



# MANAGEMENT REPORT

1 JULY TO  
31 DECEMBER  
2022



**VULCAN ENERGY**  
**ZERO CARBON LITHIUM™**

**ABN 38 624 223 132**  
**WWW.V-ER.EU**

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# 1. MANAGEMENT REPORT

## 1.1 Business Model and Corporate Profile

Founded in 2018, Vulcan's unique Zero Carbon Lithium™ Project aims to decarbonise lithium production, through developing the world's first net carbon neutral, zero fossil fuels business, with the co-production of renewable geothermal energy on a mass scale. By adapting existing technologies to efficiently extract lithium from geothermal brine, Vulcan aims to deliver a local source of sustainable lithium for Europe, built around a net zero carbon strategy with strict exclusion of fossil fuels. Already an operational renewable energy producer, Vulcan will also provide renewable electricity and heat to local communities.

Vulcan's combined geothermal energy and lithium resource is the largest in Europe, with license areas focused on the Upper Rhine Valley, Germany. Strategically placed in the heart of the European electric vehicle market to decarbonise the supply chain, Vulcan is rapidly advancing the Zero Carbon Lithium™ Project to target timely market entry, with the ability to expand to meet the unprecedented demand that is building in the European markets.

Guided by our Values of Integrity, Leadership, Future-focused and Sustainability, and united by a passion for environmentalism and leveraging scientific solutions, Vulcan has a unique, world-leading scientific and commercial team in the fields of lithium chemicals and geothermal renewable energy. Vulcan is committed to partnering with organisations that share its decarbonisation ambitions and has binding lithium offtake agreements with some of the largest cathode, battery, and automakers in the world. As a motivated disruptor, Vulcan aims to leverage its multidisciplinary expert team, leading geothermal technology and position in the European EV supply chain to be a global leader in producing zero fossil fuel, net carbon neutral lithium while being nature positive. Vulcan aims to be the largest, most preferred, strategic supplier of lithium chemicals and renewable power and heating from Europe, for Europe; to empower a net zero carbon future.

## Defining 'Zero Carbon'

Vulcan defines 'Zero Carbon' as net zero carbon emissions resulting from the activities undertaken to extract and process lithium from its combined lithium and geothermal brine resource located in the Upper Rhine Valley, Germany. Unlike existing lithium operations, Vulcan does not burn fossil fuels in the production and processing exercise. Instead, it uses its own geothermal renewable heat source to drive the process, whilst also selling its own geothermal heat and power to the grid, displacing fossil fuel generated energy. The carbon emissions avoided as a result of the displaced fossil fuel generated energy allows Vulcan to define the project as net zero, or 'Zero Carbon' per the project's trademarked nomenclature, the 'Zero Carbon Lithium™ Project'. Vulcan commissioned Minviro Ltd, an independent consultancy, to undertake an ISO-aligned Life Cycle Assessment (LCA) of the integrated geothermal energy, lithium production and processing impacts to prove and certify the validity of the carbon neutral nature of the Zero Carbon Lithium™ Project. Minviro's first ISO-aligned LCA was conducted in 2021, with the latest LCA undertaken in 2023 (after the end of the reporting period). LCAs will be updated at regular intervals going forward.

In addition to the above, Vulcan engaged Climate Active and South Pole to assess, measure and verify the GHG emissions of the whole Company, including its Australian and German operations respectively. The most recent carbon neutral certification of the organisation's emissions, which includes business travel, procurement of goods and services, waste usage and electricity usage, was undertaken in 2021. Climate Active completed the certification process for Australia, while South Pole certified Vulcan Energie Ressourcen GmbH, the German corporate subsidiary. South Pole's assessment did not include Vercana, Vulcan's electric drilling subsidiary, because it had been recently incorporated and was a shell company, or the Natürlich Insheim plant, as the acquisition of Natürlich Insheim occurred post certification. These entities will be included in the next assessment round currently being undertaken by Climate Active and Climate Impact Partners will be reported on in Vulcan's next report. This assessment

will include the development and construction activities associated with the build of the Company's Demo Plant following the successful completion of the DFS.

Following the Climate Active and South Pole reports, and in order to bring the minimal GHG emissions balance associated with the Australian and German operations to net zero, Vulcan purchased good quality carbon credits. Details of the Company's carbon emissions associated with the Zero Carbon Lithium™ Project were disclosed to the market in 2021 (Minviro LCA announcement X), GHG emissions associated with Vulcan's operations and carbon credits purchases for 2021 were reported in the FY22 Sustainability Report available via the website (<https://v-er.eu>). The GHG emissions associated with Vulcan's operations for 2022 are currently being updated and the updated Minviro LCA data was announced as part of the DFS on 13 February 2023. Vulcan expects to maintain its carbon neutral status for the period.

## 1.2 Group Structure

Vulcan, currently a team of more than 280 strong, continues to grow and combines multi-disciplinary, international scientific, engineering, project execution and commercial operation expertise. The team is passionately driven by the desire to provide sustainable decarbonised lithium and renewable energy supply, from Europe for Europe. The Company is the parent company of Vulcan Group. The following table shows the structure of Vulcan Group.

### Parent entity

Vulcan Energy Resources Limited Registered Office - Level 11, Brookfield Place, 125 St Georges Terrace, Perth Western Australia 6000, Australia

### Subsidiaries

Name, registered office, country of incorporation	Field of activity
Vulcan Energy Resources Europe Pty Ltd, Perth (Australia)	Holding Company
Vulcan Energy Italy Pty Ltd, Perth (Australia)	Holding Company
Vulcan Energie Ressourcen GmbH, Karlsruhe (Germany)	Holding Company / Geothermal Energy
Vulcan Energy Engineering GmbH (formerly Gec-co Global Engineering & Consulting-Company GmbH), Neusäß (Augsburg)(Germany)	Engineering / Consultancy
Vulcan Energy Subsurface Solutions GmbH (formerly GeoThermal Engineering GmbH), Karlsruhe (Germany)	Engineering / Consultancy
Vulcan Geothermal GmbH, Karlsruhe (Germany)	Geothermal Energy
VER GEO LIO GmbH, Karlsruhe (Germany)	Geothermal Energy
VERCANA GmbH, Karlsruhe (Germany)	Drilling Services
Natürlich Insheim GmbH, Karlsruhe (Germany)	Geothermal Energy
Natürlich Südpfalz Geschäftsführungs GmbH, Landau (Germany)	Geothermal Energy
Natürlich Südpfalz GmbH & Co. KG, Landau (Germany)	Geothermal Energy
Vulcan Energie France SAS, Haguenau (France)	Geothermal Energy
Vulcan Projektgesellschaft 1 GmbH, Karlsruhe (Germany)	Geothermal Energy

## 1.3 Management strategy and objectives

Vulcan was founded in 2018 on an environmentally focused goal, namely, to decarbonise lithium production for electric vehicle batteries, through developing the world's first Zero Carbon Lithium™ Project, with co-production of renewable geothermal energy and heat on a mass scale. The announcement of the Zero Carbon Lithium™ Project Phase One, DFS results and Resources-Reserves update in February 2023 is intended to kick-off a rapid transformation towards being a project execution and operations company. Initially, Vulcan plans to complete the commissioning of its demonstration plants to train the operations team, begin development drilling for new production wells, and secure project financing.

### Vulcan's 2023 Objectives are:



Figure 1: Vulcan 2023 objectives

## Vulcan's Broader Roadmap for Phase One Execution

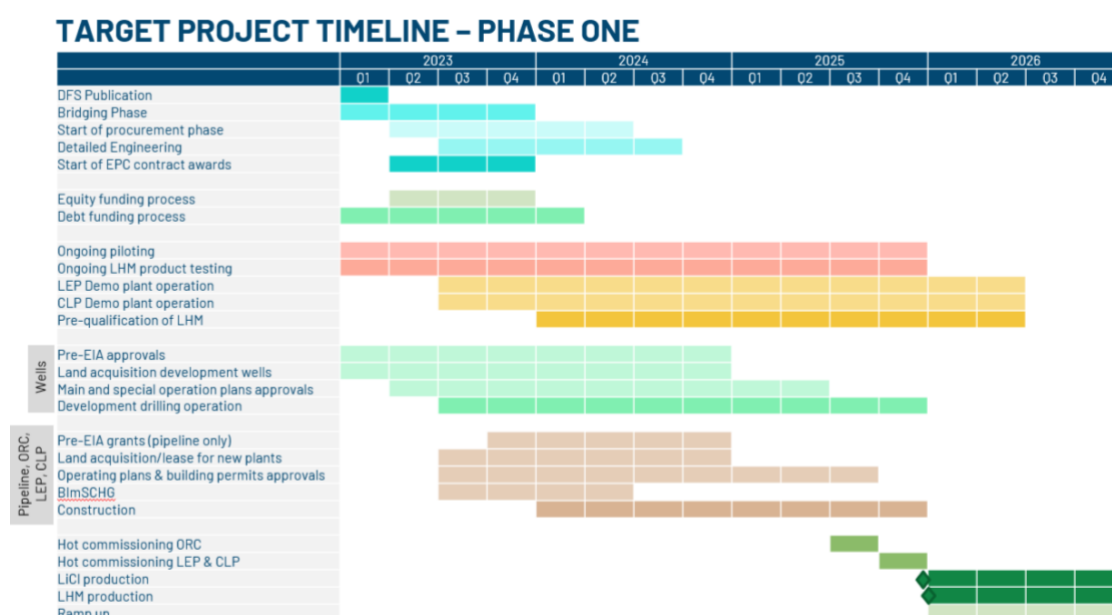


Figure 2: Vulcan's Broader Roadmap for Phase One Execution

Vulcan has a clear goal and strategy built around implementing the world's first Zero Carbon Lithium™ Project, with further expansion over the long term.

Vulcan has applied a dual business model, aiming for dual revenue sources through its lithium chemicals and geothermal renewable energy business. Vulcan has access to a strategically located and scalable lithium raw materials resource, estimated by the Company to be the largest lithium resource in Europe.<sup>1</sup> In addition, Vulcan has strategic support with secured, long term lithium supply contracts. Vulcan has five key offtake agreements secured, with binding take-or-pay and a mixture of pricing mechanisms for stable cash flow that also enables upside in pricing if the market is favourable. Vulcan is in a sold-out position for at least the first five years of production.

Throughout the reporting period Vulcan signed the first of several planned district heating agreements from geothermal energy to support local German communities. Vulcan and MVV Energie AG (MVV) have executed a binding purchase agreement for 240 gigawatt hours per year of renewable heat<sup>2</sup>. This agreement is for 20 years and is planned to commence in 2025, supplying a minimum of 240,000MWh per year, up to a maximum of 350,000MWh per year, to households in Mannheim, outside of Frankfurt, Germany.

The six months from 1 July to 31 December 2022 have seen the establishment of several European policy mechanisms that may further accelerate and support Vulcan Energy to meet the end of 2025 production target. Vulcan is well-positioned to capitalise on the expected dynamic transition to electric mobility and renewable energy in Europe through the ability to offer a sustainable lithium product from its Zero Carbon

<sup>1</sup> Refer Vulcan Zero Carbon Lithium™ Project Phase One DFS results and Resources-Reserves update Vulcan Zero Carbon Lithium™ Project Phase One DFS results and Resources-Reserves update 2023/02/13

<sup>2</sup> Vulcan executes agreement to supply German energy company, MVV, with renewable, zero carbon heat <https://www.investi.com.au/api/announcements/vul/fccbdb90-d23.pdf> 2022/04/06



Lithium™ Project. An example of these policy mechanisms is the European Battery Regulation<sup>3</sup>, which mandates more environmentally sustainable batteries to be produced and sold in the EU in the coming years. European countries' commitment to phase out the sale of fossil fuel vehicles between 2025 and 2035, depending on location, will also have a significant impact on European lithium-ion battery demand.

## Execution of Vulcan's strategy: 1 July to 31 December 2022 Snapshot:

### Delivery of Phase One development

KEY HIGHLIGHTS ACHIEVED DURING THE REPORTING PERIOD	2022 DELIVERY AGAINST STRATEGY
Renewable energy operations	During the six-month period, Vulcan sold 10,409 MWh of renewable energy from Vulcan's operational geothermal wells and plant at Natürliche Insheim, at an average selling price of €0.32 /kWh, supporting Germany's transition to domestic renewable energy sources.
Phase One integrated Zero Carbon Lithium™ and renewable energy Project development.	<ul style="list-style-type: none"> <li>Vulcan's Pilot Plant successfully produced the data required for Vulcan's Phase One DFS<sup>4</sup>, after &gt; 13,000 hours of operation, having successfully operated since April 2021. The Phase One DFS and Resource-Reserve update was released in February 2023<sup>5</sup>. The Project is now in a bridging phase, toward ordering long lead commercial equipment.</li> <li>In October 2022, Vulcan produced the highest grade, lowest impurity lithium hydroxide (LiOH) to date from its pilot plant. The sample produced graded 57.1%<sup>6</sup> LiOH, exceeding the best-on-the-market battery grade specification of 56.5% LiOH required from offtake customers. Impurities were well below market specification minimums.</li> <li>Vulcan received approval from the state authority in Rhineland-Pfalz, Germany, for the Operating Plan for Vulcan's lithium extraction Demonstration Plant (Demo Plant). On-site works are ongoing, and once operational, expected by mid-year 2023, it is intended that the Demo Plant will train the Vulcan team in a pre-commercial setting prior to commercial plant construction and operation<sup>7</sup>.</li> <li>Vulcan successfully developed, tested, and demonstrated its own in-house lithium extraction sorbent, VULSORB™<sup>8</sup>, for sustainable lithium extraction from the Upper Rhine Valley Brine Field and Vulcan's Zero Carbon Lithium™ Project. VULSORB™, as a lithium extraction sorbent based on a commercially proven technology, lithium sorption, has the</li> </ul>

<sup>3</sup> Batteries: deal on new EU rules for design, production and waste treatment. <https://www.europarl.europa.eu/news/en/press-room/20221205IPR60614/batteries-deal-on-new-eu-rules-for-design-production-and-waste-treatment>

<sup>4</sup> Approval of Operating Plan for Lithium Extraction Demo Plant <https://www.investi.com.au/api/announcements/vul/ecc7f2b3-5be.pdf> 2022/12.16

