VULCAN ENERGY RESOURCES
Zero Carbon Lithium™

ASX Release
16 March 2020
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FRA: 6KO

Vulcan Zero Carbon Lithium™ Project Update

Highlights

- Preparations underway to commence Pre-Feasibility Study (PFS) at Vulcan's **Zero Carbon Lithium™** Project, following positive Scoping Study.
- PFS planned to include both laboratory and pilot plant testwork for lithium processing and recovery.
- Pilot plant to target test production of battery quality lithium hydroxide.
- Australian "Virtual Roadshow", involving video-conferencing meetings with key broking firms and institutional investors, commencing March 17.

Managing Director, Dr. Francis Wedin commented:
"*We are maintaining the rapid momentum at the Vulcan Zero Carbon Lithium™ Project that saw us complete our maiden Mineral Resource and Scoping Study within just five months. Preparations for the Pre-Feasibility Study are already under way. Our lithium processing team is preparing to conduct initial laboratory testwork for lithium recovery from brine. Our engineering team has commenced the design of the pilot plant which will form an important part of the PFS. Meanwhile, our geological team is sourcing additional seismic data to assist with de-risking of our geological models. We look forward to keeping our shareholders informed of these exciting developments, as we advance towards the development of the world's first Zero Carbon Lithium™ Project.*

"We were due to commence an investor roadshow this week, but due to recent global events we will now be conducting our first Australian "virtual roadshow" instead, with a full schedule to key Sydney, Melbourne and Perth broking firms and institutions via video conference call. We look forward to presenting Vulcan's unique value proposition:

1. *Independently confirmed as unique Zero Carbon Lithium™ process;*
2. *Recently announced as Europe's largest lithium project;*
3. *Recently completed positive Scoping Study;*
4. *PFS to be completed this year: rapid momentum;*
5. *Centre of the world's fastest growing lithium market;*
6. *Strong government and EU support for strategic, local lithium hydroxide supply chain, exacerbated by recent global supply chain disruption.*

In the coming weeks, we will also be releasing details of a retail investor webcast."

Highlights

Large, lithium-rich geothermal brine field, in the Upper Rhine Valley of Germany.

Europe's **largest** JORC-compliant lithium resource.

Aiming to be the world's first **Zero Carbon Lithium™** producer.

Strategically located at the heart of the EU Li-ion battery industry.

MoU agreement with German geothermal operator at a **producing power plant**

Fast-track development of project under way towards production.

Corporate Directory

Managing Director
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Chairman
Gavin Rezos

Executive Director
Dr Horst Kreuter

Fast Facts

Issued Capital: 53,670,002
Market Cap (@20c): $10.7m

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Zero Carbon Lithium™

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Competent Person Statement:

The information in this report that relates to Mineral Resources for the Vulcan Geothermal-Lithium Project is extracted from the ASX announcements "maiden JORC (2012) Mineral Resource Estimate for its Ortenau licence" and "Maiden Indicated Resource Insheim Vulcan Zero Carbon Lithium" released on the 4th of December 2019 and 20th of January 2020 which are available on www.v-er.com. The Company confirms that it is not aware of any new information or data that materially affects the information included in the previous market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcements.

VULCAN ENERGY RESOURCES
Zero Carbon Lithium™

Appendix 1

Vulcan Project Summary: Unique Zero-Carbon Lithium™ Production

The **Vulcan Zero Carbon Lithium™ Project** is aiming to be Europe's and the **world's first Zero Carbon Lithium™ project**. It aims to do achieve this by producing **battery-quality lithium hydroxide** from hot, sub-surface geothermal brines pumped from wells, with a renewable energy by-product fulfilling all processing energy needs.

The Vulcan Zero Carbon Lithium™ Project is strategically located, within a region well-serviced by local industrial activity, at the heart of the European auto and lithium-ion battery manufacturing industry, just 60km from Stuttgart. The burgeoning European battery manufacturing industry is forecast to be the world's second largest, with currently zero domestic supply of battery grade lithium products.

World's First & Only Zero-Carbon Lithium™ Process

Co-generation of geothermal energy from production wells will power lithium extraction. Unique process will satisfy OEMs' stated desire for ISO-compliant, zero carbon Electric Vehicle (EV) raw materials supply.

