 Government grants as the Group receives income in return for meeting the conditions included within each of the relevant government schemes. The income approach has been applied and therefore the income is recognised when the salary and wages expenses which the schemes are intended to compensate are incurred. There are no unfulfilled conditions or other contingencies that have been recognised in respect of these schemes.

8.2 Monthly average number of employees

	2021 no.	2020 no.
Steel	**7,997**	7,613
Foundry	**2,856**	2,710
Total monthly average number of employees	**10,853**	10,323

As at 31 December 2021, the Group had 11,204 employees (2020: 10,354).

8.3 Remuneration of key management personnel

The remuneration of the Directors, who are the key management personnel of the Group, is set out below in aggregate for each of the categories specified in IAS 24 Related Party Disclosures. Further information about the remuneration of individual Directors is provided in the audited part of the Directors' Remuneration Report on pages 142 to 153.

	2021 £m	2020 £m
Short-term employee benefits	**2.5**	1.4
Post-employment benefits	**0.3**	0.2
Share-based payments	**–**	1.2
Total remuneration of key management personnel	**2.8**	2.8

9. Net Finance Costs

	2021 £m	2020 £m
Interest payable on borrowings		
Loans and overdrafts	**10.7**	15.6
Interest on lease liabilities	**1.5**	1.8
Amortisation of capitalised arrangement fees	**0.8**	0.5
Total interest payable on borrowings	**13.0**	17.9
Interest on net retirement benefit obligations	**(0.3)**	(0.1)
Adjustment to discounts on provisions and other liabilities	**0.7**	1.0
Adjustment to discounts on receivables	**(0.3)**	(0.5)
Finance income	**(6.7)**	(7.4)
Total net finance costs	**6.4**	10.9

Within the table above, total finance costs are £13.7m (2020: £18.9m) and total finance income is £7.3m (2020: £8.0m).

Notes to the Group Financial Statements continued

10. Income Tax

10.1 Accounting policy

Tax expense represents the sum of current tax and deferred tax. Current and deferred tax are recognised in profit or loss except to the extent that they relate to items charged or credited in the Group Statement of Comprehensive Income or Group Statement of Changes in Equity, in which case the associated tax is also recognised in those statements.

Current tax

Current tax is based on taxable profit for the year. Taxable profit differs from profit before tax as reported in the Group Income Statement because it excludes items of income or expense that are taxable or deductible in other years and it further excludes items that are never taxable or deductible. The Group's liability for current tax is calculated using tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

A provision is recognised when the Group considers it has a present tax obligation as the result of a past event and it is probable that the Group will be required to settle that obligation. Provisions established for such uncertain tax positions are made using a best estimate of the tax expected to be paid, based on a qualitative and quantitative assessment of all relevant information. Such a provision is typically required where the underlying tax issue is subject to interpretation and remains to be agreed, and therefore is uncertain as to outcome. Principally, the uncertain tax positions for which a provision is made relate to the interpretation of tax legislation and guidance regarding transfer pricing arrangements that have been entered into in the normal course of business. In accordance with IAS 12, tax provisions are included as income tax payable on the face of the Group Balance Sheet, and movements in tax provisions are included within income tax charges or credits in the Group Income Statement.

In assessing any appropriate provision requirements for uncertain tax items, the Group considers progress made in discussions with the tax authorities, expert advice on the likely outcome and any recent developments in case law. Due to the uncertainty associated with such tax items, it is possible that at a future date, on conclusion of the open matters, the final outcome may vary materially. Any such variations will affect the financial results in the year in which such a determination is made.

Deferred tax

Deferred tax is recognised on differences between the carrying amounts of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of taxable profit, and is accounted for using the balance sheet liability method. Deferred tax liabilities are generally recognised for all taxable temporary differences and deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which deductible temporary differences can be utilised. Such assets and liabilities are not recognised if the temporary difference arises from the initial recognition of goodwill or from the initial recognition (other than in a business combination) of other assets and liabilities in a transaction that affects neither the taxable profit nor the accounting profit. Deferred tax is calculated at the tax rates that are expected to apply in the period when the liability is settled or the asset is realised, based on tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

Deferred tax liabilities are recognised for taxable temporary differences arising on investments in subsidiaries and interests in joint ventures, except where the Group is able to control the reversal of the temporary difference and it is probable that the temporary difference will not reverse in the foreseeable future. The carrying amount of deferred tax assets is reviewed at each balance sheet date and reduced to the extent that it is no longer probable that sufficient taxable profits will be available to allow all or part of the asset to be recovered. Deferred tax assets and liabilities are offset when there is a legally enforceable right to set off current tax assets against current tax liabilities and when they relate to income taxes levied by the same taxation authority and the Group intends to settle its current tax assets and liabilities on a net basis.

10. Income Tax continued

10.2 Income tax charge

		2021 £m	2020 £m
Current tax			
Overseas taxation		**34.0**	28.1
Adjustments in respect of prior years		**(1.5)**	(3.0)
Total current tax, continuing operations		**32.5**	25.1
Deferred tax			
Origination and reversal of temporary taxable differences		**(11.6)**	(7.8)
Adjustments in respect of prior years		**(1.2)**	1.4
Total deferred tax, continuing operations		**(12.8)**	(6.4)
Total income tax charge		**19.7**	18.7
Total income tax charge attributable to:			
Continuing operations	– headline performance	**35.9**	24.4
	– separately reported	**(16.2)**	(5.7)
Total income tax charge		**19.7**	18.7

Included in the Group's total income tax charge are charges and credits meeting the criteria set out in Note 2.5 to be treated as separately reported items, as analysed in the following table:

Separately reported items	2021 £m	2020 £m
Restructuring charges	**–**	(1.1)
Amortisation and utilisation of acquired intangibles	**(0.2)**	(2.3)
Additional recognition of US deferred tax asset	**(16.0)**	–
Vacant site remediation costs	**–**	(2.3)
Total tax charge/(credit) separately reported	**(16.2)**	(5.7)

As a result of the consistent profitability of the US business, including during the current pandemic, the Group has decided to reverse a valuation allowance of (£16.0m) held against US deferred tax assets that have no expiry date. In recognising these assets, the Group has considered the future profitability of the US business from approved budgets and business plans and an extrapolation from them assuming that profits continue to grow at a rate consistent with those plans. These assets are available for carry-forward indefinitely and can be offset against any taxable income generated in the US.

The net tax debit reflected in the Group Statement of Comprehensive Income in the year amounted to £13.0m credit (2020: £3.2m debit), comprising a £12.5m credit (2020: £2.8m debit) related to tax on net actuarial gains and losses on the employee benefits plan, a £0.5m credit (2020: £nil) related to exchange adjustments and £nil (2020: £0.4m debit) relating to other temporary timing differences.

The Group operates in a number of countries that have differing tax rates, laws and practices. Changes in any of these areas could, adversely or positively, impact the Group's tax charge in the future. Continuing losses, or insufficiency of taxable profit to absorb all expenses, in any subsidiary, could have the effect of increasing tax charges in the future as headline effective tax relief may not be available for those losses or expenses. Other significant factors affecting the tax charge are described in Notes 10.1 and 10.6.

10.3 Reconciliation of income tax charge to profit before tax

	2021 £m	2020 £m
Profit before tax	**127.6**	64.5
Tax at the UK corporation tax rate of 19.0% (2020: 19.0%)	**24.2**	12.3
Overseas tax rate differences	**8.7**	2.7
Withholding taxes	**3.9**	7.2
Expenses not deductible for tax purposes	**0.3**	2.3
Income taxed in advance	**–**	(4.2)
Deferred tax assets not recognised	**0.3**	1.3
Utilisation of previously unrecognised tax losses	**(0.3)**	(1.3)
US deferred tax not previously recognised	**(16.0)**	–
Deferred tax rate changes	**1.3**	–
Adjustments in respect of prior years	**(2.7)**	(1.6)
Total income tax charge	**19.7**	18.7

Notes to the Group Financial Statements continued

10. Income Tax continued

10.4 Deferred tax

	Interest £m	Other operating losses £m	Pension costs £m	Intangible assets £m	Other temporary differences £m	Total £m
As at 1 January 2020	23.9	18.8	3.5	(22.4)	27.5	51.3
Exchange adjustments/other	(0.6)	(2.2)	0.4	0.1	–	(2.3)
Other net charge to Group Statement of Comprehensive Income	–	–	(2.8)	–	(0.4)	(3.2)
Other net (charge)/credit to Group Income Statement	(0.1)	(1.6)	0.2	2.3	3.1	3.9
Other net (charge)/credit to Group Income Statement US	(1.2)	3.9	(0.5)	(0.3)	0.6	2.5
As at 1 January 2021	**22.0**	**18.9**	**0.8**	**(20.3)**	**30.8**	**52.2**
Exchange adjustments/other	**0.4**	**(0.1)**	**(0.8)**	**(0.3)**	**0.3**	**(0.5)**
Acquisition	**–**	**–**	**–**	**(2.9)**	**–**	**(2.9)**
Other net credit to Group Statement of Comprehensive Income	**–**	**–**	**12.5**	**0.5**	**–**	**13.0**
Other net credit/(charge) to Group Income Statement	**0.8**	**0.7**	**1.0**	**(0.6)**	**1.5**	**3.4**
Other net credit/(charge) to Group Income Statement US	**11.2**	**(4.0)**	**(0.1)**	**(0.2)**	**2.5**	**9.4**
As at 31 December 2021	**34.4**	**15.5**	**13.4**	**(23.8)**	**35.1**	**74.6**

	2021 £m	2020 £m
Recognised in the Group Balance Sheet as:		
Non-current deferred tax assets	**104.2**	96.1
Non-current deferred tax liabilities	**(29.6)**	(43.9)
Net total deferred tax assets	**74.6**	52.2

Included in these deferred tax assets and liabilities are amounts expected to be utilised in 2022 as follows:

	2021 £m	2020 £m
Deferred tax assets	**9.6**	8.4
Deferred tax liabilities	**(2.3)**	(2.3)

As a result of the consistent profitability of the US business, the Group has decided to recognise certain US deferred tax assets that have no expiry date. Included in non-current deferred tax assets is £70.8m (2020: £61.8m) in respect of the partial recognition of temporary differences arising in the US computed in accordance with the policy set out in Note 10.1 above. The Group remains confident of the recovery of these assets. £3.0m (2020: £19.3m) remains unrecognised as detailed in the tables below.

Tax loss carry-forwards and other temporary differences with a tax value of £15.5m (2020: £17.7m) were recognised by subsidiaries reporting a loss. Based on approved business plans of these subsidiaries, the Directors consider it probable that the tax loss carry-forwards and temporary differences can be offset against future taxable profits of these subsidiaries.

The total deferred tax assets not recognised as at 31 December 2021 were £209.6m (2020: £182.5m), as analysed below. In accordance with the accounting policy in Note 10.1, these items have not been recognised as deferred tax assets on the basis that their future economic benefit is not probable. In total, there was an increase of £27.1m (2020: £14.7m increase) in net unrecognised deferred tax assets during the year, primarily driven by the increase in the UK corporation tax rate from 19% to 25%. All UK unrecognised deferred tax assets are now reported at the 25% rate.

	2021 £m	2020 £m
Operating losses (further described below)	**135.2**	109.3
Unrelieved US interest (may be carried forward indefinitely)	**0.7**	17.9
Capital losses available to offset future UK capital gains (may be carried forward indefinitely)	**46.2**	35.1
UK ACT credits (may be carried forward indefinitely)	**19.3**	14.6
US tax credits	**2.2**	1.4
Other temporary differences	**6.0**	4.2
Total deferred tax assets not recognised	**209.6**	182.5

10. Income Tax continued

10.4 Deferred tax continued

The Group has significant net operating losses with a tax value of £150.7m (2020: £128.2m), only £15.5m (2020: £18.9m) of which meet the criteria set out in Note 10.1 to be recognised on the Group Balance Sheet.

	Operating losses recognised 2021 £m	Operating losses not recognised 2021 £m	Total 2021 £m	Operating losses recognised 2020 £m	Operating losses not recognised 2020 £m	Total 2020 £m
UK (may be carried forward indefinitely)	**–**	**116.9**	**116.9**	–	87.9	87.9
US (due to expire 2024–2031)	**9.1**	**0.1**	**9.2**	13.1	–	13.1
ROW (may be carried forward indefinitely)	**6.4**	**18.2**	**24.6**	5.6	21.4	27.0
ROW (due to expire within 5 years)	**–**	**–**	**–**	0.2	–	0.2
	15.5	**135.2**	**150.7**	18.9	109.3	128.2

The £24.6m (2020: £27.0m) operating losses available to set against future income in the rest of the world arise in a number of countries, reflecting the spread of the Group's operations.

A liability of £1.0m (2020: £0.9m) has been recognised in respect of withholding taxes that will be due on a repatriation of funds from the Group's Chinese subsidiaries.

Deferred tax is not recognised in respect of the value of the Group's investments in subsidiaries and interests in joint ventures where we are able to control the timing of the reversal of the temporary differences and it is probable that such differences will not reverse in the foreseeable future. The amount of these temporary differences for which deferred tax liabilities have not been recognised was £14.6m (2020: £12.7m).

10.5 Income tax payable and recoverable

	2021 £m	2020 £m
Liabilities for income tax payable	**11.2**	3.7
Provisions for uncertain tax positions	**6.9**	8.5
	18.1	12.2
Less: Income tax recoverable within one year	**7.6**	3.7
Net liability	**10.5**	8.5

Provisions for uncertain tax positions are calculated in accordance with the policy outlined in Note 10.1, and are treated as income tax payable in accordance with IAS 12.

These provisions cover litigated tax matters as well as provisions for other risks where the Group believes it is more likely than not that there would be a successful challenge by a tax authority to positions it has taken in its tax filings. By its nature, litigation can result in sharp fluctuations in cash flow, both in and out, relating to taxes. Currently, management does not expect any material adjustments to these provisions in 2021.

During the year the provisions for uncertain tax positions have reduced to £6.9m (2020: £8.5m). The decrease of £1.6m (2020: £3.3m) can be explained by the partial settlement of a tax audit in Spain, £0.2m (2020: £nil), reassessment of potential uncertain tax positions following a lack of previously expected challenges by the tax authorities, £nil (2020: £2.0m credit), the expiration of the statute of limitations on certain other exposures, £1.2m (2020: £1.6m), and foreign exchange movements on the remaining balances, £0.2m credit (2020: £0.3m charge).

Notes to the Group Financial Statements continued

10. Income Tax continued

10.6 Key factors impacting the sustainability of the headline effective tax rate are as follows:

Material changes in the geographic mix of profits

The Group's headline effective tax rate is sensitive to changes in the geographic mix of profits and level of profits and reflects a combination of higher rates in certain jurisdictions such as Brazil, China, Germany, India, Mexico and the US, a nil headline effective tax rate in the UK due to the availability of unutilised tax losses, and rates that lie somewhere in between.

Changes in tax rates, tax reform and its interpretation

Changes in tax rates and laws in the jurisdictions in which the Group operates could have a material effect on the Group's headline effective tax rate.

Availability of tax advantaged rates

Vesuvius in China qualifies for a tax advantaged rate of 15% (rather than the headline rate of 25%) on part of its profits due to the high technology nature of its business. Eligibility for this rate is reviewed on a regular basis by the Chinese tax authority and was worth approximately £0.7m in 2021 (2020: £1.1m). Without that benefit, the Group's headline effective tax rate on headline performance would have been 0.5% higher in 2021 (2020: 1.2%).

Resolution of tax judgements

At any one time, the Group can be subject to a number of challenges by tax authorities in the jurisdictions in which it operates. The outcome of these challenges is inherently uncertain, potentially resulting in a different tax charge from the amounts initially provided.

Impact of Brexit on Vesuvius' tax position

Following Brexit, the EU Parent Subsidiary and Interest and Royalty directives no longer apply to dividend, interest and other payments to Vesuvius in the UK. Additional withholding taxes will therefore become payable subject to reliefs available under applicable tax treaties. The Group does not expect the impact of the changes to be material to its tax position.

11. Earnings per Share (EPS)

11.1 Earnings for EPS

Basic and diluted EPS from continuing operations are based upon the profit attributable to owners of the Parent, as reported in the Group Income Statement. The table below reconciles these different profit measures.

	2021 £m	2020 £m
Profit attributable to owners of the Parent	**102.1**	41.3
Adjustments for separately reported items:		
Amortisation of acquired intangible assets	**9.7**	9.9
Restructuring charges	**–**	6.1
Vacant site remediation costs	**–**	10.3
Guaranteed minimum pensions (GMP) equalisation charge	**–**	0.8
Income tax (credit)/charge	**(16.2)**	(5.7)
Headline profit attributable to owners of the Parent	**95.6**	62.7

11.2 Weighted average number of shares

	2021 millions	2020 millions
For calculating basic and headline EPS	**270.5**	269.9
Adjustment for potentially dilutive ordinary shares	**1.8**	1.7
For calculating diluted and diluted headline EPS	**272.3**	271.6

For the purposes of calculating diluted and diluted headline EPS, the weighted average number of ordinary shares is adjusted to include the weighted average number of ordinary shares that would be issued on the conversion of all potentially dilutive ordinary shares expected to vest, relating to the Company's share-based payment plans. Potential ordinary shares are only treated as dilutive when their conversion to ordinary shares would decrease EPS or increase loss per share.

11. Earnings per Share (EPS) continued

11.3 Per share amounts

	2021 pence	2020 pence
Earnings per share		
– basic	**37.7**	15.3
– diluted	**37.5**	15.2
– headline	**35.3**	23.2
– diluted headline	**35.1**	23.1

12. Cash Generated from Operations

	Notes	2021 £m	2020 £m
Operating profit		**132.7**	74.3
Adjustments for:			
Amortisation of acquired intangible assets	16	**9.7**	9.9
Restructuring charges		**–**	6.1
Vacant site remediation costs		**–**	10.3
Guaranteed minimum pensions (GMP) equalisation charge		**–**	0.8
Trading profit		**142.4**	101.4
Loss on disposal of non-current assets		**0.4**	1.3
Depreciation		**49.8**	50.6
Defined benefit retirement plans net charge		**6.4**	6.7
Net (increase)/decrease in inventories		**(113.5)**	21.7
Net (increase)/decrease in trade receivables		**(53.5)**	3.4
Net increase/(decrease) in trade payables		**70.6**	12.4
Net decrease/(increase) in other working capital		**(5.5)**	23.8
Outflow related to restructuring charges		**(4.0)**	(16.7)
Defined benefit retirement plans cash outflows		**(7.2)**	(9.0)
Vacant site remediation costs paid		**(3.0)**	(1.9)
Cash generated from operations		**82.9**	193.7

13. Cash and Cash Equivalents

13.1 Accounting policy

Cash and short-term deposits in the Group balance sheet consist of cash at bank and in hand, and short-term deposits with original maturity of three months or less. Bank overdrafts that are repayable on demand and form an integral part of the Group's cash management are included as a component of cash and cash equivalents for the purpose of the Group Statement of Cash Flows.

	2021 £m	2020 £m
Cash at bank and in hand	**169.1**	169.7
Short-term deposits	**–**	40.0
Cash and short-term deposits	**169.1**	209.7
Bank overdrafts	**(6.7)**	(2.9)
Cash and cash equivalents in the Group Statement of Cash Flows	**162.4**	206.8

Notes to the Group Financial Statements continued

14. Reconciliation of Movement in Net Debt

	Balance as at 1 January 2021 £m	Foreign exchange adjustments £m	Fair value gains £m	Non-cash movements* £m	Cash flow £m	Balance as at 31 December 2021 £m
Cash and cash equivalents						
Cash at bank and in hand	**169.7**	**(1.9)**	**–**	**–**	**1.3**	**169.1**
Short-term deposits	**40.0**	**–**	**–**	**–**	**(40.0)**	**–**
Bank overdrafts	**(2.9)**	**0.1**	**–**	**–**	**(3.9)**	**(6.7)**
	206.8	**(1.8)**	**–**	**–**	**(42.6)**	**162.4**
Borrowings, excluding bank overdrafts	**(376.5)**	**11.3**	**–**	**(17.1)**	**(58.0)**	**(440.3)**
Capitalised arrangement fees	**1.4**	**–**	**–**	**1.9**	**–**	**3.3**
Derivative financial instruments	**(6.8)**	**–**	**4.3**	**–**	**–**	**(2.5)**
Net debt	**(175.1)**	**9.5**	**4.3**	**(15.2)**	**(100.6)**	**(277.1)**

	Balance as at 1 January 2020 £m	Foreign exchange adjustments £m	Fair value losses £m	Non-cash movements* £m	Cash flow £m	Balance as at 31 December 2020 £m
Cash and cash equivalents						
Cash at bank and in hand	229.2	(2.2)	–	–	(57.3)	169.7
Short-term deposits	–	–	–	–	40.0	40.0
Bank overdrafts	(7.1)	–	–	–	4.2	(2.9)
	222.1	(2.2)	–	–	(13.1)	206.8
Borrowings, excluding bank overdrafts	(469.0)	(10.0)	–	(15.7)	118.2	(376.5)
Capitalised arrangement fees	1.2	–	–	0.2	–	1.4
Derivative financial instruments	(0.1)	–	(5.3)	–	(1.4)	(6.8)
Net debt	(245.8)	(12.2)	(5.3)	(15.5)	103.7	(175.1)

* £17.1m (2020: £15.7m) of new leases were entered into during the year.

