A New Light Oil Unconventional Play (Eastern Québec, Canada)*

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Search and Discovery Article #10290 (2010)
Posted December 17, 2010

*Adapted from oral presentation at AAPG Conference and Exhibition, Calgary, Alberta, Canada, September 12-15, 2010

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Abstract

The Eastern Gaspé area is characterized by the presence of numerous oil seeps (more than 50 known sites) in the Devonian sandstones, which explains the interest in this region by explorers for more than a century. Since 2005, Pétrolia has drilled five wells in the Eastern Gaspé to evaluate the oil potential of the York River Formation. The last three wells encountered light crude oil over thick intervals of tight York River sandstones reservoirs. The company has completed preliminary tests on these three wells.

Further works are planned in the first half of 2010 to prove up the oil potential of the York River sandstone and demonstrate the applicability of modern drilling and completion techniques, including multi-stage fracturing. Success will allow further developing the potential of the York River Formation over a large territory. The presentation will summarize the results of the 2010 evaluation program.
A new light oil unconventional play
(Eastern Québec, Canada)

Bernard Granger: Chief Geologist
Introduction

The York River Fm - A new light oil unconventional play

Conclusions
Introduction

Current exploration activity in the province of Quebec

Anticosti Island
New emerging Shale Oil Play

St-Lawrence Lowlands
Shale Gas Play

Eastern Gaspe
Unconventional light oil play

- Pétrolyma’s & partners
- land holdings
- Oil prone
- Gas prone
Current activities

St-Lawrence Lowlands (Shale Gas Play)
Number of fracs conducted on the Utica shale in the St. Lawrence lowlands in both vertical and horizontal wells with increasing levels of success over time.

Anticosti Island (New Emerging Shale Oil Play)
Much of Utica Fm on Anticosti Island falls within the oil window (Macasty Fm on Anticosti).

27 meters of full diameter cores were collected in order to evaluated the shale oil potential of the Macasty Fm

In the St-Lawrence Lowland, one Frac was conducted in a vertical well in Utica shale that was in the oil window. The well produced 47 bbls of 37 API oil in the first 109 hours.

This established that the Utica shale can produce both oil and gas depending upon the rock maturity.

Eastern Gaspe Peninsula (A new light oil unconventional play)
Pétrolia has made the first significant oil discovery in the Province of Québec. The discovery was made in a thick sandstones section of York River Fm.

The Company is in the process to test and prove the oil potential of the York River Formation as a resource play
A New Emerging Shale Oil Play

- Macasty (Ord) marine source rock very rich
- Oil and gas charged system / many shows
- ~ Green Point source rock for W. Nfld play
- ~ 30 billion BBLs oil equivalent expelled into petroleum system
Current activities

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The York River Formation
A new light oil unconventional play

Data from Surface Maturity Map
Undeveloped High Impact Potential
(Short-term development projects, Eastern Québec)

- Proven oil in recent wells drilled by Pétrolia
  - First viable oil discovery in the province of Québec at Haldimand
  - The play consists of thick succession of tight York River Sandstones saturated with light oil
Previous Works in Gaspé

History
- About 50 oil seeps have been described in the Eastern Gaspé area.
- Most of these seeps occur above the York River Formation.
- Since 1860, 134 wells have been drilled in the Gaspé Peninsula region.
- Most of these are old wells drilled without the support of seismic.

Haldimand play (Lower Devonian Sandstones)
- The Gaspé Sandstones were the first exploration targets in the eastern Gaspé Peninsula during the 19th century.
- Since 1970, only 8 wells were drilled based on seismic studies with the York River as primary target.
- Pétrolière has drilled 5 of these wells.
- Three of these wells have identified a potential oil play with large upside potential on a contiguous land base.
- Tight Reservoir
- **Haldimand is believed to be the first commercially viable oil project in Quebec.**
A new light oil unconventional play

Geological Setting

![Geological Setting Diagram]
Geological Setting

A new light oil unconventional play

[Diagram showing geological layers and locations such as Malbaie, Battery Point, York River, Indian Cove, Shiphead, Forillon, Indian Point, Roncelles, West Point, and Siluro-Devonian Belt.]
Geological Setting

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Structural Cross Section A A’
Haldimand Light Oil Discovery