<sup>5</sup> Refer Vulcan Zero Carbon Lithium™ Project Phase One DFS results and Resources-Reserves update <https://www.investi.com.au/api/announcements/vul/e617fca6-6d4.pdf> 2022/02/13

<sup>6</sup> Vulcan produces highest grade, lowest impurity lithium hydroxide to date from Zero Carbon Lithium™ Project <https://www.investi.com.au/api/announcements/vul/5548498e-8f2.pdf> 2022/10/22

<sup>7</sup> Approval of Operating Plan for Lithium Extraction Demo Plant <https://www.investi.com.au/api/announcements/vul/ecc7f2b3-5be.pdf> 2022/12.16

<sup>8</sup> Vulcan successfully develops in-house lithium extraction technology: VULSORB™ <https://www.investi.com.au/api/announcements/vul/a0b97e15-001.pdf> 2022/11/14

	<p>potential to be a major asset for the Company going forward, and could be applied to other projects and/or other brine fields worldwide.</p> <ul style="list-style-type: none"> <li>• 3D seismic works in the Phase One area in the Insheim license<sup>9</sup> were completed successfully. Vulcan's 3D seismic survey programme of works area, where Vulcan has operational wells and plant, were successfully completed in October, after eight out of nine councils in the area approved the survey. These surveys allow Vulcan to visualise the sub-surface, to employ industry best-practice modelling and planning for Vulcan's well developments, which are targeting dual geothermal energy and lithium production.</li> <li>• In September 2022, Vulcan received a positive result for its second preliminary EIA application (UVP-V) in its Taro licence, in the "Taro Golf" sector of the Phase One area, to drill wells for geothermal energy and lithium. This is the second positive environmental approval the Company has received, following the EIA for geothermal-lithium drilling in Taro in July 2022, in the "Taro North" sector of the Phase One area<sup>10</sup>.</li> </ul>
Phase Two and future project pipeline	<ul style="list-style-type: none"> <li>• In November 2022, Vulcan Group started initiatives to expand their exploration licence areas into the Alsace Region of France, a natural extension of the Upper Rhine Valley geothermal-lithium brine field. For this purpose, the Vulcan Group founded the French entity, Vulcan Energie France SAS ("<b>VEF</b>"). In late 2022, VEF applied for its first lithium exploration license in the region, "Les Cigognes". A decision on the application is expected in 2023<sup>11</sup>.</li> <li>• 3D seismic survey works commenced on the ground in one of the planned Phase Two<sup>12</sup> lithium and geothermal energy development areas in the Mannheim district of the Upper Rhine Valley Brine Field. These works followed prior approval of the main operating plan by the state directorate. The results will be used in feasibility studies for Phase Two, which plans to incorporate the Mannheim area.</li> </ul>
ESG and Community Stakeholder Engagement	<ul style="list-style-type: none"> <li>• In January 2023, Vulcan received the first Low ESG Risk Rating from Sustainalytics. The assessment showed Vulcan to be first amongst peers and in the second quartile for the Chemicals Industry.</li> <li>• The Head of ESG formed a Sustainability Steering Committee with an initial ten members from different departments across Vulcan to drive further sustainability agency through the team.</li> <li>• Vulcan set both individual and shared sustainability linked KPIs for the executive team to further embed responsibility and accountability.</li> <li>• With the help of an external consultant, Vulcan completed the Company's third TCFD report, including Vulcan's first climate scenario modelling analysis against two scenarios, Stated Policies Scenario (STEPS) and Net Zero Emissions (NZE) proving Vulcan's lithium product has strong demand under both.</li> <li>• Multiple community roadshows, consultations, and public events were successfully conducted in the Upper Rhine Valley region where Vulcan</li> </ul>

<sup>9</sup> Zero Carbon Lithium™ Project Update <https://www.investi.com.au/api/announcements/vul/448c2149-619.pdf> 2022/09/22

<sup>10</sup> Zero Carbon Lithium™ Project Update <https://www.investi.com.au/api/announcements/vul/448c2149-619.pdf> 2022/09/22

<sup>11</sup> <https://www.investi.com.au/api/announcements/vul/6420a193-fb5.pdf>

<https://www.investi.com.au/api/announcements/vul/6420a193-fb5.pdf> 2022/11/02

<sup>12</sup> Project Update: Zero Carbon Lithium™ Project <https://www.investi.com.au/api/announcements/vul/c7aa9b05-8e3.pdf> 2022/11/28



	<p>operates during the period 1 July to 31 December 2022. Community information centres were opened in Landau, Mannheim, and Karlsruhe. A range of communication tools were utilised to ensure continuous, accessible, and timely engagement with local stakeholders including: Local websites and regional social media to continuously inform local community groups about Project progression (e.g., <a href="https://natuerlich-kurpfalz.eu/">https://natuerlich-kurpfalz.eu/</a>). Use of a citizen telephone hotline so the team can provide local citizens with another channel of direct communication. Info Centres located in Karlsruhe, Landau and Mannheim</p>
Other	<ul style="list-style-type: none"> <li>• Vulcan's transition and focus on project execution capability development for Phase One continued, led by Deputy CEO Cris Moreno<sup>13</sup>, who was appointed during the period. Recruitment continues to gather momentum to this end, with over 280 personnel now in-house.</li> </ul>

<sup>13</sup> Appointment of Deputy CEO <https://www.investi.com.au/api/announcements/vul/44218f09-b4a.pdf> 2022/09/26

## 1.4 Management Systems and Steering

The Vulcan Group's internal management system is based on five core performance indicators. These are influenced by the Company's strategic goals and monitored on a regular basis. The following indicators are essential for steering the Vulcan Group:

- Strong cash position
- Capital expenditure
- Operating expenses
- Building a world-class team
- Net zero carbon position

Comparing to the previous period, management excluded revenue and EBITDA from the core performance indicators for the current period, as these indicators are less informative on the actual development stage of the Vulcan Group.

Maintaining a strong cash position is of high importance to Vulcan. The Company had a healthy cash position of €134m at 31 December 2022, down from €175m at 30 June 2022. Fast ramp-up of the Project is attached to a cash burn profile, including capital expenditure and operating expenses.

Capital expenditure for the six-month short financial year ended 31 December 2022 was €30.7m, down from €67.9m in the financial year ended 30 June 2022, and operating expenditure reduced to €21.2m in the six-month short financial year ended 31 December 2022, down from €27.5m in the financial year ended 30 June 2022. The reduction in CAPEX and OPEX relates to the shorter financial period and to the acquisition of Natürlich Insheim.

A world-class team is one of the key strengths of Vulcan and will be instrumental in the Company's ability to successfully execute on the project development strategy. The Company's workforce increased to ~184 FTE during the period and was >280 at the time of this report. Just over 50% of this increase came from acquisitions, with the remainder being organic growth.

Vulcan is aiming to deliver a local source of sustainable lithium hydroxide for Europe, built around a net zero carbon strategy with a strict exclusion of fossil fuels. The acquisition of the Natürlich Insheim renewable energy operation is in line with this steering indicator and adds renewable energy producer alongside Vulcan's carbon neutral lithium product. The Australian Vulcan business has been certified as carbon neutral by Climate Active since 2020, with the German operations now also certified as carbon neutral by South Pole for the calendar year 2021<sup>14</sup>.

Vulcan Group's management distinguishes between the segments concerning the performance indicators.

- A strong cash position is required at the Group level to develop the operations in Germany and to cover supporting corporate costs at the German and Australian level.
- Capital expenditure is a reasonable KPI for Australia and Germany, as the operations in EU, and

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<sup>14</sup> This certification excludes Natürlich Insheim due to the acquisition occurring on 31 December 2021, outside the year scope.

non-Germany have only just commenced.

- Operating expenditures are also used to steer the segments of Australia and Germany.
- Building a world-class team is currently important for Germany, given that the segment is responsible for development, execution, and operations of the Zero Carbon Lithium™ Project.
- A net zero carbon position is important at the group level as it is central to Vulcan's strategy to strictly exclude fossil fuels from its production process.

## 1.5 Innovation and R&D

Vulcan has a traditional focus on project development using proven technology or with strong commercial analogues from similar industries. In parallel, research, development, and innovation (R&D+I) is also conducted at Vulcan's own laboratories, with research partners (such as Potsdam Geoforschungszentrum, Karlsruhe Institute of Technology, University of Stuttgart, TU Darmstadt and other renowned institutions) and strong industrial partners. Each of these projects targets specific areas to strengthen Vulcan's long term project execution capabilities by clarifying geological, geophysical, chemical parameters, further innovating lithium extraction processes as well as optimising design and operational aspects of power plants.

Many of these research, development and innovation projects are publicly supported (European Commission and Germany)

Key R&D+I publicly funded projects during the period 1 July to 31 December 2022 include:

#	Title	Content
1	<b>Effeo</b> (GER)	Increasing efficiency of geothermal power plants Identification of efficiency-increasing measures; simulation of a geothermal power plant to increase efficiency via control optimization and demonstration tests
2	<b>CROWD THERMAL</b> (EU)	Development schemes for geothermal energy  Aims to empower the European public to directly participate in the development of geothermal projects with the help of alternative financing schemes (crowdfunding) and social engagement tools.
3	<b>GreGEO</b> (GER)  Project coordinator	Glass Fiber Reinforced Epoxy Casing System for Geothermal Application Aims to develop a new well completion strategy to provide a corrosion-resistant alternative to steel.
4	<b>MEET</b> (EU)	Multidisciplinary and multi-context demonstration of EGS exploration and Exploitation Techniques and potentials
5	<b>DGE-Rollout</b> (EU)	Roll-out of Deep Geothermal Energy in Northwest Europe.

6	<b>GeoThermScaling</b> (GER)	Development and evaluation of advanced iron-boride based coating for deep geothermal applications. Development and tests of suitable joining technologies
7	<b>GeoPro</b> (EU)	Advanced understanding and modelling of geofluid properties that has wide applicability across a majority of geothermal installations. Obtain a better understanding of CO <sub>2</sub> -solubility under plant operational conditions and the possible link between local micro-degassing and scaling and corrosion
8	<b>Reflect</b> (EU)	Redefining geothermal fluid properties at extreme conditions. Get a better understanding of the geothermal fluid properties.
9	<b>GeoSmart</b> (EU)	Smart Technologies for Geothermal to Enhance Competitiveness and Agile Operation. Insheim PP will serve as a demonstration site to install district heating, optimise electricity and heat production as well test hybrid heat exchangers for future wells/power plants.
10	<b>EIKE</b> (GER)	Inhibitor development to cope with scales and corrosion challenges in operation to increase heat output. Assessing the impact of a colder geothermal brine regarding scaling and corrosion and the chemical treatments efficiency.

## 2. ECONOMIC REPORT

### 2.1 Macroeconomic Environment

#### 2.1.1 Overall Industry Situation

Global economic activity slowed sharply through the second half of 2022 due to fiscal and monetary tightening, and China's Covid restrictions causing significant supply chain challenges. The energy supply shock, resulting from the Russia-Ukraine war has been a significant contributor to inflation rates in Europe. As an outcome, GDP growth in the second half of 2022 slowed considerably from 0.9% to 0.1%, and from 0.5% to -0.2% in Germany<sup>15</sup>.

Momentum has continued to build over the last six months, as the world rushes to avoid, and mitigate the impact of, climate change. In addition, during the six-month period between 1 July to 31 December 2022, the European commission has discussed and implemented policy and economic decision-making<sup>16</sup> in the shadow of the war in Ukraine which has forced a reassessment of current policies in many areas. Most notably for energy and critical raw materials. Germany's dependence on Russian fossil energy imports must be significantly reduced – and as quickly as possible.

While many may see fighting climate change and seeking energy independency as separate endeavours, they are interlinked, and thus are well aligned, requiring the European Union to work to deliver on its transformative "Green Policy" including the 'Green Deal'. First launched in 2019, the European Green Deal has set the blueprint for transformational change, with 27 EU member states committed to turning the EU

<sup>15</sup> EU key Indicators <https://ec.europa.eu/eurostat/>

<sup>16</sup> A European Green Deal [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)

into the first climate neutral continent by 2050. To meet its 2050 target, the EU member states pledge to reduce emissions by at least 55% by 2030; such levels are comparable to levels experienced more than 30 years ago<sup>17</sup>.

The German and European governments have also put forward policies prioritising the rapid growth of renewable energy sources through presentation of the REPowerEU Plan<sup>18</sup> in response to the magnitude of the energy threat, including geothermal energy. The German government has also implemented a €3 billion funding program to support heating grids to be fed by renewable energies. Heating grids using geothermal energy will be the main beneficiaries of the program.

### 2.1.2 Lithium and economic situation of the chemical industry

Lithium is a key and irreplaceable component in lithium-ion batteries which are used in electric vehicles and renewable energy storage. It is a cornerstone resource of global efforts to mitigate climate change.

Global sales volumes of electric vehicles are forecast to increase by 45% per annum from 2020 to 2030<sup>19</sup> (Figure. 3. According to S&P Global Mobility, demand for Li-ion batteries from light vehicle between 2020 and 2027 will increase at a compound annual growth rate (CAGR) of nearly 40% to about 2,050 GWh<sup>20</sup>. In Germany, year on year sales growth of full electric vehicles grew by 44% throughout 2022<sup>21</sup>, setting a record and representing 22% of the overall car sales market. Correspondingly, the lithium-ion battery is expected to be the fastest-growing rechargeable battery technology due to increasingly strong penetration rates in the Battery Electric Vehicle (BEV) market and a fall in manufacturing costs. The global annual consumption of lithium is expected to increase from 327,000 tonnes in 2020 to 2.1 million tonnes in 2030, which would represent a sixfold increase.