Net debt is a measure of the Group's net indebtedness to banks and other external financial institutions and comprises the total of cash and short-term deposits, current and non-current interest-bearing borrowings and derivative financial instruments.

£89.4m proceeds from borrowings, shown in the Group Statement of Cash Flows, includes £28.0m and £28.4m (€33.0m) US Private Placement Notes ('USPP'), £31.0m of sterling drawings under the UK syndicated bank facility and £2.0m of sterling drawings under the collateralised bilateral loan facility (see Note 25).

£31.4m repayment of borrowings, shown in the Group Statement of Cash Flows, includes £12.9m ($15.0m) of USPP repayments, £6.0m (€7.0m) of euro drawings repaid under the UK syndicated bank facility and net lease repayments of £12.5m.

15. Property, Plant and Equipment

15.1 Accounting policy

Freehold land and construction in progress are carried at cost less accumulated impairment losses. Other items of property, plant and equipment are carried at cost less accumulated depreciation and accumulated impairment losses. Costs are capitalised only when it is probable that they will result in future economic benefits flowing to the Group and when they can be measured reliably. Costs are capitalised to construction in progress where an asset is being developed. This is then transferred to the relevant asset class and depreciated when the asset is ready for use. All other repairs and maintenance expenditures are charged to the Group Income Statement in the period in which they are incurred.

Freehold land is not depreciated as it has an infinite life. Depreciation on other items of property, plant and equipment begins when the asset is available for use and is charged to the Group Income Statement on a straight-line basis so as to write off the cost less the estimated residual value of the asset over its estimated useful life as follows:

15. Property, Plant and Equipment continued

15.1 Accounting policy continued

Asset category	Estimated useful life
Freehold property	between 10 and 50 years
Leasehold property	the term of the lease
Right-of-use assets	shorter of the asset's useful life and lease term
Plant and equipment – motor vehicles and information technology equipment	between 1 and 5 years
– other	between 3 and 15 years

The depreciation method used, residual values and estimated useful lives are reviewed annually and changed, if appropriate. As described in Note 17.1, an asset's carrying amount is immediately written down to its recoverable amount if its carrying amount is greater than its estimated recoverable amount. Gains and losses arising on disposals are determined by comparing sales proceeds with carrying amount and are recognised in the Group Income Statement.

15.2 Movement in net book value

	Freehold property £m	Leasehold property £m	Right-of-use assets – land & buildings (Note 29.2) £m	Right-of-use assets – plant & equipment (Note 29.2) £m	Plant and equipment £m	Construction in progress £m	Total £m
Cost							
As at 1 January 2020	221.1	2.4	24.6	22.6	554.6	57.7	883.0
Exchange adjustments	(0.2)	–	(0.3)	–	(6.3)	(0.7)	(7.5)
Capital expenditure additions	1.9	–	8.4	7.3	19.6	21.8	59.0
Acquisitions through business combinations	–	–	–	–	–	–	–
Disposals	(0.1)	(1.5)	(1.9)	(3.2)	(8.1)	–	(14.8)
Assets classified as held for sale	(1.0)	–	–	–	–	–	(1.0)
Reclassifications	19.0	–	–	–	26.5	(45.5)	–
As at 31 December 2020 and 1 January 2021	**240.7**	**0.9**	**30.8**	**26.7**	**586.3**	**33.3**	**918.7**
Exchange adjustments	**(5.4)**	**–**	**(0.9)**	**(1.0)**	**(14.0)**	**(1.1)**	**(22.4)**
Capital expenditure additions	**2.3**	**–**	**9.9**	**7.2**	**17.0**	**29.1**	**65.5**
Acquisitions through business combinations	**6.6**	**–**	**–**	**–**	**4.3**	**0.5**	**11.4**
Disposals	**(4.5)**	**(0.1)**	**(0.7)**	**(3.3)**	**(31.9)**	**(0.7)**	**(41.2)**
Assets reclassified from held for sale	**0.9**	**–**	**–**	**–**	**–**	**–**	**0.9**
Reclassifications	**4.0**	**(0.1)**	**–**	**(0.6)**	**11.0**	**(19.2)**	**(4.9)**
As at 31 December 2021	**244.6**	**0.7**	**39.1**	**29.0**	**572.7**	**41.9**	**928.0**
Accumulated depreciation and impairment losses							
As at 1 January 2020	109.5	1.7	3.9	8.9	421.3	–	545.3
Exchange adjustments	0.4	–	(0.1)	–	(5.2)	–	(4.9)
Depreciation charge	6.8	0.1	4.0	6.8	32.9	–	50.6
Impairment	1.0	–	–	–	0.5	–	1.5
Disposals	–	(1.0)	(1.2)	(2.5)	(6.7)	–	(11.4)
Assets classified as held for sale	0.1	–	–	–	–	–	0.1
As at 31 December 2020 and 1 January 2021	**117.8**	**0.8**	**6.6**	**13.2**	**442.8**	**–**	**581.2**
Exchange adjustments	**(2.8)**	**–**	**(0.4)**	**(0.7)**	**(9.3)**	**–**	**(13.2)**
Depreciation charge	**6.4**	**–**	**4.6**	**6.2**	**32.6**	**–**	**49.8**
Impairment	**(2.9)**	**–**	**–**	**–**	**–**	**–**	**(2.9)**
Disposals	**(1.6)**	**–**	**(0.7)**	**(2.6)**	**(31.8)**	**–**	**(36.7)**
Assets reclassified from held for sale	**0.1**	**–**	**–**	**–**	**–**	**–**	**0.1)**
Reclassifications	**0.1**	**(0.1)**	**–**	**–**	**(2.8)**	**–**	**(2.8)**
As at 31 December 2021	**117.1**	**0.7**	**10.1**	**16.1**	**431.5**	**–**	**575.5**
Net book value as at 31 December 2021	**127.5**	**–**	**29.0**	**12.9**	**141.2**	**41.9**	**352.5**
Net book value as at 31 December 2020	122.9	0.1	24.2	13.5	143.5	33.3	337.5
Net book value as at 1 January 2020	111.6	0.7	20.7	13.7	133.3	57.7	337.7

Notes to the Group Financial Statements continued

15. Property, Plant and Equipment continued

15.2 Movement in net book value continued

Capital expenditure on customer-installation assets was £5.7m (2020: £8.7m).

Capital commitments as at 31 December 2021 were £nil (31 December 2020: £nil).

The impact of climate change has been considered in the review of carrying values to consider whether there are indications of material impairment arising from the potential physical risks arising from climate change. We have not impaired any assets this year as a result of this exercise. We have also considered the impact of climate change on the estimation of useful lives and no material impacts were noted.

As at 1 January, £2.1m net book value of Enterprise Resource Planning tools in use were reclassified from Construction in progress within Property, Plant and Equipment to Software within Intangible Assets (Note 16).

16. Intangible Assets

Intangible assets comprise goodwill, other intangible assets that have been acquired through business combinations, and software costs.

16.1 Accounting policy

(a) Goodwill

Goodwill arising in a business combination is initially recognised as an asset at cost, measured as the excess of the aggregate of the acquisition-date fair value of the consideration transferred and the amount of any non-controlling interest acquired over the net of the acquisition-date fair value amounts of the identifiable assets acquired and liabilities assumed. When the excess is negative, a bargain purchase gain is recognised immediately in profit or loss. Goodwill is subsequently measured at cost less accumulated impairment losses, with impairment testing carried out annually, or more frequently when there is an indication that the cash-generating unit (CGU) to which the goodwill has been allocated may be impaired. On disposal of a business, the attributable amount of goodwill is included in the calculation of the profit or loss on disposal.

(b) Other intangible assets

Intangible assets other than goodwill are recognised on business combinations if they are separable, or if they arise from contractual or other legal rights, and their value can be measured reliably. They are initially measured at cost, which is equal to the acquisition-date fair value, and subsequently measured at cost less accumulated amortisation charges and accumulated impairment losses. Other intangible assets are subject to impairment testing when there is an indication that an impairment loss may have been incurred and are amortised over their estimated useful lives.

(c) Research and development costs

The Group's research activity involves long-range, 'blue sky' investigation, the findings from which may be used in the future to develop new or substantially improved products. Expenditure on research activities is recognised in the Group Income Statement as an expense in the year in which it is incurred.

Development is the application of research findings for the production of new or substantially improved products, processes and services before the start of commercial production. Development expenditure is capitalised only if the expenditure can be measured reliably, the product or process is technically and commercially feasible, future economic benefits are probable and the Group intends to and has sufficient resources to complete development and to use or sell the asset. Otherwise, it is recognised in the Group Income Statement as an expense in the year in which it is incurred. Capitalised development expenditure, where there is any, is stated at cost less accumulated amortisation and impairment losses.

In determining whether development expenditure is capitalised as an intangible asset, management considers whether the strict intangible asset recognition criteria set out in IAS 38 Intangible Assets have been met at the time the expenditure is incurred. In making this determination, management recognises that a significant amount of the development expenditure undertaken by the Group is focused on dealing with local customer technical support issues and incremental developments to existing products as opposed to new or substantially improved products, and that at the time the feasibility of the project is determined, a significant proportion of the development expenditure for that project has already been incurred. In 2021 and 2020 no projects met the criteria for IAS 38 capitalisation.

(d) Software

The costs of ERP system implementations, including the purchase cost of the software and the time costs of employees directly involved in the implementation work is capitalised and amortised over a period of no more than ten years.

16. Intangible Assets continued

16.2 Movement in net book value

	Notes	Goodwill £m	Other acquired intangible assets £m	Software £m	2021 total £m	Goodwill £m	Other acquired intangible assets £m	2020 total £m
Cost								
As at 1 January		617.6	279.4	–	897.0	620.2	279.2	899.4
Exchange adjustments		(16.7)	(5.9)	(0.1)	(22.7)	(2.6)	0.2	(2.4)
Capital expenditure additions		–	–	1.9	1.9	–	–	–
Business combinations	20	13.3	12.2	–	25.5	–	–	–
Reclassifications		–	–	4.9	4.9	–	–	–
As at 31 December		614.2	285.7	6.7	906.6	617.6	279.4	897.0
Accumulated amortisation and impairment losses								
As at 1 January		–	200.9	–	200.9	–	190.9	190.9
Exchange adjustments		–	(3.9)	(0.1)	(4.0)	–	0.1	0.1
Amortisation charge for the year		–	9.7	0.4	10.1	–	9.9	9.9
Reclassifications		–	–	2.8	2.8	–	–	–
As at 31 December		–	206.7	3.1	209.8	–	200.9	200.9
Net book value as at 31 December		614.2	79.0	3.6	696.8	617.6	78.5	696.1

Amortisation charge of £9.7m (2020: £9.9m) in respect of other acquired intangible assets includes £5.4m (2020: £5.6m) recognised in respect of Foseco customer relationships, £3.6m (2020: £3.6m) in respect of Foseco trade name and £0.7m (2020: £0.7m) in respect of CCPI customer relationships.

The impact of climate change has been considered in the review of carrying values to consider whether there are indications of material impairment arising from risks arising from climate change. We have not impaired any intangible assets this year as a result of this exercise. We have also considered the impact of climate change on the estimation of useful lives and no material impacts were noted.

As at 1 January, £2.1m net book value of ERP system implementations was reclassified from Construction in progress within Property, Plant and Equipment (Note 15) to Software within Intangible Assets.

16.3 Analysis of goodwill by cash-generating unit (CGU)

Goodwill acquired in a business combination is allocated to each of the Group's CGUs expected to benefit from the synergies of the combination. For the purposes of impairment testing, the Directors consider that the Group has four CGUs: Steel Advanced Refractories, Steel Flow Control, Steel Sensors & Probes, and the Foundry Division. These CGUs represent the lowest level within the Group at which goodwill is monitored (Note 17.2).

	2021 £m	2020 £m
Steel Flow Control	269.0	276.5
Steel Advanced Refractories	140.2	130.3
Foundry	205.0	210.8
Total goodwill	614.2	617.6

Notes to the Group Financial Statements continued

16. Intangible Assets continued

16.4 Analysis of other acquired intangible assets

Other acquired intangible assets are amortised on a straight-line basis over their estimated useful lives. The assets acquired and their remaining useful lives are shown below.

	Remaining useful life years	Net book value as at 31 Dec 2021 £m	Net book value as at 31 Dec 2020 £m
Foseco			
– customer relationships (useful life: 20 years)	6.3	**32.9**	40.2
– trade name (useful life: 20 years)	6.3	**22.6**	26.3
Universal Refractories, Inc. (URI)			
– customer relationships (useful life: 20 years)*	20.0	**6.2**	–
– know-how (useful life: 20 years)*	20.0	**5.0**	–
– non-compete agreements (useful life: 5 years)*	5.0	**0.8**	–
CCPI			
– customer relationships (useful life: 20 years)	17.2	**11.5**	12.0
Total		**79.0**	78.5

* The values and useful lives of URI intangibles are provisional.

16.5 Analysis of software

Software comprises Enterprise Resource Planning tools in use and being developed. The software is installed on Vesuvius' servers and the Group has complete ownership of the assets.

17. Impairment of Tangible and Intangible Assets

17.1 Accounting policy

The Directors regularly review the performance of the business and the external business environment to determine whether there is any indication that the Group's tangible and intangible assets have suffered an impairment loss. If such indication exists, the higher of the Value in Use and the fair value less costs to sell off the asset is estimated and compared with the carrying value in order to determine the extent, if any, of the impairment loss. Where it is not feasible to estimate the recoverable amount of an individual asset, the Directors estimate the recoverable amount of the CGU to which the asset belongs. In addition, goodwill is tested for impairment on an annual basis. Goodwill acquired in a business combination is allocated to each of the Group's CGUs expected to benefit from the synergies of the combination and the Directors carry out annual impairment testing of the carrying value of each CGU, to assess the need for any impairment of the carrying value of the associated goodwill and other intangible and tangible assets.

For the purpose of impairment testing, the recoverable amount of an asset or CGU is the higher of (i) its fair value less costs to sell and (ii) its Value in Use. If the recoverable amount of a CGU is less than its carrying amount, the resulting impairment loss is allocated first to reduce the carrying amount of any goodwill allocated to the CGU and then to the other assets of the CGU pro rata on the basis of the carrying amount of each asset in the CGU. An impairment loss recognised for goodwill is not reversed in a subsequent period. An impairment loss recognised in a prior year for an asset other than goodwill may be reversed where there has been a change in the estimates used to measure the asset's recoverable amount since the impairment loss was recognised.

17.2 Key assumptions and methodology

The key assumptions in determining Value in Use are projected cash flows, growth rates and discount rates. These are disclosed as critical accounting estimates in Note 3.5.

Projected cash flows for the next three years have been based on the latest Board-approved budgets and strategic plans. They reflect management's expectations of revenue, EBITDA growth, capital expenditure, working capital and adjusted operating cash flows, based on past experience and future expectations of business performance, and take into account the cyclicality of the business in which the CGU operates. Cash flows beyond the period of the strategic plans have been extrapolated using a perpetuity growth rate of 2.5% (2020: 2.5%). The growth rate has been calculated using GDP growth forecasts published by the International Monetary Fund for the Group's end-markets. These GDP growth forecasts have been weighted to reflect the Group's weighted average sales in each end-market during 2021.

17. Impairment of Tangible and Intangible Assets continued

17.2 Key assumptions and methodology continued

The cash flows have been discounted to their current value using pre-tax discount rates, which represent each CGU's weighted average cost of capital (WACC). The assumptions used in the calculation of the WACC for each CGU have been benchmarked to externally available data. These are industry-specific beta coefficients, risk-free rates and equity risk premiums. The pre-tax discount rate used for the Steel Flow Control, Steel Advanced Refractories and Steel Sensors & Probes CGUs was 12.4% (2020: 13.7%) and for the Foundry CGU was 11.6% (2020: 15.0%). The decrease in the pre-tax discount rates has been driven by a decrease in the equity risk premiums partially offset by an increase in risk-free rates – these changes are not specific to Vesuvius.

The Group carried out its annual goodwill impairment test as at 31 October 2021 (2020: 31 October 2020). The recoverable amount of each CGU significantly exceeded its carrying value, therefore no impairment charges have been recognised. The recoverable amount of each CGU was also checked against its carrying value as at 31 December 2021 and no impairment triggers were identified.

The Directors have considered the impact of climate change on the cash flows and other assumptions used for goodwill impairment testing and no material impacts were noted.

Sensitivity of impairment reviews

Steel Flow Control (FC), Steel Advanced Refractories (AR) and the Foundry Division are the key CGUs. There were no intangible assets in the Steel Sensors & Probes CGU. The recoverable amount of all CGUs exceeded their carrying value on the basis of the assumptions set out above and any reasonably possible changes thereof. A sensitivity analysis was carried out using reasonably possible changes to the key assumptions as set out in the table below. The following decreases to the recoverable amount of the Group's goodwill and intangible assets were observed:

Key assumption	Relevant CGUs	Assumption	Sensitivity	Decrease in recoverable value, £m	Impairment arising
Free cash flow average annual growth rate	FC, AR, Foundry	12.9% – 25.6%	Decrease cash flows by 20%	(472.0)	None
Pre-tax discount rate	FC, AR	12.4%	Increase by 1%	(140.2)	None
Pre-tax discount rate	Foundry	11.6%	Increase by 1%	(78.5)	None
Long-term growth rate	FC, AR, Foundry	2.5%	Decrease by 1.5%	(274.9)	None

18. Trade and Other Receivables

18.1 Accounting policy

Trade and other receivables are initially recognised at fair value and subsequently measured at amortised cost, using the effective interest method, less impairment losses. Details on impairment of financial assets are disclosed in Note 25.

18.2 Analysis of trade and other receivables (current)

	2021				2020			
	Gross £m	ECL provision £m	Net £m	ECL provision coverage[1]	Gross £m	ECL provision £m	Net £m	ECL provision coverage[1]
Trade receivables								
– current	**292.1**	**(0.4)**	**291.7**	**0.1%**	250.6	(0.5)	250.1	0.2%
– 1 to 30 days past due	**38.5**	**(0.1)**	**38.4**	**0.3%**	35.6	(0.3)	35.3	0.8%
– 31 to 60 days past due	**10.5**	**(0.1)**	**10.4**	**1.0%**	9.1	(0.1)	9.0	1.1%
– 61 to 90 days past due	**4.6**	**–**	**4.6**	**0.0%**	3.0	(0.2)	2.8	6.7%
– over 90 days past due	**29.2**	**(22.1)**	**7.1**	**75.7%**	27.7	(22.9)	4.8	82.7%
Trade receivables	**374.9**	**(22.7)**	**352.2**		326.0	(24.0)	302.0	
Other receivables			**65.4**				49.1	
Prepayments			**27.6**				18.8	
Total trade and other receivables			**445.2**				369.9	

1. ECL provision coverage is expected credit loss provision divided by gross trade receivables.

Notes to the Group Financial Statements continued

18. Trade and Other Receivables continued

18.2 Analysis of trade and other receivables (current) continued

There is no significant difference between the fair value of the Group's trade and other receivables balances and the amount at which they are reported in the Group Balance Sheet.

Historical experience has shown that the Group's trade receivable provisions are maintained at levels that are sufficient to absorb actual bad debt write-offs, without being excessive. The Group considers the credit quality of financial assets that are neither past due nor impaired as good.

