Opportunities Spotlight: Alberta Energy

Energiemarkt Nordamerika

September 17, 2012
Overview

• Alberta Overview

• About the Oil Sands

• Alberta’s Oil Sands: Resourceful. Responsible.

• Economic Opportunities in Alberta Oil Sands

• Innovation – Technical Oil
Geography

Population (2011): 3.8 million

Greater Edmonton 1.1 million
Calgary 1 million
Red Deer 90,000
Lethbridge 85,000
Medicine Hat 61,000
Fort McMurray 89,000*

- 58% Land base is Forested
- 40% Land Base Prairie
land patented
crown land, unless patented to the owner of surface rights
CENTER OF THE EARTH
SUB SURFACE
SURFACE
AIR
HEAVEN
Ethnicity - Alberta Population by Ethnic Origin

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number (1,000's)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British/Irish</td>
<td>2,217</td>
</tr>
<tr>
<td>German</td>
<td>680</td>
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<tr>
<td>French</td>
<td>388</td>
</tr>
<tr>
<td>Ukrainian</td>
<td>332</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>245</td>
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<tr>
<td>Dutch</td>
<td>173</td>
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<tr>
<td>Polish</td>
<td>171</td>
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<tr>
<td>Norwegian</td>
<td>145</td>
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<tr>
<td>Chinese</td>
<td>138</td>
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<tr>
<td>Swedish</td>
<td>94</td>
</tr>
<tr>
<td>Russian</td>
<td>92</td>
</tr>
<tr>
<td>East Indian</td>
<td>88</td>
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<tr>
<td>Italian</td>
<td>82</td>
</tr>
<tr>
<td>American</td>
<td>64</td>
</tr>
<tr>
<td>Danish</td>
<td>59</td>
</tr>
</tbody>
</table>

Note: These numbers add up to more than the population due to multiple responses.
Source: Statistics Canada, 2006 Census of Population
Economy #1
Competitive Corporate Taxes

Comparison of Corporate Income Taxes

United States
February 2011
- Federal: 32.7%
- Provincial/State: 6.5%
- Total: 39.2%*

Alberta
January 2011
- Federal: 16.5%
- Provincial/State: 10.0%
- Total: 26.5%

Alberta 2012
- Federal: 15.0%
- Provincial/State: 10.0%
- Total: 25.0%

*6.5% represents the average effective top general state corporate income tax rate
U.S. rates known as of February 2011
Source: Alberta Finance and Enterprise, and Tax Foundation
Economy

3rd Largest
An Exporting Economy

Alberta’s Major Exports 2010*
Total Exports of Goods ($77.8 Billion)

- Crude Petroleum: $38.8 billion
- Gas and Gas Liquids: $13.7 billion
- Petrochemicals: $6.2 billion
- Metals & Machinery: $5.1 billion
- Crops & Livestock: $3.3 billion
- Forestry Products: $3.3 billion
- Processed Food & Beverages: $2.1 billion
- Refined Petroleum Products: $1.4 billion
- Sulphur & Coal: $1.3 billion
- Electronic & Electrical Products: $0.9 billion
- Others: $2.4 billion

* Export of services is not included in this estimate
Sources: Statistics Canada and Alberta Finance and Enterprise
Bioenergy

$239 million allocated to bioenergy programs
  • Over $150 million to 70+ projects
  • Leverage up to $2 billion in private investment

Renewable Fuels Standard (RFS)
  • April 2011 implementation
  • RFS mandate:
    • 2% biodiesel blend with diesel, 5% ethanol blend with gasoline
    • Biofuel must have 25% fewer GHG emissions than equivalent fossil fuel
Advanced Technology

• Information and Communications Technology
  – Alberta’s third largest value-added sector
• Health and Biotechnology
  – Significant growth in last 25 years
• Aerospace and Unmanned Vehicle Systems (UVS)
  – International hub for UVS design, development, evaluation and commercialization
• Cleantech
  – Green Building Products, Environmental Technologies, Alternative Fuels
• Nanotechnology and Microsystems
  – Largest publicly funded nanotechnology region in Canada
Tourism

• One of Alberta's largest & most important industries ($5.4 billion 2009 est.)
• 5 UNESCO World Heritage Sites (8 in rest of Canada)
• 5 National parks

Moraine Lake, Banff National Park
Edmonton Folk Music Festival
Hoodoos, Drumheller
Calgary Stampede
Sunshine Village, Banff National Park
About the
Oil Sands
History

Aboriginal people used bitumen seeping from banks of the Athabasca river to caulk canoes, dress wounds & waterproof garments.

