Canada’s Oil Sands – An Overview

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Global Primary Energy Demand

- **Significant energy demand growth:**
  - Population, standards of living

- **Need all forms of energy:**
  - Increasing role for renewables
  - Continuing reliance on hydrocarbons
  - Increasing role for non-conventional crude oil & natural gas

- **Technology is a key lever for sustainable growth**
  - Production
  - Cost competitiveness
  - Environmental performance

Source: IEA World Energy Outlook 2010
Current Policies Scenario
Global Crude Oil Reserves by Country

Source: Oil & Gas Journal Dec. 2010
Oil Sands Production Methods

Drilling (80% Resource, 97% Land)

Photo: ConocoPhillips - Surmont

Mining (20% Resource, 3% Land)

Schematic: Devon - Jackfish
Outlook for Oil Sands Activity

- **Renewed project activity...projecting sustained growth**
  - Re-activations of projects “shelved” during downturn
  - New project announcements

- **Key drivers are demand growth, recovering oil prices and lower project costs**
  - Industry mindful of potential for cost escalation

- **Increasing interest by Asian investors**
  - China, Korea, Japan

- **Evolving policy and regulatory context is a key consideration.....Canadian public supports a balanced “3E” approach**
  - Environmental
  - Social
  - Fiscal
  - Pipeline capacity & market access

- **Increasing collaboration among oil sands producers**
  - Performance (e.g., environmental technology)
  - Communications
Canadian Oil & Gas Industry Capital Spending - Cdn $ Billions

<table>
<thead>
<tr>
<th>Region</th>
<th>2009</th>
<th>2010E</th>
<th>2011F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Canada</td>
<td>$0.2</td>
<td>$0.5</td>
<td>$0.3</td>
</tr>
<tr>
<td>Oil Sands</td>
<td>$11</td>
<td>$13</td>
<td>$15</td>
</tr>
<tr>
<td>Western Canada</td>
<td>$20</td>
<td>$26</td>
<td>$26</td>
</tr>
<tr>
<td>East Coast Offshore</td>
<td>$1.7</td>
<td>$2.5</td>
<td>$3.0</td>
</tr>
<tr>
<td>AB</td>
<td>$12</td>
<td>$15</td>
<td>$16</td>
</tr>
<tr>
<td>BC</td>
<td>$5</td>
<td>$7</td>
<td>$5</td>
</tr>
<tr>
<td>SK</td>
<td>$3</td>
<td>$4</td>
<td>$5</td>
</tr>
</tbody>
</table>

Note: Excludes spending mergers & acquisitions

Oil & Gas Investment Spending:
- 2009: $34 billion
- 2010: $42 billion (estimate)
- 2011: $44 billion (forecast)
Secure supplies of Canadian oil are growing - driven by the oil sands.
Access to Current and New Oil Markets

Canadian & U.S. Crude Oil Pipeline Proposals

[Map showing various pipeline routes and expansions in Canada and the United States, including Enbridge, TransCanada, Kinder Morgan, and others.]
Canada’s Share of U.S. Imports – Crude Oil & Petroleum

Source: EIA Jan 2010
Asian Market Potential for Canadian Oil Sands Production

Competitive travel distances for Canadian supply to both markets

Source: Enbridge Pipelines
Canadian Economic Benefits of Oil Sands
(CERI 2009, over a 25 year period)

- **Economic impact generated**
  - $1.7 trillion (GDP)
  - Alberta = 90%
  - Ontario = 3.2%
  - B.C. = 2.6%
  - Quebec = 1.3%
  - Saskatchewan = 1.1%

- **Employment created**
  - 11.4 million person-years
  - Alberta = 77%
  - Ontario = 7.1%
  - B.C. = 6.2%
  - Quebec = 3.3%
  - Saskatchewan = 2.6%

- **Government Revenues**
  - Federal Tax = $188 billion
  - Provincial Tax = $118 billion
    - Alberta = 80% of total
  - Alberta Royalties = $185 billion
    - $7.4 billion per year

- **Canadian Jobs outside Alberta**

![Diagram showing distribution of jobs outside Alberta]
Incremental Employment by U.S. State (2011-2015, thousand person years)

- Alaska: 0.9
- Hawaii: 1.4

- Over 40
- 16 - 30
- 10 - 15
- Under 10

The map shows the incremental employment figures for each state, with larger numbers indicating higher employment growth.
Reputation and Oil Sands

