Canada’s oil sands
– the *in situ* producers perspective

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Who is IOSA?

- *In situ* Oil Sands Alliance
- Independent and innovative Alberta-based *in situ* oil sands companies:

  - Athabasca Oil Sands Corp.
  - MEG Energy Corp.
  - Connacher Oil and Gas Limited
  - Laticina Energy Ltd.
  - Petrobank Energy and Resources Ltd.
  - Osum
• Emerging *in situ* oil sands developers

**OUR GOAL:**
To unlock a safe, secure supply of energy using innovative methods we can all be proud of
“The world can no longer avoid three hard truths about energy supply and demand.”

Shell Energy Scenarios to 2050

- Step-change in energy use
- Supply will struggle to keep pace
- Environmental stresses are increasing
• As people become richer, they use more energy

Climbing the energy ladder

Source: Shell Energy Scenarios to 2050
• Population is a key driver for energy demand

![World population chart]

Source: Shell Energy Scenarios to 2050
“World energy demand expands by 45% between now and 2030...”
• Even with renewables & energy efficiency measures, oil production between 85 and 105 million barrels per day will be required.

Western Canada Oil Sands & Conventional Production

Source: Canadian Association of Petroleum Producers, Figure 2.3, Crude Oil Forecast, Markets & Pipeline Expansions, June 2009

Growing Dependence on the Oil Sands

Oil sands are the future of Canada’s energy sector
Growing Dependence on the Oil Sands

US Gulf Coast refineries (PADD III) are counting on Canadian oil sands production to replace declining supplies from Mexico and Venezuela.

Source: Canadian Association of Petroleum Producers, Figure 3.1, Crude Oil Forecast, Markets & Pipeline Expansions, June 2009
In situ - a Solution for Energy, People and the Environment

• Alberta’s oil sands possess 1.7 trillion bbls of bitumen; it is a key global hydrocarbon resource

• 174 billion bbls are currently considered recoverable, with 80% from in situ production
  – Development in recovery technology, primarily in situ, could increase this to 315 billion bbls (Source: EUB ST98-2007)

• Innovation with in situ recovery balances the needs of energy supply with responsible development
  – Surface impacts less than 1/1000th the impact to land from forestry
  – Deeper, non-potable water use with >90% recycle
  – Life cycle emissions ~15% greater than conventional crudes
Alberta *In Situ* Bitumen Technology

- Most common *in situ* process is Steam-Assisted Gravity Drainage (SAGD)
  - technology home grown in Alberta
  - uses horizontal wells; minimal surface disturbance
- 13,224 *in situ* wells drilled since 1992
- 9,514 of these wells are currently producing
- 552,000 barrels produced via *in situ* in 2008
- 306.5 million cumulative barrels produced since inception via *in situ* production (as of Dec. 31, 2008)

**What is SAGD?**

**The SAGD Process**

*Source: Enerplus Resources*

*Source: Laricina Energy*
A SAGD oil sands facility designed to produce 10,000 barrels of bitumen per day for ~ 25 years

*Source: Connacher Oil and Gas Ltd. – Photo of Pod 1 oil sands project at Great Divide*
In Situ Potential is Widespread

- Alberta’s total oil sands resource covers about 140,000 km²
  - Only 2% of this area is suitable for mining
- *In situ* is more representative of the oil sands and like the conventional business
- *In situ* development is distributing economic activity outside of Fort McMurray
  - Peace River, Wabasca, Cold Lake, Bonnyville

Source: Canadian Association of Petroleum Producers, Figure 2.2, Crude Oil Forecast, Markets & Pipeline Expansions, June 2009
• A SAGD well pair produces 500-2,000 BPD of oil from 1-hectare (2.5 acre)
• Land areas required to produce the same amount of energy as 500 BPD oil production:
  – California-style thermal recovery: 20 hectares (50 acres)
  – Wind turbines: 50 x 1.5 MW turbines, plus power lines
  – Iowa corn to ethanol: 750 hectares (1900 acres)
• 5 million BPD of in situ recovery:
  – would require a total of about 10,000 ha in use, equivalent to 100 km² (10x10 km)
  – less than 0.1% of the area would be under active development at any one time
In Situ Land Impact Mitigations

