

## Vulcan and BASF partner to reduce CO<sub>2</sub> emissions at world's largest integrated chemical complex

Vulcan Energy (Vulcan, ASX: VUL, FSE: VUL) has entered into a staged agreement with one of the world's largest chemical producers, BASF SE (BASF), to collaborate on the development of a renewable heat project to supply BASF with baseload heat. Furthermore, the agreement incorporates the potential construction of a commercial Lithium Extraction Plant in Ludwigshafen, BASF's global headquarters and home to the largest integrated chemical complex globally.

### Key highlights

- Vulcan and BASF to jointly develop a renewable geothermal heat project to supply BASF's Verbund site Ludwigshafen with affordable baseload heat via a staged agreement
- Approximately 2000–2500 GWh/a of heat generation is targeted from the Ludwigsland Development Project (LDP) from an integrated renewable heat and lithium brine operation, representing a significant amount of the heat demand of BASF
- Ludwigshafen is BASF's global headquarters and employs around 34,000 people. It serves as a key economic and industrial hub within the Upper Rhine Valley and is a significant contributor to the region's growth and development
- Beyond reducing CO<sub>2</sub> emissions of BASF's Verbund site Ludwigshafen operations, the geothermal opportunity extends to the potential for district heating to supply households in nearby cities. Vulcan and BASF are collaborating with regional energy providers – Technische Werke Ludwigshafen and Stadtwerke Frankenthal – to evaluate the feasibility of energy supply to the two cities, representing a major step toward sustainable, low-emission heating for local communities
- Vulcan and BASF plan to evaluate the possible construction and operation of a Lithium Extraction Plant on BASF premises within the Verbund site Ludwigshafen to produce lithium salts concentrate following energy production from the hot brine. This would then be transported to Vulcan's Central Lithium Plant to produce battery grade lithium hydroxide for Europe's electric vehicle (EV) market
- Vulcan will be the active project developer and integrated operator across the heat and lithium production facilities and would retain 100% ownership of the lithium production
- BASF will jointly fund the geothermal exploration as the first phase of the project. Assuming the first phases of the project, including seismic campaigns, exploratory well and doublet drilling are successful, and the partners decide to proceed with the project, BASF will be the heat offtaker for 100% of the geothermal heat
- Moving forward, Vulcan will seek to replicate this model across the Upper Rhine Valley, building affordable renewable heating production to decarbonise European industry and the public heating sector. The deep geothermal wells can also then be utilised to produce lithium chloride from the same brine for EV batteries.

**Vulcan's Managing Director and CEO, Cris Moreno**, stated: "Partnering with Germany's largest chemical company, BASF, to provide renewable geothermal heat at their Ludwigshafen headquarters is an excellent demonstration of Vulcan Energy's dual commitment to decarbonise energy and lithium production via our integrated business approach."

*“This collaboration highlights how geothermal renewable energy and carbon neutral lithium production can work harmoniously together, delivering mutual benefits for industry and communities.*

*“This agreement represents a strategic partnership between BASF and Vulcan, setting the course and providing a blueprint for advancing long term geothermal renewable energy production across the Upper Rhine Valley, while delivering battery- grade lithium product to drive Europe’s transition to green electromobility.”*

**BASF SE President of European Verbund Sites, Uwe Liebelt**, stated: *“We want to supply our Ludwigshafen site with C-free steam in the future. In addition to harnessing the waste heat from our production facilities, where possible, we want to consider renewable heat sources from geothermal structures.*

*“In Vulcan, we have a partner who has the necessary technological expertise, in exploiting geothermal heat to plan and implement such a complex project. Deep geothermal energy not only offers enormous potential for our own energy transformation.*

*“If the project is successful, it will set an excellent example for how we can shape the energy transition in the Rhine-Necker metropolitan region through close cooperation between politicians, energy suppliers, and the industrial sector, creating benefits for all parties involved.”*

### **Material terms of the agreement (ASX Listing Rule 3/Section 4.15 of Guidance Note 8)**

**Purpose:** Based on the commitment to deliver baseload heat following the successful development of the LDP (within Vulcan’s brine, heat and lithium exploration licenses of Ludwig and Therese, and on the margins of the Flaggenturm and Mannheim licences), the parties envisage three (3) stages:

