

# NICKLE'S DAILY OIL BULLETIN

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## Broad Spectrum Of Tight Gas Plays Evolving In Deep Basin

**By Paul Wells**

Despite relatively low natural gas prices, operators are chasing an increasingly larger number of tight sand formations in Alberta and comingling production to boost volumes and reserves on the back of technological advancements in drilling and completions.

Formations that are now in vogue that might not otherwise have been a few years back include the Cadomin, Nikanassin, Wilrich, Notikewin, as well as liquids-rich Bluesky and Cardium gas (liquids-rich).

**Brad Hayes**, president of **Petrel Robertson Consulting Ltd.**, where he has primary responsibility for strategic studies of tight gas and shale gas reservoirs in Western Canada, says tight gas sandstone plays in the Western Canada Sedimentary Basin (WCSB) have been pursued and produced for several years but generally without a great deal of success.

"Exploration companies initially tried to adopt successful strategies from basins of the western United States but found that many of these were not viable in the stratigraphic and structural regime of the WCSB. A broad spectrum of tight gas plays has now evolved in Western Canada, as operators have developed new mapping, drilling, and completion techniques to suit the geology of the basin," he said.

"Although the WCSB tight gas play spectrum is much different than that in the U.S. Rockies, huge gains in reserves and productivity have been attained with improved understanding of the reservoirs," Hayes said.

Hayes, who authored a 2008 report on the evolution of tight sandstone plays and production in Western Canada, notes that WCSB tight gas sandstone reservoirs range from Triassic to Late Cretaceous age and span depositional environments from distal turbidites to alluvial fan conglomerates. He said three examples characterize the range of play types and strategies that have evolved since the early 2000s.

\* The Nikanassin structural play is a thick -- up to about 1,000 metres -- fluvial to shallow marine sandstone-dominated section, with permeability enhanced by natural fractures associated with faulting.

\* The Cretaceous multi-formation commingled play where reservoirs are evaluated in up to 10 separate formations, with production commingled from the four or five best zones in each wellbore has also begun to see more activity. Hayes said regional mapping by formation is important in high-grading development areas when chasing these targets.

\* The deeper Triassic siltstone plays, like the now well-known Montney, where porosity associated with particular facies and diagenetic trends within the over-pressured Deep Basin is exploited with the horizontal and downspaced vertical wells and advanced completion techniques.

The Cretaceous multi-formation commingled play generally addresses Cadomin and younger strata and relies on fracture stimulation of each Cretaceous sand unit.

Until recently, Hayes said the Nikanassin was not included often in this play, because it was deeper, it is thick and reservoir sands are difficult to map. As well, conventional fracture stimulations didn't work very well. What did work was to drill the thick Nikanassin in or near the Foothills, where it was naturally fractured, and hence would produce better gas rates. Because the faulted/fractured intervals are often pretty depth-specific, the Nikanassin in these areas was the sole target, and it wasn't commingled with overlying, younger Cretaceous units.

"During the past year, we have seen more instances where the Nikanassin is now being completed successfully and commingled with younger Cretaceous units in the Plains," Hayes said.

"This situation has evolved from better mapping, better reservoir characterization, and better completion

methods for the Nikanassin. So now the line is blurring between my first two play types," he added. "However, it is still valid to consider the naturally fractured, Foothills-related Nikanassin as a separate play type. We've simply added the unfractured Plains Nikanassin to the Cretaceous commingled play."

And it is the Cretaceous multi-formation commingled play -- with its numerous reservoirs that is increasingly being targeted by producers active in the Deep Basin.

"Until recently, exploration has been limited to the pursuit of prolific, high-permeability stratigraphic sweet spots, many of them areally-limited conglomeratic shoreline facies. With advances in drilling and completion technology, operators are now developing strategies to access far larger gas volumes, by commingling production from stacked Cretaceous tight-gas sandstones," Hayes explained.

"By drilling to the Upper Jurassic Nikanassin formation, up to 10 reservoir intervals are evaluated, and the best four to five are generally completed."

Hayes said that this approach has been promoted by a sub-committee of **Canadian Association of Petroleum Producers**, working with the provincial **Energy Resources Conservation Board (ERCB)**, which in February of this year designated the Deep Basin Development Entity as an area of west-central Alberta where commingled production can proceed with reduced regulatory restriction, and hence more cost-effective and efficient exploitation of the gas resources.

"The Deep Basin Development Entity, which is largely responsible for success of multi-zone commingled vertical strategy in Alberta, is a strategy that will continue to be important through much of the Deep Basin," Hayes noted. "In reality, the horizontal multi-frac approach is critically important in selected plays and areas, but will not likely recover as much resource as the commingled producers in the long run."

Industry analysts are also taking note and are encouraged with what their seeing from initial drilling and production results in what many are calling Alberta's "new resource plays."

**Chris Theal**, managing director of oil and gas research with **Macquarie Capital Markets Canada**, says the recent trends are likely to become further ingrained as companies tinker with drilling and completion methods in an attempt to fully understand the intricacies of the various zones and what makes each of them tick.

He said that multi-frac technology is being employed on both horizontal and, in many cases, vertical wells and that a growing number of companies are drilling vertically down to the base of the Cretaceous, which he quantifies as the Nikanassin, and because producers generally have lots of well control to define it, as they drill they pierce other zones such as the Cardium, Notikewan, Falher, Wilrich, Bluesky and the Cadomin.