- Local residents are consulted
- Shared land use (e.g. roads/ROW’s) with conventional oil & gas, forestry, power transmission
- Extensive flora & fauna studies are mandatory
- Timely reclamation is mandatory
  - A typical clearing-to-reclamation cycle is ~20 years
- No soil contamination is permitted
  - In situ facilities constructed to very high standards
- In situ siting is flexible
• Water for new *in situ* projects is sourced from deep, brackish (non-potable) aquifers
  – River/surface water is not used
• Produced water is 80-95% recycled

<table>
<thead>
<tr>
<th>Product</th>
<th>Average virtual water content (m³/ton)</th>
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<tbody>
<tr>
<td>Beef</td>
<td>15,500</td>
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<tr>
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<td>Wheat</td>
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<td>Corn</td>
<td>909</td>
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<tr>
<td>SAGD Bitumen</td>
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Source: [http://www.waterfootprint.org/Reports/ResearchData/Appendix%20XV.xls](http://www.waterfootprint.org/Reports/ResearchData/Appendix%20XV.xls)
Emissions – “Wells-to-Wheels”

- Oil sands emissions are only 5-15% higher relative to the average crude oil processed in the United States, on a “well-to-wheels” basis.
  - California Heavy has higher emissions than oil sands, based on two independent studies (1)
- Most emissions, 70-80%, are released during end use

• More efficient use of energy reduces CO₂ generation proportionately:
  – Innovations in reservoir recovery will reduce energy requirements (lower Steam/Oil ratios):
    • Solvent additives to SAGD
    • Cold solvent processes
    • Variants of above
  – Facility synergies between projects
  – Cogeneration
    • Making power concurrently with steam
Technology-Driven Solutions

THAI™ (Toe-to-Heel Air Injection) - Petrobank Whitesands Project

Asphaltenes Gasification – Nexen/OPTI Long Lake

PHARM – Heat Harvesting SAGD - Laricina

Cold Solvent and Solvent Assisted SAGD - Laricina
• Since 2006, CAPP’s forecast of in situ production for 2015 has fallen by 670,000 BPD
• Why the shortfall?
  – Regulatory delays
  – Cost pressures
  – Operational and reservoir challenges
  – Capital market turmoil
  – Environmental pressures (CO2) and public perception (“dirty oil”)
• Major fiscal implications on many levels
• Future production growth
• Increased provincial revenues
• Increased employment opportunities
• Reinvesting in local communities
• Have spent over $2.5 billion on capital expenditures

$7 billion injection into North American economy over next 5 years
• 20 billion barrels of bitumen resources IOSA
• 1 million BPD of bitumen production for more than 30 years
• Moderate pace of development an ideal incubator for new technologies
• New technologies lead to advancements for the industry in efficiency, cost and performance, as well as environmental improvements
We’re all in the oil business

• Balancing Energy, the Economy and the Environment
• Time to talk about solutions
Learn more about us:

IOSA.ca
This presentation contains forward-looking information. Actual results could differ materially due to market conditions, changes in law or government policy, changes in operating conditions and costs, changes in project schedules, operating performance, demand for oil and gas, commercial negotiations or other technical and economic factors.
Canada’s oil reserves

Includes 173 billion barrels of oil sands reserves

Source: Oil & Gas Journal Dec. 2007
• 64 million barrels per day of capacity is required to meet demand growth & offset decline by 2030

Canada’s oil sands production expected to increase

1 Bitumen forecast for all Alberta oil sands projects – original estimate (January 2008) and adjusted estimate per public announcements (December 2008) Source: CAPP and Nichols Applied Management
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