

# Vulcan Energy Resources Ltd (VUL)



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## World's First Zero Carbon Lithium Project

**Overview:** Vulcan Energy Resources Ltd (“Vulcan”, “the Company”) is an ASX-listed mineral exploration company focused on exploring and developing battery metals projects in Europe. The Company’s primary asset is the Vulcan Zero Carbon Lithium™ (the Project) a lithium-rich geothermal brine project in the Upper Rhine Valley of Germany. The Project has a Total Indicated and Inferred Mineral Resource of 13.95 Mt of contained Lithium Carbonate Equivalent, at a lithium brine grade of 181 mg/l Li, making it Europe’s largest JORC-compliant lithium resource. The Company’s vision is to produce the world’s first, premium Zero Carbon Lithium™ hydroxide product by 2023. Vulcan is dual listed on the Frankfurt Stock Exchange, trading under the code “6KO”.

EXPLORATION

RESOURCE

RESERVE

**Catalysts:** Vulcan owns Europe’s largest lithium brine resource, in center of the fastest growing lithium market, with potential future upside across its five license areas. Having completed the Maiden Resource estimate and Scoping Study in just five months, fast-track development of the project is underway with targeted completion of the Pre-Feasibility Study (PFS) later this year. Vulcan has signed a Memorandum of Understanding with a German geothermal operator to fast-track production from operational geothermal power plant. As the Company advances the project, securing off-take & financing agreements are major catalysts.

**Hurdles:** Vulcan is at an early stage of its resource development and considerable further technical investigations are required to de-risk the project. Procuring finance remains a key aspect for the implementation of the zero-carbon project in the Upper Rhine Valley and there is no guarantee that funds can be procured at favourable terms. The approval process presents numerous regulatory hurdles at various stages.

**Investment View:** Vulcan offers exposure to demand for lithium in the European Union, the world’s fastest growing market for lithium. We are attracted to the magnitude and quality of the Vulcan Lithium Brine Project, proximity to existing infrastructure and access agreements in place. Procurement of funding and regulatory hurdles are principle risks. Vulcan appears well positioned to play an integral role in the European Union’s plan to establishing a consistent European supply chain of lithium hydroxide. Management has a strong track record of value creation and deep experience of developing geothermal brine projects, thus appears well equipped to advance a project of such magnitude. With a vision to deliver a project with a CO2 footprint of zero, Vulcan targets production of lithium hydroxide by 2023, preceded by a number of high impact value drivers and key milestones. Therefore, Wise-owl initiates coverage to monitor Vulcan’s progress in advancing the project.

1 June 2020

## INITIATING COVERAGE

Price: \$0.36

### DISCLOSURES

REPORT COMMISSIONED BY	VUL
COMPANY OWNS THIS SECURITY	Yes

### CORPORATE SUMMARY

TICKERS	VUL.ASX, 6KO.FRA
INDUSTRY	Metals & Mining
SHARES ON ISSUE	53.67m
OTHER SECURITIES	12.69m Options ex. \$0.285 5.10m Performance Rights Class A-F 9.28m Performance Shares Class A-C
MARKET CAP	\$19.3m
CASH ON HAND	~\$2.5m
ISSUED CAPITAL	\$4.75m

### ASSET OVERVIEW

NAME	Vulcan Lithium Brine Project
LOCATION	Baden-Wuerttemberg, Germany
STATUS	Resource
RESOURCE	13.95 Mt LCE @181 mg/l
RESERVE	-

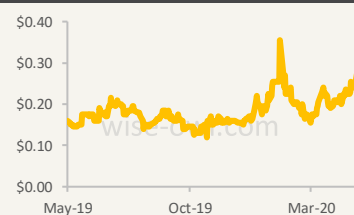
### BOARD OF DIRECTORS

MANAGING DIRECTOR	Francis Wedin
CHAIRMAN	Gavin Rezos
NON EXEC DIRECTOR	Ranya Alkadamani
NON EXEC DIRECTOR	Dr Katharina Gerber
EXEC DIRECTOR	Dr Horst Kreuter

### SHAREHOLDERS

BOARD & MANAGEMENT	28%
RETAIL	64%
INSTITUTIONAL	8%
TOP 20	59%

### SHARE PRICE



2 June 2020

## COMPANY OVERVIEW

Vulcan Energy Resources Ltd is an ASX-listed mineral exploration company focused on exploring and developing battery metals projects in Europe. The Company's primary asset is the Vulcan Zero Carbon Lithium™ Project in the Upper Rhine Valley of Germany. The Project has a Total Inferred Mineral Resource of 13.2 Mt of contained Lithium Carbonate Equivalent, at a lithium brine grade of 181 mg/l Li, making it Europe's largest JORC-compliant lithium resource.