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<sup>17</sup> A European Green Deal [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en)

<sup>18</sup> Supporting the development of Europe's geothermal energy sector <https://cordis.europa.eu/article/id/442048-supporting-the-development-of-europe-s-geothermal-energy-sector>

<sup>19</sup> Global BEV and PHEV sales forecast (Millions Units) Fastmarkets IEA

<sup>20</sup> Growth of Li-ion battery manufacturing capacity in EV markets, <https://www.spglobal.com/mobility/en/research-analysis/growth-of-liion-battery-manufacturing-capacity.html> 2022/05/20

<sup>21</sup> Open The Floodgates! Record Electric Car Sales Month In Germany – 22% Of New Cars Fully Electric <https://cleantechnica.com/2022/12/30/open-the-floodgates-record-electric-car-sales-month-in-germany-22-of-new-cars-fully-electric-39-have-a-plug/> 2022/12/30

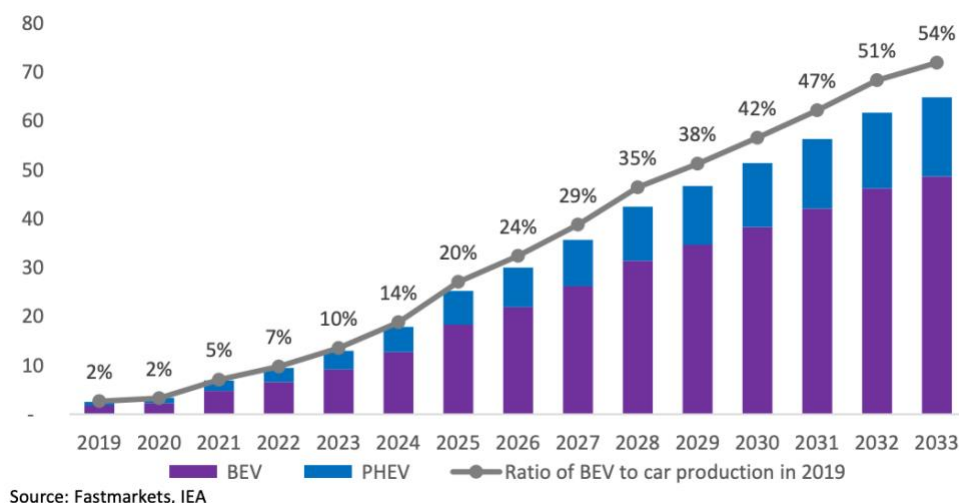


Figure: 3 Global BEV and PHEV sales forecast (Million units).

Europe is the fastest growing lithium market in the world based on electric vehicle sales and lithium-ion battery production growth<sup>22</sup>. This would imply that by 2030, the European lithium chemical market will represent approximately 900,000 tonnes per year of lithium chemicals, and potentially up to 1.3 million tonnes, based on planned battery production capacity. Notably, on the supply side, there is no existing European domestic lithium production.

### Current and future state of the lithium market

Lithium prices were well supported during the second half-year of 2022, amid an exceptional policy stimulus in China to boost the domestic EV industry, causing a tightening of global lithium supply-demand balances. As a result, prices for lithium reached new record highs of more than USD \$70,000 per metric tonne during this period.

<sup>22</sup> Europe's EV gigafactory capacity pipeline grows 6 fold to 789.2Gwh to 2030; Berlin summit to dissect battery megatrend. <https://source.benchmarkminerals.com/article/europes-ev-gigafactory-capacity-pipeline-grows-6-fold-to-789-2gwh-to-2030-berlin-summit-to-dissect-battery-megatrend> 2022/03/07



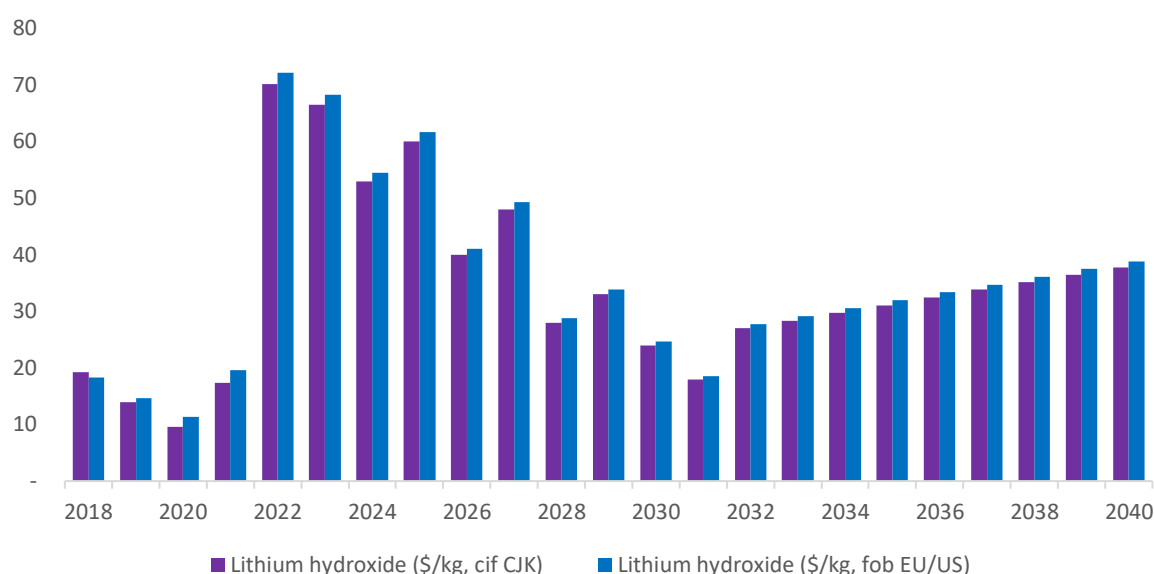


Figure: 4 Lithium hydroxide price forecasts – Base case (\$/kg, annual average)

The above graph<sup>23</sup> (Figure 4) shows the annual average spot price for lithium hydroxide from mid-2017 to the end of 2022 with forecasted based assumptions until 2040, based on the Asia and European prices and base assumptions. Fastmarkets see the price differential between Asia and the EU/US narrowing as demand for lithium hydroxide in Asia increases, due to nickel-rich battery chemistries gaining market share.

### Lithium from Europe, for Europe

Europe aims to be climate-neutral by 2050. As part of this plan, Europe needs to boost local production of green industries – including batteries to power clean vehicles. Today, China owns 70 – 80% of the entire supply chain of electric vehicles and accounts for approximately 80% of lithium hydroxide output<sup>24</sup>. There is no lithium extraction or refining capacity in Europe<sup>25</sup> and 100% of the continent's lithium needs must be imported. This is leading to several concerns and complex problems for European auto and battery makers linked to logistics, geopolitics, and supply chain risk.

As such, the member states of the European Union are now aiming to reduce the risk of over-reliance on a single supplier for energy and critical commodity imports. In December, the DIW (German Institute for Economic Research) released a paper stating Germany is entirely dependent on imports for 21 out of 27 critical raw materials, which in Vulcan's opinion is yet another sign that the tide is turning on import reliance versus local production<sup>26</sup>. These sentiments reflect the long-held objective of Maroš Šefčovič, the EU Commissioner for Interinstitutional Relations and Foresight, for the European Union to be 80% self-

<sup>23</sup> Fast markets, *Lithium Market study, Lithium price forecast Lithium hydroxide price forecasts – Base case (\$/kg, annual average*

<sup>24</sup> World Economic Forum: *The world needs 2 billion electric vehicles to get to net zero. But is there enough lithium to make all the batteries.* <https://www.weforum.org/agenda/2022/07/electric-vehicles-world-enough-lithium-resources/> 2022,07,22

<sup>25</sup> Europe's first large-scale lithium refinery will be in the UK. <https://www.soci.org/news/>. 2022/11/10

<sup>26</sup> DIW (German Institute for Economic Research) *Deutschland kann seine Versorgungssicherheit bei mineralischen Rohstoffimporten erhöhen* <https://www.diw.de/>

sufficient in lithium by 2025<sup>27</sup>. In Brussels on 14 December 2022, The European Commission adopted a set of proposals to make the EU's climate, energy, transport, and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030<sup>28</sup>, compared to 1990 levels. The European Commission President Ursula von der Leyen said Europe needs more public investment to accelerate the green transition, with complementary EU financing required, since<sup>29</sup> not every EU member has budgetary space for large increases in state aid.

Europe will require unprecedented quantities of lithium chemicals for its transition to electric vehicles and to meet its targets, otherwise its domestic auto-industry is at risk of losing its relative competitiveness to other non-domestic players, and it will likely not be able to meet its set climate goals. Europe has mandated that all new cars registered in Europe will be zero-emission by 2035. As an intermediary step towards zero emissions, the new standards require average emissions of new cars to come down by 55% by 2030<sup>30</sup>. Therefore, European OEMs and battery makers have an urgent need to secure sufficient lithium supply to be able to remain in business, and given global geopolitical instability, as well as the carbon footprint of transport, this lithium would ideally be sourced locally.

### Sustainably sourced lithium

As well as being locally sourced, the EU and its member states are implementing regulations designed to de-risk their supply chain and lower their carbon footprint.

In December 2022, negotiators of the European Council and the European Parliament reached a provisional agreement to set up an EU Carbon Border Adjustment Mechanism (CBAM) to combat climate change and prevent carbon leakage. The CBAM aims to equalise the price of carbon paid for EU products operating under the EU Emissions Trading Scheme (ETS) and imported goods. Effectively some key imports will become more expensive, however Vulcan believes that the CBAM will likely eventually benefit Vulcan and industry related peers who are already in or aiming to be in Europe to produce sustainable critical minerals. Under the provisional agreement, CBAM will begin to operate from October 2023 onwards.<sup>31</sup>

Vulcan believes that the availability of lithium chemicals with a climate neutral footprint, produced in Europe, represents a significant opportunity for European companies and that this is increasingly important to companies from a social and environmental responsibility and regulatory perspective.

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<sup>27</sup> *Green Deal: Eu agrees to new law on more sustainable and circular batteries to support EU's energy transition and competitive industry* 2022/12/09

<sup>28</sup> *A European Green Deal* [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en) 2022/12/18

<sup>29</sup> *Speech by president von der Leyen at the European Parliament Plenary on the preparation of the European Council meeting of 15 December 2022* [https://ec.europa.eu/commission/presscorner/detail/en/speech\\_22\\_7727](https://ec.europa.eu/commission/presscorner/detail/en/speech_22_7727) 2022/12/14

<sup>30</sup> *Fit for 55* <https://www.europarl.europa.eu/news/en/press-room/20230210IPR74715/fit-for-55-zero-co2-emissions-for-new-cars-and-vans-in-2035>

<sup>31</sup> *EU Climate action: provisional agreement reached on carbon Border Adjustment Mechanism (CBAM)* [www.consilium.europa.eu](https://www.consilium.europa.eu/en/press/press-releases/2022/12/13/) 2022/12/13

### 2.1.3 Energy Markets and Price Development and Procurement Strategy

Vulcan intends to enable the decarbonisation of energy supply in Europe by supplying geothermal energy. This can be demonstrated by Vulcan's heat offtake agreement with MVV, first of a few planned district heating agreements from geothermal energy to help combat Germany's local sourced energy needs<sup>32</sup>.

As noted above, Europe's and, particularly Germany's, over-reliance on Russian energy is being keenly felt due to the ongoing impact of the war in Ukraine. Germany must expand energy production at home, particularly for heating, to secure energy security and to successfully transition away from nuclear and fossil fuels towards renewables and better energy efficiency to meet the country's climate obligations.

Vulcan anticipates geothermal renewable energy on a mass scale will play an important part in achieving Europe and Germany's energy security and independence.

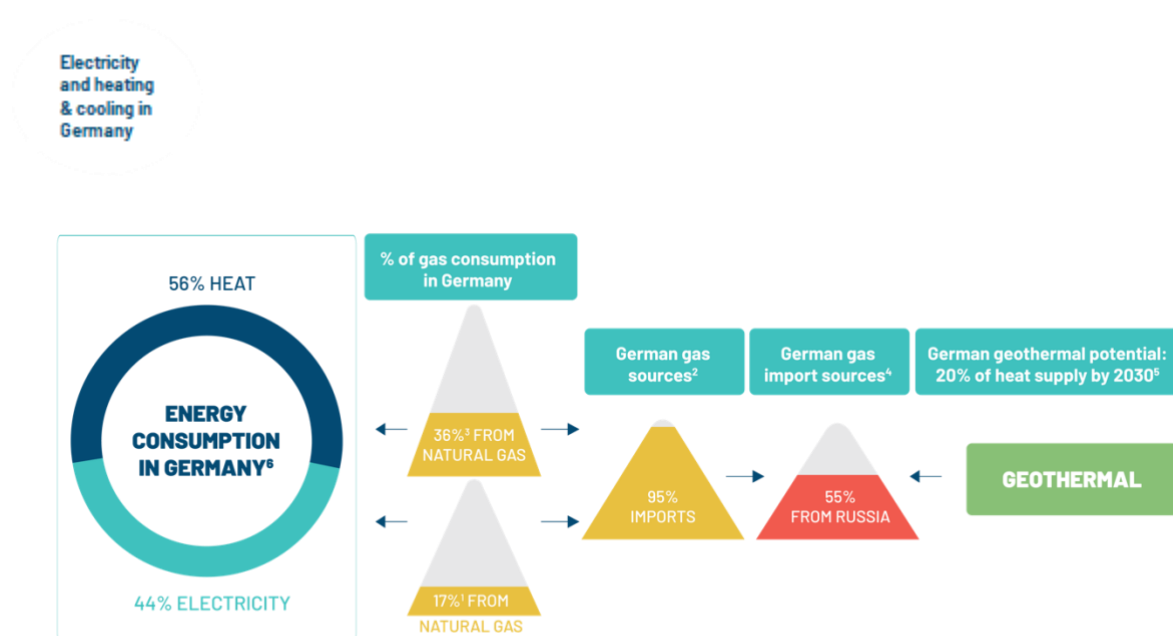


Figure 5: Heating and cooling industry snapshot for Germany

Increasingly, there is more recognition for the value of supporting geothermal energy in addition to other renewable energy sources. In September 2022, the Federal Ministry of Economic Affairs and Climate Action announced a boost for green district heating, Federal Funding for Efficient Heating Networks (BEW). In the period up to and including 2026, approximately €3 billion will be made available for renewable heat generation using geothermal energy, solar thermal energy, large-scale heat pumps and further heat network infrastructure. This subsidy scheme, which over a four-year timeframe will support the country's long-term energy transition, is targeting investment to increase the share of renewable and climate-

<sup>32</sup> Vulcan executes agreement to supply German energy company, MVV, with renewable, zero carbon heat  
<https://www.investi.com.au/api/announcements/vul/fccbdb90-d23.pdf> 2022/04/06

neutral heat sources in the heating networks to 25% by 2025 and 30% by 2030<sup>33</sup>. Vulcan has a fully integrated drilling, development, and operations team in geothermal, including in-house rigs, which makes us uniquely positioned to benefit from the funding program.