Included within Other receivables are promissory notes of £22.0m (2020: £20.4m). The majority of these notes relate to customers in China and have typical maturities of six months from the issuing date. The full amount of revenue is recognised from the customer when performance obligations are satisfied in accordance with IFRS 15. Other receivables also include VAT receivables of £32.5m (2020: £18.6m) and insurance reimbursements (see Note 30.2) of £2.0m (2020: £2.0m).

18.3 Other receivables (non-current)

Non-current other receivables of £16.2m (2020: £18.6m) include insurance reimbursements (see Note 30.2) of £12.4m (2020: £10.4m) and prepaid taxes of £1.6m (2020: £4.1m).

The Group applies the expected credit loss model under IFRS 9 to these other receivables. The expected credit loss for other receivables is immaterial.

The maximum exposure to credit risk at the end of the reporting period is the net carrying amount of these trade and other receivables.

18.4 Impairment of trade and other receivables

Details relating to the impairment of trade receivables are disclosed in Note 25.

19. Inventories

19.1 Accounting policy

Inventories are stated at the lower of cost (using the first in, first out method) and net realisable value. Cost comprises expenditure incurred in purchasing or manufacturing inventories together with all other costs directly incurred in bringing the inventory to its present location and condition and, where appropriate, attributable production overheads based on normal activity levels. Net realisable value represents the estimated selling price less all estimated costs of completion and costs to be incurred in marketing, selling and distribution. The amount of any write-down of inventories to net realisable value is recognised as an expense in the year in which the write-down occurs.

19.2 Analysis of inventories

	2021 £m	2020 £m
Raw materials	**118.8**	62.3
Work-in-progress	**19.6**	16.9
Finished goods	**161.0**	108.1
Total inventories	**299.4**	187.3

The cost of inventories recognised as an expense and included in manufacturing costs of continuing operations in the Group Income Statement during the year was £658.6m (2020: £533.5m).

The net inventories of £299.4m include a provision for obsolete stock of £12.5m (2020: £12.8m). There were inventory write-downs of £0.9m (2020: write-down reversals of £1.5m).

20. Acquisitions and Divestments

20.1 Universal Refractories

On 6 December 2021, Vesuvius plc acquired the trade and assets of Universal Refractories, Inc. (URI), a specialty refractory producer based in Pennsylvania, USA, which is focused on tundish (steel continuous casting) applications as well as consumable products for the foundry industry. It has become part of the Group's Steel Advanced Refractories business unit, with the exception of the ladle liners business, which has been absorbed by our Foundry Division (<10% of sales). The transaction valued URI at an enterprise value of $57.1m (£42.6m) on a cash and debt-free basis and was funded from Vesuvius' internal resources.

20. Acquisitions and Divestments continued

20.1 Universal Refractories continued

Given the timing of the acquisition, final valuations have not all been completed, but the provisional fair values of the assets and liabilities recognised as a result of the acquisition are as follows:

	Book value £m	Fair value adjustments £m	Adjusted value £m
Property, plant and equipment	4.5	6.9	11.4
Intangible assets (customer relationships, know-how and non-compete agreements)	–	12.2	12.2
Inventories	5.0	1.1	6.1
Receivables	5.5	–	5.5
Payables	(1.9)	–	(1.9)
Borrowings	(5.4)	–	(5.4)
Deferred tax	–	(3.0)	(3.0)
Net identifiable assets acquired	7.7	17.2	24.9
Goodwill			13.3
Consideration			**38.2**

The goodwill is attributable to URI's reputation in the marketplace and the synergies that Vesuvius expects to gain from its integration. It is expected to be tax deductible.

The decision to acquire URI was driven by its long-standing customer relationships and know-how. The identifiable intangible assets acquired are customer relationships, know-how and non-compete agreements. The fair value of these intangibles is provisional pending final valuations. A deferred tax liability of £3.0m has been provided in relation to these fair value adjustments.

In the period since acquisition, URI has contributed £2.1m to revenue and £(0.2)m to operating profit. In accordance with IFRS 3, the acquired inventory was revalued to fair value less costs to sell, resulting in a reduction to operating profit of £0.6m. If the acquisition had occurred on the first day of the financial year, it is estimated that the revenue and operating profit from the acquisition would have been £31.2m and £6.8m respectively. On acquisition, URI was subsumed into the Steel Advanced Refractories activities business unit and the Foundry Division and goodwill is monitored at the level of the Steel Advanced Refractories operating segment.

The net cash outflow on acquisition was £43.6m, including related excess working capital payment; the business was acquired on a cash and debt-free basis. In accordance with IFRS 3, we disclose above consideration of £38.2m and borrowings repaid immediately prior to acquisition of £5.4m. Receivables of £5.5m are expected to be collected. Acquisition-related costs of £1.3m were included in administrative expenses in the Income Statement.

20.2 Other acquisitions

The Group did not acquire any material interests in any companies other than URI during the year ended 31 December 2021; however, contingent consideration of £0.1m was paid during 2021 in respect of the previous acquisition of Ecil Met Tec.

The Group did not acquire any material interests in any companies in the year ended 31 December 2020; however, contingent consideration of £1.4m was paid during 2020 in respect of the previous acquisition of Ecil Met Tec.

21. Issued Share Capital

21.1 Accounting policy

Equity instruments issued by the Company are recorded as the proceeds received, net of direct issue costs.

21.2 Analysis of issued share capital

The allotted, issued and fully paid ordinary share capital of the Company as at 1 January 2021 and 31 December 2021 was 278,485,071 shares of 10 pence each. Further information relating to the Company's share capital is given in Note 9 to the Company's Financial Statements.

Notes to the Group Financial Statements continued

22. Retained Earnings

	Notes	Reserve for own shares £m	Share option reserve £m	Other retained earnings £m	Total retained earnings £m
As at 1 January 2020		(39.3)	4.5	2,497.9	2,463.1
Profit for the year		–	–	41.3	41.3
Remeasurement of defined benefit liabilities/assets		–	–	7.7	7.7
Recognition of share-based payments		–	2.4	–	2.4
Release of share option reserve on exercised and lapsed options		3.4	(3.4)	–	–
Income tax on items recognised in other comprehensive income		–	–	(3.2)	(3.2)
Dividends paid	24	–	–	(8.4)	(8.4)
As at 31 December 2020 and 1 January 2021		**(35.9)**	**3.5**	**2,535.3**	**2,502.9**
Profit for the year		**–**	**–**	**102.1**	**102.1**
Remeasurement of defined benefit liabilities/assets		**–**	**–**	**(80.6)**	**(80.6)**
Recognition of share-based payments		**–**	**3.1**	**–**	**3.1**
Release of share option reserve on exercised and lapsed options		**2.5**	**(2.5)**	**–**	**–**
Income tax on items recognised in other comprehensive income		**–**	**–**	**12.5**	**12.5**
Purchase of ESOP shares		**(1.1)**	**–**	**–**	**(1.1)**
Dividends paid	24	**–**	**–**	**(55.5)**	**(55.5)**
As at 31 December 2021		**(34.5)**	**4.1**	**2,513.8**	**2,483.4**

23. Other Reserves

	Other reserves £m	Cash flow hedge reserve £m	Translation reserve £m	Total other reserves £m
As at 1 January 2020	(1,499.3)	–	71.8	(1,427.5)
Exchange differences on translation of the net assets of foreign operations	–	–	(12.7)	(12.7)
Exchange differences on translation of net investment hedges	–	–	(9.7)	(9.7)
Net change in costs of hedging	–	0.4	–	0.4
Change in the fair value of the hedging instrument	–	(8.1)	–	(8.1)
Amounts reclassified from the income statement	–	6.3	–	6.3
As at 31 December 2020 and 1 January 2021	**(1,499.3)**	**(1.4)**	**49.4**	**(1,451.3)**
Exchange differences on translation of the net assets of foreign operations	**–**	**–**	**(31.0)**	**(31.0)**
Exchange differences on translation of net investment hedges	**–**	**–**	**14.4**	**14.4**
Net change in costs of hedging	**–**	**(1.2)**	**–**	**(1.2)**
Change in the fair value of the hedging instrument	**–**	**2.2**	**–**	**2.2**
Amounts reclassified from the income statement	**–**	**(0.7)**	**–**	**(0.7)**
As at 31 December 2021	**(1,499.3)**	**(1.1)**	**32.8**	**(1,467.6)**

Within other reserves as at 31 December 2021 is £1,499.0m (2020: £1,499.0m) arising from the demerger of Cookson Group plc, being the excess of the Vesuvius plc share capital of £1,777.9m over the total share capital and share premium of Cookson Group plc as at 14 December 2012 of £278.9m.

The translation reserve in the table above comprises foreign exchange differences attributable to the owners of the Parent. These exchange differences arise from the translation of the financial statements of foreign operations and from the translation of financial instruments that hedge the Group's net investment in foreign operations. In addition to foreign exchange differences attributable to the owners of the Parent, the Group Statement of Comprehensive Income includes foreign exchange differences attributable to non-controlling interests.

Of the closing balance in the translation reserve, a £3.0m debit relates to net investment hedging arrangements put in place on or after 1 January 2018 but discontinued as at 31 December 2021. The full closing balance in the cash flow hedge reserve relates to continuing hedges.

Cash flow hedge reserve balance includes cost of hedging balance of £0.8m debit (2020: £0.4m credit).

24. Dividends

	2021 £m	2020 £m
Amounts recognised as dividends and paid to equity shareholders during the year		
Interim dividend for the year ended 31 December 2020 of 3.1p per ordinary share	**–**	8.4
Final dividend for the year ended 31 December 2020 of 14.3p per ordinary share	**38.7**	–
Interim dividend for the year ended 31 December 2021 of 6.2p per ordinary share	**16.8**	–
	55.5	8.4

A proposed final dividend for the year ended 31 December 2021 of £40.5m (2020: £38.7m), equivalent to 15.0 pence (2020: 14.3 pence) per ordinary share, is subject to approval by shareholders at the Company's Annual General Meeting on 18 May 2022 and has not been included as a liability in these financial statements. If approved by shareholders, the dividend will be paid on 27 May 2022 to holders of ordinary shares on the register on 19 April 2022.

25. Financial Risk Management

25.1 Accounting policy

(a) Valuation of financial assets and liabilities

The Group's financial assets and liabilities are measured as appropriate either at amortised cost or at fair value through other comprehensive income or at fair value through profit and loss.

IFRS 13 Fair Value Measurement requires classification of financial instruments within a hierarchy that prioritises the inputs to fair value measurement. The three levels of the fair value hierarchy are:

Level 1 – Unadjusted quoted prices in active markets for identical assets or liabilities.

Level 2 – Inputs other than quoted prices that are observable for the asset or liability, either directly or indirectly.

Level 3 – Inputs that are not based on observable market data.

Trade receivables are amounts due from customers for goods sold or services performed in the ordinary course of business. Trade receivables are recognised initially at their fair value, which is the amount of consideration that is unconditional. The Group holds the trade receivables with the objective of collecting the contractual cash flows (held to collect) and therefore measures them subsequently at amortised cost using the effective interest method.

Derivatives which do not meet the hedge accounting criteria are classified as fair value through profit and loss (held for trading).

The cross-currency interest rate swaps (see Note 25.2) which meet the hedging criteria are measured at fair value through other comprehensive income.

Loans and borrowings are initially recognised at fair value net of directly attributable transaction costs. After initial recognition, they are measured at amortised cost, using the effective interest method.

(b) Foreign currencies

The individual financial statements of each Group entity are prepared in their functional currency, which is the currency of the primary economic environment in which that entity operates. For the purpose of the Group Financial Statements, the results and financial position of each entity are translated into pounds sterling, which is the presentational currency of the Group.

Reporting foreign currency transactions in functional currency

Transactions in currencies other than the entity's functional currency are initially recorded at the rates of exchange prevailing at the end of the preceding month or on the date of the transaction itself. At each subsequent balance sheet date:

(i) Foreign currency monetary items are retranslated at the rates prevailing at the balance sheet date. Exchange differences arising on the settlement or retranslation of monetary items are recognised either in the Group Income Statement or the Group Statement of Comprehensive Income

(ii) Non-monetary items measured at historical cost in a foreign currency are not retranslated.

Translation from functional currency to presentational currency

When the functional currency of a Group entity is different from the Group's presentational currency (pounds sterling), its results and financial position are translated into the presentational currency as follows:

(i) Assets and liabilities are translated using exchange rates prevailing at the balance sheet date

(ii) Income and expense items are translated at average exchange rates for the year, except where the use of such average rates does not approximate the exchange rate at the date of a specific transaction, in which case the transaction rate is used

(iii) All resulting exchange differences are recognised in other comprehensive income and presented in the translation reserve in equity and are reclassified to profit or loss in the period in which the foreign operation is disposed of.

Notes to the Group Financial Statements continued

25. Financial Risk Management continued

25.1 Accounting policy continued

Net investment in foreign operations

Exchange differences arising on a monetary item that forms part of a reporting entity's net investment in a foreign operation are initially recognised in other comprehensive income and presented in the translation reserve in equity and reclassified to profit or loss on disposal of the net investment.

(c) Derivative financial instruments

The Group uses derivative financial instruments ('derivatives') to manage the financial risks associated with its underlying activities and the financing of those activities. Derivatives are measured at fair value using market prices at the balance sheet date. Any derivatives which form part of a hedge accounting relationship are designated as such on the date on which they are executed. Any derivatives which do not form part of a designated hedge accounting relationship are classified as 'held for trading' for accounting purposes and are accounted for at fair value through profit or loss. They are presented as current assets or liabilities to the extent they are expected to be settled within 12 months after the end of the reporting period.

(d) Cash flow hedges

Changes in the fair value of derivatives designated as cash flow hedges are recognised in other comprehensive income to the extent that the hedges are effective. Any ineffective portion would immediately be recognised in net finance costs in the profit or loss. If a forecast transaction is no longer expected to occur, the amounts previously recognised in other comprehensive income would be transferred to net finance costs in the profit or loss.

(e) Net investment hedges

The Group designates certain of its borrowings and derivatives as net investment hedges of its foreign operations. As with cash flow hedges, the effective portion of the gain or loss on hedging instruments is recognised in other comprehensive income whilst any ineffective portion would immediately be recognised in net finance costs in the profit or loss. In the event a foreign operation is disposed of or liquidated, amounts recognised in other comprehensive income are reclassified from equity to profit or loss.

25.2 Financial risk factors

The Group's Treasury department, acting in accordance with policies approved by the Board, is principally responsible for managing the financial risks faced by the Group. The Group's activities expose it to a variety of financial risks, the most significant of which are market risk and liquidity risk.

Analysis of financial instruments

The following table summarises Vesuvius' financial instruments measured at fair value and shows the level within the fair value hierarchy in which the financial instruments have been classified.

	2021		2020	
	Assets £m	Liabilities £m	Assets £m	Liabilities £m
Investments (Level 2)	0.5	–	0.7	–
Derivatives not designated for hedge accounting purposes (Level 2)	0.1	(0.3)	0.2	–
Derivatives designated for hedge accounting purposes (Level 2)	–	(2.3)	–	(7.0)

(a) Derivative financial instruments

The Group uses derivatives in the form of forward foreign currency contracts to manage the effects of its exposure to foreign exchange risk on trade receivables, trade payables and cash. Derivatives are only used for economic hedging purposes and not as speculative investments.

In June 2020, the Group executed a US$86m cross-currency interest rate swap (CCIRS). The effect of this is to convert the $86m Private Placement Notes issued in June 2020 into €76.6m. The timing and amount of the US dollar cash flows under the CCIRS exactly mirror those of the Private Placement Notes and the maturity date of the CCIRS also matches the repayment date of the Notes. The CCIRS would by default be revalued through the Income Statement; however, as it is in a designated hedging relationship, it is instead revalued through other comprehensive income. More specifically, the US dollar exposure is designated as a cash flow hedge of the underlying Private Placement Notes and the euro exposure is designated as a net investment hedge of part of the Group's foreign operations. The CCIRS is presented as a non-current asset or liability as it is expected to be settled more than 12 months after the end of the reporting period.

With the exception of the CCIRS, the fair value of derivatives outstanding at the year-end has been booked through the Income Statement in 2021. All of the fair values shown in the table above are classified under IFRS 13 as Level 2 measurements which have been calculated using quoted prices from active markets, where similar contracts are traded and the quotes reflect actual transactions in similar instruments. All of the derivative assets and liabilities not designated for hedge accounting purposes reported in the table above will mature within a year of the balance sheet date.

Derivative financial instruments are subject to International Swaps and Derivatives Association (ISDA) agreements. Derivatives designated for hedge accounting purposes are presented net £2.3m, of which gross assets are £3.7m and gross liabilities £6.0m (2020: gross assets £1.1m and gross liabilities £8.1m).

25. Financial Risk Management continued

25.2 Financial risk factors continued

(b) Market risk

Market risk is the risk that either the fair values or the cash flows of the Group's financial instruments may fluctuate because of changes in market prices. The Group is principally exposed to market risk through fluctuations in exchange rates and interest rates.

Currency risk

The Group Income Statement is exposed to currency risk on monetary items that are denominated in currencies other than the functional currency of the companies in which they are held. The currency profile of these financial assets and financial liabilities is shown in the table below.

	2021			2020		
	Euro £m	US dollar £m	Other £m	Euro £m	US dollar £m	Other £m
Trade receivables	70.7	38.7	28.3	31.3	34.8	30.5
Cash at bank	5.2	8.3	15.7	9.8	5.3	16.1
Trade payables	(40.4)	(36.8)	(19.9)	(18.7)	(21.8)	(27.5)
Private Placement Notes	(166.4)	(107.9)	–	(160.8)	(106.8)	–
Bank loans and overdrafts	(23.1)	–	–	(29.6)	(0.1)	–
Finance leases	(0.6)	–	(0.9)	(0.5)	–	(1.1)
Cross-currency interest rate swaps	(64.4)	63.6	–	(68.4)	62.9	–
Foreign currency forward contracts						
– Buy foreign currency	0.9	5.5	–	1.1	1.2	–
– Sell foreign currency	(20.1)	(21.2)	(0.6)	(17.7)	(23.5)	–
	(238.2)	(49.8)	22.6	(253.5)	(48.0)	18.0

The Group has £(1.8)m (2020: £(1.3)m) of exchange differences recognised in the Income Statement of which £(0.9)m arose on the revaluation of derivatives (2020: £(0.7)m).

The tables below show the net unhedged monetary assets and liabilities of Group companies that are not denominated in their functional currency and which could give rise to exchange gains and losses in the Group Income Statement.

	Net unhedged monetary (liabilities)/assets			
	Euro £m	US dollar £m	Other £m	Total £m
Functional currency				
Sterling	(252.3)	(42.3)	5.2	(289.4)
Other	14.1	(7.5)	17.4	24.0
As at 31 December 2021	(238.2)	(49.8)	22.6	(265.4)

	Net unhedged monetary (liabilities)/assets			
	Euro £m	US dollar £m	Other £m	Total £m
Functional currency				
Sterling	(253.6)	(44.1)	–	(297.7)
Other	0.1	(3.9)	18.0	14.2
As at 31 December 2020	(253.5)	(48.0)	18.0	(283.5)

The Group finances its operations partly by obtaining funding through external borrowings. Where these borrowings are not in sterling, they may be designated as net investment hedges. This enables gains and losses arising on retranslation to be charged to other comprehensive income, providing a partial offset in equity against the gains and losses arising on translation of overseas net assets.

As at 31 December 2021, €224m and $60m of borrowings were designated as hedges of net investments in €224m and $60m worth of overseas foreign operations. In addition, the €76.6m CCIRS liability has been designated as a net investment hedge of a further €76.6m worth of overseas foreign operations.

Notes to the Group Financial Statements continued

25. Financial Risk Management continued

25.2 Financial risk factors continued

As the value of the borrowings and the CCIRS liability exactly matches the designated hedged portion of the net investments, the relevant hedge ratio is 1:1. The net investment hedges are therefore 100% effective with no ineffectiveness. It is noted that hedge ineffectiveness would arise in the event there were insufficient euro-denominated overseas foreign operations to be matched against the €76.6m CCIRS liability.

The total retranslation impact of the borrowings and CCIRS designated as net investment hedges was £14.4m (2020: £9.7m).

