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## Empire Rock investigates lithium in Alberta gas fields

**ALTERNATIVE LITHIUM SOURCE** | Tapping into briny Paleozoic reef complexes



A satellite image of SemGroup’s Kabob South gas plant in Fox Creek, Alberta, which includes water-handling ponds, where waste brine is treated before reinjection into the subsurface. EMPIRE ROCK MINERALS

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**L**isa Chapman hopes lithium production in the oil patch will help diversify Alberta’s economy.

The president and CEO of **Empire Rock Minerals** (TSXV: EPR) is steering the junior

explorer into the lithium space and acquiring a 70% stake in the early stage Fox Creek project in Alberta.

Fox Creek won’t use conventional evaporation ponds to extract and produce lithium carbonate — it would use lithium-enriched brines made as a by-product of petroleum from oil and gas wells.

“There are not a lot of people out there who know about Alberta formation water brines,” says APEX Geoscience president Michael Dufresne, who serves as an independent consultant to Empire Rock. “There are many Paleozoic reef complexes in the province that contain vast amounts of [brine] saline formation waters as aquifers with petroleum products.

The brines are four to five times the salinity of ocean water and are super saturated with sodium, calcium, potassium and magnesium, along with many other elements.”

Currently the petroleum industry treats the brine or formation waters that it extracts as a by-product of pumping oil and/or gas, and injects it back into the ground, which can be time-consuming and expensive. For example, if a petroleum company has 40 to 50 wells, it could treat and reinject as much as 15,000 cubic metres of brine a day. It can cost anywhere from \$1 to \$2 per barrel of oil to treat the brines.

## “IT’S A TECHNOLOGY PLAY, AND IT COULD BE ONE OR TWO YEARS, OR IT COULD BE FIVE TO TEN YEARS — BUT THERE’S A TON OF WORK GOING ON.”

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PRESIDENT, APEX GEOSCIENCE

“A big cost of producing petroleum is treating these brines,” Dufresne says in an interview. “It’s a cost centre to the oil and gas guys, and if we could take their wastewater and clean up the water while producing lithium and other products, we could help them, and make some money ... oil and gas companies will be a lot more receptive than in 2011, because they have a lot of cost constraints right now. Because of the oil and gas industry much of the required infrastructure — such as wells, pipelines, water treatment plants, etc. — are already in place.”

Dufresne concedes that the technology is “not there yet” and is at least several years away from being commercialized, but notes that companies such as **Pure Energy Minerals** (TSXV: PE; US-OTC: HMGLF) and **Lithium X** (TSXV: LIX) are analyzing potential extractive processes with ion adsorption and other techniques to precipitate the salt from the brines.

“It’s a technology play, and it could be one or two years, or it could be five to 10 years — but there’s a ton of work going on,” Dufresne says. “The whole technology is changing very, very fast, and it’s a much better time now than five years ago, in terms of advancing Alberta as a brine lithium play.”

Pure Energy Minerals is working with global technology providers Tenova Bateman and Posco, which have developed lithium-extraction technologies that outperform conventional processes. It notes that Tenova Bateman bench-tested its LiSX technology in February 2015, and is conducting prefeasibility-level design

work on Pure Energy’s Clayton Valley South lithium brine project, near Silver Peak in Nevada. It also notes that brine samples from Clayton Valley South have been shipped to Posco’s research facility and pilot plant in Korea for process testing.

Empire Rock isn’t the only company interested in Alberta’s saline formation water aquifers. **Canadian International Minerals** (TSXV: CIN) has submitted seven applications for metallic and industrial mineral permits for its Leduc property, which spans 645.1 sq. km.

Both Dufresne and Chapman say the timing couldn’t be better for the Albertan economy,

noted that several government reports during the mid-1990s showed that lithium values of up to 140 milligrams per litre of lithium in west-central Alberta saline formation waters of the Beaverhill Lake and Woodbend groups, but minimal data was released publicly.

Empire Rock’s Fox Creek ground covers parts of producing oil and gas fields hosted in a carbonate reef complex, with a saline formation water aquifer called the “Beaverhill Lake brine.” The brine contains elevated and potentially economic concentrations of lithium, potassium, boron, bromine, calcium, magnesium and sodium.

Tests of the Beaverhill Lake brine by Hazen Research has shown that up to 98% of the lithium, 88% of the bromine, 100% of the boron and 40% of the potassium can be extracted, Empire Rock says.

Under the deal announced on April 12, Empire Rock will acquire a 70% interest in Fox Creek, and receive 100% of two private companies in Alberta: Lithium Power and Dominica Energy Minerals. The vendors will receive \$100,000 and 1.2 million of Empire’s common shares.

The remaining 30% interest in Fox Creek will be held by Blizzard Finance Corp., together with a 2.2% royalty on gross revenue. Once Empire spends the first \$2 million on developing Fox Creek, the partners will share the costs on a 70–30 basis.

Fox Creek and related property interests are made up of 42 industrial and metallic mineral permits, and cover 3,550 sq. km. “This is a large property, it’s massive, so we’re excited about it,” Chapman says. “We’re looking forward to rolling up our sleeves and getting to work.”

News of its Fox Creek acquisition on April 12 sent the junior’s shares up 69% to 13.5¢.

At press time, Empire Rock traded at 26.5¢ per share.

In addition to Fox Creek, Empire Rock owns the Buck Lake platinum-palladium-nickel project, 100 km northwest of Thunder Bay and 25 km west of **North American Palladium’s** (TSX: PDL; US-OTC: PALDF) Lac des Îles palladium mine.

It also owns an interest in the Graphite West hydrothermal graphite exploration target, northwest of Hearst, Ont., near **Zenyatta Ventures’** (TSXV: ZEN) Albany graphite project, and the Gwyn Lake gold property in the Beardmore-Geraldton gold belt near Thunder Bay. TNM

which has been devastated by low oil prices and massive layoffs.

“What’s happened in Alberta’s oil and gas industry has been heart-wrenching,” says Chapman, who was born in the province. “These lithium brines could be a wonderful opportunity to create an industry in that province that will not only create jobs, but develop new sources of green energy, like lithium.”

Dufresne adds that Alberta’s new government led by the New Democratic Party is talking a great deal about diversification and job creation. “They need some good news on the green front, and converting old petroleum reservoirs and formation waters into a potential lithium product could be a win for them.”

If Empire Rock can get in front of the right people in government, he notes, it will get some support, and Alberta Innovates Technology Futures (formerly the Alberta Research Council) could be an ally. “The Alberta government and Alberta Innovates inject a lot of money into research and development,” Dufresne says. That’s one of the ways the oilsands were developed, and there’s money available.”

Indeed, the Alberta Geological Survey (AGS) was among the first to identify anomalous lithium in these fluids more than two decades ago. In a 2013 study, the AGS noted that economic concentrations of lithium are known to form in either lithium pegmatite, or in high-lithium brine and clay. The study reported that a few of the world’s oil-field waters also have medium to high lithium content, and