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Cardium Expected To Be A Bright Spot In 2010

By Paul Wells

Alberta's Cardium resource play is expected to be a bright light for the province's struggling oil and gas industry in 2010, as oil-directed exploitation through horizontal drilling and multi-stage fracturing is reinvigorating the trend and has some analysts believing it could eventually rival Saskatchewan's Bakken formation.

The area could see 200 or more horizontal wells drilled this year.

"Based on the enormous resource potential here, exceptional well control throughout the area, consistently positive drilling results to date, and strong economics, we believe the Cardium trend has the potential to rival other light oil resource trends, including the Bakken and Lower Shaunavon trends in Saskatchewan," said **Kim Page**, an analyst with Toronto-based **Wellington West Capital Markets Inc.**

"The combination of the aerial extent of the trend, extensive well control, known hydrocarbon rich, water-free system, and very encouraging initial test rates from a number of operators on a growing number of wells all point towards huge potential."

In a report, Wellington West said that while still early in the productive history of the majority of Cardium horizontal multi-stage wells drilled, it appears that these wells have initial production (IP) rates in the 200 bbls of oil equivalent per day to 250 BOE per day range. They then decline to the 100 BOE per day range within six months, then production drops further but stabilizes in the 70 BOE per day to 80 BOE per day range within a year.

Page says the economics of Cardium wells appear robust at current oil prices - Wellington West has calculated they can generate a 50% profit at \$65 (U.S.) per bbl oil prices.

"Based on our economic runs, Cardium horizontal wells have the potential to rival Bakken wells in terms of expected rates of return, and reserve potential both on a per well basis, and ultimate potential for resource development in and around existing fields," Page said.

The investment community is certainly taking note as many companies with good exposure to the play have seen their stock price fare well in recent weeks.

"If you plot the last two weeks of producers' performance, you'll see that the Cardium producers have heavily outperformed their peers in market performance," said **Cristina Lopez**, an analyst with **Macquarie Capital Markets Canada**.

"Absolutely, this has been a play that has garnered a lot of attention and will continue to do so."

Companies that are active and/or hold large acreage positions within and/or surrounding the Cardium field include: **ARC Energy Trust**, **Bonterra Oil & Gas Ltd.**, **Enerplus Resources Fund**, **NAL Oil & Gas Trust**, **Midway Energy Ltd.**, **Penn West Energy Trust**, **West Energy Ltd.**, **Daylight Resources Trust**, **Angle Energy Inc.**, **Result Energy Inc.** and **Bellatrix Exploration Ltd.**

Other early entrants into the play such as **Berens Energy Ltd.**, **Nexstar Energy Ltd.** and **Triaxon Resources Ltd.** have recently been acquired by other companies looking to increase their position in the emerging Cardium play.

In a research paper published last month, Maquarie credited NAL with advancing the Cardium light oil play in Alberta after it witnessed the success multi-stage horizontal drilling had in the Bakken and opted to try the same technique on some of its Cardium acreage.

"Although the use of multi-stage horizontal drilling was believed to be amenable to other areas, NAL Oil &

Gas Trust was the first to experiment with the technology in the Cardium (outside of a waterflood) during the fourth quarter of 2008," the report said.

Following on NAL's success at Garrington, Macquarie says development of the Cardium has grown steadily in the past six months and is "expected to explode in 2010" with an estimated 200-plus horizontal multi-stage frac wells targeting the Cardium, up from an estimated 35 wells in 2009.

The Macquarie report said notable players that have indicated Cardium oil programs in 2010 include Penn West at around 30 wells, ARC at 32 wells with approximately half completed with multi-stage fracs, NAL at 20 to 25 wells, Bonterra at approximately 25 wells, **Bonavista Energy Trust** at around 20 wells, Daylight at between 15 and 20 wells, West Energy at 24 wells, Bellatrix plans five to 10 wells, Angle up to eight wells, **Vermilion Energy Trust** six wells and **Baytex Energy Trust** five wells.

"(As of Dec. 15) there are 55 wells licensed in the Cardium and we expect these licenses to pick up materially in the first quarter of 2010 as capital budgets are established and additional test results are released," Macquarie said in its report.

The technological gem that is the horizontal drilling, multi-stage fracturing duo is breathing new life into the Cardium in and around the Pembina oilfield, which is the largest light oil field in Western Canada, having produced over 1.3 billion bbls of 37 degree to 39° API gravity oil (recovering about 17% of the estimated 7.8 billion bbls of original oil in place) and over 12 tcf of gas since initial discovery in 1953.