1719: HBC fur trader Henry Kelsey writes of an oil sand sample brought by Cree Indian named Wa-pa-su.

1778: HBC fur trader Peter Pond is the first non-native to travel into the area and describes "springs of bitumen that flow along the ground" at the confluence of the Athabasca and Clearwater rivers—the location of the town of Ft. McMurray today.

1936: Abasand plant in Ft. McMurray produces diesel from oil sands.

1938: Alberta establishes what is today the Energy Resources Conservation Board, to control and monitor the province’s hydrocarbon development.
History

1964: Construction begins on the Suncor mine, which becomes operational in 1967.

1974: Government of Alberta launches the Alberta Oil Sands Technology and Research Authority (AOSTRA) to promote the development and use of new technology for oil sands and heavy oil production.

1978: Syncrude mine begins operations.

1980: First pilot in-situ project to use the SAGD process

2001: Alberta bitumen production exceeds conventional crude production for the first time.

2002: Cenovus Foster Creek first commercial SAGD project.

2002: Canada replaces Saudi Arabia as the top U.S. supplier of crude oil.
Yor in the west - 10" referred
6 in the declaration of Alfred
of Kammerstein
Mar. 15769
Alex Lucas
$5,000,000.00 OIL COMPANY FORMED

Von Hammerstein's Proposition Is Taken Up By Strong Group of Capitalists.
What are the oil sands?

• Naturally occurring mixture of sand, clay, water and bitumen – a very heavy oil

• Bitumen is separated from the sand and upgraded to refinery-ready crude oil
Where are the oil sands?

- Located in northern Alberta
- Oil sands deposits underlie 54,903 square miles (142,200 square kilometres)
- Surface mineable deposit 1,853 square miles (4,800 square kilometres)
- Land disturbed to date for mining is about 232 square miles (600 square kilometres)
- Less than 30% of mineable area has been approved for mining
- Total minable area is about 0.15% of Canada’s Boreal forest
Oil sands: In situ and Mining

Mining

- 20% of resource
- 55% of production

In situ

Steam Assisted Gravity Drainage

- 80% of resource
- 45% of production

Cyclic Steam Process
Investment

Oil Sands Capital Investment (Billions)

2000-2010 Total: $113 billion

2011-2020 Total: $177 billion
<table>
<thead>
<tr>
<th></th>
<th>Oil Sands</th>
<th>Conventional</th>
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</thead>
<tbody>
<tr>
<td>Initial Established</td>
<td>177</td>
<td>17.8</td>
</tr>
<tr>
<td>Produced</td>
<td>7.5</td>
<td>16.3</td>
</tr>
<tr>
<td>Remaining</td>
<td>169</td>
<td>1.5</td>
</tr>
<tr>
<td>Ultimate Potential</td>
<td>315</td>
<td>19.7</td>
</tr>
</tbody>
</table>
Only 21% of the world’s proven oil reserves are accessible to private sector investment (not state controlled). 53% of the world’s open and accessible reserves are in Alberta’s oil sands.
Alberta’s Oil Sands

Resourceful. Responsible.
Oil Sands Information Portal
Oil sands and GHGs globally

The oil sands in a carbon constrained world...

GHG emissions from oil sands in 2010
• = 48 million tonnes

Oil sands = 0.15% of global emissions

Oil sands carbon intensity is decreasing, while the carbon intensity of ‘conventional’ sources is going up.

Alberta’s oil sands account for 0.15% of global GHG emissions

The challenge:
as production increases, so do total emissions
Oil Sands GHG Emissions in Context

Greenhouse Gas Emissions in Perspective:
Electricity and Oil Sands

Greenhouse gas emissions, 2008
(megatonnes CO₂e)

- 350 Mt
- 150 Mt
- 50 Mt
- 15 Mt

- Red: Electricity
- Blue: Oil sands and upgrading

Notes:
1. The area of each circle is proportional to the jurisdiction’s greenhouse gas emissions. The circles of the two maps are comparable.
2. Sources: Canadian Ministry of the Environment; European Environment Agency

Natural Resources
Canada

Ressources naturelles
Canada

Government of Alberta
Carbon Capture and Storage (CCS)

• Key element of Alberta’s Climate Change Strategy

• $2 billion for large-scale CCS projects—among the largest single capitalized funding investments by any jurisdiction in the world

• Public funding will accelerate the development of projects and encourage investment from industry to make large-scale CCS projects viable

• Alberta’s geology ideal for CCS
Specified Gas Emitters Regulation

• In 2007, Alberta regulated large industrial GHG emissions.