- **Reputation = Performance + Communication**

- **Key concerns expressed regarding oil sands development:**
  - Local / regional environmental & social impacts
  - Global climate change
  - Role of fossil fuels in future energy system.
Guiding Principles for Oil Sands Development

- People
- Air
- Water
- Land

Canada’s oil sands industry will provide a secure source of energy, reduce its impact on the environment and provide economic benefits to society while developing this globally significant resource. We will achieve this through continuous improvement, by developing new technology and by committing to these guiding principles:

**PEOPLE**
- We will provide a safe environment for our employees, contractors, and the communities where we operate.
- We will provide employment and business opportunities for regional communities, including Aboriginal peoples.
- We will consult with directly-affected stakeholders through all stages of our operations.

**AIR**
- We will design and operate our facilities to ensure that regional air quality continues to exceed provincial air quality objectives.
- We will continue to reduce greenhouse gas emissions per barrel of production by improving our energy efficiency and by developing new technologies.

**WATER**
- We will continue to reduce the amount of fresh water required per barrel of production by improving water recycle rates, using non-potable water sources where feasible, and by developing new technologies.
- We will safeguard the quality of regional surface and groundwater resources.

**LAND**
- We will mitigate our impact on the land while maintaining regional ecosystems and biodiversity.
- We will progressively reclaim all lands affected by oil sands operations, returning them to self-sustaining landscapes.
Oil Sands Tailings - Mining

- **A mixture of water, clay, sands and residual bitumen**
  - Used to settle solids and recycle water - 80%+ recycle ratio

- **Research to increase recycle, reduce pond size**
  - Consolidated tailings
  - CO2 treatment (CNRL)
  - Thickeners, Paste/Dry tailings
  - Tailings Reduction (Suncor)
  - Atmospheric Fines Drying (Shell)
  - Centrifuge (Syncrude)

- **First tailings pond (Suncor) surface reclamation in 2010**

- **Industry Tailings Collaborative**
  - December 2010
**Oil Sands Water Use & Quality**

- **Mining**
  - Currently use 0.5 per cent of the annual flow of the Athabasca river (1/3 of City of Toronto water use).
  - 80-90% recycle.
  - Withdrawals restricted during low flow periods (on-site water storage).
  - “No impact on Athabasca water quality/ecosystem and no evidence of impact on human health in downstream communities” (Royal Society, 2010 report).

- **Drillable (Insitu)**
  - 90-95% recycle.
  - No water from Athabasca River.
  - Shift to using non-potable (saline) from sub-surface aquifers.
  - New projects are using 100% saline for steam.
Boreal Forest Impacts

- Canada’s boreal forest (3,200,000 km²)
- Land covering the oil sands (142,200 km²)
- Land that could be impacted by mining (4,802 km²)
- Land mined over the last 40 years (662 km²)

11% of land mined has been reclaimed

How big is 662 km²?

<table>
<thead>
<tr>
<th>Area (km²)</th>
<th>City proper</th>
<th>Greater metropolitan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edmonton, Alberta</td>
<td>684</td>
<td>9,418</td>
</tr>
<tr>
<td>Toronto, Ontario</td>
<td>630</td>
<td>7,125</td>
</tr>
<tr>
<td>Chicago, Illinois</td>
<td>606</td>
<td>28,164</td>
</tr>
<tr>
<td>Olso, Norway</td>
<td>454</td>
<td>8,900</td>
</tr>
</tbody>
</table>
Reclamation and Restoration

Oil Sands Mining Footprint and Reclamation Process

- Tailings Ponds
- Surface Mining*
- Reclaimed Land

Source: Cambridge Energy Research Associates.
Global Energy-Related GHG Emissions

Global Emissions

- United States: 20%
- China: 21%
- OECD Europe: 15%
- Canada: 2%
- Non-OECD Europe & Eurasia: 10%
- Japan: 4%
- India: 5%
- Australia/New Zealand: 2%
- Other: 21%
- Other Fossil Fuel*: 5%

Canada’s Emissions

- Conventional Oil & Gas Production: 12%
- Electricity: 16%
- Oil Sands: 5%
- Manufacturing & Heavy Industry: 15%
- Transportation: 22%
- Agriculture: 10%
- Residential: 7%
- Service Industries: 8%
- Other Fossil Fuel*: 5%
- Canada: 2%

GHG emissions from oil sands:
- 5% of Canada’s GHG emissions
- less than 1/1000th of global GHG emissions
GHG Emissions - Canada & Europe