The $86m CCIRS asset has been designated as a cash flow hedge of the $86m USPP Notes issued in 2020. As all principal and interest cash flows under the CCIRS exactly mirror those under the USPP Notes, the cash flow hedge is 100% effective with no ineffectiveness. It is noted that hedge ineffectiveness would arise in the event there was a change in the contractual terms of either the USPP Notes or the CCIRS.

Hedge effectiveness is determined at inception of the hedge relationship and through periodic effectiveness assessments, to ensure that an economic relationship exists between the hedged item and hedging instrument.

Interest rate risk

The Group's interest rate risk principally arises in relation to its borrowings. Where borrowings are held at floating rates of interest, fluctuations in interest rates expose the Group to variability in the cash flows associated with its interest payments, and where borrowings are held at fixed rates of interest, fluctuations in interest rates expose the Group to changes in the fair value of its borrowings. The Group's policy is to maintain an appropriate mix of fixed and floating rate borrowings based on the Vesuvius trading environment, market conditions and other economic factors.

As at 31 December 2021, the Group had $146m, €198m and £28m (£302.3m in total) of USPP Notes outstanding, which carry a fixed rate of interest, representing 75% of the Group's total borrowings outstanding at that date. The interest rate profile of the Group's borrowings is detailed in the tables below.

	Financial liabilities (gross borrowings)		
	Fixed rate £m	Floating rate £m	Total £m
Sterling	28.0	76.4	104.4
US dollar	107.9	1.2	109.1
Euro	166.4	27.2	193.6
Capitalised arrangement fees	(1.2)	(2.1)	(3.3)
As at 31 December 2021	301.1	102.7	403.8

	Financial liabilities (gross borrowings)		
	Fixed rate £m	Floating rate £m	Total £m
Sterling	–	43.3	43.3
US dollar	106.8	0.3	107.1
Euro	160.8	31.5	192.3
Other	–	0.5	0.5
Capitalised arrangement fees	(1.3)	(0.1)	(1.4)
As at 31 December 2020	266.3	75.5	341.8

Information in respect of the currency risk management of $86m of US dollar-denominated fixed rate financial liabilities is provided above.

The floating rate financial liabilities shown in the tables above typically bear interest at the inter-bank offered rate of the appropriate currency, plus a margin. The fixed rate financial liabilities of £302.3m (2020: £267.6m) have a weighted average interest rate of 3.2% (2020: 3.4%) and a weighted average period for which the rate is fixed of 6.2 years (2020: 6.2 years).

The financial assets attract floating rate interest.

Based upon the interest rate profile of the Group's financial liabilities shown in the tables above, a 1% increase in market interest rates would increase both the finance costs charged in the Group Income Statement and the interest paid in the Group Statement of Cash Flows by £1.0m (2020: £0.8m), and a 1% reduction in market interest rates would decrease both the finance costs charged in the Group Income Statement and the interest paid in the Group Statement of Cash Flows by £1.0m (2020: £0.8m).

25. Financial Risk Management continued

25.2 Financial risk factors continued

(c) Credit risk

Credit risk arises from cash and cash equivalents, derivative financial assets and deposits with banks and financial institutions, as well as credit exposures to customers, including outstanding receivables.

(i) Risk management

For banks and financial institutions, apart from certain limited circumstances, Group policy is that only independently rated entities with a minimum rating of 'A-' are accepted as counterparties. In addition, the Group's operating companies have policies and procedures in place to assess the creditworthiness of the customers with whom they do business.

(ii) Impairment of financial assets

The Group subjects trade receivables for sales of inventory and from the provision of services to the expected credit loss model.

Whilst cash and cash equivalents are also subject to the impairment requirements of IFRS 9, the identified impairment loss was immaterial.

The Group applies the IFRS 9 simplified approach to measuring expected credit losses, which uses a lifetime expected loss allowance for all trade receivables and contract assets. The expected loss rates are based on the payment profiles of sales over a period of 60 months before 31 December 2021 and the corresponding historical credit losses experienced within this period. The historical loss rates are adjusted to reflect current and forward-looking information on macro-economic factors affecting the ability of the customers to settle the receivables. The Group has identified the current state of the economy (such as market interest rates or growth rates) and particular industry issues in the countries in which it sells its goods and services to be the most relevant factors, and accordingly adjusts the historical loss rates based on expected changes in these factors.

Regardless of the analysis above, a significant increase in credit risk is presumed if a debtor is more than 30 days past due in making a contractual payment. Where objective evidence exists that a trade receivable balance may be impaired, provision is made for the difference between its carrying amount and the present value of the estimated cash that will be recovered.

Evidence of impairment may include such factors as a change in credit risk profile of the customer, the customer being in default on a contract, or the customer entering bankruptcy or financial reorganisation proceedings. All significant balances are reviewed individually for evidence of impairment.

Trade receivables and contract assets are written off when there is no reasonable expectation of recovery. Indicators that there is no reasonable expectation of recovery include, amongst others, the failure of a debtor to engage in a repayment plan with the Group, and a failure to make contractual payments for a period of greater than 120 days past due. Where loans or receivables have been written off, the Company continues to engage in enforcement activity to attempt to recover the receivable due.

Where recoveries are made, these are recognised within the Income Statement.

The closing expected credit loss allowance for trade receivables as at 31 December 2021 reconciles to the opening loss allowances as follows:

	2021 £m	2020 £m
As at 1 January	24.0	26.6
(Decrease)/increase in expected credit loss allowance recognised in profit or loss during the year	(0.5)	(0.3)
Receivables written off during the year as uncollectable	(0.3)	(2.2)
Exchange adjustments	(0.5)	(0.1)
As at 31 December	22.7	24.0

The credit for the year shown in the table above is recorded within administration, selling and distribution costs in the Group Income Statement.

Historical experience has shown that the Group's trade receivable provisions are maintained at levels that are sufficient to absorb actual bad debt write-offs, without being excessive. The Group considers the credit quality of financial assets that are neither past due nor impaired as good.

The Group also applies the expected credit loss model under IFRS 9 to other receivables. If, at the reporting date, the credit risk of the receivables has not increased significantly since initial recognition, the Group measures the loss allowance at an amount equal to 12-month expected credit losses. If the credit risk on that receivable has increased significantly since initial recognition, the Group measures the loss allowance at an amount equal to the lifetime expected credit losses. The expected credit loss on other receivables is not material.

Notes to the Group Financial Statements continued

25. Financial Risk Management continued

25.2 Financial risk factors continued

(d) Liquidity risk

Liquidity risk is the risk that the Group might have difficulties in meeting its financial obligations. The Group manages this risk by ensuring that it maintains sufficient levels of committed borrowing facilities and cash and cash equivalents to ensure that it can meet its operational cash flow requirements and any maturing financial liabilities, whilst at all times operating within its financial covenants. The level of operational headroom provided by the Group's committed borrowing facilities is reviewed at least annually as part of the Group's three-year planning process. Where this process indicates a need for additional finance, this is addressed on a timely basis by means of either additional committed bank facilities or raising finance in the capital markets.

The Group's £300m committed bank facility was scheduled to mature in June 2022. This was cancelled early in July 2021 and re-financed with an enlarged committed bank facility for £385m. The replacement facility is scheduled to mature in July 2025 and there is a one-year extension option exercisable at the discretion of the Group and its lenders. In December 2021, the Group issued £28m and €33m of USPP Notes. These Notes mature in December 2031 and have a weighted average interest rate of 1.77%.

As at 31 December 2021, the Group had committed borrowing facilities of £706.3m (2020: £586.6m), of which £308.1m (2020: £246.6m) were undrawn. These undrawn facilities are due to expire in July 2025. The Group's borrowing requirements are met by USPP, a multi-currency committed syndicated bank facility of £385.0m (2020: £300.0m) and a committed bilateral bank facility of £19.0m (2020: £19.0m) which is fully collateralised against a portion of the Group's cash balance in China.

USPP Notes issued as at 31 December 2021 amounted to £302.3m ($146.0m, €198.0m and £28.0m) and had a weighted average period to maturity of 6.2 years. $30.0m is repayable in December 2023, €15.0m and $60.0m in 2025, €100.0m and $26.0m in 2027, $30.0m in 2028, €50.0m in 2029 and €33.0m and £28.0m in 2031. The maturity analysis of the Group's gross borrowings (including interest) is shown in the tables below. The cash flows shown are undiscounted.

As at 31 December 2021	Within 1 year £m	Between 1 and 2 years £m	Between 2 and 5 years £m	Over 5 years £m	Total contractual cash flows £m	Carrying amount £m
Trade payables	253.8	–	–	–	253.8	253.8
Loans and overdrafts	37.4	9.6	178.2	235.0	460.2	407.1
Lease liabilities	11.6	9.2	13.4	13.2	47.4	39.9
Capitalised arrangement fees	–	–	–	–	–	(3.3)
Derivative liability	(0.6)	(0.6)	(0.6)	0.2	(1.6)	2.6
Total financial liabilities	302.2	18.2	191.0	248.4	759.8	700.1

As at 31 December 2020	Within 1 year £m	Between 1 and 2 years £m	Between 2 and 5 years £m	Over 5 years £m	Total contractual cash flows £m	Carrying amount £m
Trade payables	185.7	–	–	–	185.7	185.7
Loans and overdrafts	44.7	84.2	80.5	187.4	396.8	343.2
Lease liabilities	11.2	9.1	11.1	12.9	44.3	36.3
Capitalised arrangement fees	–	–	–	–	–	(1.4)
Derivative liability	(0.5)	(0.4)	2.7	1.4	3.2	7.0
Total financial liabilities	241.1	92.9	94.3	201.7	630.0	570.8

Capitalised arrangement fees shown in the tables above, which have been recognised as a reduction in borrowings in the financial statements, amounted to £3.3m as at 31 December 2021 (31 December 2020: £1.4m), of which £1.2m (2020: £1.3m) related to the USPP and £2.1m (2020: £0.1m) related to the newly signed syndicated bank facility.

The carrying amount of lease liabilities falling due within one year was £11.6m (2020: 11.2m). The carrying amount of lease liabilities falling due after more than one year was £28.3m (2020: £25.1m).

25. Financial Risk Management continued

25.3 Capital management

The Company considers its capital to be equal to the sum of its total equity, disclosed on the Group Balance Sheet, and net debt (Note 14). It monitors its capital using a number of KPIs, including free cash flow, average working capital to sales ratios, net debt to EBITDA ratios and ROIC (Note 4). The Group's objectives when managing its capital are:

- To ensure that the Group and all of its businesses are able to operate as going concerns and ensure that the Group operates within the financial covenants contained within its debt facilities
- To have available the necessary financial resources to allow the Group to invest in areas that may deliver acceptable future returns to investors
- To maintain sufficient financial resources to mitigate against risks and unforeseen events
- To maximise shareholder value through maintaining an appropriate balance between the Group's equity and net debt.

The Group operated within the requirements of its debt covenants throughout the year and has sufficient liquidity headroom within its committed debt facilities. Details of the Group's covenant compliance and committed debt facilities can be found in the Strategic Report on page 42.

25.4 Cash pooling arrangements

The Group enters into zero balancing and notional cash pooling arrangements as part of its ongoing Treasury management activities. Certain notional cash pooling arrangements meet the criteria for offsetting as clarified in amendments to IAS 32 Financial Instruments: Presentation about a legally enforceable right of set-off both in the ordinary course of business and in the event of default. The following tables set out the amounts of recognised financial assets and liabilities shown as cash and cash borrowings and those amounts which are subject to these agreements.

	Gross amounts of recognised financial assets/ liabilities £m	Gross amounts of recognised financial assets/ liabilities offset in the statement of financial position £m	Net amounts of financial assets/liabilities presented in the statement of financial position £m
Financial assets/liabilities			
Cash deposits	169.1	–	169.1
Cash borrowings	(6.7)	–	(6.7)
As at 31 December 2021	162.4	–	162.4
Financial assets/liabilities			
Cash deposits	209.8	(0.1)	209.7
Cash borrowings	(3.0)	0.1	(2.9)
As at 31 December 2020	206.8	–	206.8

26. Employee Benefits

26.1 Accounting policy

The net liability or net surplus recognised in the Group Balance Sheet for the Group's defined benefit plans is the present value of the defined benefit obligation at the balance sheet date, less the fair value of the plan assets. The defined benefit obligation is calculated by independent actuaries using the projected unit credit method and by discounting the estimated future cash flows using interest rates on high-quality corporate bonds that have durations approximating the terms of the related pension liability.

Any asset recognised in respect of a surplus arising from this calculation is limited to the asset ceiling, where this is the present value of any economic benefits available in the form of refunds or reductions in future contributions in respect of the plans. The Group has an unconditional right to a refund of the UK surplus, as defined under IFRIC 14, and considers that the possibility that a surplus could be reduced or extinguished by discretionary actions by the Trustee does not affect the existence of the asset at the end of the reporting period. The Group therefore recognises a pension asset with respect to the scheme valued on an IAS 19 basis. No liability is recognised with respect to further funding contributions.

The expense for the Group's defined benefit plans is recognised in the Group Income Statement as shown in Note 26.8. Actuarial gains and losses arising on the assets and liabilities of the plans are reported within the Group Statement of Comprehensive Income; and gains and losses arising on settlements and curtailments are recognised in the Group Income Statement in the same line as the item that gave rise to the settlement or curtailment or, if material, separately reported as a component of operating profit.

Notes to the Group Financial Statements continued

26. Employee Benefits continued

26.2 Group post-retirement plans

The Group operates a number of pension plans around the world, both defined benefit and defined contribution, and accounts for them in accordance with IAS 19.

The Group's principal defined benefit pension plans are in the UK and the US, the benefits of which are based upon the final pensionable salaries of plan members. The assets of these plans are held separately from the Group in trustee-administered funds. The Trustees are required to act in the best interests of the plans' beneficiaries. The Group also has defined benefit pension plans in other territories but, except for those in Germany, these are not individually material in relation to the Group.

(a) Defined benefit pension plans – UK

The Group's main defined benefit pension plan in the UK ('the UK Plan') is closed to new members and to future benefit accrual. The existing plan was established under a trust deed and is subject to the Pensions Act 2004 and guidance issued by the UK Pensions Regulator.

In November 2021, the Trustee of the Vesuvius Pension Plan signed a pension insurance buy-in agreement with Pension Insurance Corporation plc (PIC). This buy-in secures an insurance asset from PIC that matches the remaining pension liabilities of the UK Plan, with the result that the Company no longer bears any investment, longevity, interest rate or inflation risks in respect of the UK Plan. The insurance policies with PIC now cover over £450m of liabilities, and all benefits in the UK Plan (with the exception of a small amount of benefits expected to arise in future as a result of guaranteed minimum pensions (GMP) equalisation) are now insured with PIC.

There is a 'long-term scheme-specific funding standard' in Part 3 of the Pensions Act 2004. In terms of Part 3, the UK Plan is subject to a requirement ('the statutory funding objective') that it must have sufficient and appropriate assets to cover its technical provisions. Such technical provisions are determined as part of the triennial valuation. Under the rules of the UK Plan, the Trustee, after consultation with the Company, has the power to set the funding contributions taking into account the results of the triennial valuation and the Pension Act 2004 legislation. Following the buy-in referred to above, no further contributions are expected to be paid to the UK Plan by the Company, and the cost of GMP equalisation will be met out of the surplus UK Plan assets.

(b) Defined benefit pension plans – US

The Group has several defined benefit pension plans in the US, providing retirement benefits based on final salary or a fixed benefit. The Group's principal US defined benefit pension plans are closed to new members and to future benefit accrual for existing members. Actuarial valuations of the US defined benefit pension plans are carried out every year and the last full valuation was carried out as at 31 December 2021. At that date, the market value of the plan assets was $65.4m, representing a funding level of 80.6% of funded accrued plan benefits at that date (using the projected unit method of valuation) of $81.1m. Funding levels for the Group's US defined benefit pension plans are based upon annual valuations carried out by independent qualified actuaries and are governed by US Government regulations.

The Group's US qualified defined benefit pension plan is subject to the minimum contribution requirements of the Internal Revenue Code Sections 412 and 430. Contributions are determined by trustees, in consultation with the Company, based on the annual valuations which are submitted to the Internal Revenue Service. During the fiscal year beginning 1 January 2021, total minimum required contributions were approximately $1.0m. Under these funding laws and based on the plan deficit, the required minimum annual contribution for the 2022 fiscal year is expected to be $nil and the required annual contributions for the period 2023–2024 are expected to be in the $0.0m to $1.0m range. Contributions of $1.3m were made during 2021.

There was a $0.2m settlement gain reported in the main US defined benefit pension plan in 2020 which related to annuity purchases of $7.8m being made in May 2020 (the defined benefit obligation settled was $8.0m).

(c) Defined benefit pension plans – Germany

The Group has several defined benefit pension arrangements in Germany which are unfunded, as is common practice in that country. The main plan was closed to new entrants on 31 December 2016 and replaced by a defined contribution plan for new joiners. The German defined benefit plan contains mainly direct pension promises based on works council agreements as well as on some individual pension promises. The legal framework is the German Company Pensions Act ('Betriebsrentengesetz'). The plan is unfunded (book reserved) and the company pays all benefit payments when they fall due.

(d) Defined benefit pension plans – rest of the world and other post-retirement benefits

The Group has several defined benefit pension arrangements across the rest of the world (ROW), the largest of which are in Belgium. The net liability of the ROW plans at 31 December 2021 was £16.9m (2020: £20.7m). The Group also has liabilities relating to medical insurance arrangements and termination plans which provide for benefit to be paid to employees on retirement. The net liability of these other post-retirement benefits as at 31 December 2021 was £7.0m (2020: £7.0m).

(e) Defined contribution pension plans

The total expense for the Group's defined contribution plans in the Group Income Statement amounted to £10.2m (2020: £9.7m) and represents the contributions payable for the year by the Group to the plans.

26. Employee Benefits continued

26.2 Group post-retirement plans continued

(f) Multi-employer plans

Due to collective agreements, Vesuvius in the US participates, together with other enterprises, in union-run multi-employer pension plans for temporary workers hired on sites. These are accounted for as defined contribution plans. The bulk of the multi-employer pension plans related to BMI, which was disposed in 2018. The BMI sale transaction was structured to ensure as best as possible that any pension liability would go to the acquiring company. There is a five-year window where Vesuvius US could still have some liability for any shortfall in the BMI plans should the buyer cease to exist.

26.3 Post-retirement liability valuation

The main assumptions used in calculating the costs and obligations of the Group's defined benefit pension plans, as detailed below, are set by the Directors after consultation with independent professionally qualified actuaries and include those used to determine regular service costs and the financing elements related to the plans' assets and liabilities. It is the Directors' responsibility to set the assumptions used in determining the key elements of the costs of meeting such future obligations. Whilst the Directors believe that the assumptions used are appropriate, a change in the assumptions used could affect the Group's profit and financial position.

(a) Mortality assumptions

The mortality assumptions used in the actuarial valuations of the Group's UK, US and German defined benefit pension liabilities are summarised in the table below and have been selected to reflect the characteristics and experience of the membership of those plans.

For the UK Plan, the assumptions used have been derived from the Self-Administered Pension Schemes ('SAPS S3') All table, with future longevity improvements in line with the 'core' mortality improvement tables published in 2020 by the Continuous Mortality Investigation (CMI), with a long-term rate of improvement of 1.25% per year. For the Group's US plans, the assumptions used have been based on the Pri-2012 mortality tables and MP-2021 projection scale. The Group's major plans in Germany have been valued using the modified Heubeck Richttafeln 2018G mortality tables. In respect of the life expectancy tables below, current pensioners are assumed to be 65 years old, while future pensioners are assumed to be 45 years old.