Also discovered in the 1950s, the Cardium in the smaller Garrington field is generally tighter than at Pembina. For this reason, Lopez and Macquarie said waterflooding was not very successful and operators ceased further development in the 1980s. As a result, Garrington has experienced a very low recovery factor of about eight per cent of its estimated 220 million bbls of OOIP compared with the average of about 17% at Pembina.

However, the tight rock reservoir characteristics make Garrington an ideal candidate for experimentation with horizontal stage fracs and in the fourth quarter of 2008, NAL initiated its first four-well program at Garrington using multi-stage fracture completions and has become a pioneer in a play that is revitalizing the extensive Cardium trend in west central Alberta.

According to the Macquarie report, the trust initially used six to eight-stage 20-tonne oil based fractures on 1 000 metre long horizontal legs. While results were variable, initial one-month IP rates of 200 to 500 BOE per day were "very encouraging and underscored the massive potential through re-entering the tight Cardium oil package."

While a relatively limited number of producers have Cardium rights in the heart of the Pembina area covering the conventional Pembina Cardium field, there are an increasing number of companies testing horizontal development potential of the Cardium formation surrounding the field and up and down the wedge.

"Areas that have historically produced oil versus gas are expected to dominate future activity. Historical pool boundaries are becoming less relevant since tighter, oil saturated units that were not economic with past technology now lend themselves to horizontal, stage frac technology," the Macquarie report said.

In other words, technology is likely to extend field limits well beyond the designated unit boundaries, as it is the outlying halo area that will benefit most from new technology.

As a result, Lopez said that recent horizontal drilling activity has targeted the fringes of the conventional Pembina and Garrington Cardium fields. She notes that while larger producers such as Penn West and ARC continue to use horizontal drilling in the heart (principally the conglomerate) of the Pembina Cardium, where the reservoir has higher permeability, other producers are targeting the edges of the Pembina play.

She said this is where the more prolific well results have recently been achieved as producers tap into virgin pressure and expand known pool boundaries.

"It just started gradually, but it happens that the halo is an area of increasing activity recently. The halo is a term we use at Pembina but it definitely includes the Garrington area where they are drilling off the flanks," Lopez said.

Wellington West's Page agrees, saying industry players are in the "early innings of exploiting tighter portions" of the Cardium trend surrounding the Pembina field, using horizontal multi-stage fracs.

"Until recently, the productive area on the two sides was controlled by the general decrease in effective porosity and permeability, with increasing depth placing an economic limit in the southwest down-dip direction," Page said.

"But with the advent of horizontal drilling multi-stage frac techniques, these flank areas away from the main field have now become prime hunting grounds for large light oil reserves previously unrecoverable using vertical well economics."

In its report, Macquarie said that while it's still early in the game, industry has identified three distinct development schemes through which horizontal stage frac technology is anticipated to increase reserve potential and become a "needle mover" for some companies at Pembina: infill horizontal drilling within existing pool boundaries; improving waterflood potential through horizontal injectors; and horizontal drilling around the existing pool boundaries to extend identified OOIP.

And the junior sector is leading the charge in the fringe areas of the Pembina and Garrington fields.

"While (larger entities) Penn West and ARC have been more focused on the first two, game changing production and reserve additions for some smaller players are beginning to come to fruition through success achieved from drilling the halo," the Macquarie report said.

Gary Leach, executive director of the **Small Explorers and Producers Association of Canada (SEPAC)**, said the success of some junior companies involved in the Cardium has been a positive occurrence in an otherwise tough period for the junior sector.

"It's great to see the junior and midcap sector leading the way in the rejuvenation of the Cardium play and it has proven to be bright spot in what has been otherwise a tough year. It's a good example of what smaller, more nimble companies do best -- introduce a new idea and put it to work faster," he said.

"Observers are watching closely the reported results on the horizontal multi-stage fracturing completions done to date and the results have no doubt influenced several recent acquisitions by companies wanting to be positioned in this play."

Although his company has about 550,000 acres in the Cardium fairway, Penn West Chief Executive Officer **Bill Andrew** is quick to tip his hat to the junior companies that have advanced the play's unconventional potential, especially when it comes to exploring on the flanks.

"We haven't been as fast off the mark as some of the juniors and thank God for the juniors - they always lead the way," Andrew said.

"Where we're seeing success right now is with Berens, Nexstar and other smaller companies that have been announcing wells left, right and centre, in the broad area right from the Yellowhead Highway all the way down to the city of Calgary, almost."

According to the Macquarie report, the known productive trend of the Cardium formation in Alberta extends from Calgary to Edson and beyond to Kakwa, but becomes primarily gas bearing to the northwest. It also covers an expanse from W5M into the foothills structural province, forming a mega-scale series of stratigraphic traps.

