Alberta’s Oil Sands

The Role of Pipeline Infrastructure in U.S. Energy Security: Getting Canadian Oil to U.S. Markets

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Alberta covers 255,285 miles, an area slightly less than Texas.
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
Oil sands: In situ and Mining

**Mining**

- 20% of resource
- 55% of production

**In situ**

- 80% of resource
- 45% of production
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 reserve are in Alberta’s oil sands.
Sources of U.S. Crude Oil Imports in 2011

The U.S. imported 45% of the petroleum it consumed in 2011.

47% of U.S. crude imports come from OPEC members—Canada accounts for 47% of non-OPEC imports.
U.S. Crude Oil Supply Forecast

- Other Crude Imports
- Potential Canadian Crude Imports
- U.S. Domestic Crude Production

Assumes all Canadian exports go to United States

Moving Energy: Pipelines
Canadian oil in U.S. supply
Gulf Coast Suppliers Decline

Crude Oil Production

US Imports of Crude Oil

Thousands of Barrels per Day

Mexico
Venezuela
Refinery Utilization Mid-West vs Gulf Coast

- Gulf Coast
- Mid West
Keystone XL
Keystone XL

- Keystone State Department Approval: 1 year, 11 months
- Alberta Clipper State Department Approval: 2 years, 2 months
- Keystone XL Environmental Impact Analysis: 2 years, 11 months + 1 year
Intra-US Oil Sands Crude Movement

- 2011 volume roughly 2.5 times greater than previous 5-year period
- Large volumes of oil sands derived crudes are moving from Midwest to Gulf Coast through indirect/inefficient routes
  - Motivated by price differential
- Recent US EIA estimates:
  - Indirect/Older Pipeline → 166k bbl/d
  - Tanker/Barge → 28,000 bbl/d
  - Truck/Rail → Unknown, but may exceed pipeline shipments
U.S. Exports of Refined Petroleum Products

Billions

$100
$90
$80
$70
$60
$50
$40
$30
$20
$10
$0

Pipeline Corrosion

• Oil sands products have been transported for decades through pipelines in the U.S. and Canada.

• The American Petroleum Institute (API) examined U.S. pipeline accident data from 2002 through 2011 and found “no instances of crude oil releases caused by internal corrosion from pipelines carrying Canadian crude”.

[Image of a worker in a hard hat and safety gear]
Pipeline Corrosion

“...the internal corrosion related failures in the Alberta system over this time period per 1,000 pipeline miles per year were approximately 24 percent lower than in the U.S. system...Therefore, there is no evidence that the transportation of oil sands derived crude oil in Alberta has resulted in a higher corrosion related failure rate than occurs in the transportation of the variable-sourced crude oils in the U.S. system.”

U.S. State Department
Keystone XL
Supplemental Draft Environmental Impact Statement
Energy and Security
Energy and security

“Significant growth in oil sands imports into the United States will reduce the required volume of oil imports from elsewhere in the world.

The oil sands are sourced from a politically stable and secure country adjacent to the United States.”

Energy and security

“Perhaps the greatest impact of expanded oil sands exploitation would be a diversion of revenues away from adversarial governments.”


“Production from Canadian oil sands is set to continue to grow over the projection period, making an important contribution to the world’s energy security.”

Energy Security

Corruption Indices of Countries with Top Global Reserves

These Ten Countries Represent 85% of the Planet's Oil Reserves

Oil and Democracy

World's Top 15 Oil Producers 2010 (Barrels per Day)

- Russia
- Saudi Arabia
- United States
- Iran
- China
- Canada
- Mexico
- Nigeria
- UAE
- Iraq
- Kuwait
- Venezuela
- Brazil
- Angola
- Norway

Source: U.S. Energy Information Administration
Economist Intelligence Unit Democracy Index 2010
“The international energy market is dependent upon reliable transport. The blockage of a chokepoint, even temporarily, can lead to substantial increases in total energy costs. In addition, chokepoints leave oil tankers vulnerable to theft from pirates, terrorist attacks, and political unrest in the form of wars or hostilities as well as shipping accidents which can lead to disastrous oil spills.”

SOURCE: BP Statistical Review 2011
Major Oil Movement and Chokepoints

Major trade movements 2010
Trade flows worldwide (million tonnes)

A 30 day closure of the Strait of Hormuz would cost the U.S. $75 billion in GDP
CNA Military Advisory Board October 2011

**Bosphorus**
- 2.9 m bbl/d
- ½ mile wide
- Difficult navigation

**Strait of Hormuz**
- 17 m bbl/d (40% world total)
- 4 miles wide shipping lane
- Iran has threatened to close in the past

**Suez Canal**
- 2 m bbl/d
- 2.3 m bbl/d Sumed Pipeline through Egypt also vulnerable

**Bab el-Mandeb**
- 4 m bbl/d
- 2 mile wide channel
- Terrorist attack on tanker Limburg in 2002

**Strait of Malacca**
- 14 m bbl/d
- Mideast oil to Asia
- 1.7 miles wide at narrowest point
- Piracy problem

Source: BP Statistical Review 2011
Economic impact of the Oil Sands:

United States
Investment

Oil Sands Capital Investment (Billions)

2000-2011 Average: $11.5 billion/year

2012-2021 Average: $19.4 billion/year
Oil Sands and the U.S. Economy

• With $194 billion in forecast capital spending on oil sands development in the next 10 years a significant amount of that will be spent on purchasing material, equipment, parts and services from suppliers in the United States.

• “A greater fraction of money used to buy Canadian oil will likely later be spent directly on U.S. goods and services and hence contribute directly to U.S. growth.”

Economic impact in the U.S.