Legend

- 1201+ teragram
- 801-1200 teragram
- 401-800 teragram
- 0-400 teragram

Source: UNFCC & EC
http://maps.unfccc.int/di/map/

Legend:
- 150 megatonnes
- 50 megatonnes
- 10 megatonnes

- US coal-fired power plant emissions, by state, 2007
- Canadian coal-fired power plants emissions, by province, 2007
- Canadian oil sands and upgrader emissions, by province, 2007
Full Cycle GHG Emissions

- On a life cycle basis, oil sands have similar GHG emissions to other sources of oil.
- Full cycle emissions or “wells to wheels” is the appropriate measure to use in setting carbon policies.

Source: Jacobs Consultancy, Life Cycle Assessment Comparison for North America and Imported Crudes, June 2009
Carbon Price - Europe & Alberta

Alberta Carbon Price
CDN $15/tonne

Settlement Price (Euros/Tonnes)

Source: ICE Futures Report Monthly Utilities Report & CAPP
Reducing Greenhouse Gas Emissions

• **Energy Efficiency**
  - Using less energy input
  - Reducing energy waste/losses
  - Capturing waste heat
  - Cogeneration power/steam

• **Improved recovery processes**
  - Lower temperature extraction
  - Additives to reduce use of both water and energy (steam)
  - Use of electricity rather than steam
  - Underground combustion rather than steam

• **Carbon capture & sequestration**
  - Most effective at upgraders
• **Science-based, independent analysis of the environmental aspects of Canada’s oil sands**

• **Addresses many of the issues and perceptions of oil sands development:**
  - Reclamation is not keeping pace, but sustainable reclamation is achievable
  - Water use does not threaten viability of the Athabasca River
  - No impact on Athabasca water quality/ecosystem and no evidence of impact on human health in downstream communities
  - Tailings technologies are emerging, but tailings inventory is growing
  - GHG emissions per barrel are reducing but growing production creates a challenge in meeting international commitments
  - Minimal impacts on regional air quality

December 2010
Oil Sands Performance

- Oil Sands Principles provide foundation
- Continue investment in technology development and deployment:
  - Energy efficiency
  - Water use
  - Tailings
  - GHG reduction (process & CCS)
  - Surface impacts
  - Reclamation
- Common metrics
- Transparency in performance monitoring & reporting (e.g., CAPP Oil Sands RCE report)
- 3rd party review
Oil Sands Communications & Engagement
- A Portfolio of Activity

• **Communications & outreach:**
  - Advertising
  - Media – mainstream, social
  - Speeches & presentations
  - National Oil Sands Dialogues
  - Meetings & tours
  - Responsible Canadian Energy Report
  - Employees
  - Educational materials (fact books, etc.)

• **Directly by industry and via 3rd parties**

• **Canada, U.S., Europe, Asia**
Which is the best goal when it comes to the oil sands?

- To develop the oil sands with an effort to limit the environmental impacts
- To stop the development of the oil sands altogether
- To focus on maximizing the full economic benefits of the oil sands resource

Total: 74% (Develop), 17% (Stop), 9% (Maximize)

Conservative: 78% (Develop), 4% (Stop), 18% (Maximize)

Liberal: 79% (Develop), 12% (Stop), 9% (Maximize)

NDP: 65% (Develop), 31% (Stop), 4% (Maximize)

Green: 58% (Develop), 38% (Stop), 4% (Maximize)

BQ: 78% (Develop), 20% (Stop), 2% (Maximize)
 Responsible Canadian Energy

• Oil Sands Report
  ▪ Principles & Performance
  ▪ Measurement & Reporting
  ▪ Transparency

GUIDING PRINCIPLES FOR OIL SANDS DEVELOPMENT

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Oil Sands Information

• Information/Education
  - English, French, Norwegian, and German
  - Information on environment, economics and energy
  - Real examples of technology

• Come See For Yourself videos
  - CAPP website
  - YouTube
Canada’s Oil Sands - Summary

• Providing Energy Security
  ▪ Large resource base.
  ▪ Safe, secure and reliable energy.

• Ensuring Environmental & Social Performance
  ▪ Strong policy & regulatory framework.
  ▪ Technology & innovation a key lever for industry performance improvement.
  ▪ Industry, governments, regulators focused on continuous performance improvement.

• Generating Economic Benefits
  ▪ Investing to create jobs and economic growth (Canada & U.S.).
  ▪ Royalty and taxes for governments.