	2021			2020		
Life expectancy of pension plan members	UK years	US years	Germany years	UK years	US years	Germany years
Age to which current pensioners are expected to live:						
– Men	**87.2**	**85.0**	**85.5**	87.1	85.4	85.3
– Women	**88.9**	**87.0**	**88.9**	89.4	87.4	88.8
Age to which future pensioners are expected to live:						
– Men	**87.5**	**86.5**	**88.2**	87.5	86.9	88.1
– Women	**90.4**	**88.4**	**91.1**	90.8	88.8	91.0

(b) Other main actuarial valuation assumptions

	2021			2020		
	UK % p.a.	US % p.a.	Germany % p.a.	UK % p.a.	US % p.a.	Germany % p.a.
Discount rate	**2.00**	**2.45**	**1.20**	1.40	2.05	0.60
Price inflation – using RPI for UK	**3.25**	**2.25**	**2.00**	2.90	2.00	1.50
– using CPI for UK	**2.45**	**n/a**	**n/a**	2.20	n/a	n/a
Rate of increase in pensionable salaries	**n/a**	**n/a**	**2.75**	n/a	n/a	2.25
Rate of increase to pensions in payment	**3.15**	**n/a**	**2.00**	2.80	n/a	1.50

The discount rate used to determine the liabilities of the UK Plan for IAS 19 accounting purposes is required to be determined by reference to market yields on high-quality corporate bonds. The UK discount rate in the above table is based on analysis using the expected future cash flows of the Vesuvius Pension Plan and the AON Hewitt AA yield curve; the US discount rate is based on the FTSE (formerly Citigroup) pension discount curve; and the Germany discount rate is based on AA corporate bond yields included in the iBoxx Euro AA corporate bond indices.

The assumptions for UK price inflation are set by reference to the difference between yields on longer-term conventional government bonds and index-linked bonds, except for CPI, for which no appropriate bonds exist, which is assumed to be 0.8 points lower (2020: 0.7 points lower) than RPI-based inflation.

Notes to the Group Financial Statements continued

26. Employee Benefits continued

26.3 Post-retirement liability valuation continued

(c) Sensitivity analysis of the impact of changes in significant IAS 19 actuarial assumptions

The UK Plan Trustee has entered into a pension insurance buy-in agreement with the Pension Insurance Corporation (PIC). The US pensions are not inflation linked. The rate of increase in pensionable salaries and of pensions in payment is therefore not significant to the valuation of the Group's overall pension liabilities.

The sensitivity of the defined benefit obligation to changes in the weighted principal assumptions is:

Assumption	Change in assumption	UK	US	Germany
Discount rate	Increase/decrease by 0.1%			
	– impact on plan liabilities	Decrease/increase by £7.7m	Decrease/increase by £0.7m	Decrease/increase by £1.1m
	– impact on plan assets	Decrease/increase by £7.7m	n/a	n/a
Price inflation	Increase/decrease by 0.1%			
	– impact on plan liabilities	Increase/decrease by £5.1m	n/a	Increase/decrease by £0.3m
	– impact on plan assets	Increase/decrease by £5.1m	n/a	n/a
Mortality	Increase by one year			
	– impact on plan liabilities	Increase by £23.9m	Increase by £3.0m	Increase by £2.0m
	– impact on plan assets	Increase by £23.9m	n/a	n/a

26.4 Defined benefit obligation

The average duration of the obligations to which the liabilities of the Group's principal pension plans relate is 16 years for the UK, 19 years for Germany and 12 years for the US.

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	plans £m	Total £m
Present value as at 1 January 2021	501.8	74.3	63.1	52.1	691.3	7.0	698.3
Exchange differences	–	0.7	(3.7)	(3.0)	(6.0)	(0.2)	(6.2)
Current service cost	–	–	1.7	3.1	4.8	0.4	5.2
Interest cost	6.8	1.5	0.3	0.5	9.1	0.2	9.3
Remeasurement of liabilities:							
– demographic changes	(0.4)	0.2	–	0.1	(0.1)	–	(0.1)
– financial assumptions	(24.8)	(2.9)	(5.7)	(0.6)	(34.0)	–	(34.0)
– experience (gains)/losses	5.0	0.5	(0.9)	(0.8)	3.8	0.1	3.9
Benefits paid	(24.1)	(4.1)	(1.5)	(3.1)	(32.8)	(0.5)	(33.3)
Present value as at 31 December 2021	464.3	70.2	53.3	48.3	636.1	7.0	643.1

26. Employee Benefits continued

26.4 Defined benefit obligation continued

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	plans £m	Total £m
Present value as at 1 January 2020	482.0	78.9	54.5	47.5	662.9	6.9	669.8
Exchange differences	–	(2.2)	3.1	1.7	2.6	–	2.6
Current service cost	–	0.1	1.6	3.1	4.8	0.4	5.2
Past service cost	0.8	–	–	(0.1)	0.7	–	0.7
Interest cost	9.0	2.0	0.6	0.7	12.3	0.2	12.5
Settlements	–	(6.2)	–	–	(6.2)	–	(6.2)
Remeasurement of liabilities:							
– demographic changes	2.2	(0.7)	–	–	1.5	–	1.5
– financial assumptions	38.2	6.4	4.8	1.9	51.3	0.3	51.6
– experience losses/(gains)	(6.2)	0.5	–	0.3	(5.4)	0.1	(5.3)
Benefits paid	(24.2)	(4.5)	(1.5)	(3.0)	(33.2)	(0.9)	(34.1)
Present value as at 31 December 2020	501.8	74.3	63.1	52.1	691.3	7.0	698.3

26.5 Fair value of plan assets

	2021				2020			
	UK £m	US £m	ROW £m	Total £m	UK £m	US £m	ROW £m	Total £m
As at 1 January	616.4	48.4	31.4	696.2	581.6	50.3	29.4	661.3
Exchange differences	–	0.4	(2.0)	(1.6)	–	(1.5)	1.2	(0.3)
Interest income	8.4	1.0	0.2	9.6	11.0	1.2	0.4	12.6
Settlements	–	–	–	–	–	(6.0)	–	(6.0)
Return on plan assets	(113.7)	1.3	1.6	(110.8)	49.1	6.3	0.1	55.5
Contributions from employer	0.1	0.9	2.7	3.7	–	2.2	2.5	4.7
Administration expenses paid	(0.7)	(0.5)	–	(1.2)	(1.2)	(0.6)	–	(1.8)
Benefits paid	(24.1)	(3.2)	(2.5)	(29.8)	(24.1)	(3.5)	(2.2)	(29.8)
As at 31 December	486.4	48.3	31.4	566.1	616.4	48.4	31.4	696.2

The Group's pension plans in Germany are unfunded, as is common practice in that country, and accordingly there are no assets associated with these plans.

26.6 Remeasurement of defined benefit liabilities/assets

	2021 total £m	2020 total £m
Remeasurement of liabilities/assets:		
– demographic changes	0.1	(1.5)
– financial assumptions	34.0	(51.6)
– experience (losses)/gains	(3.9)	5.3
Return on plan assets	(110.8)	55.5
Total movement	(80.6)	7.7

The remeasurement of defined benefit liabilities and assets is recognised in the Group Statement of Comprehensive Income.

Notes to the Group Financial Statements continued

26. Employee Benefits continued

26.7 Balance sheet recognition

The amount recognised in the Group Balance Sheet in respect of the Group's defined benefit pension plans and other post-retirement benefit plans is analysed in the following tables, which all relate to continuing operations. All equity securities and bonds have quoted prices in active markets.

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	£m	2021 total £m
Equities	**9.8**	**3.3**	**–**	**2.4**	**15.5**	**–**	**15.5**
Bonds	**–**	**44.0**	**–**	**3.0**	**47.0**	**–**	**47.0**
Annuity insurance contracts	**456.7**	**–**	**–**	**22.5**	**479.2**	**–**	**479.2**
Other assets	**19.9**	**1.0**	**–**	**3.5**	**24.4**	**–**	**24.4**
Fair value of plan assets	**486.4**	**48.3**	**–**	**31.4**	**566.1**	**–**	**566.1**
Present value of funded obligations	**(462.7)**	**(59.9)**	**–**	**(43.3)**	**(565.9)**	**–**	**(565.9)**
	23.7	**(11.6)**	**–**	**(11.9)**	**0.2**	**–**	**0.2**
Present value of unfunded obligations	**(1.6)**	**(10.3)**	**(53.3)**	**(5.0)**	**(70.2)**	**(7.0)**	**(77.2)**
Total net surpluses/(liabilities)	**22.1**	**(21.9)**	**(53.3)**	**(16.9)**	**(70.0)**	**(7.0)**	**(77.0)**
Recognised in the Group Balance Sheet as:							
Net surpluses	**23.7**	**–**	**–**	**1.4**	**25.1**	**–**	**25.1**
Net liabilities	**(1.6)**	**(21.9)**	**(53.3)**	**(18.3)**	**(95.1)**	**(7.0)**	**(102.1)**
Total net surpluses/(liabilities)	**22.1**	**(21.9)**	**(53.3)**	**(16.9)**	**(70.0)**	**(7.0)**	**(77.0)**

	Defined benefit pension plans					Other post-retirement benefit plans	
	UK £m	US £m	Germany £m	ROW £m	Total £m	£m	2020 total £m
Equities	29.7	4.3	–	1.7	35.7	–	35.7
Bonds	301.3	43.2	–	3.3	347.8	–	347.8
Annuity insurance contracts	282.1	–	–	22.4	304.5	–	304.5
Other assets	3.3	0.9	–	4.0	8.2	–	8.2
Fair value of plan assets	616.4	48.4	–	31.4	696.2	–	696.2
Present value of funded obligations	(500.0)	(63.2)	–	(46.8)	(610.0)	–	(610.0)
	116.4	(14.8)	–	(15.4)	86.2	–	86.2
Present value of unfunded obligations	(1.8)	(11.1)	(63.1)	(5.3)	(81.3)	(7.0)	(88.3)
Total net surpluses/(liabilities)	114.6	(25.9)	(63.1)	(20.7)	4.9	(7.0)	(2.1)
Recognised in the Group Balance Sheet as:							
Net surpluses	116.4	–	–	0.7	117.1	–	117.1
Net liabilities	(1.8)	(25.9)	(63.1)	(21.4)	(112.2)	(7.0)	(119.2)
Total net surpluses/(liabilities)	114.6	(25.9)	(63.1)	(20.7)	4.9	(7.0)	(2.1)

(a) UK Plan asset allocation

As at 31 December 2021, of the UK Plan's total assets, 93.9% (2020: 45.8%) were represented by the annuity insurance contracts covering the UK Plan's pension liabilities; 2.0% (2020: 4.8%) were allocated to equities; nil% (2020: 48.9%) to fixed income securities; and 4.1% (2020: 0.5%) to cash.

The UK Plan Trustee has entered into a pension insurance buy-in agreement with the Pension Insurance Corporation (PIC), whereby the UK Plan Trustee has paid insurance premiums to PIC to insure all of the UK Plan's liabilities. Under this arrangement, the value of the PIC insurance contract matches the value of the liabilities for current benefits because the inflation, interest rate, investment and longevity risk for Vesuvius in respect of these liabilities are eliminated. The buy-in agreement ensures that the UK pension plan obligations in respect of all its members and their approved dependants are insured.

As at 31 December 2021, the IAS 19 valuation of the PIC insurance contract value associated with the bought-in liabilities was £456.7m (2020: £282.1m). The policy and the associated valuation are updated annually to reflect retirements and mortality.

26. Employee Benefits continued

26.7 Balance sheet recognition continued

(b) US Plan asset allocation

All of the assets in the main US Plan have a quoted market price in an active market. The Plan mitigates exposure to interest rates by employing a liability matching investment strategy. All non-derivative assets are invested in liability matching bonds with a similar average duration to the liabilities of the Plan. Since 2018, the investment allocation has been de-risked from an allocation of 72% liability matching and 28% return seeking assets, to an allocation of 100% liability matching. The Plan retains equity risk through use of equity derivative contracts, which provides equity market exposure with some level of equity downside protection.

(c) Defined benefit contributions in 2022

In 2022, the Group is expected to make contributions into its defined benefit pension and other post-retirement benefits plans of around £6.2m with specific contributions of approximately £1.1m, £1.6m and £1.8m anticipated for the US Plans, German Plans and Belgian Plans respectively.

26.8 Income statement recognition

The expense recognised in the Group Income Statement in respect of the Group's defined benefit retirement plans and other post-retirement benefit plans is shown below:

	2021			2020		
	Defined benefit pension plans £m	Other post-retirement benefit plans £m	Total £m	Defined benefit pension plans £m	Other post-retirement benefit plans £m	Total £m
Current service cost	**4.8**	**0.4**	**5.2**	4.8	0.4	5.2
Past service cost	**–**	**–**	**–**	0.7	–	0.7
Settlements	**–**	**–**	**–**	(0.2)	–	(0.2)
Administration expenses	**1.2**	**–**	**1.2**	1.8	–	1.8
Net interest (gain)/cost	**(0.5)**	**0.2**	**(0.3)**	(0.3)	0.2	(0.1)
Total net charge	**5.5**	**0.6**	**6.1**	6.8	0.6	7.4

The total net charge of £6.1m (2020: £7.4m), recognised in the Group Income Statement in respect of the Group's defined benefit pension plans and other post-retirement benefits plans, is analysed in the following table:

		2021 £m	2020 £m
In arriving at trading profit	– within other manufacturing costs	**1.8**	1.7
	– within administration, selling and distribution costs	**4.6**	5.0
In arriving at profit before tax	– guaranteed minimum pension equalisation charge	**–**	0.8
	– within net finance costs	**(0.3)**	(0.1)
Total net charge		**6.1**	7.4

GMP equalisation

A UK High Court ruling was made on 26 October 2018 in respect of the gender equalisation of guaranteed minimum pensions (GMPs) for occupational pension schemes. The impact of GMP equalisation as at 31 December 2018 was estimated to be £4.5m.

A second UK High Court GMP equalisation ruling was issued on 20 November 2020. This second ruling considered the treatment of historical transfers out, i.e. those members who had transferred out before 26 October 2018. The 2020 ruling covers both individual and bulk transfers out. It does not revisit any of the issues addressed in the 2018 ruling. The impact of GMP equalisation for the second ruling was estimated to be £0.8m as at 31 December 2020.

The increase in pension liabilities resulting from these judgements have been treated for IAS 19 purposes as plan amendments and resulted in an increase in the pension deficit in the balance sheet and a corresponding past service cost in the Income Statement. These amendments have previously been treated as separately reported items so that there has been no impact on headline performance. We are working with the Trustees of our UK pension plan and our actuarial and legal advisers to understand the extent to which these judgements crystallise additional liabilities for the UK pension plan.

Notes to the Group Financial Statements continued

26. Employee Benefits continued

26.9 Risks to which the defined benefit pension plans expose the Group

The principal risks faced by these plans comprise: (i) the risk that the value of the plan assets is not sufficient to meet all plan liabilities as they fall due; (ii) the risk that plan beneficiaries live longer than envisaged, causing liabilities to exceed the available plan assets; and (iii) the risk that the market-based factors used to value plan liabilities and assets change materially adversely to increase plan liabilities over the value of available plan assets. Further details are given below.

Following the UK Plan pension insurance buy-in agreement, the inflation, interest rate, investment and longevity risks for Vesuvius in respect of the UK Plan are eliminated. The following risks relate to the other plans operated by the Group:

Counterparty risk

This is mitigated by using a diversified range of counterparties of high standing and ensuring positions are collateralised as required.

Asset volatility

The liabilities are calculated using a discount rate set with reference to corporate bond yields; if assets underperform against this yield, this will create a deficit. To reduce this risk, the pension plans are largely invested in government and corporate bonds.

Changes in bond yields

A decrease in corporate bond yields will increase the scheme liabilities, although this will be partially offset by an increase in the value of the schemes' bond holdings.

Inflation risk

Much of the plans' benefit obligations outside the US are linked to inflation, and higher inflation will lead to higher liabilities.

Life expectancy

The majority of the plans' obligations are to provide benefits for the life of the member and in some cases their spouse on death of the member, so increases in life expectancy will result in an increase in the liabilities.

In August 2016, the pensions for the majority of current pensioners in the US main plan were bought out with an insurance company, removing all responsibility and risk related to these pensions from the Group. In recent years, a number of further exercises have been carried out to buy out US benefits.

27. Share-based Payments

27.1 Accounting policy

The Group operates an equity-settled share-based payment arrangement for its employees. Equity-settled share-based payments are measured at fair value at the date of grant. For grants with market-based conditions attached to them, such as total shareholder return, fair value is measured using a form of stochastic option pricing model. For grants with non-market-based conditions, such as growth in headline earnings per share, fair value is measured using the Black-Scholes option pricing model. The fair value is expensed on a straight-line basis over the vesting period with a corresponding increase in equity. The cumulative expense recognised is adjusted for the best estimate of the shares that will eventually vest.

27.2 Income statement recognition

The total expense recognised in the Group Income Statement is shown below:

	2021 £m	2020 £m
Long-Term Incentive Plan	**0.2**	0.8
Other plans	**2.9**	1.6
Total expense	**3.1**	2.4

The Group operates a number of different share-based payment plans, the most significant of which is the Long-Term Incentive Plan (LTIP), details of which can be found in the Directors' Remuneration Report.

27. Share-based Payments continued

27.3 Details of outstanding options

	Number of outstanding awards					
	As at 1 Jan 2021	Granted	Exercised	Forfeited/ lapsed	Expired	As at 31 Dec 2021
LTIP	**1,717,225**	**702,982**	**(31,637)**	**(448,606)**	**nil**	**1,939,964**
Weighted average exercise price	**nil**	**nil**	**nil**	**nil**	**nil**	**nil**
Other plans	**635,031**	**391,769**	**(437,328)**	**(40,439)**	**nil**	**549,033**
Weighted average exercise price	**nil**	**nil**	**nil**	**nil**	**nil**	**nil**

For the awards exercised during 2021, the market value at the date of exercise ranged from 473 pence to 574 pence per share.

	Number of outstanding awards					
	As at 1 Jan 2020	Granted	Exercised	Forfeited/ lapsed	Expired	As at 31 Dec 2020
LTIP	1,833,220	847,503	(345,500)	(617,998)	nil	1,717,225
Weighted average exercise price	nil	nil	nil	nil	nil	nil
Other plans	685,099	198,891	(207,211)	(41,748)	nil	635,031
Weighted average exercise price	nil	nil	nil	nil	nil	nil

For the options exercised during 2020, the market value at the date of exercise ranged from 351 pence to 540 pence.

Details of market performance conditions are included in the Directors' Remuneration Report.

	2021			2020		
	Awards exercisable as at 31 Dec 2021 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence	Awards exercisable as at 31 Dec 2020 no.	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
LTIP	**–**	**8.3**		–	8.4	
Weighted average exercise price	**–**		**n/a**	–		n/a
Other plans	**–**	**0.9**		–	0.5	
Weighted average exercise price	**–**		**n/a**	–		n/a

Notes to the Group Financial Statements continued

27. Share-based Payments continued

27.4 Options granted under the LTIP during the year

	2021 EPS element	2021 TSR element
Fair value of options granted	538p	340p
Share price on date of grant	538p	538p
Expected volatility	n/a	39.2%
Risk-free interest rate	n/a	0.2%
Exercise price (per share)	nil	nil
Expected term (years)	3	3
Expected dividend yield	nil	nil

	2020 EPS element	2020 TSR element
Fair value of options granted	392p	242p
Share price on date of grant	392p	392p
Expected volatility	n/a	30.3%
Risk-free interest rate	n/a	0.2%
Exercise price (per share)	nil	nil
Expected term (years)	3	3
Expected dividend yield	nil	nil

Vesting of 50% of shares awarded is based on the Group's three-year total shareholder return (TSR) performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts) and vesting of the remaining 50% of shares awarded is based on headline EPS growth.

Expected volatility was determined by calculating the historical volatility of the Group's share price over the 2.8 years (2020: 2.8 years) prior to the grant date for the March 2021 grant. The risk-free rate of return was assumed to be the yield to maturity on a UK fixed gilt with the term to maturity equal to the expected life of the option. At the discretion of the Remuneration Committee, award holders receive the value of dividends that would have been paid on their vested shares in the period between grant and vesting. Accordingly, there is no discount to the valuation for dividends foregone during the vesting period.

28. Trade and Other Payables

28.1 Accounting policy

Trade and other payables are initially recognised at fair value and subsequently measured at amortised cost, using the effective interest method.

28.2 Analysis of trade and other payables

	2021 £m	2020 £m
Non-current		
Accruals and other payables	11.6	13.1
Deferred purchase and contingent consideration	–	0.1
Total non-current other payables	11.6	13.2
Current		
Trade payables	253.8	185.7
Other taxes and social security	33.5	31.5
Accruals and other payables	85.6	71.5
Total current trade and other payables	372.9	288.7

There is no significant difference between the fair value of the Group's trade and other payables balances and the amount at which they are reported in the Group Balance Sheet.