In July 2019, Australian company Kopper Resources Limited signed an agreement to acquire 100% of Vulcan Energy Resources, owner of the Vulcan Lithium Brine Project in South Germany. The Company subsequently changed its name to Vulcan Energy Resources Ltd (ASX:VUL), highlighting the new direction of the company. Vulcan is dual listed on the Frankfurt Stock Exchange, trading under the code "6KO".

LiOH

Vulcan owns Europe's largest JORC-compliant lithium resource.

## BACKGROUND

A global shift away from fossil fuels is leading to a boom in lithium-ion battery applications, ranging from electric vehicles (EVs) to energy storage systems

Electric vehicle systems are projected to become the primary solution for mobility development in the future. The lithium-ion battery is the fastest growing battery system and currently the most suitable energy storage device for powering EVs owing to their attractive properties. There are other technologies available but the lithium component is indispensable for all battery technologies that are currently industrially relevant.



Europe is the world's fastest growing lithium market with virtually zero local supply

In Europe, many countries including Germany have aggressive greenhouse gas emissions and climate targets, and there is now a concerted push towards establishing a globally relevant lithium-ion industry. While Europe is the world's fastest growing lithium market, there is currently virtually zero local supply.

Europe remains heavily reliant on lithium supply from China and South America, and industrial policy ambitions are therefore aimed at establishing a consistent European supply chain. Institutions involved have announced multi-million euro grants to foster lithium-ion battery ventures, secure resources, and build mega-factories.



Image: The lithium-ion battery is currently the most suitable energy storage device for powering EVs

**ASSET OVERVIEW – THE VULCAN ZERO CARBON LITHIUM™ PROJECT**

The Vulcan Zero Carbon Lithium™ Project is situated in the Upper Rhine Valley in southwest Germany, east of the Rhine and in close proximity to Stuttgart, the capital of the federal state of Baden-Württemberg. The area is uniquely endowed with lithium-rich hot brines.

The project comprises of two granted exploration licenses (granted in the first half of 2019), and three license applications covering a total area of approximately 78,600ha. The brine field has been extensively studied due to its geological and geothermal characteristics with readily available seismic and drilling data for resource evaluation. The thermal water in the Upper Rhine Valley has a content of up to 210 mg/l. The only other known geothermal field with similar lithium grades and a similar flow rate is Salton Sea, California.

The Project has a Total Inferred Mineral Resource of 13.2 Mt of contained Lithium Carbonate Equivalent, at a lithium brine grade of 181 mg/l Li, making it Europe’s largest JORC-compliant lithium resource. VUL plans to extract lithium from brine using geothermal power, via a process that generates zero net carbon emissions.

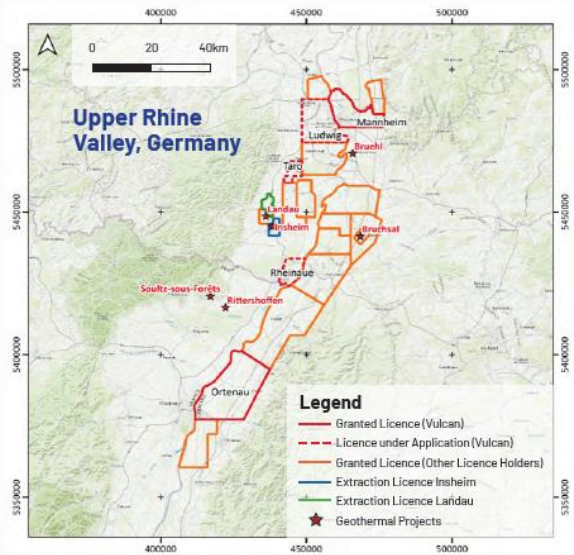


Chart: Location of licenses covering total area of 78,600ha. Source: Vulcan Energy Resources



The Upper Rhine Valley in Germany has the geological conditions that allow Zero Carbon Lithium production

The Vulcan Project will adapt an existing Direct Lithium Extraction (DLE) process to extract lithium from the brine, driven by readily available heat and power used to produce premium, battery quality Zero Carbon Lithium™ hydroxide. DLE is commercially mature and well understood.