Europe's Largest JORC Lithium Resource

Recent JORC Mineral Resources contain a total combined Indicated and Inferred estimates of 13.95 million tonnes of Lithium Carbonate Equivalent (LCE)[1]. Large enough to be Europe's primary source of battery-quality lithium hydroxide.

Most Optimally Positioned for Supply Chain Security & Footprint Reduction

Located in Germany, in the centre of the European lithium-ion battery industry. Removes dependence on South America/China for this designated Critical Raw Material. Removes carbon footprint of supply chain.

Europe's Lowest Impact Lithium Project

No hard-rock mining, no evaporation ponds required in Vulcan's Zero Carbon Lithium™ process. Instead lithium extraction the European way, from renewable energy-producing geothermal brine wells rich in Li.

Rapidly Advancing Lithium Project

Recent agreement with German geothermal operator provides access to existing wells and potentially a fast-track to production.

Unprecedent Demand Forecast for Lithium Hydroxide in Europe

Ramp-up of lithium-ion battery manufacturing for auto industry in Europe in 2020s forecast to dwarf China expansion of 2016-18. Zero local supply of battery quality lithium hydroxide.

[1] See ASX releases 4th of December 2019 and 20th of January 2020. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcements.

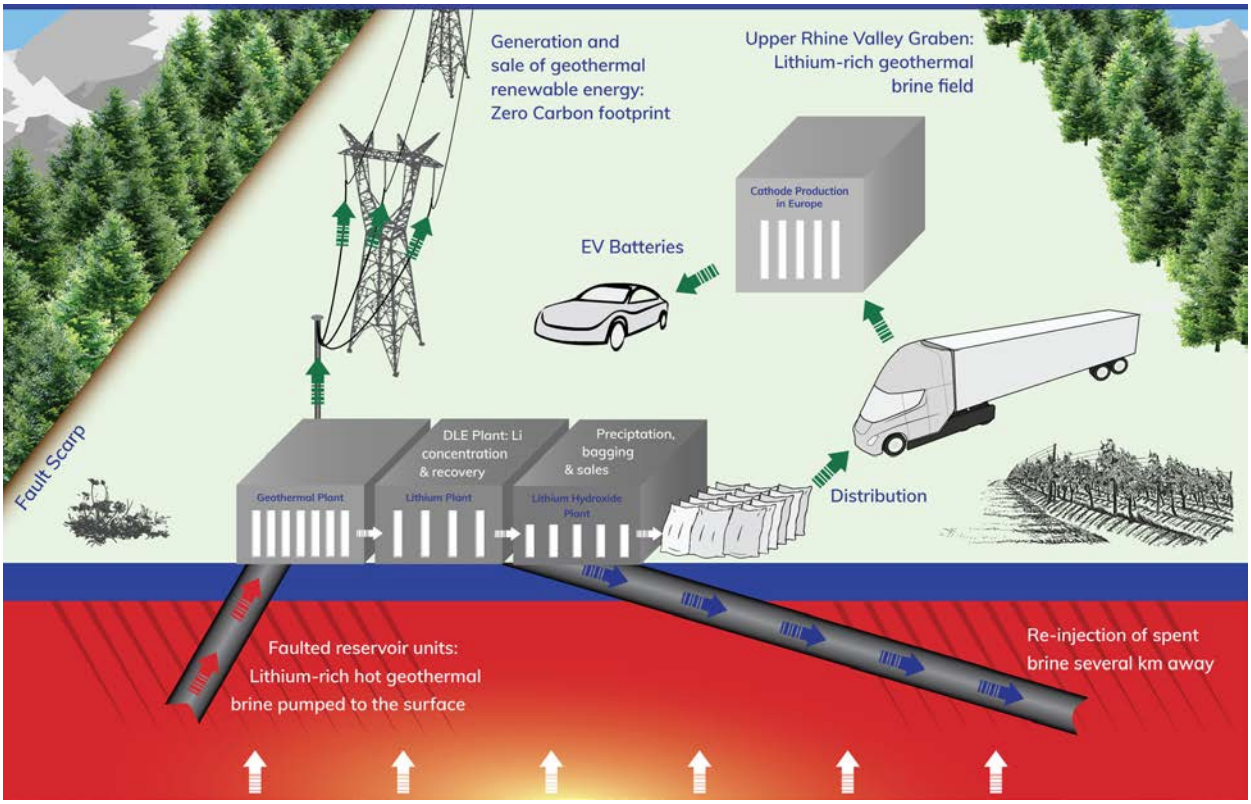

Figure 1: Schematic of the Zero Carbon Lithium™ project

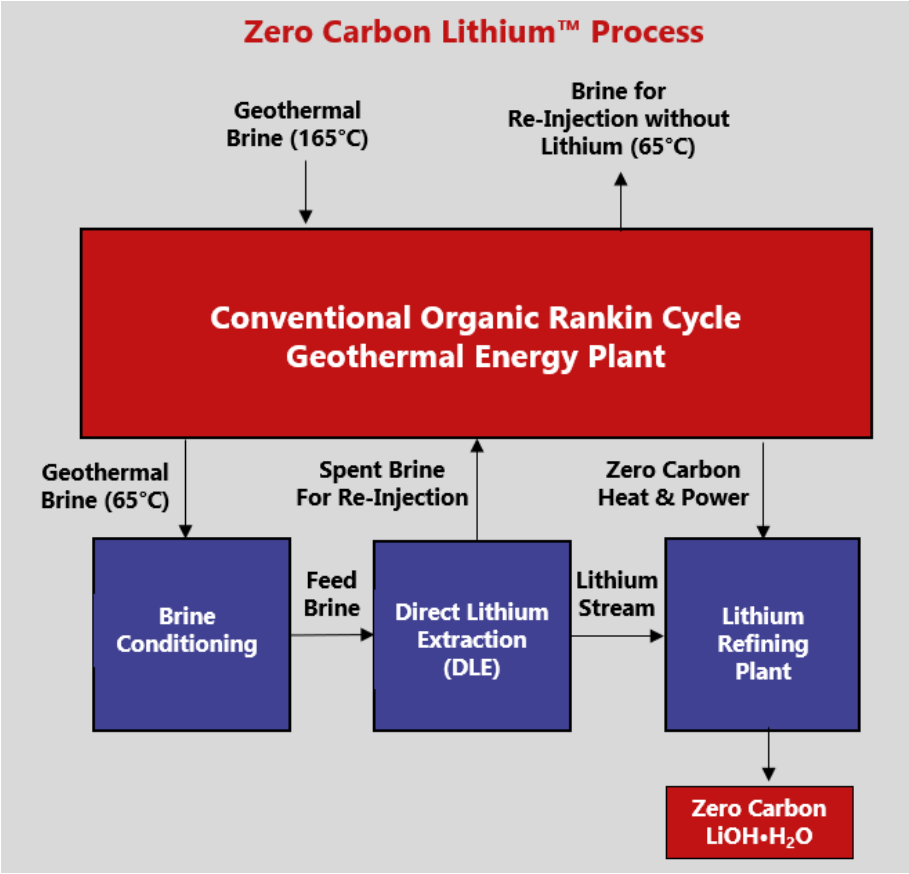

Figure 2: Vulcan's Zero Carbon Lithium™ process

Unprecedented Demand for Lithium in Europe - The Next China?

- In the 2010s, China experienced the world's highest growth in lithium-ion battery production for electric vehicles**. It caused a lithium supply shortage & 300% lithium price spike**.
- In the 2020s, the **same is forecast to happen in Europe, on a larger scale.**
- "European battery cell production capacity is set to increase rapidly in the coming decade. Europe currently has no commercial lithium production or refining capacity of its own to meet this demand, but plans are afoot to change this" (Benchmark Mineral Intelligence, 2019).

There is an unprecedented ramping up of lithium-ion and associated cathode production in Europe. Forecasts show that the European Union (EU) is set to require the equivalent of the entire current global battery quality lithium demand by the mid-2020s, with 2023 being the main inflection point. There is currently zero EU production of battery-quality lithium hydroxide, let alone a CO_2-neutral product. A severe battery-quality lithium chemical supply shortfall is thus developing in the EU.