• Existing facilities required to immediately reduce per unit GHG output by 12%

• Three compliance options:
  1. Physically reduce emissions
  2. Purchase accredited Alberta offsets
  3. $15 dollar/tonne towards technology fund that supports development and application of transformative technologies.

RESULTS (March 2012):

– 32.3 million tonnes of emissions avoided (from BAU)

– $312 million into the Climate Change and Emissions Management Fund

– $155 million invested in clean energy projects
$194B

Major Projects
### Inventory of Major Alberta Projects Summary - August 2012

<table>
<thead>
<tr>
<th>Project Sector</th>
<th>Number of Projects</th>
<th>Value of Projects ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture &amp; Related</td>
<td>3</td>
<td>$45.4</td>
</tr>
<tr>
<td>Biofuels</td>
<td>7</td>
<td>$723.0</td>
</tr>
<tr>
<td>Chemicals &amp; Petrochemicals</td>
<td>5</td>
<td>$1,433.5</td>
</tr>
<tr>
<td>Commercial/Retail</td>
<td>79</td>
<td>$7,104.5</td>
</tr>
<tr>
<td>Commercial/Retail &amp; Residential</td>
<td>3</td>
<td>$328.3</td>
</tr>
<tr>
<td>Forestry &amp; Related</td>
<td>4</td>
<td>$126.5</td>
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<tr>
<td>Infrastructure</td>
<td>268</td>
<td>$18,383.4</td>
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<tr>
<td>Institutional</td>
<td>115</td>
<td>$8,032.6</td>
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<tr>
<td>Mining</td>
<td>5</td>
<td>$1,122.0</td>
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<tr>
<td>Oil &amp; Gas</td>
<td>18</td>
<td>$2,262.0</td>
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<tr>
<td>Oil Sands</td>
<td>63</td>
<td>$129,948.0</td>
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<tr>
<td>Other Industrial</td>
<td>8</td>
<td>$167.7</td>
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<tr>
<td>Pipelines</td>
<td>30</td>
<td>$8,619.8</td>
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<tr>
<td>Power</td>
<td>27</td>
<td>$10,243.0</td>
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<tr>
<td>Residential</td>
<td>100</td>
<td>$2,573.1</td>
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<tr>
<td>Telecommunications</td>
<td>1</td>
<td>$6.0</td>
</tr>
<tr>
<td>Tourism/Recreation</td>
<td>74</td>
<td>$2,706.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>810</td>
<td><strong>$193,825.1</strong></td>
</tr>
</tbody>
</table>
Oil Sands Projects

- Operating Projects: 1.765 M bbl/d (2012)
- Mining – 0.883 M bbl/d
- In-Situ – 0.882 M bbl/d
- 17 projects under construction – $39.3 billion
- 35 projects proposed - $75.3 billion
- 9 projects announced - $10.8 billion
- 1 project recently completed - $0.4 billion

Source: Inventory of Major Alberta Projects, Alberta Enterprise and Advanced Education, June 2012
International Supplies - Germany

- ThyssenKrupp AG (Essen)
- FAM MAGDEBURGER FOER (Magdeburg)
- Siemens AG (Munich)
- Linde AG - Division Linde Engineering
- Bosch Rexroth
- Henze Plastic Pipe Technology
- NDE Technical Services GmbH
- Man (Renk)
- FAG (Schaeffler Group)
- Ruhrpumpen GMBH
- HeidelbergCement AG
- Bilfinger Berger, Deutsche Bank, Dragerwerk AG & Co. KGaA, European Energy Exchange, GEA Group, Lufthansa …
Figure 1.13
Alberta conventional oil and gas and oil sands capital expenditure

Source data: Statistics Canada, Canadian Association of Petroleum Producers, ERCB
Oil Sands Annual Capital And Operating Expenditures

$100 billion invested since 1997

Source: CAPP Statistical Handbook and Nichols Applied Management
Supply Requirements by Category

