

## Alberta's next bonanza?

### Promising Duvernay formation ignites firestorm in oil patch

BY DAVE COOPER, EDMONTON JOURNAL NOVEMBER 5, 2011

Klondike prospectors panning for gold in Yukon streams a century ago always dreamed of finding the "motherlode."

In Alberta, the source for most of our oil gushers has been known for decades, a very deep formation of shale rock formed 400 million years ago during the Devonian era when the province was an inland sea.

Named the Duvernay by geologists, it was known and ignored - until now.

Thanks to a new technology called multistage hydraulic fracking, this potentially huge deposit has ignited a firestorm throughout the oilpatch, with companies bidding hundreds of millions of dollars each for the right to drill into it.

This land rush has already yielded the province more than \$3.2 billion for hundreds of thousands of hectares, and the year isn't over yet. It is likely to set a record, and may even largely erase this year's provincial deficit.

"A lot of very smart industry players have demonstrated a belief in the Duvernay. There are lots of geological signs that it is sizable and will be a major focus for capital spending over the next decade," said Don Rawson, a managing director of equity research at AltaCorp Capital in Calgary.

"But the reality is until you start drilling you aren't going to know where the sweet spots are. There will be winners and losers for sure, because some companies may have vastly overpaid for land, and others may have got the bargain of the year."

His firm estimates the oil industry will have to drill between 1,000 and 1,500 wells into the Duvernay "just to validate three-quarters of the higher-priced lands over the next few years. And that doesn't include the development wells," he adds.

Why the large multinational oil firms never thought to use multistage fracking on the Duvernay is a mystery; it is being used widely in the big natural gas plays of the Horn River basin in northeastern B.C. and the major U.S. shale gas plays.

"But the smaller companies got this play going," said Gary Leach, executive director of the Small Explorers and Producers Association of Canada (SEPAC).

"Duvernay has really reminded people that Alberta still has some big surprises and big potential. And that is a big part of the excitement."

Three firms - Trilogy Energy, Celtic Exploration and Yoho Resources - pooled their resources to drill the first two wells last year, and reported good production of natural gas that was rich in liquids - the methanes, pentanes and butanes as well as very light oil - which were coming up at the rate of 75 barrels for every million cubic feet of gas.

These liquids command a price equal to or better than oil, and for a natural gas industry struggling with very low prices, it was potentially a godsend.

Companies were soon paying \$35,000 per hectare for land with drilling rights to "the basement" - the lowest oil-bearing formation above the granite bedrock - in the hot areas north of Edson and near Fox Creek.

"Land sales (sealed bid auctions) are the most competitive part of the industry," said Leach.

"With a land position, a company can then look for partners to share the risk. This is how you can really build a company, by being adept at acquiring a land position before the prices go up - and the prices for Duvernay have really gone up," he said.

One mid-sized firm with a good land position in Duvernay - Daylight Energy - was purchased for \$2.2 billion last month by a large Chinese oil company, partly because of its great land holdings.

Some firms have been sitting on Duvernay land for years, purchased originally for the oil-bearing zones above the Duvernay.

"Probably the best exposure for Duvernay has been picked over by now, but some of the small companies will be packaging up some of their land rights now and selling them off," said Leach.

Oil and gas giants like Encana, Shell, Talisman and ConocoPhillips were into the Duvernay on the heels of the small firms.

Mike Graham, an Encana vicepresident, called the Duvernay "one of the hottest new plays" during a webcast of the firm's third-quarter financial report in late October.

"We plan to spud (begin) three wells during the fourth quarter. We hold about 365,000 net acres in what we believe to be some of the best liquid-rich acreage in the play," he said.

"It is still early days but we are very excited about the potential of the Duvernay shales to add significant liquids volume to the production profile of the Canadian division. And we expect to be more active in this play next year."

As Canada's largest natural gas producer, Encana has been looking for ways to produce more highvalue products like liquids and very light oils to balance out its portfolio, which is heavy in lower-value natural gas.

But while the Duvernay may be a rich resource, it is not cheap to produce.

Fracking is very expensive, usually responsible for two-thirds or more of the \$10-million to \$15-million cost at each well.

And the wells are deep - 3,000 metres down and then at least another 2,000 metres running horizontally through the 100-metre thick deposit.

And this, says Rawson, is going to make it harder for the smaller firms to compete with the industry giants as time goes on.

"There will be a merger and acquisition cycle to this, it is part of a bigger trend that has been going on for the past five to 10 years as resource plays get more and more capital intensive, and technologically intensive, in Western Canada," said Rawson.

"I cover the \$500-million cap companies (firms worth half a billion dollars) and they might be spending \$150 million on a capital (spending) program. One of these wells might be 10 per cent of their capital program, which may work out well, but may also be a total disaster, so the risk-reward is a tricky thing."