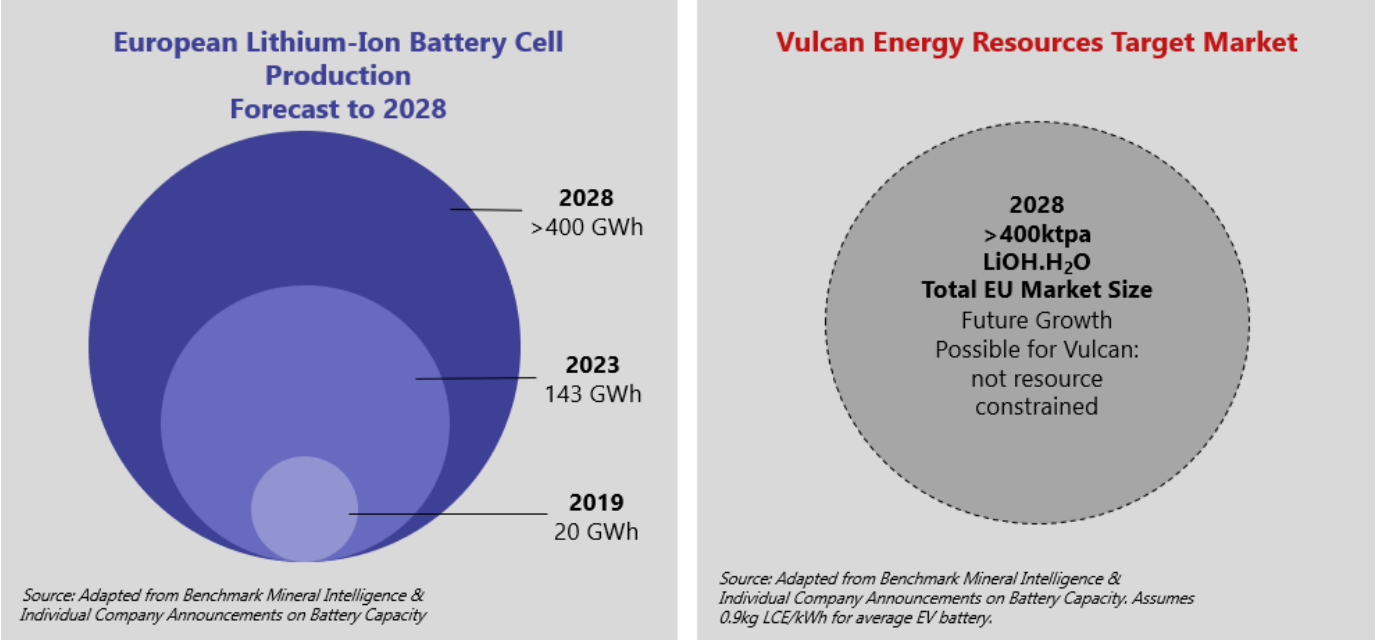

Figure 3: Forecast battery production in EU and associated lithium demand[2]

Why Vulcan? Zero Carbon Supply Chains Required

BEV raw material supply chains have a carbon footprint problem, producing more CO_2 during production than Internal Combustion Engines (ICE). Car manufacturers are actively trying to reduce the carbon footprint of their battery supply chains to bolster the credibility of their BEV offerings. This will enable them to avoid financial emissions penalties and obtain premium pricing for lowest carbon footprint in production. Volkswagen, among

[2] Adapted from Benchmark Mineral Intelligence and Individual Lithium-Ion Battery Manufacturing Company Announcements from Tesla, Northvolt, CATL, Leclanche, PSA, SVolt, TerraE, BMZ, Freyr Energy, Microvast, Farasis, LG Chem, Johnson Matthey, Umicore, SK Innovation, Samsung, BYD.

others, is placing great importance on having a CO_2-neutral production supply chain for its very extensive new EV line-up, with a raw materials purchasing metric for sustainability put on par with price[3], and the goal of producing net zero carbon BEVs as delivered to the customer. The European Commission is following suit, recently flagging that "CO2 Passports" will be issued to BEVs detailing the full CO_2 footprint of each battery. The aim is to differentiate EU lithium-ion battery and BEV production, by producing uniquely low CO_2 products. The EU has declared a climate emergency and aims to cut 55% of emissions by 2030, net zero by 2050. Currently, there is no "zero carbon" lithium chemical product in the world, since all current extraction, processing and transport routes are very carbon intensive. Spodumene converted by fossil fuel-fired processes and lithium products transported from South America will always emit significant quantities of CO_2 to sell their lithium products in Europe.