- Metal manufacturing
- Structural steel fabricators
- Pressure vessel and heat exchanger manufacturing
- Tool & machinery manufacturing
- Drilling & completion (for SAGD oilsands production) and other ‘conventional’ energy services companies
- Construction contractors (and all related construction sub-trades)
- Site services / site preparation (for preparing land & services for facilities, plants, etc.)
- Environmental services
- Clean technology (air, water, land, tailing solutions)
- Machining
- Tank companies
- Piping companies (spools and modules)
- Electrical equipment & services
- Instrumentation
- Materials handling
- Building equipment
- Camp construction and camp services
- Transportation
- Professional services
Procurement Patterns, In-Situ Construction

- 30% Industrial Machinery (incl. drilling rigs)
- 15% Iron Steel Products
- 13% Electrical Products
- 10% Fabricated Metal Products
- 7% Measuring Control Instruments
- 4% Structural Steel
- 21% Other

Source: Adapted from Alberta Economic Development 2003: Manufacturing Opportunities Related to In Situ Oil Sands Industry Expansion.
Typical Mining Project (100,000 bbls/day)

- Procurement Budget
  - Equipment > C$500 million
  - Bulks > C$800 million
- Purchasing cycle of nearly 4 years from initial enquiries to final delivery
- 10 Purchase Orders (POs) of $10M - $40M each (boilers, pumps)
- $100M spent on logistics to site (incl. heavy lifts, highway escorts); 500 trucks/month arriving at site
- 625 POs incorporating over 50,000 vendor supplied documents
- 20 million site manhours
- Peak manning >4,000 at site
- 2,500 person camp – 10 days in 4 days out
Bulk Materials

- 250km of electrical cable
- 280km of instrument cable
- 27,000t of structural steel in 319 modules (piperack, equipment and structural modules); $120M spent on structural steel
- 1300 tagged valves
Bulk Materials

- 400km of carbon steel pipe up to 56 inch lines
- 100,000 fittings and flanges
- 14km of glass-reinforced epoxy (GRE) pipe (largely 36 inch diameter)
- 12,000 tagged items (Mechanical, Instrumentation, Electrical, HVAC)
- 92 new buildings erected and clad on site
Sourcing

- Materials overwhelmingly sourced through existing agreements for bulks with Canadian located companies – with a push for Alberta content to be maximised
- Materials from UK, Norway, Italy, Netherlands, Finland, Germany, Mexico and Korea – as well as 23 US States
- European involvement mainly in engineered equipment – pumps, complex instruments, fire fighting systems and controls
Value-Added Strategic Opportunity
Moving the oil sands up the value chain to enhance product and market diversification

- Production of the bitumen from the oil sands is expected to reach 3 million bpd by 2020
- Upgrading and refining of the bitumen produces by-products that can be used as low-cost feedstock for further value-add operations
- Alberta has the potential to become the next world-class eco-industrial integrated hydrocarbon processing hub based on the oil sands

Statistics
- 1.8 million bpd production of crude oil, 60% is raw bitumen
- 5 bitumen upgraders
  - 1.2 million bpd capacity
- 3 oil refineries
  - over 430,000 bpd capacity
- 4 major petrochemical facilities
  - 8.6 billion pounds production
Alberta Metal Manufacturing and Fabrication: Sector Stats

- Annual average revenues of $10B; 2011 rose to over $13.5B

Revenue Shares in 2011 for Major Sub-Sectors:

- Oil and gas field machinery: 36.2%
- Architectural and structural metals: 18.8%
- Pumps and compressors: 16.1%
- Boilers and tanks: 11.6%
- Machine shops: 7.4%
- HVAC: 6.8%
- Other: 3.2%
Collaborative and Market Opportunities in the MMF Sector

• Demand for metal manufacturing best practices:
  – Productivity
  – Technology deployment
  – Labour optimization

• Supply chain collaboration with Alberta firms

• Contribute to increasing the scale of the sector:
  – Mergers/acquisitions, joint ventures, integrated services
  – New capital investments

• Skilled labour supply and development

• Expertise in heavy industrial and energy construction
Engineering and Construction Sector

- Revenues of over $56 billion in 2011
- GDP contribution of approximately 10% of total Alberta economy
- Total direct employment estimated at over 275,000
- Approximately 25,000 firms comprise the sector
- Skill Sets include: engineers, architects, technologists, estimators, skilled construction, trades
  - There are more engineers and geosciences professionals in Alberta per capita than any other province in Canada.
Opportunities in the Engineering and Construction Sector

- Construction Services
- Maintenance Services
- Engineering
- Environmental Services
- Clean Technology – Air and Water
- Testing and Monitoring Services
- Project Management Services
Alberta`s Labour Market
Alberta’s Labour Market

