

WHY MAKERS OF ELECTRIC VEHICLES COULD SOON BE THANKING SIMBOL MINING

One consequence of persuading motorists to ditch the combustion engine in favour of a battery pack is that vehicle manufacturers will need to find a lot of lithium, which is neither cheap nor readily available. Texas-based start-up Simbol Mining could be about to change all this, with a little help from a geothermal developer.

By Denise Heckbert

As automakers, investors and governments funnel cash into electric vehicle technology it is clear that demand for lithium-ion batteries will escalate. While this is good news for the handful of companies that control the supply of the lithium carbonate that makes these batteries possible, it raises important questions over where it will come from and at what cost.

Naysayers argue that a move to battery-powered vehicles will simply replace dependence on Middle Eastern oil with dependence on Chinese and Bolivian lithium. However, there may be an alternative, a home-grown option that would solve the potential lithium supply problem.

Thanks to a game-changing lithium extraction technique developed at a Department of Energy lab, a small Texas-based start-up says it can extract lithium from the brine produced at geothermal power plants in the US for a fraction of the cost and time it takes using traditional methods.

In recent months Simbol Mining has quietly moved from the lab to the field and is now ready to piggyback on its first geothermal project.

Under a deal signed with Char, a US geothermal project developer, Simbol has the option to extract lithium from brine produced at the 50MW Hudson Ranch project, which it says could eventually yield 15,000 tonnes of lithium annually, equivalent to about 12% of global lithium production in 2008.

The company started life back in 2006 when Luka Erceg and Scott Conley met in Houston, at Rice University's business school, where Erceg had registered after managing power project investments for El Paso Merchant Energy. For his part, Conley was a chemical engineer from Georgia Tech. The two started talking about geothermal power and lithium extraction.

"The process was not entirely new but had not been done with much success," Erceg said. "We wondered, why doesn't this happen? It should be done and can be done." Their first move was to enlist as co-founders Doctors William Boucier, Carol Bruton and Brian Viani from the DOE's Lawrence Livermore National Laboratory.

The three geochemists had done work on extracting silica from brine produced at geothermal projects, and Bruton in particular had made a study of areas with a strong geothermal flow rate and a high concentration of lithium. Simbol used the doctors' expertise to refine their lithium extraction process and identified the Salton Sea region in California as an area with strong geothermal resources and significant lithium deposits.

The company then licensed the geochemists' silica extraction technology from Lawrence Livermore and raised \$6.7m in July 2008 to fund its initial development work. Investors included industry names such as Firelake Capital and Mohr Davidow Ventures along with the "Grand Order of Successful Entrepreneurs" or GOOSE, that includes co-founder of Compaq Computer Rod Canon, founder of Vanguard Ventures Jack M Gill and Michael Holthouse who successfully sold his computer network services company in 1997.

Simbol was ready to start work in earnest; but 2008 was not to be the easiest year to dive into lithium production. Credit Suisse estimates that the economic downturn reduced global demand for lithium in 2009 by roughly 20%. That has had an impact on pricing – one of the three major lithium producers has been forced to drop its future contract prices by 20%.

Even in good times the lithium sector can be a tough one to crack. Production is dominated by the 'Lithium Three' – Rockwood Holdings, Sociedad Quimica y Minera de Chile and FMC, which together account for more than 60% of global production, with Chinese producers making up the remainder. The Lithium Three can essentially dictate prices by manipulating their production levels.

Why try to get into such a tightly controlled market? Firstly, there is the expected boom in demand for lithium. Credit Suisse predicts demand will jump from 82,000 tonnes in 2008 to 200,737 tonnes in 2020 as electric vehicles become increasingly popular – accounting for roughly 66% of the increased demand – while the traditional markets of pharmaceuticals, energy storage and industrial applications continue to expand.

Mostly though, Simbol simply believes that it can produce lithium faster, more cheaply and more cleanly than other developers and so decided to elbow its way into the sector.