Hard-rock lithium production has a high OPEX and high CO_2 footprint due to its inherent energy requirement for mining, crushing and processing to producing battery quality lithium chemicals, as well its transport distance to major global markets. A processing bottleneck has also developed for spodumene concentrate going through lithium refinery plants in China, creating downward pressure on concentrate prices. South American lithium brine operations make up the balance of current production. Because of their distance to market, remoteness and substantial use of reagents from North America, there is a substantial CO_2 footprint inherent in these operations also. These operations can also be very slow and unreliable in terms of producing battery quality lithium chemicals, as the evaporation process makes them vulnerable to weather events. The evaporation can also cause stresses on local environment and communities.

The world's conventional lithium supply chains are not geared towards low carbon intensity production, so Europe will need to build its own.

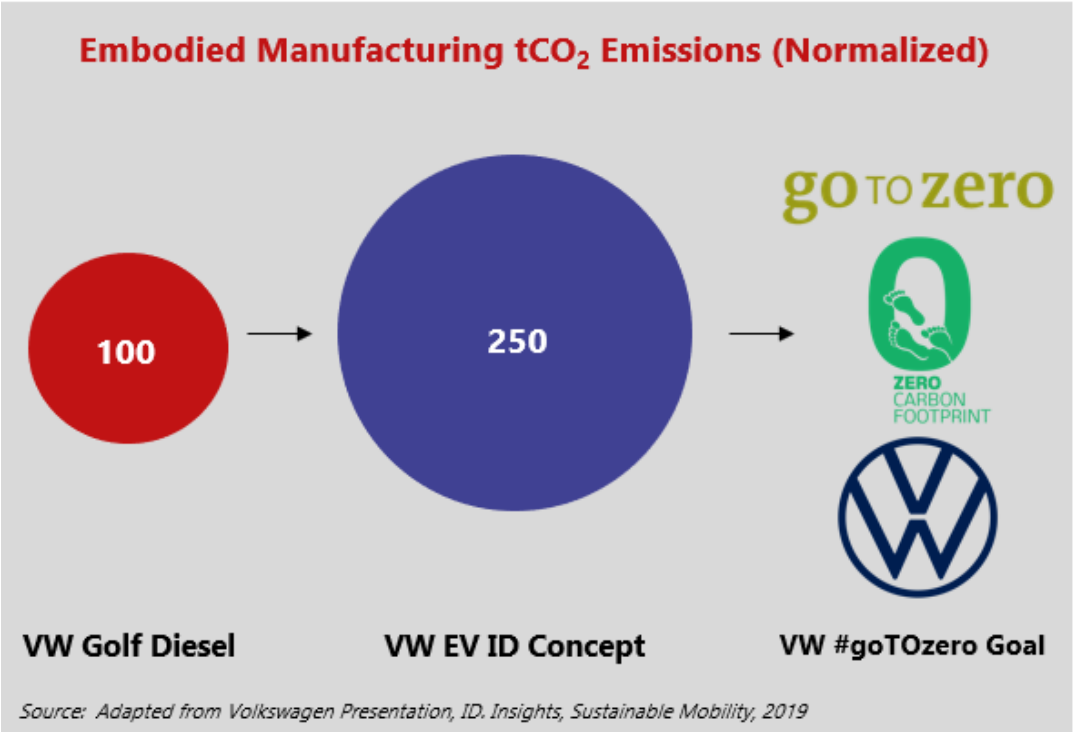

Figure 4: EVs' carbon problem, and the industry goal to fix the problem

[3] Volkswagen ID presentation, 2019

The Solution: Vulcan's Zero Carbon Lithium™ Project

The Company believes that the solution lies in the **Vulcan Zero Carbon Lithium™ Project.** This comprises a very large, lithium-rich geothermal brine field in the Upper Rhine Valley of South-West Germany, in the heart of the EU's battery "giga-factory" production.