At a state level, the government of Baden-Württemberg launched a “Task Force25” aimed at halving the planning and approval timeline for the commissioning of new renewable energy projects. This follows state governments in the Upper Rhine Valley voicing their support for geothermal-lithium project development in the region, including the Greens-Christian Democratic Union Coalition in Baden-Württemberg, who stated in their Coalition Contract: *“We support sustainable approaches for the extraction of lithium in the Upper Rhine Graben.... We want to demonstrate the possibilities of deep geothermal energy through initial large-scale projects, which are being closely supported by the state government, the licensing authorities, and the research community, and then take the step toward widespread application. The “deep Geothermal RoadMap” is to be continued in this spirit”.*

At a community level, support continues to grow for geothermal production. The Upper Rhine Council, a cross-border association of the regions of Baden-Württemberg, Rhineland-Palatinate, Alsace and the cantons of North-western Switzerland, resolved in favour of supporting deep geothermal projects in Ortenau, one of Vulcan’s Phase Two project areas. The City Council of Landau, which covers part of Vulcan’s geothermal production license at Insheim, as well as the Landau-South production licence where Vulcan has a brine offtake agreement with the operator, voted to:

- support geothermal energy production in the area and,
- to take a positive stance towards the extraction of lithium from geothermal brine, taking into consideration climate protection goals and the interests of the regional – urban development in the area.

Further to the measures already in place, Vulcan is proactively advocating for German legislators to support the enormous potential of deep geothermal energy for a safe and clean heat supply in Germany.

### Energy pricing feed in tariffs

Geothermal electric power has a fixed Feed-in Tariff (FiT) of €0.252 kWh<sup>34</sup> however, under the market conditions experienced over the last six months, the market price in some months is much higher than the FiT. The higher prices have been driven by the war in Ukraine and the threat of energy supply disruptions.

At this stage of project development, Vulcan has purchased electricity for self-consumption on the market. Vulcan’s contract is with the local energy supplier Pfalzwerke AG. As noted above, Vulcan can always choose to use its own produced electricity in the geothermal power plants or sell it to the market

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<sup>33</sup> Boost for green district heating: Federal funding for efficient heat networks (BEW) begins. <https://www.bmwk.de/Redaktion/EN/2022/09/15>

<sup>34</sup> Network Transparency, ‘Market value overview’, <https://www.netztransparenz.de/EEG/Marktpremie/Marktwerte> Accessed August 2022.

for the fixed relevant value to the market and buy the necessary self-consumption from the market at better conditions.



Figure 6: Germany Electricity Spot Prices (EUR/MWh)

## 2.2 Review of Operations

### 2.2.1 Exploration and Development

In the second half of 2022, Vulcan continued to expand its licence footprint in the Upper Rhine Valley Brine Field in response to customer demand. The Company has the largest lithium resource, compliant with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code'),<sup>35</sup> in Europe. An update of the resource estimate can be found on page 22.



Figure 7: Overview of Vulcan's Zero Carbon Lithium™ Project area, including Phase One.

### 2.2.2 Licence area

An overview of licence locations and details is provided in (Figure.7) Vulcan holds 15 licences in the URV, for a total secured licence area of 1,583km<sup>2</sup>. The Company has also applied for an additional 155 km<sup>2</sup> of licences in the same region. Vulcan has acquired the geothermal brine and lithium rights(licences)through direct application to the respective mining authorities of the German states of Rheinland-Pfalz, Baden-Württemberg, and Hessen. All exploration licences were granted pursuant to the German Federal Mining Act (Bundesberggesetz 'BBergG') for the purpose of commercial exploration of mining-free mineral

<sup>35</sup> Based on public information.



resources: geothermal brine and lithium. Vulcan has acquired the geothermal production licence at Insheim with 100% ownership and applied for the lithium exploration licence in Insheim.

### Vulcan's combined Upper Rhine valley project Li- Brine

#### Measured, Indicated, and Inferred Mineral Resource Estimates and licences.

Licence/ Area	Reservoir	Classification	GRV km <sup>3</sup>	Avg. NTG %	Avg. Phie %	Avg. Li mg/L	Elemental Li t	LCE kt
Mannheim	BST	Indicated	4	90	10	153	54,111	288
	BST	Inferred	32	65	9	153	290,312	1,545
Ludwig	BST	Indicated	7	90	10	153	93,220	496
	BST	Inferred	22	65	9	153	199,226	1,060
Therese	BST	Indicated	2	90	10	153	29,907	159
	BST	Inferred	22	65	9	153	200,708	1,068
Flaggenturm	BST	Indicated	7	90	10	181	115,215	613
	BST	Inferred	37	65	9	181	391,201	2,082
Kerner	BST	Indicated	5	90	10	181	76,242	406
	BST	Inferred	13	65	9	181	132,558	705
Kerner Ost	*MUS, BST, ROT	Indicated	4.3	73	8	181	66,708	355
Taro	*MUS, BST, ROT	Indicated	14.5	73	8	181	237,362	1,263
Landau South	*MUS, BST, ROT	Measured	7.4	73	8	181	102,383	545
	BST	Indicated	1.2	90	11	181	22,220	118
Insheim	*MUS, BST, ROT	Measured	9	73	8	181	127,779	680
Rift-North	*MUS, BST, ROT	Measured	10.1	73	8	181	134,132	714
	*MUS, BST, ROT	Indicated	11.9	73	8	181	178,000	946
Ortenau	*MUS, BST, ROT	Indicated	57	73	8	181	659,013	3,507
	BST	Inferred	105	73	8	181	1,883,212	10,024
						mg/L		kt
<b>Total LCE</b>		<b>Measured</b>				<b>181</b>		<b>1,939</b>

Licence/ Area	Reservoir	Classification	GRV km <sup>3</sup>	Avg. NTG %	Avg. Phie %	Avg. Li mg/L	Elemental Li t	LCE kt
		Indicated				178		8,151
		Inferred				172		16,484

Figure: 8 Vulcan's combined URVBF Li- Brine Measured, Indicated and Inferred Mineral Resource Estimates.

- Total URVBF Resource: Inferred 16.5Mt LCE @ 172mg/l Li, indicated 8.2 Mt LCE @ 178 mg/l Li, Measured 1.94 Mt LCE @ 181 mg/l Li.
- Total Phase One Resource (Measured and Indicated): 4.6 Mt LCE @ 181 mg/l Li.
- Total Resource (all classifications): 26.6 Mt LCE @ 175 mg/l Li
- **Note 1:** Mineral Resources are not Ore Reserves and do not have demonstrated economic viability.
- **Note 2:** The weights are reported in metric tonnes (1,000 kg or 2,204.6 lbs). Numbers may not add up due to rounding of the resource value percentages.
- **Note 3:** Reservoir abbreviations: MUS – Muschelkalk Formation, BST – Buntsandstein Group; ROT – Rotliegend Group.
- **Note 4:** To describe the resource in terms of industry standard, a conversion factor of 5.323 is used to convert elemental Li to Li<sub>2</sub>CO<sub>3</sub>, or Lithium Carbonate Equivalent (LCE).
- **Note 5:** NTG and Phie averages have been weighted to the thickness of the reservoir. These averages are consolidations of multiple zones and therefore multiplied together will not equate to the Elemental Lithium values presented. The Elemental Lithium values presented are determined separately using detailed data for each zone and then summed together to show a total value for the purposes of the summary table.
- **Note 6:** GRV refers to gross rock volume, also known as the aquifer volume. GRV values presented in table are rounded to the first significant figure from presentation purposes.
- **Note 7:** The elemental Lithium values presented are calculated using GRV values that have not been rounded.
- **Note 8:** Mineral resources are considered to have reasonable prospects for eventual economic extraction under current and forecast lithium market pricing used in the DFS with application of Vulcan's DLS processing.

### 2.2.3 Geothermal and Renewable Energy Operations

Geothermal, renewable energy is at the heart of the Zero Carbon Lithium™ Project. During the period from 1 July to 31 December 2022, the geothermal powerplant Natürlich Insheim operated by the Natürlich Insheim GmbH generated a total amount of 17,000,000 kWh of renewable electrical energy, saving approximately 5,000 tonnes of CO<sub>2</sub>.

To underline Vulcan Energy's commitment to play a leading role in the German heat transition, Natürlich Insheim is currently being redesigned to be able to produce district heating in the future as well. This will allow the supply of CO<sub>2</sub>-free district heating to nearby municipalities.

Natürlich Insheim (Figure 9), has the capacity to produce up to 4.8 MW of renewable power. There are two operating wells located at this plant, one for production of the 165°C hot brine and one for reinjection of cooled brine. The wells were drilled between 2009 and 2010. The plant has been in operation since 2012. There is a second geothermal plant in the region at Landau-South for which Vulcan has secured an offtake agreement for brine production with Geox GmbH (the operating company). The plant and wells have been in operation since 2007. Vulcan has entered into a 51:49 (in Vulcan's favour) Joint Venture agreement with the owners of the Landau-South licence to develop a new geothermal project in the same Landau-South licence as the current Landau plant, which will also supply Vulcan's Phase One operations with brine for lithium extraction. Vulcan has an agreement to develop new geothermal projects on the Rift-North

exploration licence in return for a production royalty. Vulcan plans to develop the licence areas in a phased approach. Phase One will be developed first, followed by Phase Two which will be a further development in stepped out areas. Subsequent Phases are planned to follow to fully leverage the large licence area that Vulcan has secured. The Project plans for multiple central surface facilities for geothermal operations to be fed from multi-well pads.



Figure 9: Aerial photograph of Vulcan's Natürlich Insheim Geothermal Plant

## 2.2.4 Focus Phase One Execution

During the reporting period, the Vulcan team moved into an expanded laboratory. With its state-of-the-art equipment for wet and solid-state analyses, including full in-house inductively coupled plasma optical emission spectrometry (ICP-OES) and Ion chromatography (IC) analytical capability, the new laboratory has enabled Vulcan to expand its core competencies and centralise its proprietary lithium processes and deliver the required information for Vulcan's Phase One Definitive Feasibility Study.

A key element of Vulcan's strategy to de-risk its Zero Carbon Lithium™ Project is the design and construction of its demonstration plants. Vulcan's demonstration plants will consist of two parts: the lithium extraction plant (LEP-Demo Plant) (Figure 10) and the lithium hydroxide production plant (CLP-Demo Plant) and will replicate the full process from sorption-DLE to lithium hydroxide production including recycle streams. Importantly, technical and operations personnel will be trained in the plant to develop a comprehensive understanding of the process and its operation prior to the construction of the first commercial plant.



Figure 10: In-house designed lithium extraction Demo Plant, currently under construction.

When it comes to expanding the Demo Plants to their commercial size, the sorption of lithium chloride at the commercial plant represents a very manageable scale-up factor of only 1:50 in terms of column size, as each Lithium Extraction plant (LEP) will be operating four trains of extraction units. Meanwhile, the commercial CLP electrolysis cells will have a multiplication factor, not scale-up factor, as electrolysis cells are not scaled up further but multiplied. Initial commissioning of the lithium extraction Demo Plant is planned to commence in 2023.

In November 2022, Vulcan successfully developed its own in-house lithium extraction sorbent, VULSORB™. Additionally, the team completed multi-cycle sorption tests on Upper Rhine Valley geothermal brine using multiple commercially available and in-house aluminate-based sorbents. Vulcan's VULSORB™ sorbent has demonstrated higher performance and lower water consumption for lithium extraction in Vulcan's pilot plant compared with commercially available sorbents tested by the Company. The team carried out test work on live brine from Vulcan's commercially operating geothermal renewable energy plant, Natürlich Insheim. The manufacturing process for VULSORB™ is environmentally friendly, with most of the reagents recycled and with opportunities for Vulcan to use its own produced lithium to manufacture future sorbent once in production, thus further reducing Vulcan's carbon footprint and operating costs while fulfilling the European Union's circular economy goals.

VULSORB™ is a variation of the type of lithium extraction sorbents originally developed thirty years ago and used commercially worldwide for lithium extraction from brine for the last 25 years. This Technology Readiness Level (TRL) approach for lithium extraction can be used in most lithium-rich brines globally, provided salinity in the brine is high enough, and there is sufficient heat to drive the process, with a brine pre-treatment step to increase sorbent durability, which can be adjusted depending on local brine chemistry. Vulcan's VULSORB™ enables the lithium to be selectively extracted from the brine, providing a pure lithium chloride eluate which can then be electro-chemically converted to lithium hydroxide monohydrate for use in lithium-ion batteries in the European cathode, battery, and automaker industries.

This process is much faster and more efficient, with a lower carbon footprint, than the legacy industry method of using large-scale evaporation and large quantities of chemical reagents to extract the lithium

and process the product into lithium hydroxide. Sorbent extraction happens in hours, rather than up to 18 months as is the case with legacy extraction routes.

Lithium extraction will be conducted in two stages, starting at geothermal facility-based Lithium Extraction Plants (LEPs), and proceeding to a single facility near Frankfurt, the Central Lithium Plant (CLP). LHM product will be produced and marketed from the CLP. The Phase One area is well located, close to existing road infrastructure and within relatively flat valley terrain. The Phase One area is mixed land use with rural, urban, agricultural, industrial, and park land. Vulcan has been diligent in ongoing planning development with consideration of existing land uses in consultation with local communities and landowners.

Vulcan is targeting to start operations by the end-2025 and ramp up after that. Vulcan recognises the significant challenge ahead as a growing company. To this end, Vulcan is rapidly transforming into a project execution and operations company. The Project will be delivered under a single integrated projects group, providing a consistent approach to delivery and overall accountability. During the first quarter of 2023, Phase One of the Project will move into a bridging engineering phase with Hatch Ltd.