Broadly speaking, there are two main ways to extract lithium: the first is ore mining, which is expensive as it requires significant processing and energy; the second is extraction from brine which is cheaper but takes longer. The latter process involves the creation of ponds using brine from just below the earth's surface. The sun's heat slowly evaporates the water, leaving behind lithium chloride that can be transformed into lithium carbonate. This process requires virtually no energy but takes roughly 18 months and leaves behind what Erceg calls "salt mountains".

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In stark contrast, Erceg says Simbol can extract lithium from geothermal brine in roughly 90 minutes. The idea is that a geothermal power plant extracts the brine and uses it to generate electricity, then, before re-injecting the brine as normal, it is sent via a pipe system to Simbol's plant where 100% of the lithium is extracted before being returned.

Erceg is keeping details of the technology close to his chest, but he did say that the extreme heat of the brine water enables the process to work quickly, and compared with the brine pond method, the lithium chloride is in a state that is much easier to convert into lithium carbonate. Simbol may eventually extract manganese and zinc as part of this process, which also includes a silica management component to keep the pipe-clogging mineral at bay.

All this can be done relatively inexpensively as Simbol's only cost, aside from its processing plant, is the rent it pays the geothermal producer for borrowing the brine, along with possible royalties owed to the land owner. Simbol's projects do not require additional permits so long as the geothermal project owner's lease includes the lithium rights.

Erceg estimates Simbol could produce as much as 15,000 tonnes per year at a 50MW project and could continue to do so indefinitely. "There's a lot of lithium down there. Geothermal plants will be built and rebuilt many times before the lithium runs out," he said.

Another string in Simbol's bow is that it plans to produce the lithium in the US. Opponents of the US government's tax credits for electric vehicles, its generous support for battery companies such as A123 Systems, and its insistence that the 'Big Three' automakers produce more electric cars, argue that the government is saving America from a dependence on Middle Eastern and Venezuelan oil only to hook the nation on Chilean, Chinese and Bolivian lithium.

Only Rockwood has an operating lithium project in the US. It uses this



What lies beneath: Geochemists say Simbol should explore the area around Salton Sea, California's largest lake, as it has good geothermal resources and plenty of lithium.

Source: Aquaforma

largely as back-up capacity for its less expensive Chilean operations. A low-cost, domestic lithium source could silence some critics of electric vehicles in the US.

At least one geothermal developer is ready to take a chance on Simbol's technology thanks largely to the work the company has done over the past year to prove that its technology works. Erceg said the company has tested brines from a number of geothermal developers at the lab and small-scale stage.

"We've done it at the beaker level," Erceg said. "We've done it at the bench level. We've done it at an eight-by-16 level - about the size of two cubicles - and now we're doing it at the 1,000 square foot level." Simbol recently completed construction of a 1,000 square foot pilot plant and has started processing geothermal brines there using the equipment it plans to use in larger-scale projects. All this has been funded with the \$6.7m Series A that Simbol raised in the summer of 2008.

Erceg said the company is gearing up to demonstrate the technology

onsite at a geothermal project, and plans to kick off a second financing round soon but that the company is not looking to raise much. "We are not going to need \$500m for a project," Erceg said. "It'll be a fraction of the cost of a biofuels project. We could do everything on an all-equity basis and still provide a return."

Although Erceg would not be specific, Simbol is likely to build its first demonstration project at Char's 50MW Hudson Ranch project in California. The two companies have worked together for some time, but Erceg has stated that Simbol will continue to work with other developers as well. Char expects to commission the 50MW project in 2011 and aims to build four other plants of the same size at the site. Should Simbol install its technology at each project, it could produce 75,000 tonnes of lithium annually, nearly half of Credit Suisse's 2020 demand forecast.

"We're not trying to take over the world here," Erceg said. "And a lot depends on electric vehicle demand but we are ready to produce our 'green lithium'." ■

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