Summary

- Unique flowsheet developed by Vulcan, making use of **binary cycle geothermal electricity & heat** to create a **Zero Carbon Lithium™ product.**
- Direct Lithium Extraction (DLE) process to produce $LiOH \bullet H_2O$ from the brine,
- Zero carbon electricity generated and used to produce premium, Zero Carbon Lithium™ with no gas input.
- Spent brine re-injected into reservoir with no evaporation losses.
- Processing time **hours instead of months**, not dependent on weather like South American brines.
- Creates high purity, high concentration solution that is easily converted on site into **battery quality $LiOH \bullet H_2O$.**
- Excess **power will be sold** at a Feed-in-Tariff, displacing coal and decarbonizing the German electric grid.
- No need for high energy mining, crushing, grinding and conversion processes used in hard-rock lithium deposits.

Vulcan intends to test and de-risk this flowsheet in 2020, during its feasibility studies.

The Zero Carbon Lithium™ production stems from a clever, unique process:

1. Standard geothermal production wells will be drilled into high flow rate, lithium-rich brine reservoir units, including the Buntsandstein unit. Geothermal energy wells have been successfully doing this for decades in the Upper Rhine Valley, so there is strong precedent. The heated brine is pumped up and produces geothermal energy via a binary cycle plant, which emits no CO_2.

2. Usually the spent brine would then be re-injected into the reservoir. In the Vulcan process, the spent brine gets diverted through a Direct Lithium Extraction (DLE) plant, where the vast majority of the lithium is extracted in less than an hour, while leaving other impurities. The brine is then re-injected into the reservoir minus the lithium. A new lithium stream of much higher concentration is formed for further processing and nothing is added to the brine. Livent has used a similar process to produce LiOH•H2O from Argentine brine for over 30 years.

3. A series of chemical operations convert the lithium stream into battery quality lithium hydroxide using conventional processes all previously demonstrated at commercial scale. Water is recycled, no toxic wastes are produced, and no gases are emitted. Heat and power from the geothermal plant are used, meaning no fossil fuels are burned, eliminating carbon emissions from lithium hydroxide processing. On top of being a zero-carbon product, it is expected that the Vulcan flowsheet will be a very low cost LiOH•H2O operation.

Vulcan Project, Germany: Strategic Location, Large License-Holding

Summary

- Most well-explored graben system in the world: large quantities of existing 2D and 3D seismic data to shortcut development timeline.
- Dominant license landholding in lithium-rich brine field - ~800 km^2 of license area.
- Thousands of historical wells and multiple operating geothermal wells in the region provide a wealth of data and readily accessible brine.
- Geothermal brine production socially & environmentally accepted in region with vineyards and communities next to existing operations.
- Lithium hydroxide is a "semi-bulk" commodity. Vulcan's short distance to markets is a major cost advantage as well as carbon advantage.
- Strategic, secure domestic supply for EU OEMs at a time of global trade insecurity.
- Located in Germany just 60km from Stuttgart; the centre of the burgeoning European lithium-ion supply chain.

The **Vulcan Zero Carbon Lithium™ Project** is situated within one of the most well-studied and well-explored graben systems in the world. This means that the lithium-rich brine in the field is very well understood, and large amounts of seismic and geochemical data are readily available, reducing the need for exploration time and spend. Drilling data and existing wells are also available and can be used to shortcut project development. Based on historical data, the Upper Rhine Valley brines have been shown to have grades in the same order of magnitude as typical South American salars, in the hundreds of ppm Li, but with the advantage of readily available heat and power. Commonly, grades are >150 mg/l Li in the Upper Rhine Valley at the depths targeted, with grades sometimes up to 210mg/l Li. The means that the Upper Rhine Valley brine field is one of the only geothermal brines in the world, the Salton Sea in California being the other main example, with both high flow rates and lithium grades within the brine reservoir. The Vulcan project represents a dominant licence landholding within this brine field.

Importantly, as well as being European, the project is just 60km away from Stuttgart, the home of the German auto-industry. It is perfectly placed to reduce the transport footprint of lithium chemicals down to almost negligible amounts, both from a carbon cost and direct financial cost perspective. In addition, existing and recently permitted geothermal operations within the area are testament to the social and environmental acceptance of drilling geothermal wells within the region, in contrast with hard rock mining projects elsewhere in Europe. Indeed, the Insheim geothermal operation, which is the subject of Vulcan's MoU with Pfalzwerke geofuture, is surrounded by vineyards, showing the harmony of such operations with local communities.