Vulcan will continue to deliver according to the Company's contract strategy and delivery model and seek early engagement of key technology and equipment suppliers. Throughout this execution phase, Vulcan will continue to increase its extensive stakeholder engagement activities already implemented by Vulcan's communications and ESG team, including regular monitoring, multiple communication channels and local Info Centres run by local people. Vulcan sees it as essential to ensure the community comes along with Vulcan on this journey.

## 2.2.5 Further phases of development

A core focus during the reporting period was on the delivery of the Phase One Definitive Feasibility Study. In parallel Vulcan remained focused on the future and subsequent phases which will include the delivery of the DFS for Phase Two later in 2023.

To that effect 3D seismic survey works commenced on the ground in one of Vulcan's planned lithium and geothermal energy development areas, in the Mannheim district of the Upper Rhine Valley Brine Field. Vulcan signed a renewable heat offtake agreement with Vulcan and MVV Energie AG (MVV), the utility provider for the city of Mannheim, in April 2022. These works follow earlier approval in 2022 of the main operating plans by the state directorate, after a thorough review process, which involved the relevant municipalities, technical agencies, and associations. This seismic survey is the first step in the development of new power plants, which, from 2025 onwards, aiming to supply up to 350,000 MWh of heat into the heating grid of Mannheim.

In November 2022, Vulcan announced it was expanding its activities to the French side of the Upper Rhine Valley Brine Field (URVBF), which accounts for roughly one third of the Upper Rhine Graben, containing both geothermal energy and lithium-rich brine. Vulcan had previously collected a bulk (10,000 litres) brine sample from the French side of the border and conducted test work on it. Historical data and sampling coming from existing geothermal operations in the region indicate brine composition in Alsace is

materially the same as the brine composition across the border at Vulcan's operations in Germany, meaning Vulcan's sustainable lithium production process is applicable across the whole field. Vulcan created a French entity, Vulcan Energie France SAS (VEF), registered in Strasbourg with offices in Haguenau, where Vulcan is growing an experienced French team. VEF applied for its first lithium exploration licence in the region, "Les Cigognes". The requested licence is 155km<sup>2</sup> in size and located east of the city of Haguenau. The Company will look to access additional licence areas later in 2023. VEF is in discussions with local companies in Alsace to develop combined geothermal energy and lithium projects, and support industrials and municipalities to decarbonise their heating supply. The Company is focused on increasing engagement with local stakeholders to develop projects in full alignment with local communities, which is paramount to the ongoing success of Vulcan's activities.

## 2.2.6 Offtake Agreements

As of the date of this report, Vulcan has entered into binding lithium offtake agreements with five customers.

- In October 2021, Vulcan Group entered into a lithium offtake agreement with Umicore to sell between 28,000 metric tonnes and 42,000 metric tonnes of battery-grade LHM to Umicore over an initial five-year term with start of commercial delivery initially scheduled for 2025 (postponed to 2026).
- In November 2021, Vulcan Group entered into lithium offtake agreements with Renault and Stellantis, respectively, to sell to Renault between 29,000 to 49,000 metric tonnes of battery-grade LHM over an initial six-year term and to Stellantis between 222,000 metric tonnes and 272,000 metric tonnes of battery-grade LHM over a ten-year term. Commercial delivery is scheduled for 2027.
- In December 2021, Vulcan entered into a lithium offtake agreement with Volkswagen, to sell to Volkswagen between 34,000 to 42,000 metric tonnes of battery-grade LHM over an initial five-year term, with start of commercial delivery scheduled for 2027.
- In January 2022, Vulcan Group entered into a lithium offtake agreement with LG Energy to sell to LG Energy between 41,000 metric tonnes and 50,000 metric tonnes of battery-grade lithium with an initial term of five years and start of commercial delivery scheduled for 2026.

Together, the volumes of LHM to be delivered under these agreements correspond to the entire expected quantity of the first five years of production from Vulcan Group's Zero Carbon Lithium™ Project. Vulcan Group is also in discussions with other potential offtake partners that have demonstrated interest in securing LHM feed from potential additional phases of Vulcan Group's Zero Carbon Lithium™ Project. Overall, it is the Company's goal to have most volumes of battery-grade LHM produced in Vulcan Zero Carbon Lithium™ Project committed under lithium offtake agreements with reputable counterparties.

The following table provides an overview of the binding lithium offtake agreements entered by Vulcan Group as of the date of this report.



Partner	Category	Start & duration	Volume over the duration of the contract (t)
Umicore	Tier one cathode maker	2026 5 years	28,000 to 42,000
Renault Group	OEM	2027 6 years	29,000 to 49,000
Stellantis	OEM	2027 10 years	222,000 to 272,000
Volkswagen Group	OEM	2027 5 years	34,000 to 42,000
LG Energy Solutions	Tier one battery maker	2026 5 years	41,000 to 50,000

## 2.2.7 Corporate

Vulcan's corporate team, spanning the Company's Australian and German offices, are committed to accelerating and expanding Vulcan's integrated renewable energy and lithium development strategy.

### Target Operating Model (TOM) 360

In Q1 2022 Vulcan completed a Target Operating Model (TOM) 360 review, with the objective of developing a fit for purpose corporate structure for the next phase of project development and expansion. One key recommendation of the TOM was the centralisation of backbone functions to ensure better governance and higher efficiency which was implemented on July 1, 2022. By the end of 2022, the vast majority of TOM measures had been implemented. One of the last key steps was the design of the project execution structure in late 2022 which will be implemented over the course of H1 2023.

## 2.2.8 Segment Information

The consolidated entity is organised into three operating segments based on geographical location: in Germany, other European and Australia. These operating segments are based on the internal reports that are reviewed and used by the Board of Directors (who are identified as the Chief Operating Decision Makers (CODM)) in assessing performance and in determining the allocation of resources. There is no aggregation of operating segments.

The CODM reviews EBITDA (earnings before interest, tax, depreciation, and amortisation). The accounting policies adopted for internal reporting to the CODM are consistent with those adopted in the financial statements.

The information reported to the CODM is on a monthly basis.

### *Types of products and services*

Germany – the supply of geothermal energy, exploration relating to the Zero Carbon Lithium™ Project and engineering services.

France, Norway and Italy – exploration relating to battery minerals and geothermal lithium.

Australia – ASX, corporate administration and DFS engineering costs.

## 2.3 Earnings Performance, Financial and Assets Situation

The overall development of Vulcan's business was very favourable in the management's view. An increase in non-current assets through project development with no financial debt and operating revenue from the Insheim Plant were highlights in the six-month short financial year ended 31 December 2022. The year-end cash position of €134 million puts Vulcan in a solid position to rapidly advance the Zero Carbon Lithium™ Project.

### 2.3.1 Earnings Performance

Summary of Results for the Six Months ended 31 December 2022 and the Year Ended 30 June 2022

	Six months To 31 Dec 22	FY22
	€ '000	€ '000
Revenue from continuing operations	3,622	3,799
Other income	213	317
Finance income	615	350
Gain on deconsolidation	-	1,975
Share of loss from equity accounts investments	(249)	(495)
Other own work capitalised	3,489	3,696
Raw materials and purchased services	(3,119)	(2,512)
Finance costs	(177)	(155)
Administrative expenses	(2,127)	(3,790)
Compliance and regulatory expenses	(304)	(729)
Consulting and legal fees	(1,362)	(4,099)
Depreciation and amortisation	(2,299)	(2,629)
Employee benefit expenses	(8,097)	(7,793)
Investor relations expenses	(231)	(615)
Impairment expenses	-	(36)
Loss on disposal of financial assets	-	(745)
Occupancy costs	(1,265)	(498)
Share-based payments expense	(711)	(3,637)
Other expenses	(1,446)	(1,175)
Foreign currency gain/(loss)	(105)	285
<b>Loss before income tax expense</b>	<b>(13,553)</b>	<b>(18,486)</b>
Income tax benefit/ (expense)	103	(365)
<b>Loss after income tax for the period</b>	<b>(13,450)</b>	<b>(18,851)</b>

**EBITDA**

(11,692)

(16,052)

*Revenue from continuing operations*

During the six-month short financial year ended 31 December 2022, the Group's revenue from Insheim increased to €3.1 million (financial year ended 30 June 2022: €3.0 million). The Group had external engineering revenue of €0.5 million for the six-month short financial year ended 31 December 2022 (financial year ended 30 June 2022: €0.8 million).

*Other income*

Other Income comprised principally of government grants.

*Finance Income*

The Group also had interest income of €0.6 million on cash held for the six-month short financial year ended 31 December 2022.

*Other own work capitalised.*

In July 2021, Vulcan completed the acquisition of Global Engineering and Consulting GmbH, now Vulcan Energy Engineering GmbH (VEE) and GeoThermal Engineering GmbH, now Vulcan Energy Subsurface Engineering GmbH (VES). Time spent by engineers from VEE and VES on Vulcan projects have been capitalised to exploration and evaluation expenditure or Plant Equipment on the balance sheet if time was incurred on the design and construction of Vulcan's sorption-demo plant. Furthermore, with the ongoing rig refurbishment, Vercana staff cost which relate to refurbishing work have also been capitalised. These costs are reflected as Other Own Work capitalised in the Consolidated Statement of Profit and Loss for the six-month short financial year and total €3.5 million (financial year ended 30 June 2022: €3.7 million).

*Gain on deconsolidation*

During the prior financial year Vulcan completed the successful spin-off of its Norwegian assets through the initial public offering of Kuniko Ltd. The deconsolidation of the Norway assets resulted in a one-off gain of €2.0 million the financial year ended 30 June 2022.

*Expenses*

Raw materials and purchased services increased to €3.1 million for the six-month short financial year ended 31 December 2022 (FY22: €2.5 million).

Administration costs were €2.1 million for the six months to 31 December 2022 and €3.8 million for the financial year ended 30 June 2022. Costs were higher on a pro rata basis from the previous financial year due to an increase in operations at the Zero Carbon Lithium™ Project including acquisition of the Insheim plant.

Employee costs were €8.1 million for the six months to 31 December 2022 and €7.8 million for the financial year to 30 June 2022. The increase was attributable to the level of full-time equivalent staff which increased from 129 to 184 during the six months ended 31 December 2022.

Consulting and legal fees were €1.4 million for the six months to 31 December 2022 and €4.1 million for the financial year to 30 June 2022. On a pro-rata basis legal and consulting fees were lower due to one-off legal costs associated with the Frankfurt listing costs and due diligence costs on the acquisitions during the financial year ended 30 June 2022.

Non-cash share-based payments relating to long term incentives amounted to €0.7 million for the six-month short financial year ended 31 December 2022 and €3.6 million for the financial year to 30 June 2022. Costs were lower on a pro rata basis as the previous financial year included securities which have now vested. In addition, some rights have lapsed during the six-month period.

#### *Loss before income tax*

The net loss after tax was €13.4 million for the six-month short financial year and €18.9 million for the financial year to 30 June 2022. The loss increased on a pro-rata basis predominately due to an increase in employee benefit costs associated with full time equivalent staff rising from 129 to 184 during the period as well as an increase in occupancy costs principally due to lease of additional buildings and reservation costs associated with the CLP proposed site in Frankfurt.

#### *EBITDA*

EBITDA was -€11.7 million for the six-month short financial year and -€16.1million for the financial year to 30 June 2022. The decrease in EBITDA on a pro rata basis from the previous financial year was reflective of the increased activity in development of the Company's Zero Carbon Lithium™ Project including the addition of technical and administrative staff.

EBITDA for Germany was -€6.9 million and for Australia -€4.8 million.

## 2.3.2 Asset and Financial Position of the Vulcan Group Financial situation

### Financial management of the Vulcan Group

The financial management of the Vulcan Group is conducted in Australia and Germany. The primary objectives of Vulcan's financial management are to establish a sustained increase in corporate value and ensure the Group's liquidity. The management of currency risk helps to reduce volatility in its earnings. During financial year ended 30 June 2022 the Company changed its reporting currency from Australian dollars (A\$) to Euros (€) to align with the major spend of its operating and capital expenditures in Germany.

The Company converted, at spot price, a large portion of its available funds in Australia dollars to Euros during the financial year ended 30 June 2022 to mitigate any foreign currency risk. The Australian dollar funds were derived from equity raisings most notably in the 2021 calendar year.

Liquidity and capital expenditures of the Vulcan Group		
Vulcan Group Summary Statements of Cash Flows	<b>6 months To 31 Dec 22</b> €000's	<b>12 months to 30 June 22</b> €000's
Net cash used in operating activities	(7,418)	(11,347)
Net cash used in investing activities	(31,768)	(64,358)
Net cash used in financing activities	(462)	172,054
Cash and cash equivalents at beginning of the period	175,416	72,494
Effect of exchange rate fluctuations	(1,661)	6,573
	134,107	175,416

### Net cash *used in* operating activities

The net operating cash outflow from continuing operations for the 6 months ending 31 December 2022 amounted to €7.4 million compared to €11.3 million for the financial year to 30 June 2022. The increase in outflow on a pro rata basis reflects the additional operational costs associated with the growth of German operations including an increase in full time equivalent staff. This was partially offset by increased revenue generated from the recently acquired Insheim geothermal power plant.

### Net cash *used in* investing activities

Investing activities in the six-month short financial year led to a cash outflow of €31.8 million compared to €64.4 million for the financial year to 30 June 2022. Significant cash outflows for the six-month short financial year included:

- €9.2 million for the refurbishment of the rigs.
- €9.8 million for the construction and engineering of the DLE demo sorption plant and the CLP demo plant,
- €10.4 million for exploration activities including DFS engineering costs.



#### Net cash *used in* financing activities

There was a net cash outflow of €0.5 million in the six-month short financial year relating to lease payments for buildings and vehicles.

#### Asset and Capital Structure of the Vulcan Group

	Dec 31	FY22
Current assets	140,620	179,663
Non-Current Assets	109,515	81,477
<b>Total Assets</b>	<b>250,135</b>	<b>261,140</b>
Equity	233,161	247,323
Current liabilities	11,039	9,733
Non- Current Liabilities	5,935	4,084
Total Liabilities	16,974	13,817
<b>Total equity and liabilities</b>	<b>250,135</b>	<b>261,140</b>

Current assets decreased by €39.0 million to €140.6 m due to a reduction of cash on hand following expenditure on construction of sorption demo plant, refurbishment of electric drill rigs, as well expenditure on DFS engineering costs.