Included within trade payables in the table above is £27.8m (2020: £17.5m) subject to supplier financing agreements entered into with certain of the Group's banks. Under the terms of the agreements, the Group's suppliers in certain countries can elect to be paid earlier than the terms of their agreement with Vesuvius by requesting discounted early settlement from the arranging bank. This early settlement is effected between the bank and the supplier; from the perspective of the Group, the terms of each payable remain unchanged. The Group is not charged any interest cost or fee in respect of the agreements.

29. Leases

29.1 Accounting policy

Lease liabilities are recognised at the present value of the remaining lease payments, discounted using the interest rate implicit in the lease if that rate can be readily determined. If that rate cannot be readily determined, the lessee's incremental borrowing rate is used, calculated as the local government bond rate plus an interest rate spread. In cases where there was an option to terminate or extend a lease, the duration of the lease assumed for this purpose reflected the Group's existing intentions regarding such options. Lease liabilities include the net present value of the following lease payments:

- Fixed payments (including in-substance fixed payments), less any lease incentives receivable
- Variable lease payments that are based on an index or a rate
- Amounts expected to be payable by the lessee under residual value guarantees
- The exercise price of a purchase option if the lessee is reasonably certain to exercise that option
- Payments of penalties for terminating the lease, if the lease term reflects the lessee exercising that option.

Leases of low-value assets and short-term leases (shorter than 12 months) are classified as operating leases and neither the asset nor the corresponding liability to the lessor is recognised in the Group Balance Sheet. Rentals payable under operating leases are charged to the Group Income Statement on a straight-line basis over the term of the lease. Benefits received and receivable as an incentive to enter an operating lease are also spread on a straight-line basis over the lease term.

29.2 Lease liabilities

The maturity analysis of the lease liabilities is disclosed in Note 25.2 (d).

The net book value of the Group's property, plant and equipment assets held as right-of-use assets under lease contracts at 31 December 2021 was £41.9m (2020: £37.7m) (Note 15). The right-of-use asset is depreciated over the shorter of the asset's useful life and the lease term on a straight-line basis. The cash payments for leases during the year were £14.1m (2020: £14.3m).

29.3 Operating lease commitments

The future aggregate minimum lease payments under non-cancellable operating leases are payable as follows:

	2021 £m	2020 £m
Not later than one year	0.5	0.9
Later than one year and not later than five years	0.2	0.6
Later than five years	–	0.1
Total operating lease commitments	0.7	1.6

The cost incurred by the Group in the year in respect of assets held under operating leases, all of which was charged within trading profit, amounted to £2.9m (2020: £4.2m), of which £2.2m (2020: £3.7m) related to short-length leases and £0.7m (2020: £0.5m) related to leases of low-value items.

Notes to the Group Financial Statements continued

30. Provisions

30.1 Accounting policy

Provisions are recognised when the Group has a present obligation as a result of a past event and it is probable that the Group will be required to settle that obligation. Provisions are measured at the Directors' best estimate of the expenditure required to settle the obligation at the balance sheet date. Where the effect of the time value of money is material, provisions are discounted using a pre-tax discount rate that reflects both the current market assessment of the time value of money and the specific risks associated with the obligation. Where discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

30.2 Analysis of provisions

	Disposal, closure and environmental costs £m	Restructuring charges £m	Other £m	Total £m
As at 1 January 2020	34.8	19.1	2.9	56.8
Exchange adjustments	(1.7)	0.7	–	(1.0)
Charge to Group Income Statement – separately reported items	10.3	6.1	–	16.4
Charge to Group Income Statement – trading profit	4.8	–	11.8	16.6
Adjustment to discount	1.0	–	–	1.0
Cash spend	(7.0)	(16.7)	(9.3)	(33.0)
As at 31 December 2020 and 1 January 2021	**42.2**	**9.2**	**5.4**	**56.8**
Exchange adjustments	0.4	(0.2)	(0.1)	0.1
Charge to Group Income Statement – trading profit	7.4	–	9.2	16.6
Adjustment to discount	0.7	–	–	0.7
Cash spend	(8.9)	(4.0)	(10.6)	(23.5)
As at 31 December 2021	**41.8**	**5.0**	**3.9**	**50.7**

Of the total provision balance as at 31 December 2021 of £50.7m (2020: £56.8m), £32.6m (2020: £34.0m) is recognised in the Group Balance Sheet within non-current liabilities and £18.1m (2020: £22.8m) within current liabilities.

Disposal, closure and environmental charges

The provision for disposal, closure and environmental costs includes the Directors' current best estimate of the amounts to be payable in respect of known or probable costs resulting from third-party claims, including legacy matter lawsuits.

There remains inherent uncertainty associated with estimating the future costs of legacy matter lawsuits. In assessing the probable costs and realisation certainty of these provisions, or related assets, management has made reasonable assumptions, including projections of the number of future claims, the approximate average cost of those claims (including legal costs and infrequent larger value claims) and the length of time taken to resolve such claims. The provision reflects the Directors' best estimate of the future liability and the value of the corresponding asset. By nature, these assumptions are uncertain and therefore changes to the assumptions used could significantly alter the Directors' assessment of the value, volume of claims, timing or certainty of the costs or related amounts. Sensitivity analyses have been conducted using variations to the key assumptions listed above and indicatively show:

- A 10% change in the average cost of claims would impact the gross provision by approximately £1.0m
- A 20% change in the level of larger value claims would impact the gross provision by approximately £0.7m
- An increase in the duration over which claims are received of 10% would increase the gross provision by approximately £1.9m.

Assumptions are determined with reference to historical information and trends experienced to date, combined with specialist views on future outlook. As assumptions can vary individually or in combination, over the longer term there can be no guarantee that the assumptions used to estimate the provision will result in an accurate prediction of the actual costs that may be incurred.

30. Provisions continued

30.2 Analysis of provisions continued

Disposal, closure and environmental charges continued

As the resolution of many of the obligations for which provision is made is subject to legal or other regulatory process, the timing of the associated cash outflows is also subject to some uncertainty. However, the majority of the amounts provided are expected to be utilised over the next ten years. The provision, underlying estimates of costs and associated insurance estimates are regularly assessed, to reflect any changed circumstances with regard to individual matters. Any movements impacting the Income Statement are included within headline performance.

As set out above, where insurance cover exists for any of these known or probable costs, a related asset is recognised in the Group Balance Sheet only when its value can be reliably measured and reimbursement is considered to be virtually certain by management. As at 31 December 2021, £14.4m (2020: £12.4m) was recorded in other receivables in respect of associated insurance reimbursements, of which £12.4m (2020: £10.4m) is non-current.

In addition, this provision covers the estimate of costs to be payable both in the fulfilment of obligations incurred in connection with former Group businesses, resulting from either disposal or closure, together with those related to the demolition and clean-up of closed sites.

The Group owns a number of disused properties in the US, which do not form part of our trading operations. In 2020, costs of £10.3m (2021: nil) were incurred at one of these sites to address the significant increase in the volume of water run-off occurring in recent years. We engaged waste management specialists and have taken actions to reduce the level of water. We are in contact with the relevant regulatory authorities and are currently implementing remediation solutions, including the installation of a treatment facility. These non-recurring costs were treated as a separately reported item in 2020. There was no impact upon headline performance.

Restructuring charges provisions

The provision for restructuring charges includes the costs to complete the Group's major restructuring programmes. The majority of this balance of £5.0m as at 31 December 2021 (2020: £9.2m) is expected to be paid out over the next two years.

Other

Other provisions comprise amounts payable in respect of known or probable costs resulting both from legal or other regulatory requirements, workers' compensation and medical claims, and from third-party claims. As the settlement of many of the obligations for which provision is made is subject to reasonable assumptions, legal or other regulatory process, the timing of the associated outflows is subject to some uncertainty, but the majority of amounts provided are expected to be utilised over the next two years and the underlying estimates of costs are regularly updated to reflect changed circumstances with regard to individual matters. During 2021, the Group recognised net charges of £9.2m (2020: £11.8m) in the Group Income Statement to provide for various medical benefits and other claims.

The Group has considered the impact of climate change on provisions including decommissioning or environmental rehabilitation and there have been no material changes needed to amounts already provided.

31. Off-Balance Sheet Arrangements

In compliance with current reporting requirements, certain arrangements entered into by the Group in its normal course of business are not reported in the Group Balance Sheet. Of such arrangements, the largest amounts are future lease payments in relation to assets used by the Group under non-cancellable operating leases (Note 29).

32. Contingent Liabilities

Details of guarantees given by the Company, on behalf of the Group, are given in Note 11 to the Company Financial Statements.

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters.

Certain of Vesuvius' subsidiaries are subject to legacy matter lawsuits, predominantly in the US, relating to a small number of products containing asbestos manufactured prior to the acquisition of those subsidiaries by Vesuvius. These suits usually also name many other product manufacturers. To date, Vesuvius is not aware of there being any liability verdicts against any of these subsidiaries. Each year, a number of these lawsuits are withdrawn, dismissed or settled.

As the settlement of many of the obligations for which reserve is made is subject to legal or other regulatory process, the timing and amount of the associated outflows is subject to some uncertainty (see Note 30 for further information). The amount paid, including costs in relation to this litigation, has not had a material effect on Vesuvius' financial position or results of operations in the current year.

Notes to the Group Financial Statements continued

33. Investments in Subsidiaries, Joint Ventures and Associates

33.1 Investment in subsidiaries

A subsidiary is an entity over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and can affect those returns through its power over the entity. Subsidiaries are fully consolidated from the date on which control is transferred to the Group.

The subsidiaries, joint ventures and associates of Vesuvius plc and the countries in which they are incorporated are set out below. With the exception of Vesuvius Holdings Limited, whose ordinary share capital was directly held by Vesuvius plc, the ordinary capital of the companies listed below was wholly owned by a Vesuvius plc subsidiary as at 31 December 2021.

Company legal name	Registered office address	Jurisdiction
Advent Process Engineering Inc.	333 Prince Charles Drive, Welland, Ontario, L3B 5P4, Canada	Canada (Ontario)
BMI Refractory Services Inc.	600 N 2nd Street, Suite 401, Harrisburg, PA 17101-1071, United States	US (Pennsylvania)
Brazil 1 Limited	165 Fleet Street, London, EC4A 2AE, England	England
CCPI Inc.	Suite 201, 910 Foulk Road, Wilmington, New Castle, DE 19803, United States	US (Delaware)
Cookson Dominicana, SRL	Km 7 1/2, Autopista San Isidro, Edificio Modelo A, Zona Franca San Isidro, Santo Domingo Oeste, Dominican Republic	Dominican Republic
East Moon Investment (HK Holding) Company Limited	Unit 01, 82/F, International Commerce Centre, 1 Austin Road West, Kowloon, Hong Kong	Hong Kong
Flo-Con Holding, Inc.	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Foseco (FS) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco (Jersey) Limited	44 Esplanade, St Helier, JE4 9WG, Jersey	Jersey
Foseco (UK) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Canada Limited	181 Bay Street, Suite 1800, Toronto, Ontario, M5J 2T9, Canada	Canada (Ontario)
Foseco Espanola S.A.	5, Barrio Elizalde, Izurza, Bizkaia, 48213, Spain	Spain
Foseco Foundry (China) Co Limited	Room 819, Shekou Zhaoshang Building, Nanshan District, Shenzhen, Guangdong, 518067, China	China
Foseco Fundición Holding (Espanola), S.L.	5, Barrio Elizalde, Izurza, Bizkaia, 48213, Spain	Spain
Foseco Holding (Europe) Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Holding (South Africa) (Pty) Limited	12 Bosworth Street, Alrode, Alberton, 1449, South Africa	South Africa
Foseco Holding BV	Rivium Boulevard 301, Capelle aan den Ijssel, Rotterdam 2909LK, Netherlands	Netherlands
Foseco Holding International Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Holding Limited	165 Fleet Street, London, EC4A 2AE, England	England

Company legal name	Registered office address	Jurisdiction
Foseco Industrial e Comercial Ltda	Km 15, Rodovia Raposo Tavares, Butanta Cep, São Paulo, 05577-100, Brazil	Brazil
Foseco International Holding (Thailand) Limited	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand
Foseco International Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco Japan Limited	9th Floor, Orix Kobe Sannomiya Building, 6-1-10, Goko dori, Chuo-ku, Kobe Hyogo, 651-0087, Japan	Japan
Foseco Korea Limited	74 Jeongju-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, 14523, South Korea	South Korea
Foseco Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Metallurgical Inc.	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Foseco Nederland BV	Binnenhavenstraat 20, 7553 GJ Hengelo (OV), Netherlands	Netherlands
Foseco Overseas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Foseco Philippines Inc.	Unit 401, 4th Floor 8 Antonio Centre, Prime St. Madrigal Business Park 2, Ayala Alabang Muntinlupa City, 1770 Philippines	Philippines
Foseco Portugal Produtos Para Fundição Lda	Rua Manuel Pinto de Azevedo, No 626 4100-320 Porto, Portugal	Portugal
Foseco S.A.S.	Le Newton C, 7 Mail Barthélémy Thimonnier, 77185 Lognes, France	France
Foseco Steel (UK) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Foseco Technology Limited	165 Fleet Street, London, EC4A 2AE, England	England
J.H. France Refractories Company	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
John G. Stein & Company Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Mainsail Insurance Company Limited	Victoria Place, 5th floor, 31 Victoria Street, Pembroke, Hamilton, HM 10, Bermuda	Bermuda
Mascinco Empreendimentos e Participações Ltda	Avenida Brasil, 49550 – parte, Distrito Industrial de Palmares – Campo, Grande – Cep: 23065-480, Rio de Janeiro, RJ, Brazil	Brazil

33. Investments in Subsidiaries, Joint Ventures and Associates continued

33.1 Investment in subsidiaries continued

Company legal name	Registered office address	Jurisdiction
Mastercodi Industrial Ltda	Rodovia Raposo Tavares, KM15, Butantã, 05577-100, Butantã, São Paulo, Brazil	Brazil
Mercajoya, S.A.	Capitán Haya, 56 – 1ºH, 28020 Madrid, Spain	Spain
Metal Way Equipamentos Metalurgicos Ltda	Estrada Santa Isabel, 7655 KM37, Bairro Do Una, Itaquaquecetuba, São Paulo – SP, CEP: 08580 000, Brazil	Brazil
New Foseco (UK) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Process Metrix, LLC	6622 Owens Drive, Pleasanton, CA 94588, United States	US (California)
PT Foseco Indonesia	Jl Rawa Gelam 2/5, Kawasan Industri, Pulogadung, Jakarta, 13930, Indonesia	Indonesia
PT Foseco Trading Indonesia	Jl Rawa Gelam 2/5, Kawasan Industri, Pulogadung, Jakarta, 13930, Indonesia	Indonesia
Realisations 789, LLC	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
S G Blair & Company Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
SIDERMES Inc. Business name Vesuvius Sensors and Probes	175 montée, Calixa-Lavallée Verchêres, Québec J0L2R0, Canada	Canada
SIDERMES Do Brasil Sensores Termicos Ltda	Estrada Municipal PDD 436, S/N, Prédio 'C', Bairro da Boa Vista, Municipio de Piedade, Estado de São Paulo, Brazil	Brazil
SIDERMES Latinoamericana CA	Zona Industrial, San Vicente Av., Anton Phillips Grupo Industrial, San Vicente Local 4, Maracay, Venezuela	Venezuela
SIDERMES S.A.	Urquiza 919 Piso 2 Rosario, Santa Fe, CP 2000, Argentina	Argentina
SIR Feuerfestprodukte GmbH	Siegener Strasse 152, Kreuztal, D-57223, Germany	Germany
SOLED S.A.S.	Centre d'Activités Economiques Zone Industrielle de Franchepré 54240 Joeuf, France	France
Veservice Ltda	Av Brasil, 49550, Distrito Industrial de Palmares, Campo Grande, Rio de Janeiro, 23065-480, Brazil	Brazil
Vesuvius (Thailand) Co., Limited	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand
Vesuvius (V.E.A.R.) S.A.	Street Urquiza, 919,Floor 2, Rosario, Provincia de Santa Fé, Argentina	Argentina
Vesuvius Advanced Ceramics (China) Co., Limited	221 Xing Ming Street, China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215021, China	China
Vesuvius America, Inc.	1209 Orange Street, Wilmington, DE 19801, United States	US (Delaware)
Vesuvius Australia (Holding) Pty Limited	40-46 Gloucester Boulevarde, Port Kembla, NSW, 2505, Australia	Australia

Company legal name	Registered office address	Jurisdiction
Vesuvius Australia Pty Limited	40-46 Gloucester Boulevarde, Port Kembla, NSW, 2505, Australia	Australia
Vesuvius Belgium N.V.	Zandvoordestraat 366, Oostende, B-8400, Belgium	Belgium
Vesuvius Canada Inc	181 Bay Street, Suite 1800, Toronto, Ontario, M5J 2T9, Canada	Canada
Vesuvius Ceramics Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius China Holdings Co. Limited	Unit 01, 82/F International Commerce Centre, 1 Austin Road West, Kowloon, Hong Kong	Hong Kong
Vesuvius China Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Colombia S.A.S.	Calle 26 No. 102-20 Floor 3, Bogota, Colombia	Colombia
Vesuvius Corporation S.A.	Via Nassa 17, Lugano, CH 6900, Switzerland	Switzerland
Vesuvius CSD Sp z.o.o.	ul. Jasnogórska 11, Kraków, 31-358, Poland	Poland
Vesuvius Emirates FZE	Warehouse No: 1J-09/3, P O Box 49261, Hamriyah Free Zone, Sharjah, United Arab Emirates	United Arab Emirates
Vesuvius Europe Beteiligungs GmbH	Geschaftsanschrift, Schieferbank 2-16, 45472 Mülheim an der Ruhr, Germany	Germany
Vesuvius Europe GmbH & Co KG	Geschaftsanschrift, Schieferbank 2-16, 45472 Mülheim an der Ruhr, Germany	Germany
Vesuvius Europe S.A.	17 Rue de Douvrain, Ghlin, 7011, Belgium	Belgium
Vesuvius Europe S.A.S.	3, Avenue De L'europe, Parc Les Pivolles, 69150 Décines-Charpieu, France	France
Vesuvius Financial 1 Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Finland OY	Pajamäentie 8D7, 00360 Helsinki, Finland	Finland
Vesuvius Foundry Products (Suzhou) Co. Limited	12 Wei Wen Road, China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius Foundry Technologies (Jiangsu) Co. Limited	2 Changchun Road, Economic Development Area, Changshu, Jiangsu, 215537, China	China
Vesuvius France S.A.	Rue Paul Deudon 68, Boite Postale 19, Feignies 59750, France	France
Vesuvius GmbH	Gelsenkirchener Strasse 10, Borken, D-46325, Germany	Germany
Vesuvius Group Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Group S.A.	17 Rue de Douvrain, Ghlin, 7011, Belgium	Belgium
Vesuvius Holding Deutschland GmbH	Gelsenkirchener Strasse 10, Borken, D-46325, Germany	Germany
Vesuvius Holding France S.A.S.	68 Rue Paul Deudon, Boite Postale 19, Feignies 59750, France	France
Vesuvius Holding Italia – Società a Responsabilità Limitata	Via Mantova 10, 20835 Muggio MB, Italy	Italy