1. Seismic campaigns (binding commitment): The parties intend to develop the sub-surface via:
  - a. 2D seismic (precursor) survey in the 2024/2025 European Winter to delineate exact locations for the 3D seismic survey. This is to be managed, executed and evaluated by Vulcan with support of BASF; and
  - b. 3D seismic survey expected in the 2025/2026 European Winter to detail the well site locations based on a positive public funding decision following interpretation and evaluation of the 2D data. It is intended that the 3D Seismic Survey will be funded as a Joint Project (“Verbundvorhaben”) by the German Government.

The costs of the 2D and 3D seismic surveys are to be borne evenly (BASF up to €5m).

2. Exploration well (joint decision): Subject to successful seismic campaigns, identification of suitable drilling targets and public funding being obtained, the parties intend to drill, log and test one well<sup>1</sup> with further details to be agreed within a co-operation agreement.
3. Doublet drilling and construction (joint decision): Subject to the first well producing sufficient quantities of hot brine, lithium and geothermal energy, the parties will decide whether to drill an estimated 12 new production and 12 re-injection wells on an estimated 5 new well sites. Each well cluster would contain a heat transfer station connected to Vulcan’s Lithium Extraction Plant on BASF premises within the

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<sup>1</sup> The target is to receive government funding for up to 50% of the exploration drilling and well site, logging and testing.

Ludwigshafen complex and BASF heating station via a new pipeline system, with BASF to act as facilitator.

**Project financing:** Subject to successful continuation through each stage (as agreed by both parties), the parties will move forward based on:

- a. BASF will carry 50% of the seismic cost capped at €5m, excluding any receipt of public funding of the 3D seismic survey;
- b. BASF and Vulcan intend to be the founding partners of a Joint Venture Cooperation (JVC) to plan and operate all further stages using their best endeavors to negotiate and agree on an economic agreement setting forth, inter alia, the procedure for carrying the cost of an exploration well, to layout interconnecting pipe and powerlines (ICPP) and to construct the heat plants;
- c. The Parties will negotiate heat offtake terms, for BASF to receive the heat from the LDP;
- d. Project financial metrics are optimised at each stage to drive the lowest possible cost;
- e. BASF evaluates the provision to provide land space to host a 24ktpa LCE equivalent lithium extraction plant on its premises to optimise overall field development in terms of OPEX and CAPEX<sup>2</sup>; and
- f. BASF will support Vulcan with project permitting and acceptance by citizens, stakeholders, and municipalities within the area.

**Term:** The agreement continues until the earlier of five years, execution of formal written agreements for the LDP or termination. The agreement can be terminated in the event either party decides not to proceed to the following stage or upon 30 days' notice. No repayment obligation occurs unless Vulcan terminates without a material breach by BASF.

**Other:** The agreement is otherwise subject to terms and conditions standard for such a document.

<ENDS>

#### For and on behalf of the Board

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<sup>2</sup> Subject to obtaining a minimum brine flowrate to start the LEP.

## About BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. Around 112,000 employees in the BASF Group contribute to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio comprises six segments: Chemicals, Materials, Industrial Solutions, Surface technologies, Nutritional care, and Agricultural Solutions. BASF generated global sales of around €68.9 billion in 2023. BASF shares are traded on the stock exchange (BAS) and as an American Depositary Receipts (BASFY) in the United States. More information can be found at [www.basf.com](http://www.basf.com).

## About Vulcan Energy

Vulcan Energy (ASX: VUL, FSE: VUL) is building the world's first carbon neutral, integrated lithium and renewable energy business to decarbonise battery production. Vulcan's Lionheart Project, located in the Upper Rhine Valley Brine Field bordering Germany and France, is the largest lithium and geothermal resource in Europe and a tier-one lithium project globally. Harnessing natural heat to produce lithium from sub-surface brines and to power conversion to battery grade material, and using its in-house industry-leading technology VULSORB®, Vulcan is building a local, low-cost source of sustainable lithium for European electric vehicle batteries. For more information, please go to <https://v-er.eu/>

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