A number of agreements are already in place to support Vulcan in advancing the project.

In November 2019, the Company signed a Memorandum of Understanding (MOU) with German geothermal operator Pfalzwerke geofuture GmbH (Pfalzwerke). Pursuant to the MOU, Vulcan will base the pilot plant for lithium production at an operational geothermal power plant. The agreement will likely shorten the exploration and construction process of the geothermal power plant.

In May 2020, Vulcan signed a binding agreement with InnoEnergy to assist Vulcan with securing project funding, driving relationships and obtaining and fast-tracking necessary licenses. InnoEnergy is supported by the European Institute of Innovation and Technology (EIT), a body of the European Union.

Following completion of the Scoping Study in February 2020, Vulcan has now commenced the Pre-Feasibility Study - due for completion later this year – ahead of the Definite Feasibility Study (DFS) in 2021.

**Vulcan Project Licenses**

Name	Area (ha)	Status	Ownership
Ortenau	37,360	Granted	100%
Mannheim	14,427	Granted	100%
Taro	3,268	Application	Earn in to 80%
Ludwig	17,716	Application	Earn in to 80%
Rheinaue	5,848	Application	Earn in to 80%

Table: Vulcan Energy Tenement Schedule  
Source: Vulcan Energy



**MOU with  
German plant  
operator for  
pilot**

2 June 2020

## ECONOMICS

Various cost advantages due to the location as well as geological factors point to the economic viability of Vulcan's lithium project in the Upper Rhine Valley.

Brine lithium production is relatively cost-effective compared to hard rock. The infrastructure for lithium separation requires lower investments and less working capital. While the European Union has only small or complex hard-rock projects, we see strategic merit in Vulcan's proposition.

The exploration of the lithium reserves in the Upper Rhine Valley, on which geological data is available, is already a process involving a low level of complexity based on data that is already available. This will simplify any future mining campaigns.



Compelling economics due to low-capital production process and low environmental footprint

In addition, the location of the Upper Rhine Valley and immediate proximity to commercial customers offers various advantages with respect to costs as well as the environmental footprint. The transportation distance to existing or planned battery factories will allow Vulcan to run a comparably low-capital production process.

Combined with the substantial size and attractive grade of the resource, the project makes a compelling case that should assist Vulcan in procuring offtake and finance arrangement to advance the project.

The scoping study (February 2020) conducted by Vulcan Energy Resources on lithium mining in the Upper Rhine Valley used publicly available price assumption, based on models that forecast and increase in supply, demand and inventories. According to Fastmarkets the spot price for lithium hydroxide (56.5% battery grade) was in the range of USD 10.00/kg to USD 11.50/kg (cif China, Japan, Korea).

Commercial production is forecasted to occur in two stages: Stage 1 will involve a small commercial plant to be built at an existing geothermal operation, a low capex model. Stage 2 will involve construction of Vulcan's own wells and geothermal plants. Vulcan has established a model that forecasts dual revenue potential from the project.

However, raising the required capital remains a key aspect for the implementation of the project, with funds in excess of USD 50 million likely required for Stage 1.

In May 2020, Vulcan signed a binding agreement with European funding body EIT InnoEnergy to assist in securing project funding, including the use of applicable EU, national or regional grant schemes, and liaising with EU project finance and development banks.