Notes to the Group Financial Statements continued

33. Investments in Subsidiaries, Joint Ventures and Associates continued

33.1 Investment in subsidiaries continued

Company legal name	Registered office address	Jurisdiction
Vesuvius Holdings Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Ibérica Refractarios S.A.	Capitán Haya, 56 – 1ºH, 28020 Madrid, Spain	Spain
Vesuvius International Corporation	CT Corporation, 1209 Orange Street, The Corporation Trust Company, Wilmington, DE 19801, United States	US (Delaware)
Vesuvius Investments Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Istanbul Refrakter Sanayi ve Ticaret AS	Gebze OSB2 Mh. 1700., Sok No:1704/1, Cayirova, Kocaeli, 41420, Turkey	Turkey
Vesuvius Italia S.p.A.	Via Mantova 10, 20835 Muggio MB, Italy	Italy
Vesuvius Japan Inc.	9th Floor, Orix Kobe Sannomiya Building 6-1-10, Goko dori, Chou-ku,Kobe Hyogo, 651-0087, Japan	Japan
Vesuvius K.S.R. Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire S43 4XA, England	England
Vesuvius Life Plan Trustee Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius LLC	502, 5th floor, 1 Myasicsheva str., Zhukovsky, Moscow region, 140180, Russian Federation	Russia
Vesuvius Malaysia Sdn Bhd	Unit 30-01, Level 30 Tower A, Vertical Business Suite Avenue 3, Bangsar South, No 8 Jalan Kirinchi, Kuala Lumpur Wilayah Persekutuan, 59200, Malaysia	Malaysia
Vesuvius Management Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Management Services Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Mexico S.A. de C.V.	Av. Ruiz Cortinez, Num. 140, Colonia Jardines de San Rafael, Guadalupe, Nuevo León, CP 67119, Mexico	Mexico
Vesuvius Mid-East Limited	56, rd 15, Apt 103, Maadi, Cairo, Egypt	Egypt
Vesuvius Moravia, s.r.o.	Konska c.p. 740, Trinec, 739 61, Czech Republic	Czech Republic
Vesuvius Mulheim Beteiligungs GmbH	Geschaftsanschrift, Schieferbank 2-16, 45472 Mülheim an der Ruhr, Germany	Germany
Vesuvius Mulheim GmbH & Co KG	Geschaftsanschrift, Schieferbank 2-16, 45472 Mülheim an der Ruhr, Germany	Germany
Vesuvius NC, LLC	Corporation Trust Center, 1209 Orange Street, Wilmington, New Castle County, DE 19801, United States	US (Delaware)
Vesuvius New Zealand Limited	Bell Gully, Level 22, Vero Centre, 48 Shortland Street, Auckland, 1010 New Zealand	New Zealand
Vesuvius Overseas Investments Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Overseas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Penn Corporation	CT Corporation, 1209 Orange Street, Wilmington, DE 19801, United States	US (Delaware)
Vesuvius Pension Plans Trustees Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Peru SAC	Jiron Saenz Pena 185, Magdalena del Mar, Lima, Peru	Peru
Vesuvius Poland Sp z.o.o.	Ul Tyniecka 12, Skawina, 32-050, Poland	Poland
Vesuvius Ras Al Khaimah FZ-LLC	Street No. F14, RAK Investment Authority Free Zone, Al Hamra, Ras Al Khaimah, PO Box 86408, United Arab Emirates	United Arab Emirates
Vesuvius Refractarios de Chile S.A.	Street San Martin 870, Room 308, Tower B, Concepcion, Chile	Chile
Vesuvius Refractories S.r.l.	Galati, Marea Unire avenue 107, Galati county, 800329, Romania	Romania
Vesuvius Refractory India Private Limited	Room No. 9, 3rd Floor, 7 Ganesh Chandra Avenue, Kolkata, WB 700013, India	India
Vesuvius Refratários Ltda	Av Brasil, 49550, Distrito Industrial de Palmares, Campo Grande, Rio de Janeiro, 23065-480, Brazil	Brazil
Vesuvius Scandinavia AB	4, Forradsgatan, Amal, S-662 34, Sweden	Sweden
Vesuvius Sensors & Probes Europe S.p.A.	10 Via Mantova, Muggio, Monza e Brianza, 20835, Italy	Italy
Vesuvius-SERT S.A.S.	3, Avenue de l'Europe, Parc, Les Pivolles, Decines-Charpieu 69150, France	France
Vesuvius Solar Crucible (Suzhou) Co., Ltd	1/F, building 3, No. 12, Weiwen Road China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius South Africa (Pty) Limited	Pebble Lane, Private Bag X2, Olifantsfontein, Gauteng Province, 1665, South Africa	South Africa
Vesuvius Sp z.o.o.	ul. Jasnogórska 11, Kraków, 31-358, Poland	Poland
Vesuvius SSC Sp z.o.o.	ul. Jasnogórska 11, Kraków, 31-358, Poland	Poland
Vesuvius UK Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Vesuvius Ukraine LLC	27, Udarnykiv Street, City of Dnipropetrovsk, 49000, Ukraine	Ukraine
Vesuvius USA Corporation	CT Corporation, 208 South LaSalle Street, Chicago, Cook County, IL 60604, United States	US (Illinois)
Vesuvius VA Limited	165 Fleet Street, London, EC4A 2AE, England	England
Vesuvius Vietnam Limited	7th Floor, Peakview Tower Building, No.36 Hoang Cau Street, O Cho Dua Ward, Don Da District, Hanoi City, Vietnam	Vietnam
Vesuvius Zyarock Ceramics (Suzhou) Co., Limited	1/F, building 3, No. 12, Weiwen Road China-Singapore Suzhou Ind Park, Suzhou, Jiangsu Province, 215122, China	China
Vesuvius-Premier Refractories (Holdings) Limited	1 Midland Way, Central Park, Barlborough Links, Derbyshire, S43 4XA, England	England
Vesv Distribution (Private) Limited	R Tech Park, 13th Floor Western Express Highway, Goregaon (East) Mumbai, Mumbai City, MH 400063, India	India
VSV Advanced Ceramics (Anshan) Co., Limited	Xiaotaizi Village, Ningyuan Town, Qianshan District, Anshan, Liaoning Province, 114011, China	China
Wilkes-Lucas Limited	165 Fleet Street, London, EC4A 2AE, England	England
Yingkou Bayuquan Refractories Co., Limited	Cui Tun Village, Hai Dong Office, Bayuquan District, Liaoning Province, YingKou, 115007, China	China

The following subsidiary companies have branches registered in the named countries: Foseco (Jersey) Limited in England, Foseco Holding BV in England, Vesuvius LLC in Kazakhstan, Vesuvius UK Limited in Taiwan and Republic of Korea and Vesuvius International Corporation in Belgium.

33.2 Investment in joint ventures and associates

A joint venture is a type of joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the joint venture. Joint control is the contractually agreed sharing of control of the arrangement, which exists only when decisions about the relevant activities require unanimous consent of the parties sharing control. An associate is an entity over which the Group has significant influence. Significant influence is the power to participate in the financial and operating policy decisions of an entity, but is not control or joint control over those policies.

The Group's investments in its associates and joint ventures are accounted for using the equity method from the date significant influence/joint control is deemed to arise until the date on which significant influence/joint control ceases to exist or when the interest becomes classified as an asset held for sale. The Group Income Statement reflects the Group's share of profit after tax of the related associates and joint ventures. Investments in associates and joint ventures are carried in the Group Balance Sheet at cost adjusted in respect of post-acquisition changes in the Group's share of net assets, less any impairment in value.

	2021 £m	2020 £m
As at 1 January	**12.1**	12.7
Share of post-tax profit of joint ventures	**1.3**	1.1
Dividends received from joint ventures	**(1.0)**	(2.3)
Foreign exchange	**0.4**	0.6
As at 31 December	**12.8**	12.1

The investment in joint ventures and associates includes £12.3m (2020: £11.6m) in respect of joint ventures and £0.5m (2020: £0.5m) in respect of associates. Dividends received from joint ventures consists of £0.2m (2020: £0.2m) from Wuhan Wugang-Vesuvius Advanced CCR Co., Limited and £0.8m (2020: £2.1m) from Wuhan Wugang-Vesuvius Advanced Ceramics Co., Limited.

Joint ventures

Set out below is the summarised financial information in respect of joint ventures.

	2021 £m	2020 £m
Revenue	**48.8**	39.7
Trading profit	**3.6**	2.9
Net finance costs	**–**	0.1
Profit before tax	**3.6**	3.0
Income tax expense	**(0.9)**	(0.7)
Profit after tax	**2.7**	2.3
Non-current assets	**7.6**	7.8
Current assets	**25.0**	19.1
Non-current liabilities	**–**	–
Current liabilities	**(9.2)**	(4.9)
Net assets	**23.4**	22.0

Notes to the Group Financial Statements continued

33. Investments in Subsidiaries, Joint Ventures and Associates continued

33.2 Investment in joint ventures and associates continued

Set out below is the summarised financial information for Wuhan Wugang-Vesuvius Advanced Ceramics Co., Limited, a joint venture that has transactions and balances which are material to the Group.

	2021 £m	2020 £m
Revenue	**42.7**	34.5
Depreciation	**(0.9)**	(0.9)
Trading profit	**3.0**	2.4
Net finance costs	**–**	–
Profit before tax	**3.0**	2.4
Income tax expense	**(0.8)**	(0.6)
Profit after tax	**2.2**	1.8
Non-current assets	**7.3**	7.5
Current assets[1]	**16.6**	11.7
Non-current liabilities	**–**	–
Current liabilities	**(7.8)**	(4.2)
Net assets	**16.1**	15.0

1. Included in current assets are cash and cash equivalents of £3.2m (2020: £2.4m).

The purpose of the Chinese joint venture companies is to research, develop, manufacture and sell refractory products. The role of Vesuvius is to provide technical personnel, training and access to the Group's international sales network.

Name of entity	Registered address	Jurisdiction	2021 % ownership	2020 % ownership
Wuhan Wugang-Vesuvius Advanced CCR Co., Limited	Gongnong Village Qingshan District, Wuhan, Hubei Province, 430082, China	China	**50**	50
Wuhan Wugang-Vesuvius Advanced Ceramics Co., Limited	Gongnong Village Qingshan District, Wuhan, Hubei Province, 430082, China	China	**50**	50

Associates

Name of entity	Registered address	Jurisdiction	2021 % ownership	2020 % ownership
Sapotech Oy	Paavo Havaksen tie 5 D, 90570 Oulu, Finland	Finland	**14.9**	14.9
Newshelf 480 Proprietary Limited	144 Oxford Road, Rosebank, Melrose, Johannesburg, 2196, South Africa	South Africa	**45**	45

The Group is considered to hold significant influence over Sapotech Oy despite holding less than 20% of its shares because the agreement under which the Group invested in Sapotech Oy provides that the Group holds one of the four seats on the company's board. This allows the Group to participate in policy-making processes and have additional controls over Sapotech Oy's major decision-making that do not amount to control but give significant influence.

33.3 Non-controlling interests

Non-controlling interests represent the portion of the equity of a subsidiary not attributable either directly or indirectly to the Parent Company and are presented separately in the Group Income Statement and within equity in the Group Balance Sheet, distinguished from Parent Company shareholders' equity.

The total profit attributable to non-controlling interests as at 31 December 2021 is £5.8m (2020: £4.5m) of which £3.1m relates to Vesuvius India Limited (2020: £2.6m). The profit attributable to non-controlling interests in respect of the Group's other subsidiaries is not considered to be material.

Name of entity	Registered address	Jurisdiction	2021 % ownership	2020 % ownership
Vesuvius India Limited	P-104 Taratala Road, Kolkata, 700 088, India	India	**55.57**	55.57
Foseco India Limited	922/923, Gat, Sanaswadi, Taluka, Shirur, Pune, 412208, India	India	**74.98**	74.98
Foseco Golden Gate Company Limited	6 Kung Yeh 2nd Road, Ping Tung Dist, Ping Tung, 90049, Taiwan	Taiwan	**51**	51
Foseco (Thailand) Limited	170/69, 22nd Floor Ocean Tower 1, Ratchadapisek Road, Klongtoey, Bangkok, 10110, Thailand	Thailand	**74**	74
Vesuvius Ceska Republika, a.s.	Prumyslová 726, Konská, Trinec, 739 61, Czech Republic	Czech Republic	**60**	60

33. Investments in Subsidiaries, Joint Ventures and Associates continued

33.3 Non-controlling interests continued

As with Vesuvius plc, all of the above companies have a 31 December year-end. The summarised financial information for Vesuvius India Limited is presented below:

	2021 £m	2020 £m
Summarised balance sheet		
Current assets	**99.4**	88.6
Current liabilities	**(24.9)**	(17.8)
Current net assets	**74.5**	70.8
Non-current assets	**17.0**	15.7
Non-current liabilities	**(2.4)**	(2.3)
Non-current net assets	**14.6**	13.4
Net assets	**89.1**	84.2
Accumulated NCI	**(39.9)**	37.8
Summarised statement of comprehensive income		
Revenue	**102.5**	82.8
Profit after tax	**6.9**	5.9
Profit allocated to NCI	**3.1**	2.6
Dividends paid to NCI	**(0.6)**	(0.7)
Summarised cash flows		
Cash flows from operating activities	**4.0**	12.7
Cash flows from investing activities	**(3.1)**	(1.4)
Cash flows from financing activities	**(1.4)**	(1.7)
Net increase/decrease in cash and cash equivalents	**(0.5)**	9.6

34. Related Parties

All transactions with related parties are conducted on an arm's-length basis and in accordance with normal business terms. Transactions between related parties that are Group subsidiaries are eliminated on consolidation.

The related parties identified by the Directors include joint ventures, associates and key management personnel. To enable users of our financial statements to form a view on the effects of related party relationships on the Group, we disclose the related party relationship irrespective of whether there have been transactions between the related parties.

34.1 Transactions with joint ventures and associates

All transactions with joint ventures and associates are in the normal course of business. Transactions between the Group and its joint ventures and associates are disclosed below:

	2021 £m	2020 £m
Sales to joint ventures	**4.8**	3.8
Purchases from joint ventures	**31.5**	26.7
Purchases from associates	**–**	0.3
Dividends received	**1.0**	2.3
Trade payables owed to joint ventures	**10.3**	5.5
Trade receivables owed by joint ventures	**1.3**	0.6

Trade payables owed to joint ventures are settled net of trade receivables owed by joint ventures 60 days after the delivery of goods or services. There are no loans to and from joint ventures.

Notes to the Group Financial Statements continued

34. Related Parties continued

34.2 Transactions with key management personnel

There have been no transactions with key management personnel of the Group other than the Directors' remuneration.

Directors' remuneration is disclosed in Note 8 to the Group Financial Statements and in the Directors' Remuneration Report.

34.3 Transactions with other related parties

There are no controlling shareholders of the Group as defined by IFRS. There have been no material transactions with the shareholders of the Group.

Pension contributions to Group schemes are disclosed in Note 26 to the Group Financial Statements.

Other than the parties disclosed above, the Group has no other material related parties.

Company Balance Sheet

As at 31 December 2021

	Notes	2021 total £m	2020 total £m
Fixed assets			
Investments	7	**1,778.0**	1,778.0
Total fixed assets		**1,778.0**	1,778.0
Current assets			
Debtors – amounts falling due within one year		**4.7**	1.2
Cash at bank and in hand		**–**	–
Total current assets		**4.7**	1.2
Creditors – amounts falling due within one year			
Bank loans and overdraft		**–**	(0.1)
Other creditors including taxation and social security	8	**(979.8)**	(955.4)
Net current liabilities		**(975.1)**	(954.3)
Total assets less current liabilities		**802.9**	823.7
Net assets		**802.9**	823.7
Equity capital and reserves			
Called up share capital	9	**27.8**	27.8
Retained earnings	9	**775.1**	795.9
Total shareholders' funds		**802.9**	823.7

Company number 8217766

Under Section 408 of the Companies Act 2006, the Company is exempt from the requirement to present its own income statement. During 2021, the Company recognised a profit of £32.7m (2020: £17.0m loss).

The Financial Statements on pages 229 to 236 were approved and authorised for issue by the Directors on 3 March 2022 and signed on their behalf by:

Patrick André
Chief Executive

Guy Young
Chief Financial Officer

Company Statement of Changes in Equity

For the year ended 31 December 2021

	Notes	Share capital £m	Retained earnings £m	Total £m
As at 1 January 2020		27.8	818.9	846.7
Comprehensive loss recognised for the year		–	(17.0)	(17.0)
Recognition of share-based payments	10	–	2.4	2.4
Dividend paid	6	–	(8.4)	(8.4)
As at 31 December 2020		**27.8**	**795.9**	**823.7**
As at 1 January 2021		**27.8**	**795.9**	**823.7**
Comprehensive income recognised for the year		–	32.7	32.7
Recognition of share-based payments	10	–	3.1	3.1
Purchase of ESOP shares		–	(1.1)	(1.1)
Dividend paid	6	–	(55.5)	(55.5)
As at 31 December 2021		**27.8**	**775.1**	**802.9**

Notes to the Company Financial Statements

1. General Information

Vesuvius plc ('Vesuvius' or 'the Company') is a public company limited by shares. It is incorporated and domiciled in England and Wales, United Kingdom, and listed on the London Stock Exchange. The nature of the company is a holding company. The address of its registered office is 165 Fleet Street, London EC4A 2AE.

2. Basis of Preparation

2.1 Basis of accounting

The financial statements of the Company have been prepared in accordance with Financial Reporting Standard 101 Reduced Disclosure Framework (FRS 101) and the Companies Act 2006 as applicable to companies using FRS 101. The financial statements have been prepared under the historical cost convention.

The results of the Company are included in the preceding Group Financial Statements.

In these financial statements, the Company has applied the exemptions available under FRS 101 in respect of the following disclosures:

- A cash flow statement and related notes (IAS 1 para 10(d) and IAS 7)
- Disclosures in respect of capital management and financial instruments (IAS 1 paras 134–136 and IFRS 7)
- Disclosures in respect of related party transactions with wholly owned members of the Vesuvius plc Group (IAS 24)
- Disclosures in respect of the compensation of key management personnel (IAS 24 para 17)
- Disclosures in respect of fair value measurements (IFRS 13 paras 91–99)
- The effects of new but not yet effective IFRSs (IAS 8 paras 30–31).

Under Section 408 of the Companies Act 2006, the Company is exempt from the requirement to present its own profit and loss account.

The accounting policies set out below have, unless otherwise stated, been applied consistently to all periods presented in these financial statements.

2.2 Going concern

The Directors have a reasonable expectation that the Group and the Company have adequate resources to continue in operational existence for a period of at least 12 months from the date of approval of these financial statements (disclosed in Note 2.3 to the Group Financial Statements) and that there is no material uncertainty in respect of going concern. The net current liabilities are due to amounts owed to subsidiary undertakings, therefore the Directors do not believe that they will affect the Company's ability to continue in operational existence. Accordingly, they continue to adopt a going concern basis in preparing the financial statements of the Group and the Company.

2.3 Accounting policy

Taxation

Both current and deferred tax are calculated using tax rates and laws that have been enacted, or substantively enacted, by the balance sheet date.

Current tax payable is based on the taxable result for the year. Deferred taxation is recognised, without discounting, in respect of all temporary differences that have originated, but not reversed, at the balance sheet date, with the exception that deferred taxation assets are only recognised if it is considered more likely than not that there will be suitable future profits from which the reversal of the underlying temporary differences can be deducted. Provision is made for the tax that would arise on remittance of the retained earnings of overseas subsidiaries only to the extent that, at the balance sheet date, dividends have been accrued as receivable. All other accounting policies are set out within the respective notes.

Notes to the Company Financial Statements continued

3. Critical Accounting Judgements and Estimates

Impairment of investment in subsidiaries and other companies (estimate and judgement)

For the below estimate, the Group does not have any key assumptions concerning the future, or other key sources of estimation uncertainty in the reporting period, that are reasonably expected to have a significant risk of causing a material adjustment to the carrying amounts of assets/liabilities within the next financial year. Nonetheless, this estimate has the potential to materially vary over time and is therefore highlighted.

The Company assesses its investments in subsidiaries and other companies for impairment shortly before the Company's year-end or whenever events or changes in circumstances indicate that the recoverable amount of the investment could be less than the carrying amount of the investment. If this is the case, the investment is considered to be impaired and is written down to its recoverable amount. Judgement is required in the determination of the recoverable amount as the Company evaluates various factors related to the operational and financial position of the relevant investee business, appropriate discounting and long-term growth rates. The annual investment impairment test is described in Note 7.3 below.

4. Employee Benefits Expense

	2021 £m	2020 £m
Wages and salaries	**2.8**	2.5
Social security costs	**0.4**	0.5
Share-based payments	**0.1**	1.3
Total employee benefits expense	**3.3**	4.3

The total average number of employees for 2021 was 3 (2020: 3). As at 31 December 2021, the Company had 3 (2020: 3) employees.

Details of the Directors' remuneration are disclosed in the Directors' Remuneration Report on pages 144 and 145.

5. Audit and Non-Audit Fees

Amounts payable to PricewaterhouseCoopers LLP in relation to audit and non-audit fees are disclosed within Note 6 to the Group Financial Statements.