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Haldimand Light Oil Discovery

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Haldimand Light Oil Discovery
Top York River Formation (TWT)
Closure of 4.8 km²
Reservoir Rock

Open Fractures

Fractures

Frac

MP

924.74m

925.33

0.25mm
US Bakken vs York River

- **Reservoir Lithology**
  - Bitumen rich, tight siltstone, sandstone, silty and sandy dolomite

- **Thickness**
  - Vertical pay (PHI>5%) = 2.4 m to 4.3 m

- **Permeabilities Range from Core**
  - 0.01 to 0.19 md (average 0.04 md)

- **Porosity Type**
  - Intergranular commonly related to open horizontal micro fractures

- **Porosity Range**
  - 3 to 16% (average 5%)

- **Oil Gravity**
  - 42° API at 60 °F (15.5°C)

- **Natural Fractures**
  - Open vertical fractures

- **Average Production per Well**
  - Antelope field
    - Vertical after frac: 209 bbls/day
    - Cumulative production per well: 307 000 bbls

- **Reservoir Lithology**
  - Bitumen rich, tight sandstone and / or siltstones and mudstones, dolomitic and calcitic cement,

- **Thickness**
  - Vertical pay (PHI>5%) = 170 m (gross 474 m)

- **Permeabilities Range from Core**
  - 0.01 to 2.74 md (average 0.04 md)

- **Porosity Type**
  - Intergranular commonly related to open micro fractures

- **Porosity Range**
  - 2 to 15% (Average 5%)

- **Oil Gravity**
  - 53° API at 60 °F (15.5°C)

- **Natural Fractures**
  - Open vertical fractures

- **Average Production per Well**
  - Haldimand field
    - Vertical after frac: ?
Unconventional play: Haldimand

- **Haldimand**
  - First significant oil discovery in the Quebec Province - Light oil (53°API)
  - 13 km² of 3D seismic
  - Trap closure 4.8 km² - with up dip and down dip potential extensions
  - Oil resource in place (4.8 km² - 69.7 millions barrels)
  - 2 wells drilled on the structure
    - Pétrolia Haldimand N°1 - discovery well:
    - Pétrolia Haldimand N°2 - appraisal well (1 km from N°1 well)
  - **Haldimand N°1**
    - Tested 22 m of net perforated intervals (130 m gross sandstone interval)
    - Average of 34 barrels /d - 12 days test
    - Presently producing at 10 barrels /day from a total of 42 m of net perforated intervals without artificial lift
  - **Haldimand N°2**
    - Light oil on DST’s
    - Gross reservoir interval: 474 m+ (oil saturated)
    - 170 m of net reservoir thickness (Phi > 5 %)
    - Tight reservoir with sub-vertical open fractures
    - Untested potential for deeper pay
Petroleum System

Gaspe Sandstones Gp (3 km+)

Haldimand 1 & 2

Burial

York River Fm

Ro = 1.4
TOC = 1%

Ro = 0.8
TOC = 1.7%

Ro = 1.6
TOC = 4%

Ordovician Source Rocks

A new light oil unconventional play
Resource Play?

- Oil has been produced from wells located in structural lows.
- Early migration prior to Mid-Devonian folding (Acadian Foldbelt).
- Most of the oil has been flushed.
- Some of this oil has been preserved under unknown trapping mechanisms.

A new light oil unconventional play.
Micro Seeps Geochemistry

Geochemistry Results
Distribution of Haldimand Oil Concentration and Haldimand and Covenant Oil Rank

Haldimand Oil Concentration (ppm)
- 12 - 28
- 29 - 34
- 35 - 53

Haldimand Oil Seep Rank
- 12 - 88
- 89 - 91
- 92 - 100

Covenant Oil Rank
- 65 - 80
- 81 - 83
- 84 - 90

Kilometers
Pétrolia has drilled 5 wells in the Gaspé Block

The last 3 wells encountered light crude oil.

Fracking of the Haldimand No 2 well and Horizontal drilling of a third well on the Haldimand structure is planned.

If successful the Company would look to future drilling with the goal of proving up a significant oil development project.
Conclusions

- Large light oil unconventional play in the York River Formation
- Significant upside potential
- Potential to become a resource play