Non-current assets increased by €28.0 million to €109.5 million. The increase was principally due to:

- Construction costs towards completion of the DLE demo sorption plant and the CLP demo plant (€9.8 million).
- Capitalised exploration and evaluation attributable to progression of the DFS and exploration activity including the acquisition of 3D seismic data (€10.4 million).
- Refurbishment of two electric drill rigs (€9.2 million).

Current liabilities increased by €1.3 million to €11.0 million primarily due to an increase in trade and other payables, attributable to an increase in development activity for the Zero Carbon Lithium™ Project, as well as an increase in lease liabilities and provisions.

Non-current liabilities marginally increased to €5.9 million from €4.1 million during the six months ended 31 December 2022 principally due to deferred income relating to research and development.

## Capital expenditures

	<b>Dec 31</b>	<b>FY22</b>
<b>Plant &amp; Equipment</b>		
<b>Software</b>	137	168
<b>Plant &amp; Equipment</b>	2,001	28,400
<b>Assets under Construction</b>	18,166	22,314
<b>Land and Building</b>	-	1,623
<b>Intangible Assets</b>	-	4,148
<b>Exploration &amp; Evaluation</b>	10,400	11,273
<b>TOTAL</b>	<b>30,703</b>	<b>67,926</b>

### *Software*

The Group invested in financial and geological software systems during the financial year given the increase in activity and as the Company generates crucial data needed for de-risking the lithium extraction process.

### *Plant and equipment*

The Company acquired assets in relation to Insheim Plant as well as office equipment during the six months totalling €2.0 million.

### *Assets under construction*

During the six months ended 31 December 2022 the Group spent €18.2 million on construction of the Demo Plants as well as the refurbishment of rigs.

### *Exploration and Evaluation Assets*

The largest expenditures for exploration and evaluation during the six months ended 31 December 2022 were engineering costs towards the Company's DFS, as well as the acquisition of 3D seismic and drilling data and geological studies.

In accordance with segments disclosed in the Company's Consolidated Financial Statements capital expenditure can be categorised as follows:

Germany – Plant and Equipment (€20.3 million), Exploration (€5.2 million)

Australia – Exploration (€5.1 million) relating to DFS costs.

Other European – Exploration (€0.1 million)

### 2.3.3 Key performance measures used by Vulcan Group

#### *Financial Performance Measures*

Vulcan determines the following financial key performance indicators that are used for internal management of the Group. These key performance indicators are reflective of the development stage of Vulcan and its Zero Carbon Lithium™ Project.

	6 months to 31 Dec 2022 € million	FY22 € million
<b>Cash Position</b>	134.1	175.4
<b>Operating expenditures</b>	21.1	27.5
<b>Capital expenditures</b>	30.7	67.9

#### *Cash Position*

At 31 December 2022, the Company maintained a healthy cash position of €134.1 million. Cash decreased during the six-month period from €175.4 to million €134.1 million reflecting costs incurred in developing the Company's Zero Carbon Lithium™ Project, most notably capital expenditure on the construction of the Direct Lithium Sorption Plant, refurbishment of electric drills, 3D seismic and associated exploration as well engineering costs related to the recently published Definitive Feasibility Study.

Cash was divided into Australia (€64.9 million), Germany (€69.1 million) and Other European (€0.1 million).

#### *Operating Expenses*

Operating expenditures are the ongoing cost of running a business. These include raw materials for the Insheim power plant, external purchased services, administrative expenses, compliance and regulatory expenses, consulting and legal fees, depreciation and amortisation, employee benefits, investor relations, impairment, occupancy, share-based payments and other expenses.

Operating expenses for the six-months period were €21.1 million compared with €27.5 million for the financial year ended 30 June 2022. Operating expenses increased on a pro-rata basis reflecting the ramp up of Vulcan's operations in Germany including personnel increasing from 129 FTE to 184 FTE in the period.

Operating expenses relating to Germany were €16.6m and Australia €4.5 million.

#### *Capital Expenditure*

Capital expenditures are the purchase of goods or services that will be used to improve a company's performance in the future. Capital expenditure includes investment in tangible and intangible fixed assets before depreciation and disposals. During the six-month period the Company incurred €30.7 million on capital expenditure (12 months FY22: €67.9 million). The twelve-month financial year ended 30 June 2022

included the acquisition of the Insheim geothermal power plant for €31.3 million. Please refer to section 2.3.2 for a breakdown of the Group's capital expenditure including segmental.

#### *Non-Financial Performance Measures*

##### *Building a world-class team*

The Vulcan team continues to grow across geothermal renewable energy and lithium battery chemicals business units and totalled 184 FTE people at 31 December 2022, an increase from 123 FTE at June 30, 2022.

##### *Net zero carbon position –*

As Vulcan scales up, the Company will continue to expand its data reporting and be able to provide year on year comparisons.

Vulcan will continue to work on achieving carbon neutral certification across all operations through each year in the four-year period and remaining in the lowest quartile for absolute GHG emissions (Scope 1, 2, 3) comparative to peers.

## **3. MATTERS SUBSEQUENT TO THE REPORTING PERIOD**

On 13 February 2023, Vulcan announced the results of its Definitive Feasibility Study for Phase One of Vulcan's Zero Carbon Lithium™ Project<sup>36</sup>. More than 13,000 hrs of data have been gathered and analysed from Vulcan's lithium extraction pilot plant (PP1) operation, using brine from the commercial geothermal wells in the core of the Phase One area since April '21. Vulcan have also been able to incorporate VULSORB™, Vulcan's newly developed high-performing in-house sorbent, into the DFS, as well as data from the newer, higher pressure lithium extraction pilot plant (P1A). The combined study has shown compelling financial results and world-leading environmental metrics.

#### **Key DFS Highlights**

##### **Financials**

- 24Ktpa Lithium Hydroxide Monohydrate (LHM) p.a. production from EU, for EU.
- >300GWh/a renewable power, >250GWh/a renewable heat production p.a.
- >250% increase in NPV<sub>8</sub> compared to PFS: €3.9Bn pre-tax, €2.6Bn post-tax.
- Increased 34% IRR pre-tax, 26% IRR post-tax.
- >€700Mpa revenues. EBITDA margin of 84%.

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<sup>36</sup> Vulcan Zero Carbon Lithium™ Project Phase One DFS results and Resources-Reserves update  
<https://www.investi.com.au/api/announcements/vul/e617fca6-6d4.pdf> 2023/02/13

- €1,496M CAPEX. This increase from the PDF is broadly similar with larger projects and incorporates the increase in project size and inflation.
- A very low OPEX of €4,359/t LHM.
- 3.5-year payback (integrated Project). Target start of production end-2025.

**A larger, sustainable project with a long-term pipeline.**

- Vulcan has forecasted a 60% increase in Phase One production target to 24ktpa LHM per annum. The increase in CAPEX is mostly related to developing a larger project and global inflation.
- The Upper Rhine Valley Brine Field (URVBF) lithium Resource increases to 26.6Mt LCE; the largest lithium Resource in the EU.
- There has been an increase in overall Phase One Proven and Probable Reserves to 0.54Mt LCE, centred around current production wells in the core of the URVBF field.
- Vulcan's Phase Two DFS is to follow, targeting an additional further modular 24ktpa production, as per the 2021 PFS study, updated for new engineering data from the Phase One DFS.

**Environmental metrics.**

- Net zero project Scope 1, 2 and 3 Greenhouse Gas Emissions per tonne LHM carbon footprint: a world-first in the lithium industry.
- Zero Scope 1 fossil fuels consumption in the lithium production process.
- Vulcan aims to be a net producer of renewable energy from Phase One.
- Low water consumption due to recycling: only 1.36 tonnes of water consumption per tonne of LHM, net of products: the lowest compared to current global production.

Vulcan is targeting first production by the end-2025 and ramp up after that. The Project will be delivered under a single integrated projects group, providing a consistent approach to delivery and overall accountability. Phase One of the Project is now moving into bridging engineering with Hatch Ltd. We will continue to deliver according to the contract strategy and delivery model and seek early engagement of key technology and equipment suppliers.

On 17 January 2023, Vulcan and Stellantis announced they have entered into a phased project agreement, aimed at developing, building, and operating geothermal renewable energy assets to help decarbonise the Company's energy supply in Rüsselsheim, by providing renewable heat. Stellantis aims to be the auto industry champion in climate change mitigation, becoming carbon net zero by 2038, with a 50% reduction by 2030. This requires Stellantis, to decarbonise and localise its energy supply across its manufacturing facilities. In the northern area of the Upper Rhine Valley in Rüsselsheim am Main, Stellantis maintains a large manufacturing facility in which the DS 4 and Opel Astra models are produced, including the electrified variants. This facility in the German state of Hesse is also the traditional home of the Opel brand

and the German headquarters of Stellantis. The planned Project will be at the northernmost extent of Vulcan's focus area in the Upper Rhine Valley. The first phase of the Project will include a Pre-Feasibility Study for the construction of geothermal assets for Stellantis' Rüsselsheim facility, carried out by Vulcan and based on existing data. The following phase, if the first phase is successful, will focus on drilling and more advanced studies and development. Stellantis will aim to source funding for 50% of the project development after the first phase.

On January 4, 2023, Vulcan signed a share purchase agreement to acquire Comeback Personaldienstleistungen GmbH, a company which provides skilled workforce in the drilling industry. The transaction was closed on 31 January 2023. Total consideration for the acquisition was €278,000 comprised of a €150,000 cash component as well as a qualified purchase price component of €128,000. The identifiable net assets and intangibles of the business totalled €296,000. The final purchase price allocation will be determined over the twelve-month period from completion.

## 4. OUTLOOK, OPPORTUNITIES AND RISKS

### 4.1 Outlook

#### 4.1.1 Economic Outlook

##### Lithium

Global demand for battery-quality lithium chemicals, such as lithium hydroxide and lithium carbonate, is expected to be very strong for the coming 12 months and beyond due mainly to high demand from electric vehicle manufacturers. This demand is expected to continue into the second half of the decade.

The forecast average realised price per tonne of LHM in the Vulcan DFS Phase One economic model is taking into consideration Fastmarkets' long term price forecast (min 56.5% LiOH) (\$/kg, EU & US) and combining it with Vulcan's pricing mechanisms concluded in its offtake agreements. Regulatory support from the European Union is also expected, with recent comments from the President of the European Commission Ursula von der Leyen, indicating strong support for domestic critical raw materials production, such as lithium<sup>37</sup>. This could include efforts to streamline regulatory processes, as well as possible financial support for lithium projects. More announcements on this topic are expected from the EU in March.

	Forecast average price realised combining Fastmarkets price forecast and Vulcan offtake agreements pricing mechanisms (€/t)
<b>Average</b>	30,283
<b>2026</b>	37,524
<b>2027</b>	33,743
<b>2028</b>	21,153
<b>2029</b>	23,477
<b>2030</b>	19,209
<b>2031</b>	15,571
<b>2032</b>	22,385
<b>2033</b>	24,975
<b>2034</b>	26,177
<b>2035</b>	27,378

<sup>37</sup> European Commission (EC), 'Critical Raw Materials Act', EC, 14 September 2022, European Commission website, accessed September 2022.

<b>2036</b>	28,580
<b>2037</b>	33,020
<b>2038</b>	34,353
<b>2039</b>	36,018
<b>2040</b>	37,017
<b>2041</b>	37,017
<b>2042</b>	37,017
<b>2043</b>	37,017
<b>2044</b>	37,017
<b>Long term price</b>	37,017

Figure 11. DFS economic model LHM price forecast, using Fastmarkets combined with Vulcan's offtake pricing mechanisms.

## Geothermal renewable energy

Vulcan expects political and community support for developing geothermal heat and power to increase over the coming years. This is due to Europe and Germany's dual goals of climate change mitigation and regaining energy sovereignty. Vulcan expects this geo-political situation to provide tailwinds for Vulcan both in renewable energy project development and its permitting process.

An example of this assumed transition and potential support is the German and European governments prioritising of the rapid growth of renewable energy sources through presentation of the REPowerEU<sup>38</sup> Plan in response to the magnitude of the energy threat, including geothermal energy. The German government has started a €3 billion funding program to support heating grids to be fed by renewable energies. Heating grids using geothermal energy will be the main beneficiaries of the program.

### 4.1.2 Corporate Outlook

#### Operations

From an operational perspective, Vulcan expects to successfully complete the construction of, commission and start operating its CLP Demo Plant and Sorption Demo Plant within 2023. The operation of these plants will assist with training its team in a pre-commercial setting and will also complement financing activities.

<sup>38</sup> Supporting the development of Europe's geothermal energy sector <https://cordis.europa.eu/article/id/442048-supporting-the-development-of-europe-s-geothermal-energy-sector>



Vulcan is anticipating refurbishment of its geothermal drilling rigs to be completed and for drilling of new geothermal wells to commence in summer and autumn 2023 respectively, as part of its plans to ramp up renewable energy production. Vulcan is also putting in place plans to scale up its teams accordingly in a tight labour market. The acquisition of Comeback marks an important step on this journey.

### **Cash position**

With a cash position of €134 million at the end of December 2022, the Company has a good funding basis to expand its project. Vulcan plans a significant cash spend over the next 12 months to develop its project in line with its targets. Vulcan has started multiple workstreams on the equity and debt side to provide a sound financial basis for expansion.

### **Capital expenditure**

For the current financial year 2023 Vulcan Group plans to substantially increase its capital expenditure.

### **Operating expenses**

Increase in operational expenditure will largely follow the planned increase in headcount to ensure the start of the execution of Phase One of its Zero Carbon Lithium™ Project.

### **Building a world-class team**

Vulcan is undertaking an ambitious recruitment drive as the Company accelerates and expands its operations for Phase 1. The Company is targeting a significant increase in FTE by end 2023, from the current levels of ca. 280 at the time of this report. The majority of this FTE increase will be hires in the project execution and the drilling areas.

### **Net zero carbon**

As Vulcan scales up, the Company will continue to expand its data reporting and be able to provide year on year comparisons.