6. Dividend Paid

	2021 £m	2020 £m
Amounts recognised as dividends and paid to equity shareholders during the year		
Interim dividend for the year ended 31 December 2020 of 3.1p per ordinary share	**–**	8.4
Final dividend for the year ended 31 December 2020 of 14.3p per ordinary share	**38.7**	–
Interim dividend for the year ended 31 December 2021 of 6.2p per ordinary share	**16.8**	–
	55.5	8.4

A proposed final dividend for the year ended 31 December 2021 of £40.5m (2020: £38.7m), equivalent to 15.0 pence (2020: 14.3 pence) per ordinary share, is subject to approval by shareholders at the Company's Annual General Meeting on 18 May 2022 and has not been included as a liability in these financial statements. If approved by shareholders, the dividend will be paid on 27 May 2022 to holders of ordinary shares on the register on 19 April 2022.

7. Investments

7.1 Accounting policy

Shares in subsidiaries, associates and joint ventures are stated at cost less any impairment in value. Impairment is assessed in accordance with Note 17.1 to the Group Financial Statements.

7.2 Analysis of investments

	Shares in subsidiaries £m
As at 1 January 2021 and 31 December 2021	**1,778.0**

The subsidiaries, joint ventures and associates of Vesuvius plc, their country of incorporation and percentage ownership are set out in Note 33 to the Group Financial Statements. With the exception of Vesuvius Holdings Ltd, whose ordinary share capital was directly held by Vesuvius plc, the ordinary share capital of the other companies was owned by a Vesuvius plc subsidiary as at 31 December 2021.

7.3 Impairment of investment in subsidiaries, associates and joint ventures

The Group carried out its investment impairment test as at 31 October 2021. The recoverable amount of the investment exceeded its carrying value, therefore no impairment charges have been recognised. No further impairment indicators were identified up to 31 December 2021.

The cash flow predictions are based on financial budgets and strategic plans approved by the Board. These assume a level of revenue and profits which are based on both past performance and expectations for future market development and take into account the cyclicality of the business in which the Group operates. In assessing the cash flows of the Parent's investment in its subsidiaries, the amounts payable by the Parent to subsidiaries are also taken into account. A sensitivity analysis was carried out using reasonably possible changes to the key assumptions set out in Note 17.2 to the Group Financial Statements. No scenarios of impairment were identified.

8. Other Creditors including Taxation and Social Security

	2021 £m	2020 £m
Amounts owed to subsidiary undertakings	**977.4**	953.5
Accruals and other creditors	**2.4**	1.9
Total amounts falling due within one year	**979.8**	955.4

Amounts owed to subsidiary undertakings are interest free, have no fixed date of repayment and are repayable on demand.

9. Issued Share Capital and Retained Earnings

9.1 Accounting policy

Equity instruments issued by the Company are recorded at the proceeds received, net of direct issue costs.

9.2 Analysis of issued share capital

The allotted, issued and fully paid ordinary share capital of the Company as at 1 January 2021 and 31 December 2021 was 278,485,071 shares of £0.10 each. 7,271,174 (2020: 7,271,174) shares of £0.10 each were held in Treasury and 884,856 (2020: 1,093,098) shares of £0.10 each were held by the Vesuvius Group employee share ownership plan trust (ESOP). The Company has one class of shares in issue, ordinary shares. All shareholders enjoy the same rights in relation to these shares, including rights in relation to voting at General Meetings of the Company, distribution of dividends and repayment of capital.

9.3 Distributable reserves

The Company had distributable reserves in excess of £765m as at 31 December 2021 (2020: £796m), subject to filing these financial statements with Companies House. When making a distribution to shareholders, the Directors determine profits available for distribution by reference to guidance on realised and distributable profits under the Companies Act 2006 issued by the Institute of Chartered Accountants in England and Wales and the Institute of Chartered Accountants of Scotland in April 2017. The profits of the Company have been received in the form of dividends from subsidiaries and through court-approved capital reduction. The availability of distributable reserves in the Company is dependent on those dividends meeting the definition of qualifying consideration within the guidance and on available cash resources of the Group and other accessible sources of funds. The distributable reserves are subject to any future restrictions or limitations at the time such distribution is made.

Notes to the Company Financial Statements continued

10. Recognition of Share-based Payments

10.1 Accounting policy

The Company operates an equity-settled share-based payment arrangement for its employees. Equity-settled share-based payments are measured at fair value at the date of grant. For grants with market-based conditions attached to them, such as total shareholder return, fair value is measured using a form of stochastic option pricing model. For grants with non-market-based conditions, such as growth in headline earnings per share, fair value is measured using the Black-Scholes option pricing model. The fair value is expensed on a straight-line basis over the vesting period with a corresponding increase in equity. The cumulative expense recognised is adjusted for the best estimate of the shares that will eventually vest.

The Company recharges its subsidiaries for the IFRS 2 expense relating to their employees on an annual basis.

10.2 Profit and loss account recognition

The Company operates a number of different share-based payment schemes, the main features of which are detailed in the Directors' Remuneration Report and Note 27 to the Group Financial Statements. A total of £0.1m was charged to the profit and loss account in the year with regard to share-based payments (2020: £1.3m).

10.3 Details of outstanding options

	Number of outstanding awards						Awards exercisable as at 31 Dec 2021	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
	As at 1 Jan 2021	Granted	Exercised	Forfeited/ lapsed	Expired	As at 31 Dec 2021			
LTIP	1,110,699	391,786	(5,955)	(295,946)	nil	1,200,584	–	8.3	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	nil	–		n/a
Other plans	89,309	15,523	(28,246)	–	nil	76,586	–	0.8	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	nil	–		n/a

For the awards exercised during 2021, the market value at the date of exercise was 531 pence per share.

	Number of outstanding awards						Awards exercisable as at 31 Dec 2020	Weighted average outstanding contractual life of awards years	Range of exercise prices pence
	As at 1 Jan 2020	Granted	Exercised	Forfeited/ lapsed	Expired	As at 31 Dec 2020			
LTIP	872,737	481,238	(243,276)	–	nil	1,110,699	–	8.4	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	nil	–		n/a
Other plans	76,920	12,389	–	–	nil	89,309	–	0.5	n/a
Weighted average exercise price	nil	nil	nil	nil	nil	nil	–		n/a

For options exercised during 2020, the market value at the date of exercise ranged from 351 pence to 395 pence.

Details of market performance conditions are included in the Directors' Remuneration Report.

As at 31 December 2021, the total options exercisable by all Group employees over the £0.10 ordinary shares and capable of being satisfied through new allotments of shares or through shares held by the Company's ESOP were as follows:

	Years of award/grant	Option prices	Latest year of exercise/ vesting	Number of options/ allocations outstanding
Long-Term Incentive Plan	2019–2021	nil	2031	1,939,964
Medium-Term Incentive Plan	2020–2021	nil	2023	472,447
Deferred Share Bonus Plan	2019–2021	nil	2024	76,586

10. Share-based Payments continued

10.3 Details of outstanding options continued

Fair value of options granted under the LTIP during the year:

	2021 EPS element	2021 TSR element
Fair value of options granted	538p	340p
Share price on date of grant	538p	538p
Expected volatility	n/a	39.2%
Risk-free interest rate	n/a	0.2%
Exercise price (per share)	nil	nil
Expected term (years)	3	3
Expected dividend yield	nil	nil

Vesting of 50% of shares awarded is based on the Group's three-year total shareholder return (TSR) performance relative to that of the constituent companies of the FTSE 250 (excluding investment trusts) and vesting of the remaining 50% of shares awarded is based on headline EPS growth.

Expected volatility was determined by calculating the historical volatility of the Group's share price over the 2.8 years (2020: 2.8 years) prior to the grant date for the March 2020 grant. The risk-free rate of return was assumed to be the yield to maturity on a UK fixed gilt with the term to maturity equal to the expected life of the option. At the discretion of the Remuneration Committee, award holders receive the value of dividends that would have been paid on their vested shares in the period between grant and vesting. Accordingly, there is no discount to the valuation for dividends foregone during the vesting period.

11. Contingent Liabilities

Where the Company enters into financial guarantee contracts to guarantee the indebtedness of other companies within its Group, the Company considers these to be insurance arrangements and accounts for them as such. In this respect, the Company treats the guarantee contract as a contingent liability until such time as it becomes probable that the Company will be required to make a payment under the guarantee. Guarantees provided by the Company as at 31 December 2021 in respect of the liabilities of its subsidiary companies amounted to £418.8m (2020: £362.7m), which includes guarantees of $146.0m, €198.0m and £28.0m (2020: $146.0m and €180.0m) in respect of US Private Placement Loan Notes; £76.9m (2020: £53.5m) in respect of drawings under the syndicated bank facility; £32.9m (2020: £32.9m) in respect of a guarantee provided to the Company's UK subsidiary which acts as Trustee for the Group's UK pension plan; £2.6m (2020: £7.0m) in respect of guarantees issued to certain banks covering their exposure on derivative contracts governed by ISDA agreements; and £4.1m (2020: £1.7m) in respect of overdraft facilities utilised by certain of the Company's subsidiary companies. The guarantee in respect of the UK pension plan is over all present and future pension liabilities of the plan and the contingent liability amount represents the net deficit on a buy-out basis as shown in the most recent valuation.

Vesuvius has extensive international operations and is subject to various legal and regulatory regimes, including those covering taxation and environmental matters. Several of the Company's subsidiaries are parties to legal proceedings, certain of which are insured claims arising in the ordinary course of the operations of the company involved, and are aware of a number of issues which are, or may be, the subject of dispute with tax authorities. Whilst the outcome of litigation and other disputes can never be predicted with certainty, having regard to legal advice received and the insurance arrangements of the Company and its subsidiaries, the Directors believe that none of these matters will, either individually or in the aggregate, have a materially adverse effect on the Company's financial condition or results of operations.

Notes to the Company Financial Statements continued

12. Related Parties

All transactions with related parties are conducted on an arm's-length basis and in accordance with normal business terms. Transactions between related parties that are wholly owned Company subsidiaries are not disclosed in this Note.

The related parties identified by the Directors include joint ventures, associates and key management personnel. To enable users of our financial statements to form a view on the effects of related party relationships on the Company, we disclose the related party relationship, irrespective of whether there have been transactions between the related parties.

Transactions with joint ventures and associates

All transactions with joint ventures and associates are in the normal course of business. Further details of joint ventures and associates are included in Note 33 to the Group Financial Statements.

Transactions with key management personnel

There have been no transactions with key management personnel of the Company other than the Directors' remuneration.

Directors' remuneration is disclosed in the Annual Report on Directors' Remuneration.

Transactions with other related parties

There are no controlling shareholders of the Company as defined by IFRS. There have been no material transactions with the shareholders of the Company.

Pension contributions are disclosed in Note 26 to the Group Financial Statements.

Other than the parties disclosed above, the Company has no other material related parties.

Five-Year Summary: Divisional Results from Continuing Operations

		2021	2020	2019	2018	2017
Steel Division						
Revenue	£m	**1,171.5**	1,045.4	1,195.3	1,236.7	1,148.7
Trading profit	£m	**102.0**	76.4	120.1	128.3	100.4
Return on sales	%	**8.7**	7.3	10.0	10.4	8.7
Employees: year-end	no.	**8,323**	7,619	7,677	7,766	7,930
Foundry Division						
Revenue	£m	**471.4**	412.9	515.1	561.3	535.2
Trading profit	£m	**40.4**	25.0	61.3	68.9	65.1
Return on sales	%	**8.6**	6.1	11.9	12.3	12.2
Employees: year-end	no.	**2,881**	2,735	2,819	3,043	3,080

Shareholder Information (Unaudited)

Enquiries

The share register is managed by Equiniti, who can be contacted if you have any Vesuvius shareholding queries.

Equiniti Limited
Aspect House, Spencer Road
Lancing, West Sussex, BN99 6DA
United Kingdom

Telephone*
0371 384 2335 (UK only)
+44 121 415 7047 (Outside the UK)

Website: www.shareview.co.uk

Email: customer@equiniti.com

For the hard of hearing, Equiniti offers a Textel service which can be accessed by dialling 0371 384 2255 (or +44 121 415 7028 if calling from outside the UK).

Any shareholder enquiries not related to the share register should be sent by email to shareholder.information@vesuvius.com or by letter to the Company Secretary at the registered office.

Registered Office and Group Head Office

Vesuvius plc
165 Fleet Street
London EC4A 2AE
United Kingdom

Telephone: +44 (0)20 7822 0000

Registered in England and Wales No. 8217766
LEI: 213800ORZ521W585SY02

Vesuvius Website

Shareholder and other information about the Company, including details of the current and historical share price, can be accessed on the Vesuvius website: www.vesuvius.com.

You can view the online Annual Report 2021 on the website.

Shareview and Electronic Communication

Equiniti's website, www.shareview.co.uk, enables shareholders to register online to view details of their shareholdings. To access online information on your shareholding, you will require your shareholder reference number, which can be found at the top of your share certificate or on your dividend confirmation. The Shareview website provides answers to frequently asked questions and information useful for the management of investments, including indicative share valuations and dividend payment details.

Shareholders can register on Shareview to receive shareholder communications electronically, including the Company's Annual Report and Financial Statements, rather than receiving them in paper form. The registration process requires shareholders to input their shareholder reference number. To receive shareholder communications in electronic form, shareholders should select 'email' as their mailing preference. Once registered, shareholders will receive an email notifying them each time a shareholder communication has been published on the Vesuvius website.

Share Dealing Service

The Company's shares can be traded through most banks, building societies or stockbrokers. UK resident shareholders can also buy and sell shares by telephone or online using Equiniti's Shareview dealing service.

Telephone 0345 603 7037 between 8.00 am and 4.30 pm on any business day (excluding public holidays in England and Wales)

Website: www.shareview.co.uk/dealing

Email: sharedealing@equiniti.com

The shareholder reference number (at the top of your share certificate or on your dividend confirmation) is required to use the dealing service.

ShareGift

ShareGift, the charity share donation scheme, is a free service for shareholders wishing to give shares to a wide range of UK charitable causes. It is particularly useful for those shareholders who may wish to dispose of a small quantity of shares where the market value makes it uneconomic to sell on a commission basis. Further information can be obtained from ShareGift.

Telephone: +44 (0)20 7930 3737

Website: www.sharegift.org

Email: help@sharegift.org

Dividend Reinvestment Plan

Equiniti offers a dividend reinvestment plan through which shareholders can use their Vesuvius cash dividends to buy additional shares in Vesuvius. Further details, including how to sign up and the terms and conditions of the plan, are available from the Share Dividend Helpline.

Telephone: 0371 384 2335
(or +44 121 415 7047 if calling from outside the UK)

Website: www.shareview.co.uk

Overseas Payment Service

Equiniti provides a dividend payment service in over 90 countries that automatically converts dividend payments into local currency and pays the funds into a shareholder's bank account. Further details, including an application form and the terms and conditions of the service, are available from Equiniti.

Telephone: +44 (0)121 415 7047

Website: www.shareview.co.uk

By post: Equiniti, Aspect House, Spencer Road, Lancing, West Sussex, BN99 6DA, United Kingdom

Please quote Overseas Payment Service, the Company's name and your shareholder reference number.

Financial Calendar

2022 Annual General Meeting	18 May 2022

* Lines are open Monday to Friday 8.30 am to 5.30 pm (excluding public holidays in England and Wales).

Analysis of Ordinary Shareholders

	Investor type			Shareholdings			
As at 31 December 2021	Private	Institutional and other	Total	1–1,000	1,001–50,000	50,001–500,000	500,001+
Number of holders	2,362	519	2,881	2,232	452	132	65
Percentage of holders	81.99%	18.01%	100%	77.47%	15.69%	4.58%	2.26%
Percentage of shares held	0.48%	99.52%	100%	0.11%	1.34%	7.98%	90.57%

Share Fraud – Spot the Warning Signs

Investment scams are designed to look like genuine investments.

Have you been …

- Contacted out of the blue
- Promised tempting returns and told the investment is safe
- Called repeatedly
- Told the offer is only available for a limited time?

If so, you might have been contacted by fraudsters.

How to Avoid Share Fraud

1. Reject cold calls

If you have been contacted by telephone, email or post, or via a third party or at a seminar or exhibition, with an offer to buy or sell shares, the chances are that it's a high-risk investment or a scam. You should treat any offer with extreme caution. The safest thing to do is to ignore the approach and if you were contacted by phone to hang up on the call.

2. Check if the firm is authorised by the Financial Conduct Authority (FCA) and recorded on the Financial Services register at https://register.fca.org.uk/

The Financial Services Register is a public record of all the firms and individuals in the financial services industry that are, or have been, regulated by the Prudential Regulation Authority and/or the FCA. If there are no contact details on the Register or if the firm claims the Register is out of date, call the FCA Consumer Helpline on 0800 111 6768.

If you're dealing with an overseas firm, you should check with the regulator in that country and also check the scam warnings from foreign regulators.

3. Get impartial advice

Think about getting impartial financial advice before you hand over any money. Seek advice from someone unconnected to the firm that has approached you.

Reporting a Scam

If you suspect that you have been approached by fraudsters, please tell the FCA Consumer Helpline by contacting them on 0800 111 6768 (or +44 20 7066 1000 from outside the UK) or by using the share fraud reporting form at www.fca.org.uk/scams, where you can find out more about investment scams.

If you have lost money to investment fraud, you should report it to Action Fraud on 0300 123 2040 (or +44 300 123 2040 from outside the UK) or online at www.actionfraud.police.uk.

Find out more at www.fca.org.uk/scamsmart.

Glossary

5S	Five Steps to improve housekeeping and therefore workplace safety and efficiency: separate, sort, shine, standardise and sustain
8D	Eight Disciplines: an eight-step methodology to resolve customer, supplier and internal quality issues
AGM	Annual General Meeting
CG Statement	The Corporate Governance Statement
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
Code	The UK Corporate Governance Code
Company	Vesuvius plc
CORE Values or Values	The Group's key values of Courage, Ownership, Respect and Energy
COVID-19 or COVID-19 pandemic	Coronavirus disease (COVID-19), the infectious disease caused by the newly discovered coronavirus, and the pandemic that has arisen from this
DO	Dangerous occurrence
DOFR	Dangerous occurrence frequency rate
DSBP	Deferred Share Bonus Plan
DTR	The Disclosure and Transparency Rules of the UK Financial Conduct Authority
EBITDA	Trading profit before depreciation and amortisation of non-acquired intangible charges
ECL	Expected Credit Loss
EEMEA	Eastern Europe, Middle East and Africa
EMEA	Europe, Middle East and Africa
EPS	Earnings per share
ESOP	Employee Share Ownership Plan
EU	European Union
EU27	The 27 European Union countries
FRC	Financial Reporting Council
FRS	Financial Reporting Standards
FTSE 250	Equity index whose constituents are the 101st to 350th largest companies listed on the London Stock Exchange in terms of their market capitalisation
FX	Foreign exchange
GEC	Group Executive Committee
GHG	Greenhouse gas
Group	Vesuvius plc and its subsidiary companies
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
KPI	Key Performance Indicator
LMS	Learning Management System
LTI	Lost time injury
LTIFR	Lost time injury frequency rate, a KPI which calculates the number of LTIs per million hours worked
Median	The middle number in a sorted list of numbers
MTI	Medically treated injury
MTIFR	Medically treated injury frequency rate
PwC	PricewaterhouseCoopers LLP
NAFTA	Canada, Mexico and USA
Ordinary share	An ordinary share of 10 pence in the capital of the Company
R&D	Research and development
Scope 1 emissions	Direct CO_2 and CO_2e emissions from owned or controlled sources
Scope 2 emissions	Direct CO_2 and CO_2e from indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the Company
Scope 3 emissions	All other direct CO_2 and CO_2e emissions that occur in the Company's value chain
Senior Leadership Group	The Group Executive Committee plus the most senior Vesuvius managers worldwide, in terms of their contribution to the Group's overall results and to the execution of the Group's strategy. This group comprises between 150 and 160 members
Top Management	Key leadership roles reporting directly to members of the GEC
TSR	Total shareholder return
Turbo S	The Vesuvius safety training programme
UK GAAP	UK Generally Accepted Accounting Principles
VISO	Vesuvius Isostatic
VSP	Vesuvius Share Plan

These images were taken by Vesuvius colleagues who were asked to submit photographs of different aspects of their work in a staff competition:

Page 22 Photography by Saugata Datta, Process Specialist Dry Processes, Vesuvius Visakhapatnam

Page 76 Photography by Michel Wissink, Development & Service Technician, Vesuvius Hengelo

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