"With vertical multi-fracs, you can frac three zones in a well, for instance. You're seeing some results from this with wells doing five to seven mmcf a day initial production rates," Theal said.

"It's a highly efficient way to do it. It's essentially about \$2 million to take a well down to the Nikanassin and then depending on what you see on logs, it's maybe \$200,000 or \$300,000 per frac interval vertically. So really what you're seeing is industry grounding their economics on the 'Nik' and then getting leverage out of anything they can tie into uphole."

Theal said this "stack-zone concept" combined with newer drilling and completion techniques are changing the face of drilling in Alberta.

"If permeability was your constraint in chasing these plays historically in terms of permeability being too tight, with the advent of multi-stage frac technology it kind of opens up a whole different universe of reservoir to go and chase," he said. "That's what we're seeing right now."

Whether they are pursuing horizontal multi-stage frac opportunities or vertical multi-zone options, producers are increasingly encouraged by what's occurring in the areas like the Deep Basin or the Peace River Arch, both in terms of production rates and the economics.

"A good summary point on why the activity is what it is in and around our core area (Ansell/Sundance in the Deep Basin) is you've got these multiple zones getting stacked up," said **Lyle Michaluk**, chief financial officer of **Open Range Energy Corp.**

"Now in the last year or so, we've seen that the horizontal technology is certainly looking like it's unlocking reserves that you might not have otherwise have unlocked vertically, or it would take multiple wells to unlock

vertically. A lot of guys are having success."

Michaluk added that the economics for many of the zones being chased by producers "look really strong."

"We've done some base-case economics and it looks really encouraging. Our area in particular, where everything we are going after for the time being is under 2,500 metres, falls under a sweet spot in the royalty system right now."

As an example, Michaluk said that by taking a horizontal to 4,000 metres, the company gets \$800,000 in the meterage credit (\$200 per metre) while the province's natural gas drilling credit chips in another \$2.9 million.

"So you've got a good starting point from an economics point of view. You've got potentially about \$3.7 million of credits and you've also got this five per cent royalty on the first 0.5 bcf of production. So that first year payout with some of the initial production rates you're seeing, the payout in months looks good."

Michaluk said that even with a \$5 per mcf natural gas price, some wells will be paying out in 10 to 12 months. "We really like the competitiveness of it, we like the economics. We think it's a very competitive play and although it's maybe not as hot a topic as some of the other plays, when you really boil down the economics we think we're just as competitive as any of the other plays going on right now."

**Steve Nielsen**, chief financial officer for **Daylight Resources Trust**, agreed that significant advances in horizontal drilling and multi-stage fracture stimulation technology can now provide "very positive economics for geological zones that were previously considered too tight to be economically produced."

Daylight uses multi-stage fracture horizontal wells targeting one single formation or utilize multiple uphole conventional completions to combine all production and reserves in a single well bore. Nielsen said this provides "significant enhancements" to economics since the incremental cost of the uphole completions are relatively minor but the incremental reserve and production are significant.

"We have applied this skill and experience more recently within West Central Alberta on several additional Cretaceous zones ... throughout our 2009 drilling program and continuing in our 2010 drilling program," Nielsen said.

Daylight has a large inventory of opportunities in the Nikanassin and the Cadomin zones in the Peace River Arch area, as well as the tighter portion -- often on the fringe or halo of existing conventional pools -- of multiple other Cretaceous zones, like the Cardium, Bluesky, Wilrich and Notikewin, throughout the Deep Basin.

"The application of new technologies has resulted in excellent initial production rates and long-life reserves additions that are repeatable over a large scale area which is the basis for defining these opportunities as the new 'resource plays' that provide highly economic investments with very reliable results," Nielsen said.

**Steve VanSickle**, president and chief executive officer of **Fairborne Energy Ltd.** is also a big believer in the potential of the next wave of Deep Basin development.

"The new technologies have really taken zones that, stand alone in a vertical well, are uneconomic to marginal and made them economic," he told the Bulletin.

"Being able to lay down a horizontal well and frac it a number of times gives you an order of magnitude more sandface exposure with the fracs and you can make something that's not economic very economic with the flow rates and reserves you recover with those wells."

VanSickle said that horizontal drilling is not always the best method to extract the most value from the targeted resource.

"It's tough to chase all those (plays) with horizontal drilling. It's a situation where you look at the potential and how many zones you can have in a vertical well and then you look at the same in a single-zone horizontal well," he explained.

"You then obviously run your business case on each of those and decide which one gives you the best rate of return and how to attack it."

The top officials of two Canadian industry groups say the potential for increased activity in Alberta's Deep

Basin is a welcome respite after almost two years of negative news associated with the province's oil and gas industry.

"If early results continue to be promising junior and midcap companies active in some of these plays will be able to get the investment capital they need," said **Gary Leach**, executive director of the **Small Producers and Explorers Association of Canada**.

"I think it demonstrates there remains a lot of exciting resource potential here in Alberta."

Added **Roger Soucy**, president of the **Petroleum Services Association of Canada**: "Obviously this has some exciting potential for the service sector in that it could add to the activity levels. However, I think that it will be at least a year or two before the industry will really be able to judge the future prospects of these new developments and the eventual impact on the drilling numbers."

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