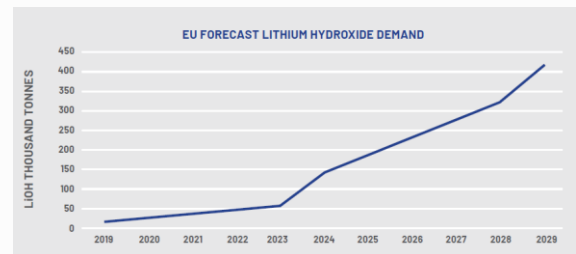


Image: Forecasted lithium hydroxide demand for the EU.  
Source: Vulcan Energy

2 June 2020

**OUTLOOK & INVESTMENT VIEW**

Following completion of the Maiden Resource estimate and Scoping Study in just five months, fast-track development of project is underway, targeting completion of the Pre-Feasibility Study (PFS) later this year. As the Company advances the project, securing off-take & financing agreements are major catalysts.

Vulcan seeks to unlock value from its lithium hydroxide project in South Germany and offers investors exposure to demand for lithium in the European Union, the fastest growing market for lithium. We are attracted to the magnitude and quality of the Vulcan Lithium Brine Project, proximity to existing infrastructure and access agreements in place. However, Vulcan is at an early stage of its resource development and considerable further technical investigations are required to de-risk the project, while procurement of funding and regulatory hurdles are additional risks.

Vulcan appears well positioned to play an integral role in the European Union's plan to establishing a consistent European supply chain of lithium hydroxide. With a vision to deliver a project with a CO2 footprint of zero, Vulcan targets production of lithium hydroxide by 2023, preceded by a number of high impact value drivers and key milestones.



**Wise-owl initiates coverage to monitor project development**

## THE BULLS AND THE BEARS



## THE BULLS SAY

- Vulcan owns Europe's largest JORC-compliant lithium resource, the Vulcan Zero Carbon Lithium™ Project in the Upper Rhine Valley of Germany. The Project has a Total Inferred Mineral Resource of 13.95 Mt of contained Lithium Carbonate Equivalent, at a lithium brine grade of 181 mg/l
- Europe is the fastest growing lithium-ion battery production centre in the world, yet it has zero local supply of lithium hydroxide to feed this demand. Policies are aimed at establishing a sovereign supply chain, thus potentially supporting Vulcan's Project
- Following completion of the Maiden Resource estimate and Scoping Study in just five months, fast-track development of project is underway, targeting completion of the Pre-Feasibility Study (PFS) later this year
- Vulcan has signed a Memorandum of Understanding with a German geothermal operator to fast-track production from existing infrastructure, thus offering a low-cost pathway
- As the Company advances the project securing off-take & financing agreements are major catalysts.



## THE BEARS SAY

- Vulcan is at an early stage of its resource development and considerable further technical investigations are required to de-risk the project
- Procuring finance remains a key aspect for the implementation of the zero-carbon project in the Upper Rhine Valley and there is no guarantee that funds can be procured at favourable terms.
- The approval process presents numerous regulatory hurdles at various stages.
- The scoping study was based on models that forecast and increase in supply, demand and inventories, which is not guaranteed

2 June 2020

## GLOSSARY

<b>Buy</b>	Increasing value of established business operations is likely to yield share price appreciation
<b>Speculative Buy</b>	Increasing value of a new or developing business operation is likely to yield share price appreciation.
<b>Hold</b>	There exists an even balance of risks.
<b>Sell</b>	There is elevated risk of share price depreciation.
<b>Stop</b>	Our recommended, pre determined sell price, to be executed if the share price fails to appreciate
<b>Exploration</b>	An early stage of oil and gas development where assets are either absent of resource estimates 'or contain 'undiscovered', prospective resource estimates according to Society of Petroleum Engineers International (SPE)
<b>Resource</b>	An intermediate stage of oil and gas development characterised by Contingent Resource estimates according to SPE standards. These Resources (2C) are discovered but yet to be deemed commercial.
<b>Reserve</b>	An advanced stage of oil and gas development. Refers to companies that have defined Proved and Probable (2P) Reserves according to SPE standards.

## ARCHIVES

Vulcan Energy Resources Ltd (VUL)

JUN - 20

INITIATING COVERAGE

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## ABOUT US

Wise owl is a global supplier of intelligence, strategic solutions, and expansion capital for emerging companies and investors. Established in 2001, wise owl drives efficient capital allocation towards developing assets.

### Media Partners:



## CONTACT

Wise-owl  
Level 4,  
152 Elizabeth St  
Melbourne, VIC 3000

[www.wise-owl.com](http://www.wise-owl.com)

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