Penn West has a dominant land, production and infrastructure position in west central Alberta including the Cardium horizontal multi-frac plays at Pembina, Willesden Green, Leafland, Garrington and Sylvan Lake.

Andrew said that within Penn West's Cardium acreage, the trust has between 200,000 and 250,000 acres of exposure in an area that has had some waterflood activity and that this area will primarily see some infill drilling and additional waterflood.

"I think we've still got lots to do there and lot's more oil to take out."

However, following the lead of the juniors, he says the area that's "really exciting for us right now" is the other 250,000 or so acres that are located in the fringe of the play.

"We're looking at that broad area and we have land holdings in most parts of it, so we're going to be picking spots through those 250,000 acres and just get started," Andrew said, adding that Penn West intends to spend about \$100 million in the Cardium in 2010 to drill between 30 and 35 wells.

"And I think we could push that up to more wells," he added.

Like others in the play, Andrew said getting well costs down will be a priority in the coming months. He said Penn West currently spends about \$3 million per well all in, but is confident the trust will achieve the same results as it did in the Lower Shaunavon play, where initial wells were in the same \$3 million range but were reduced to about \$2 million each within two years.

"Cardium costs are generally running over \$3 million right now all in, and they should be less," Andrew said. "The costs are certainly more than people are experiencing in the Bakken right now, but I expect they will come down as we get smarter and drill more wells."

Comparisons between the Bakken and the Cardium tight oil plays come as no surprise to **Result Energy Inc.** President and CEO **Brett Herman**, who headed up the **TriStar Oil & Gas Ltd.** team that was one of the early movers and most successful exploration and production companies involved in the Bakken. And Herman has high hopes for similar success with his new company in Alberta's Cardium.

In August 2009, **Petrobank Energy and Resources Ltd.** and TriStar agreed to merge in a cash and stock deal that created a new entity -- called **PetroBakken Energy Ltd.**, which became the dominant player in southeast Saskatchewan's prolific Bakken light oil play.

Subsequent to the deal, Herman and the TriStar management contingent took the helm of Calgary-based junior Result Energy and quickly made a number of moves to position itself as a player of note in the emerging Cardium trend, chief among which was the acquisition of Nexstar Energy and its stable of Cardium assets.

"For us, we consolidated that Bakken play in southeast Saskatchewan so there wasn't much to come back to there when we sold TriStar - there wasn't really many deals left for us to get a stranglehold position," Herman explained.

"So we identified other areas in Alberta to move into, and one of them was the Cardium play where we felt we could take our skill set and apply it there."

Herman said Result plans to hit the ground running in the Cardium and will spend \$60 million in 2010 to drill 20 horizontal multi-stage frac wells in the play, a program he notes is "quite substantial for a company of our size."

With his group's extensive knowledge and experience gained in the Bakken and from the 300-plus horizontal multi-stage wells drilled by the team to date, Herman is confident that Result Energy's learning curve in the Cardium will not be steep. In fact, he believes the company will be able to drill wells for about \$500,000 less than the current average of about \$3 million, right from the get go.

"When we started drilling Bakken wells we were between \$2.2 million and \$2.4 million and at the end of TriStar we had those wells down to about \$1.3 million to \$1.5 million," he said.

"We've given market guidance where we feel we can come in (to the Cardium) initially and drill wells for about \$2.5 million and we think we can reduce that substantially. Obviously, we've got to get a couple of those wells under our belt before we can do that, but we've already identified many cost savings for these wells that we really haven't talked publicly about yet."

Macquarie said that instead of using oil based frac fluids in the Cardium producers will soon begin experimenting with slickwater fracs starting in 2010, which should reduce the cost of drilling the wells. Macquarie estimates slickwater fracs will save \$400,000 per well. The firm also notes that current completions are between eight and 11 frac intervals in horizontal wellbores ranging from 1 000 to 1 600 metres, with frac sizes of approximately 20 to 30 tonnes.

However, Macquarie anticipates that in 2010 producers will begin to experiment with higher intensity fracs, for example more fracs in the wellbore. "Without the risk of fracturing into formation water, we expect to producers will experiment with frac sizes to see if there is any productivity gains to be made from larger fracs," the report said.

Lopez noted that because unconventional Cardium activity is still in the early stages, there is a lot of variability in well results as the play is not highly delineated.

"It's still in its infancy at this point so you're going to get variability in results and find out which plays are better than others," she said.

"It's early days, so that's going to be a challenge. The evolution of completions - the costs are still a little bit high, so bringing down those drilling costs are all part of an early stage resource play evolution."

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