Vulcan will continue to work on achieving carbon neutral certification across all operations through each year in the four-year period and remaining in the lowest quartile for absolute GHG emissions (Scope 1, 2, 3) comparative to peers.

## 4.2 Risks Report

### 4.2.1 Risk Management System

#### Risk Management System

Vulcan's approach to opportunity and risk management is underpinned by the Company Value of *Integrity*, as the Company commits to being respectful, authentic, and trustworthy to each other and to external groups.

The Zero Carbon Lithium™ Project is highly complex and involves many known and unknown risks, some of which are beyond the Company's control. Vulcan is committed to ensuring it has the right measures in place to mitigate these risks, and the right team to execute on the project and to capitalise on opportunities.

#### *Audit, Risk and ESG Committee*

The role of the Audit, Risk and ESG Committee is to assist the Board in monitoring and reviewing any matters of significance affecting financial reporting and compliance. The Committee oversees the Company's risk management systems, practices, and procedures to ensure effective risk identification and management and compliance with internal guidelines and external requirements. The Committee Charter, which is available on the Company's website at <https://v-er.eu> sets risk parameters and defines the Audit, Risk and ESG Committee's function, composition, mode of operation, authority, and responsibilities. In line with the Committee Charter the Committee had a regular review of the Company's risk management framework in its July 2022 meeting. In light of the upcoming DFS for Phase One, the Board undertook an extraordinary risk review in a dedicated risk workshop in September 2022 and discussed its outcome with the Vulcan management team.

#### *Projects Oversight Committee*

The Projects Oversight Committee is responsible for regularly reviewing the status of nominated projects and applying appropriate corporate governance frameworks and risk management. Given the current status of Vulcan's progress, the Board considered that the establishment of this committee, with specific focus on the development and execution of the program of projects, was beneficial to allow for more risk specific oversight. The Project Oversight Committee reviewed and challenged the assumptions for the DFS Phase One in various dedicated sessions before release of the DFS.

During the period an operational management committee, called the Projects Execution Committee was formed because Vulcan is transitioning from a development company to an integrated project execution and operations company. The Deputy CEO has been instrumental in defining the project execution

strategy and building out the team to achieve this, with projects to be delivered under a single integrated projects group which will provide a consistent approach to:

- Delivery (project execution, contract strategy, engineering standards, strategic sourcing).
- Integrating schedules and visibility of critical paths.
- Interfaces being effectively managed.
- Risks and opportunities defined and managed.
- Control processes to give strategic management and insights.

Strong project governance is applied via an Executive Project Steering Committee (SteerCo) and Project Directorate that oversee and manage the project delivery teams.

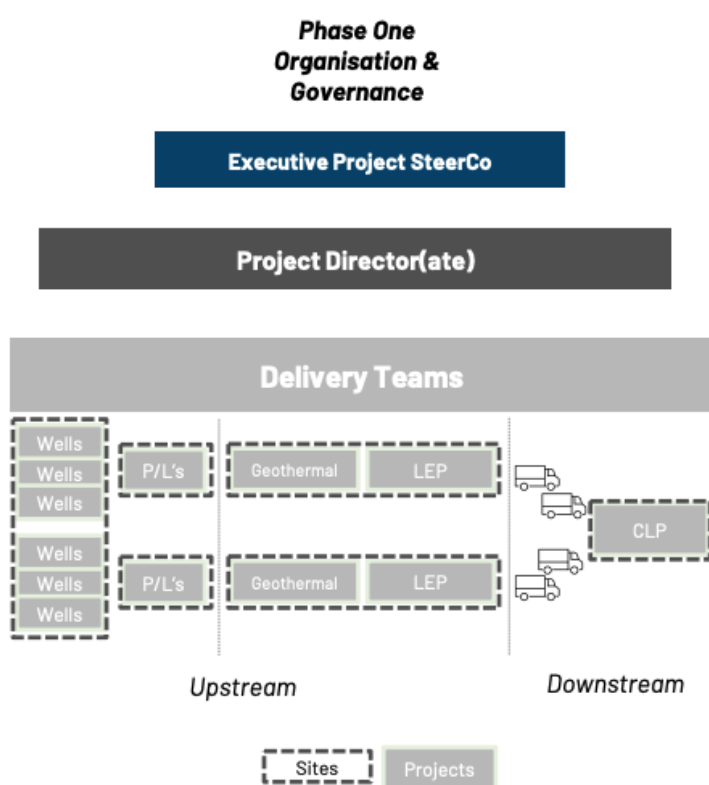


Figure 26 Projects Execution Governance Framework

One nominated Project Sponsor will chair the Executive Project SteerCo which will govern, support, and steer the Project Directorate. The Project Sponsor will report Capital Project updates to the Vulcan Board and Projects Oversight Committee, while a dedicated Project Director will lead the Project Directorate, ensuring overall Projects requirements, budgeting and milestones are met, and be the single point accountable for all Capital Projects until handover to production. The Head of ESG will sit within the Executive Project SteerCo and assist with reporting on sustainability aspects of project execution to the

Board. The proposed strategy will deliver operational integrity, will maximise site synergies and will help deliver on cost competitiveness.

#### *People and Performance Committee*

The People and Performance Committee comprises three NEDs, of which two are independent, and meets regularly through the year. The role of the Committee is to develop remuneration strategy, framework and policy and provides Executive and NED remuneration recommendations to the Board. The CEO attends certain Committee meetings by invitation, where management input is required. The CEO is not involved in the final decision related to their own remuneration arrangements.

#### *Internal Control System for Group Accounting and Financial Reporting*

Vulcan's leadership team is responsible for internal controls within the business. Examples of the internal controls at Vulcan include the segregation of duties for recording and payment of invoices, dual payment authorisations in all jurisdictions and pre-approval for goods and service purchase requisitions in accordance with the delegations of authority.

During the previous financial year, the Company increased its internal control system through the development and improvement of policies such as the Travel Policy, Anti-Bribery and Anti-Corruption Policy and Securities Trading Policy which adheres to both ASX and FSE trading requirements. Due to the still early maturity level of the company Vulcan has identified points for improvement for its ICS and will implement these going forward.

Vulcan Energie Ressourcen GmbH, as the holding company for the German operating entities, received ISO 14001:2015 Environmental Management System (EMS) and 9001 Quality Management System (QMS) certification in Q3. Certification to these standards is international good practice and will help ensure Vulcan's internal systems are robust.

Vulcan undertakes reconciliations of its bank, supplier statement and credit cards. Understanding which items have cleared or not yet posted allows the Company to determine any potential fraud or errors.

The preparation of the financial statements requires management to make judgements, estimates and assumptions that affect the reported amounts in the financial statements.

Management bases its judgements, estimates and assumptions that affect the reported amounts in the financial statements. Management continually evaluates its judgements and estimates in relation to assets, liabilities, contingent liabilities, revenue, and expenses. Management bases its judgements, estimates and assumptions on historical experience and on other various factors, including expectations of future events, which management believes to be reasonable under the circumstances.

The Group's activities expose it to a variety of financial risks related to the financial instruments on the balance sheet of the Group: market risk (including foreign exchange risk and interest rate risk), credit risk

and liquidity risk. The Group's overall risk management program focuses on the unpredictability of the financial markets and seeks to minimise potential adverse effects on the financial performance of the Group. The Group uses different methods to measure and manage different risks to which it is exposed.

These include monitoring levels of exposure to interest rate and foreign exchange risk and assessments of market forecasts for interest rates and foreign exchange prices. Ageing analysis and monitoring of specific credit allowances are undertaken to manage credit risk. Liquidity risk is monitored through the development of future cash flow forecasts. Risk management is carried out by Management and overseen by the Board of Directors with assistance from suitably qualified external advisors.

The main financing risks arising for the Group are foreign exchange risk, interest rate risk, credit risk and liquidity risk. The Board reviews and agrees on policies for managing each of these risks, and they are summarised in Note 29 to the Consolidated Financial Statements included in the Company's six months short financial year Annual Report available on its website at <https://v-er.eu>.

## 4.2.2 Main Opportunities and Risks Identified

*Supply of products (procurement, production, logistics)*

### **Risk (HIGH)**

Vulcan is being impacted by disruptions to supply chains due to the impact of Covid-19. These unprecedented global supply chain issues with sourcing certain pieces of equipment, mean that project delays are possible.

The Company is in the process of analysing risk specifically associated with delays and raw materials cost increases. Part of this planning includes regular budget and forecast allocation and project updates with the leadership team and the Board. Assignment of specific enterprise risk management to team members and extending the internal financial accounting capabilities is also one of the measures Vulcan has implemented, alongside the recommendations of the Target Operating Model 360.

### **Opportunity (HIGH)**

Local supply of geothermal renewable energy and heating assists Germany's move to decrease reliance on imported energy. This puts Vulcan in a strong position to benefit from government support and funding to increase renewable energy and heat generation. Disruptions to the global supply chain and European Union regulation surrounding carbon pricing and the potential for border control adjustments for imported products means that OEMs located within Europe prefer local suppliers with less disruption risk. This opportunity has benefited Vulcan with the first upstream investment by top-tier automaker Stellantis and offtake agreements with Volkswagen Group and Renault Group.

*Finance*

### **Risk (MEDIUM)**

Over the last 12 months, credit markets have tightened as central banks in major economies have reduced money supply in response to rising inflation. The Pew Research Centre reports that, of 44 advanced economies reviewed, consumer prices have risen substantially in nearly all of them when compared to pre-pandemic times<sup>39</sup>. Institutional investors are now looking for lower capex investments with conservative growth plans.

Significant future funding will be required by Vulcan to support the further implementation of its Zero Carbon Lithium™ Project. Vulcan needs to balance this requirement to keep capital costs at reasonable levels with the push from customers for more product as soon as possible.

### **Opportunity (MEDIUM)**

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<sup>39</sup> D. Desilver, '[In the U.S. and around the world, inflation is high and getting higher](#)', Pew Research Centre, 15 June 2022, accessed August 2022.

With the DFS results now being published, capital expenditure for the Zero Carbon Lithium™ Project will increase from the levels noted in the PFS, in line with the rest of the industry. The Company's cost position relative to its peers remains very competitive.

The Company believes the Zero Carbon Lithium™ Project is crucial for Europe, both from an energy security perspective and due to the need to have a local, reliable supply of critical raw materials like lithium. With these macro-policy tailwinds in the Company's favour, Vulcan expects to be able to fund the Zero Carbon Lithium™ Project at a cost that is reasonable for the Company's shareholders.

#### *Regulatory changes*

##### **Risk (LOW)**

As noted in the lithium and economic situation of the chemical industry section, a proposal has been put forward to the European Commission by the European Chemicals Agency (ECHA), to re-classify lithium as a Category 1A chemical, on a similar level as cobalt. The reclassification could increase regulatory requirements around controlling, processing, packaging, and storage of lithium.

Vulcan, together with European OEMs and lithium battery supply chain companies and institutions, has raised its concerns with the European Union and member states. The Company believes that rejecting the proposal is an opportunity for the EU to demonstrate further its commitment to building out a local, European lithium supply chain, which is consistent with recent targets and actions.

##### **Opportunity (HIGH)**

Regulatory changes in the lithium-ion battery industry and the renewable energy industry are likely to favour Vulcan's combined renewable energy and Zero Carbon Lithium™ Project. This includes the: European Battery Regulation, which mandates more environmentally sustainable batteries to be produced and sold in the EU in the coming years; European countries' commitment to phase out the sale of fossil fuel vehicles between 2025 and 2035, depending on location, which will have a very significant impact on lithium-ion battery demand and therefore lithium demand in Europe; the Carbon Border Adjustment Mechanism, which is tipped to be extended to include chemicals in the future, and will favour domestic, lower carbon forms of production of chemicals like lithium; As Commissioner Thierry Breton noted, "We (Europe) prefer to import from third countries and turn a blind eye to the environmental and social impact that occurs there, not to mention the carbon footprint of the imports"<sup>40</sup>. Germany's increasing commitment to phasing out fossil fuels, achieving energy independence, and achieving climate neutrality, all of which have accelerated since the new Coalition government in Germany was formed, and since the Russian invasion of Ukraine. Such favourable regulatory changes in lithium, electric vehicle batteries and renewable energy provide an opportunity for Vulcan as a renewable energy producer and sustainable lithium chemicals developer.

#### *Social and macroeconomic trends and geopolitical risk*

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<sup>40</sup> T Breton, 'Increasingly strategic raw materials', Blog of Commissioner Thierry Breton, 12 June 2022, accessed August 2022

### **Risk (LOW)**

There is a risk that a number of mining and resources projects, long considered ‘taboo’ in Europe, may not be permitted.

### **Opportunity (HIGH)**

The development of a decarbonised lithium product is crucial to powering Europe’s switch to a sustainable and compliant auto industry. As noted in the lithium and economic situation of the chemical industry section of this report, there is a concerted push in Europe to support and develop a local supply of critical battery minerals, including lithium. According to planned lithium-ion battery production capacity, Europe will need approximately >1,000kt lithium hydroxide supply per annum by 2030, more than twice the global market today. Currently, Europe has no domestic production of battery-quality lithium hydroxide chemicals, with 80-90% of the current global supply being sourced from China<sup>41</sup>.

Vulcan believes there is strong and growing government support for the local production of critical raw materials, as noted earlier in this report. Further, Vulcan’s Zero Carbon Lithium™ Project is not a mining project, nor will it disturb or change large areas of the landscape. There is, therefore, significant opportunity for Vulcan’s Zero Carbon Lithium™ Project, given its ability to reduce this almost total reliance on China for battery-grade lithium hydroxide by establishing a local, secure supply of lithium from Europe for Europe.

#### *Climate related risk*

### **Risk (LOW)**

Climate-related risks continue to be considered as the Company advances the Zero Carbon Lithium™ Project. These risks can take the form of physical impacts, such as acute weather events (flooding, drought) and chronic weather events (an increase in precipitation or mean temperature), as well as transitional risks, as governments and countries adapt to new conditions as the result of climate change. Further information can be found in the TCFD and EU Taxonomy Report on the website, including the Company’s first climate scenario modelling, considering two climate scenarios, Net Zero Emissions (NZE) and Stated Policies Scenario (STEPS).