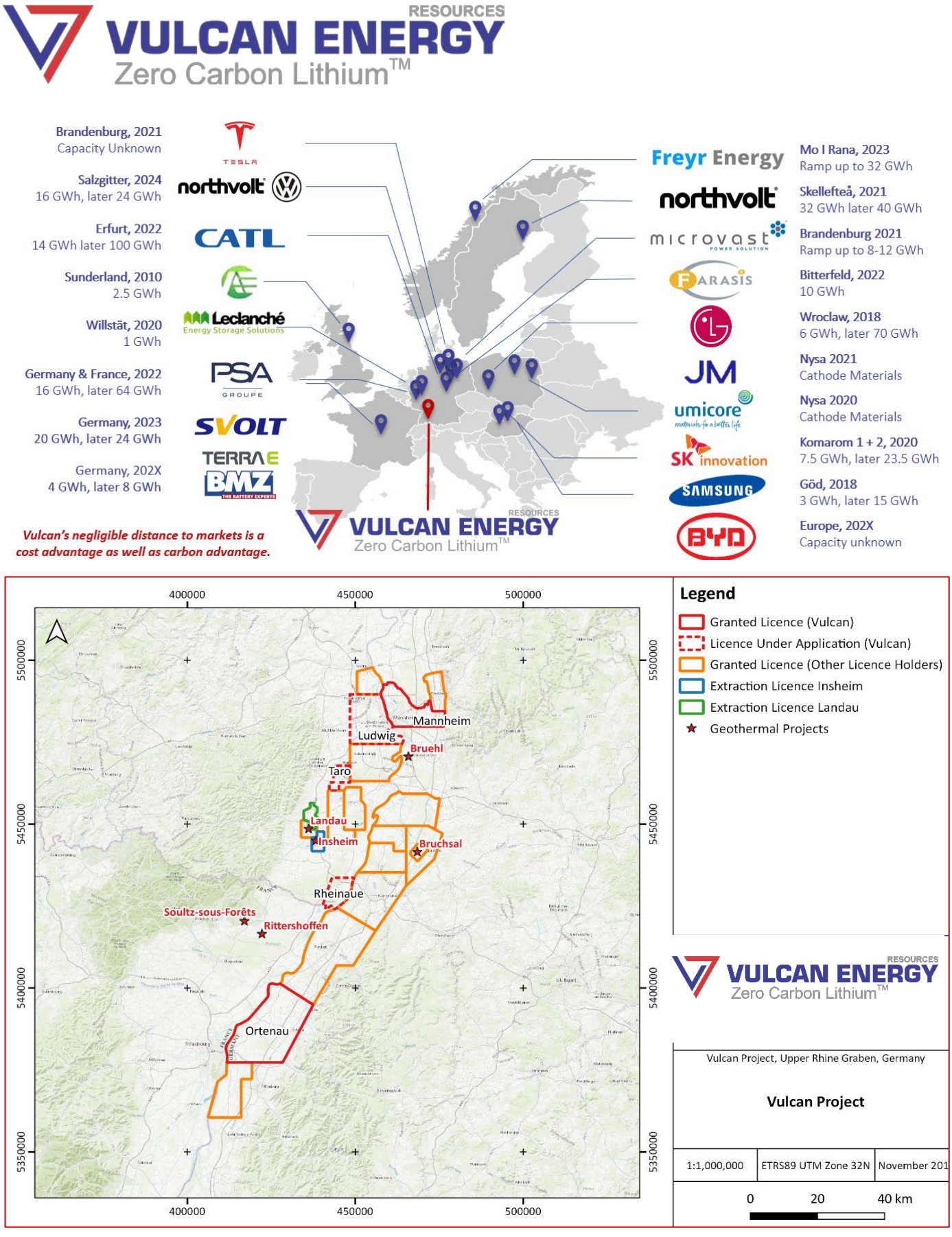

Figure 5: Vulcan Zero Carbon Lithium™ Project Location