- Forecasting a shortage of ~114,000 jobs by 2021
- Employment growth of 3.8% in 2011 – highest in Canada
- Lowest unemployment rates – 4.6% in July 2012
- Accounted for about half of all new jobs created in Canada over the past year.
- Alberta hires and trains more than 20% of the country’s apprentices
Alberta’s Labour Market

• The Oil Sands directly employs ~ 20,000 workers (2011)
  – In situ operations – 40% (8,217 jobs)
  – Mining operations - 40% (8,110 jobs)
  – Upgrading - 20% (3,977 jobs)

• By 2015, oil sands employment will increase by 30%

• By 2013, it will increase by 73% with in-situ employing ~ 46% of oil sands employment
Alberta’s Labour Market Outlook

Top 10 Occupations in highest demand:
- Project engineers
- Steam ticketed operators
- Electrical / Instrumentation engineer
- Mining engineers
- Heavy-duty equipment operators
- Mechanical engineering technologists
- Quality assurance analysts
- Drafting technologists
- Environmental technicians, Industrial electricians, Instrumentation technicians
Oil and Gas Technology and Services

• The oil & gas technology and services sector is wide-ranging and includes oilfield equipment and services, research and development, and oil and gas technologies.

• Revenues for the sector increased 45% from 2009 to 2010 to about $19 billion (because of a large increase in drilling activity).

• The industry more than doubled in size between 2000 and 2010.

• There were over 7,500 equipment and service firms employing 95,000 Albertans in 2011.

• In 2010, exports in the sector totaled $2.5 billion.
Opportunities in the Oil and Gas Technology and Services Sector

• Export of Alberta energy equipment, services and expertise, in particular in the heavy oil, sour oil and gas treatment, unconventional oil and gas, enhanced oil recovery and environment sectors.

• Export of Alberta energy products such as crude oil, gas and coal.

• Investment attraction in conventional and unconventional oil and gas.

• International collaboration of research and development.

• Supply chain expansion.

• Labour attraction and training opportunities.

• Regulatory framework and industry best practices.
“Over the next five years, more money ($6.1 billion) will be invested in climate friendly technology in Alberta than all the other Canadian provinces combined”

*The Conference Board of Canada (2010)*
R&D: Energy

Canadian Oil Sands Innovation Alliance

- Tailings
- Water
- Land
- Greenhouse Gases

Petroleum Technology Alliance of Canada

- Development of a Model to Predict Benzene Emissions from Glycol Dehydrators with Condensation Tanks
- Emissions Trade-offs for Combustion Sources (Boilers & Heaters)
- The Roles of Predation in Woodland Caribou Population Declines in Northeastern Alberta
**Education & Innovation**

**Economic Development Through Innovation**

Develop educated & innovative workforce

- Strong Public Primary / Secondary Education System

- Increase Post-Secondary Enrolment
- Increase Graduate Students/Graduate Scholarships

Connect post-secondary education to the world

- Internationalization action plan for universities
- Increase international visa students
- Enhance recognition of Alberta institutions abroad
## Alberta Innovates

Alberta’s New Advanced Technology Agencies:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta Innovates Bio Solutions</td>
<td>Builds on strength of Alberta Prion Research Institute and former Alberta Agriculture Research Institute, Alberta Forestry Research Institute and Alberta Life Sciences Institute</td>
</tr>
<tr>
<td>Alberta Innovates Energy and Environment Solutions</td>
<td>Includes the Alberta Water Research Institute and builds on strengths of former Alberta Energy Research.</td>
</tr>
<tr>
<td>Alberta Innovates Health Solutions</td>
<td>Builds on strengths of former Alberta Heritage Foundation for Medical Research</td>
</tr>
<tr>
<td>Alberta Innovates Technology Futures</td>
<td>Includes programs from Alberta ingenuity and Alberta Advanced Education and Technology and builds on strengths of former Alberta Research Council and iCORE</td>
</tr>
<tr>
<td>Alberta Research and Innovation Authority</td>
<td>Builds on the strengths of Alberta Science and Research Authority and provides policy direction</td>
</tr>
</tbody>
</table>
Alberta: A Great Place to Live, Work and Invest

- Strong and Growing Economy
- Low Personal and Corporate Taxes
- Skilled and Productive Workforce
- High Quality of Life

www.albertacanada.com