### **Opportunity (HIGH)**

Since Vulcan’s whole strategy and project development has been built around net “zero carbon” with its Zero Carbon Lithium™ Project, much of what would be considered as a climate-related risk for most companies can be seen as opportunities for Vulcan. Vulcan is located within the European Union, whose climate related legislation is some of the most supportive globally. Already a renewable energy producer, Vulcan will also become a zero fossil fuel, carbon neutral lithium producer at a time when electric vehicle uptake is at its most ambitious. Vulcan’s lithium resource is one of the largest in the world and plans to supply at least 40 kilo tonnes of battery grade LiOH annually at full capacity.

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<sup>41</sup> IEA (International Energy Agency), [The Role of Critical Minerals in Clean Energy Transitions](#), IEA, May 2021, accessed February 2022.



## *Project development and execution*

### Brine flow rates

#### **Risk (MEDIUM)**

The amount of renewable energy and lithium that can be extracted will depend on the brine flow rate achieved at each site, and the re-injection rate. The flow rate from each well will be verified once the well has been drilled. Recent DFS-work for Phase 1, including reservoir analyses and results from the 3D-seismic in Lionheart have confirmed the robustness of Vulcan's flow rate assumptions and examined for the first time the degree of lithium depletion over time. The DFS was designed to optimise the benefit of a high brine flow rate combined with a modest long-term lithium depletion.

#### **Opportunity (MEDIUM)**

Vulcan uses modern geothermal industry best practice by incorporating 3D seismic data and analysis into its geological modelling to target high-flow fault zones, and factors in state-of-the-art techniques to increase the flow rate, such as double completion of wells and multi-reservoir completion, using the experience of its technical team. Further optimization of drilling strategy and thus flow rates may be possible as certain data analysis from the 3D-seismic in Lionheart is still ongoing and could not be fully reflected in the DFS.

### Resources/ Reserves

#### **Risk (MEDIUM)**

Lithium resources and reserves indicated must be considered as estimates only until such reserves are actually extracted and processed. Vulcan's resources are based on limited data points because the reservoir is deep. Grades of lithium in brine produced may vary negatively from the amount anticipated.

#### **Opportunity (MEDIUM)**

Vulcan utilises the considerable local geological expertise of its team, as well as state-of-the-art 3D seismic data and where possible, its existing production/re-injection wells, to construct the most accurate models it can. Vulcan reports on its estimates of Mineral Resources and Ore Reserves in compliance with the JORC Code, the ASX Listing Rules German Securities Trading Act, European Regulation No. 596/2014 and other applicable regulations. Vulcan's resource estimates and reserves are signed off by external consultants GLJ Ltd. and Groundwater Insight Ltd. There may be upside to Vulcan's modelled lithium-in-brine amounts, and furthermore, there may be an opportunity to add further resources and reserves in Vulcan's other licence areas throughout the Upper Rhine Valley Brine Field in the future. Compared to the PFS mineral resource estimation, Vulcan has increased its mineral resource estimate to 26.6 Mio. tonnes of LCE in ten out of fifteen license areas.

### Sorption

**Risk (MEDIUM)**

Lithium extraction from brine using sorption is used commercially, but each brine chemistry is different, and risks remain when adapting methods to each brine.

**Opportunity (HIGH)**

Vulcan has unique, in-house expertise on the operation of sorbents for lithium extraction, which is a valuable asset when looking to expand production to other lithium brine resource areas. Vulcan has two years of pilot plant testing data which proves the sorbent type lithium extraction works well with Vulcan's brine.

Permitting

**Risk (MEDIUM)**

The Zero Carbon Lithium™ Project may be affected by delays in receiving the necessary approvals from all relevant authorities and parties. Multiple, different permits will be needed to enter commercial operation for geothermal production on a larger scale, and lithium production.

After receiving approval in July 2022 to carry out a 3D seismic survey from eight local councils across the Company's licence area in the German state of Rhineland-Palatinate, Vulcan has successfully completed its 3D seismic survey in this area and most recently completed another 3D seismic survey in the Mannheim area. Vulcan has also received approval for three preliminary EIAs, negating the need for a full EIA, at three sites in its Phase One development area.

Vulcan has a team of experts in geothermal development who have developed numerous projects in the past and will continue to keep stakeholders updated on the timetable. Vulcan has received encouragement from state and federal governments that renewable energy project permitting times will be reduced as a priority. Further, government policy settings are moving to support the domestic production of strategic raw materials, which is in Vulcan's favour. So far, Vulcan has received multiple preliminary EIA approvals, in line with its development plans.

*Market developments*

**Risk (MEDIUM)**

Lithium prices are subject to unpredictable fluctuations, driven partly by changes in the balance of global supply and demand. Fluctuations in market demand and commodity prices for lithium, due to new market or technology developments and other factors may adversely impact Vulcan's financial results and future cash flows. Vulcan has limited its exposure to lithium price fluctuations by flooring the lithium prices for parts of its future sales volume in the offtake contracts with OEMs.

**Opportunity (MEDIUM)**

The DFS has confirmed that Vulcan's Zero Carbon Lithium™ Project is still forecast to be a very low OPEX operation due to three key factors:

- Vulcan's "feedstock" is expected to be low-cost and have a dual purpose: lithium extraction and energy production in the form of renewable heat and electricity.
- Vulcan plans to use sorption to isolate lithium as opposed to using large volumes of chemicals such as sulfuric acid to dissolve a rock feedstock or soda ash for brine.
- Vulcan plans to use electrolysis to upgrade chloride into a high purity hydroxide using renewable energy, with no heavy reagent usage such as sodium hydroxide or lime.

Risk	Related to segment
<i>Supply of products</i>	<i>Germany</i>
<i>Finance</i>	<i>All</i>
<i>Regulatory changes</i>	<i>All</i>
<i>Social and macroeconomic trends</i>	<i>All</i>
<i>Climate related</i>	<i>All</i>
<i>Project development</i>	<i>Germany, other European</i>
<i>Market developments</i>	<i>Germany, other European</i>

### 4.3 Overall Assessment of Opportunities and Risks by Management

The Board of Management assesses Vulcan's risk and opportunities management system as adequate and believes it puts shareholders and stakeholders in a position to make a fair assessment on risks and opportunities of Vulcan's business. .

## 5. TAKEOVER RELEVANT INFORMATION

### Information on subscribed capital

1. **The composition of the subscribed capital, separately showing the rights and duties that each class entails as well as the proportion of the capital held.**

The issued capital of Vulcan Energy Resources Limited comprises

- 143,435,301 fully paid ordinary shares,
- 8,382,801 unquoted performance rights ("**Performance Rights**") (of various classes); and
- 91,174 unquoted performance shares ("**Performance Shares**").

Refer also to the ASX Additional Information and Remuneration Report sections of Vulcan Energy Resources Limited's (**Vulcan** or the **Company**) Annual Reporting Suite 1 July 2022 to 31 December 2022 (**FYE 31 Dec Annual Report**).

The fully paid ordinary shares in the Company (**Shares**) are governed by the Company's constitution, the Australian Corporations Act, the ASX Listing Rules and Australian general law. All Shares carry full dividend rights. Each Share carries one vote at a meeting of the Company's shareholders. Except for the restrictions set forth in lock-up agreements of the Company from time to time, the Shares are freely transferable, subject to formal requirements, the registration of the transfer not resulting in contravention of or failure to observe the provisions of a law of Australia and the transfer not being in breach of either the Australian Corporations Act or the ASX Listing Rules. In the case of insolvency, a person's liability as a shareholder is limited to any amount unpaid on their Shares.

Each Performance Right, subject to the satisfaction of the applicable vesting criteria before the expiry date, entitles the holder to elect to receive one Share for nil consideration by notifying the Company of such election.

Each Performance Share, subject to the satisfaction of the applicable vesting criteria before the expiry date, entitles the holder to elect to receive one Share for nil consideration by notifying the Company of such election. Before conversion into a Share, the Performance Shares provide no voting rights and no dividend rights and are not transferable.

2. **Restrictions on voting rights or on the transfer of shares of stock, also as may result from agreements made among shareholders, insofar as the company's board of management is aware of them.**

In connection with the entry by the Company into a partnership agreement ("**Partnership Agreement**") with Legacy & Partners S.a.R.L., a company affiliated with Mr Nico Rosberg and Rosberg X Racing ("**RXR**"), the Company issued an aggregate of 58,355 Shares to Mr Rosberg and

RXR. Mr Rosberg, RXR and the Company have agreed to the lock-up of 20,424 of these Shares, the terms of which require that neither RXR nor Mr Rosberg dispose of such Shares before 7 April 2023, in each case subject to certain customary exceptions.

Subject to any rights or restrictions for the time being attached to any class or classes of shares, at a meeting of the Company's shareholders (each a **Shareholder**):

- Each Shareholder entitled to vote may vote in person or by proxy, attorney or corporate representative.
- On a show of hands, every person present who is a Shareholder or a proxy, attorney or corporate representative of a Shareholder has one vote;
- On a poll, each Shareholder who is present in person or by proxy, attorney or corporate representative has one vote in respect of each Share held by that person, or in respect of which that person is appointed a proxy, attorney or corporate representative (but, in respect of partly paid shares, will have such number of votes as bears the same proportion to the total of such shares registered in the Shareholders' name as the amount paid (not credited) bears to the total amounts paid and payable (excluding amounts credited).

**3. Direct or indirect participating interests in the capital that comprise more than ten per cent of the voting rights.**

Refer to the ASX Additional Information section of the Company's FYE 31 Dec Annual Report.

**4. The holders of shares of stock endowed with special rights granting powers of control and a description of such special rights.**

Not applicable. See sections (1) and (2) above for details of the rights attaching to the Company's securities.

**5. The nature of the voting control if employees hold a share in the capital and do not directly exercise their rights of control.**

The employees participating in the capital of the Company may exercise their control rights directly themselves.

**6. The stipulations of the law and of the statutes regarding the appointment of the members of the board of management and their removal from office, as well as the stipulations regarding amendments to the statutes.**

Subject to the Company's Constitution, the Company may elect a person as a Director by resolution passed at a general meeting of Shareholders. A Director elected at a general meeting of Shareholders is taken to have been elected with effect immediately after the end of that

meeting unless the resolution by which the Director was appointed or elected specifies a different time.

At the Company's annual general meeting of Shareholders each year, one third of the Directors (other than the Managing Director) or, if their number is not a multiple of three, then the number nearest one-third, must retire from office (and each such Director who retires is eligible to seek re-election at that annual general Shareholders' meeting).

In addition, no Director (except the Managing Director) may hold office without re-election past the longer of (i) the third annual general meeting of Shareholders following their appointment or election, and (ii) three years.

The Directors to retire at each annual general meeting of Shareholders are those who have been in office the longest since their last election. Where persons have become Directors on the same day, unless otherwise agreed amongst themselves, the Directors to retire by rotation will be determined by drawing lots.

The Directors may also, at any time, appoint a person to be a Director, either to fill a casual vacancy or as an addition to the existing Directors. Any Director so appointed holds office only until the next annual general meeting of Shareholders and is then eligible for re-election (but will not be taken into account in determining the Directors who are to retire by rotation (if any) at that meeting).

Any proposed modification of the Company's Constitution must be approved by a special resolution of the Company's Shareholders (that is, passed by at least 75% of the votes cast by Shareholders entitled to vote on the resolution).

## **7. The powers of the board of management, particularly regarding the possibility of issuing shares of stock or repurchasing them.**

The role of the Company's Board of Directors is to provide overall strategic guidance and effective oversight of management.

Subject to any specific requirements under the Australian Corporations Act, the ASX Listing Rules or the Company's Constitution, the Board of Directors may exercise all of the powers of the Company (including the power to issue shares) except for those which require approval of the general meeting of shareholders. The Company's Board of Directors is permitted under the Company's Constitution to delegate any of their powers to one or more persons or committees.

Under Australian law, the Directors of the Company are subject to certain duties, including to act in good faith in the interests of the Company, to act for a proper purpose, not to fetter their discretion, to exercise care, skill and diligence, to avoid conflicts of interest, not to use their position to their advantage, and not to misappropriate company property. Pursuant to section 14.1 of the Company's Constitution, the Company's Board of Directors is to comprise not less than

three and not more than nine Directors (excluding any alternate Directors). The quorum for a meeting of the Board of Directors is two Directors.

Under the Australian Corporations Act, the Company does not have an authorised share capital, and there is generally no limit under the Australian Corporations Act or the Constitution on the power of the Directors to issue Shares or other securities.

Subject to specified exceptions, the ASX Listing Rules restrict a company admitted to the official list of ASX from issuing, or agreeing to issue, more than 15% of the company's total number of securities (calculated according to a prescribed equation) in any rolling 12-month period without obtaining shareholder approval.

**8. Material agreements of the parent undertaking that are subject to a change of control clause in the event of a takeover bid and the effects resulting therefrom.**

Not included.

**9. Compensation agreements the parent undertaking has concluded with the members of the board of management or with employees for the case of a takeover bid.**

The Company has no specific compensation agreements with its board, management or employees in the case of a successful takeover bid other than under the terms of the Executive Service Agreement with the CFO in the case of a takeover bid which is recommended by the Board, the CFO has the choice to terminate his agreement after the bid has been accepted, but subject to a maximum of 2 months' notice after the acceptance date or to work for a maximum of 3 months after the acceptance date and then be paid out an additional 3 months' salary plus outstanding leave and bonuses.

## 6. FURTHER INFORMATION

Corporate governance statement § 315d HGB

As a sustainability-centric company, Vulcan is committed to the highest standards of corporate governance practice and regulatory compliance and promotes ethical and responsible decision making.

As an ASX listed Company, Vulcan's Board of Directors believes that the Company's policies and practices comply with the recommendations set out in the ASX Corporate Governance Principles and Recommendations – 4th Edition (Recommendations).

A copy of Vulcan's 1 July – 31 December 2022 Corporate Governance Statement can be found on the Company's website at <https://v-er.eu>

### *Diversity*

The Board has set measurable gender diversity objectives of 40% female representation on the Board, in senior executive positions, and across the entire workforce.

Further information about the Company's business wide diversity targets can be found in Vulcan's FY22 Sustainability Report and 2022 Annual Report at [www.v-er.eu](http://www.v-er.eu)