In other words, companies need to drill a lot of wells to reduce their risks.

"Bigger companies have to take the lead, and consolidation will occur with the smaller entities, as well as joint ventures and new capital coming into the market - such as with Daylight (and its purchase by state-backed Sinopec International Petroleum Exploration and Production Corp.). I think we'll see more of those deals."

The high-tech and high-cost Duvernay is the latest example of a trend which has been occurring in the Western Canadian Sedimentary Basin.

After 60 years of drilling, there really aren't too many surprises left for exploring firms, says Rawson.

"There isn't much exploring these days, everybody is really focused on resource plays that have hundreds of development locations. They aren't single pools but more pervasive developments that require scale, and that goes against the juniors' advantage, that nimbleness to make a discovery," he said.

"That's what the market is looking for."

While the Duvernay would yield nothing to drillers before the arrival of fracking, it provided plenty of oil to the wildcat firms of the 1950s and 1960s.

Duvernay petroleum percolated up over the eons, collecting in sandstones and in old reefs like the Golden Spike, Leduc and Redwater - formations which kicked off the oil boom.

John Faltison, a research petroleum engineer with Alberta Innovates, says the Duvernay is "tight" in the same way as other better-known gas fields - think Horn River in B.C, and the Haynesville, Barnett and Marcellus plays in the U.S. - which are now producing huge volumes of natural gas at prices that have slashed prices for consumers.

When a drill bores into the Duvernay, no oil and gas erupts.

"It has micro-porosity. You might Fort Nelson get some ooze into the borehole, but there is no permeability, no connections, and no way for liquid to move through it," said Faltison.

"The Duvernay was mostly organic matter - mostly plant matter Fort - St. that John was laid down over millions of years in a calm inland sea at levels deep enough - probably Duvernay 100 Formation metres - that there was no oxygen. So things did not decay, but accumulated."

The shale (clay material) is the source rock, but this organic material contained in it will Alberta percolate up. The carbonate reefs and sandstone, which formed later, did not originally have oil. But Fort they McMurray were like a sponge and collected the rising organic material.

"The Duvernay material will eventually reach the surface if not trapped. So over time much of it has already seeped away," said Faltison.

The Athabasca oilsands are an example of this. The light components of the petroleum seeped into the atmosphere over the years, leaving the heavy oil in the sands.

Faltison, who has supervised oilfield fracking, said up to a million barrels of "slick water" - with chemicals added to reduce friction and biocide to kill bacteria which produce dangerous sulphides - are pumped down the well, and immense pressure is exerted at various points along the drill bore where valves can be opened and closed.

The pressure cracks the surrounding brittle rock the way a rock can shatter a sheet of pond ice, and sand particles flow into the cracks to keep them open when the pressure is shut off.

The cracks provide a route for the gas and liquids to escape from the shale.

"Fracking is opening up reservoirs all over the place. The Pembina Cardium (near Drayton Valley) is the biggest in Canada, with an estimated nine billion barrels of oil in

place. It is a giant, but with thin sands, and the porosity is largely plugged with shales and carbonates," said Faltison.

After decades of pumping at thousands of well sites, about one billion barrels has been recovered.

"Fracking technology can transform a field like Pembina, and many others," he added.

"There are all kinds of reservoirs (including the huge Bakken deposit which stretches from southern Alberta through Saskatchewan and into North Dakota) that couldn't produce at economic rates that can do so now."

While the Athabasca oilsands are rapidly growing, Alberta's conventional oil production has been in slow decline since the 1970s.

Fracking could slow this decline. And the Duvernay could be just the latest success story for this technology.

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## THE DUVERNAY FORMATION

Formed about 400 million years ago when Alberta was an inland sea, organic material and clays became a carbon-rich shale layer. It sits atop granite rock which makes up the Rockies and Canadian Shield.

Fox Creek/Edson area: This is believed to be the "sweet spot" for the Duvernay, although virtually nothing is known of the complete formation. Here wells are sunk 3,000 metres into the formation, and then travel another 2,000 metres horizontally. This horizontal stretch is fractured or "fracked" in perhaps a dozen spots to open up the non-porous shale rock.

Foothills Deep Gas: Pockets of natural gas in this region are the target of 6,000metre-deep vertical wells.

Athabasca Oilsands: Some of the Duvernay petroleum eventually moved to the great sand deposits. The lightest portions - the gas and light oil - dissipated into the atmosphere over the eons, while the heavy components remained in the sand deposits, some which are mined from the surface.

Oil traps, Leduc/Redwater formations: Large reefs formed over time in the inland sea. And as the petroleum of the Duvernay formation slowly rose, some of it became trapped in these reef formations, which today are major oil reservoirs. This is why the Duvernay is called the "source rock" for much of Alberta's petroleum.

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