For every dollar spent on imported goods in 2011, this is how much returned to the US through exports

- Canada: $0.89
- Mexico: $0.75
- Saudi Arabia: $0.29
- Venezuela: $0.29
- OPEC: $0.34
- European Union: $0.73
- Japan: $0.51
- China: $0.26

Source: US Census Bureau and Statistics Canada

- The value of Alberta crude oil exports to the U.S. in 2011 was $52 billion.
- 89% of $52 billion = $47 billion in return U.S. exports to Canada.
## Number of Firms Supplying the Canadian Oil Sands

<table>
<thead>
<tr>
<th>State</th>
<th># Suppliers</th>
<th>State</th>
<th># Suppliers</th>
<th>State</th>
<th># Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>9</td>
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<td>California</td>
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<td>Delaware</td>
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<td>Montana</td>
<td>5</td>
<td>Tennessee</td>
<td>8</td>
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<tr>
<td>Florida</td>
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<td>North Carolina</td>
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<tr>
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<td>26</td>
<td>North Dakota</td>
<td>4</td>
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<td>Iowa</td>
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<td>West Virginia</td>
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<td>Louisiana</td>
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</tr>
</tbody>
</table>

Over 906 U.S. companies supply equipment, parts and services being used in oil sands operations.
Oil sands development will, on average, contribute between $8.4 billion and $15.9 billion per year to the U.S. economy between 2010 and 2035.*

* On this and following slides, the actual U. S. benefit depends on the extent to which growing production has pipeline access to markets.

Oil sands development and U.S. jobs

- Oil sands development will support an average 93,000 to 175,000 U.S. jobs per year between 2010 and 2035.
- The total earnings of these workers will average from $4 billion to $7.5 billion per year.

## SLC Oil Sands Economic Impact

### Impact of Alberta Oil Sands Development 2010-2035

<table>
<thead>
<tr>
<th>State</th>
<th>GDP Gain ($ Millions) Annual Average</th>
<th>Employment Created or Preserved Annual Average</th>
<th>Annual Avg. Compensation of Employees ($ Millions)</th>
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<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Alabama</td>
<td>$ 76</td>
<td>$ 147</td>
<td>1,120</td>
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<tr>
<td>Arkansas</td>
<td>$ 44</td>
<td>$ 85</td>
<td>680</td>
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<td>Florida</td>
<td>$ 302</td>
<td>$ 576</td>
<td>4,080</td>
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<td>Georgia</td>
<td>$ 166</td>
<td>$ 317</td>
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<td>Kentucky</td>
<td>$ 71</td>
<td>$ 139</td>
<td>1,040</td>
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<td>Louisiana</td>
<td>$ 209</td>
<td>$ 388</td>
<td>1,600</td>
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<tr>
<td>Mississippi</td>
<td>$ 45</td>
<td>$ 86</td>
<td>680</td>
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<tr>
<td>Missouri</td>
<td>$ 101</td>
<td>$ 196</td>
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<td>$ 355</td>
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<td>Oklahoma</td>
<td>$ 80</td>
<td>$ 155</td>
<td>960</td>
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<td>South Carolina</td>
<td>$ 65</td>
<td>$ 128</td>
<td>1,040</td>
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<tr>
<td>Tennessee</td>
<td>$ 109</td>
<td>$ 214</td>
<td>1,600</td>
</tr>
<tr>
<td>Texas</td>
<td>$ 766</td>
<td>$ 1,457</td>
<td>7,080</td>
</tr>
<tr>
<td>Virginia</td>
<td>$ 152</td>
<td>$ 289</td>
<td>1,800</td>
</tr>
<tr>
<td>West Virginia</td>
<td>$ 24</td>
<td>$ 45</td>
<td>360</td>
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<tr>
<td><strong>Sub Total</strong></td>
<td><strong>$ 2,394</strong></td>
<td><strong>$ 4,577</strong></td>
<td><strong>27,920</strong></td>
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<tr>
<td>the United States</td>
<td><strong>$ 8,421</strong></td>
<td><strong>$ 15,860</strong></td>
<td><strong>93,120</strong></td>
</tr>
</tbody>
</table>
Keystone XL Economic Impact on the U.S.

+ $5.9 billion per year in GDP
+ 65,480 U.S. jobs per year
+ $2.8 billion per year in wages.

Source: Canadian Energy Research Institute, "Economic Impacts of Staged Development of Oil Sands Projects in Alberta (2010-2035)", June 2011
## SLC KXL Economic Impact

### US Impact of Keystone XL

<table>
<thead>
<tr>
<th>State</th>
<th>GDP ($ Millions)</th>
<th>Compensation of Employees ($ Millions)</th>
<th>Employment Created or Preserved (Person-Years)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Average per Year</td>
<td>Total</td>
</tr>
<tr>
<td>Alabama</td>
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<td>$831</td>
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<td>$676</td>
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<td>$3,554</td>
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<td>Mississippi</td>
<td>$825</td>
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<td>Missouri</td>
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<td>$1,005</td>
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<tr>
<td>North Carolina</td>
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<td>$1,559</td>
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<tr>
<td>Oklahoma</td>
<td>$1,512</td>
<td>$60</td>
<td>$617</td>
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<tr>
<td>South Carolina</td>
<td>$1,267</td>
<td>$51</td>
<td>$676</td>
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<tr>
<td>Tennessee</td>
<td>$2,130</td>
<td>$85</td>
<td>$1,084</td>
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<tr>
<td>Texas</td>
<td>$13,871</td>
<td>$555</td>
<td>$5,484</td>
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<tr>
<td>Virginia</td>
<td>$2,758</td>
<td>$110</td>
<td>$1,403</td>
</tr>
<tr>
<td>West Virginia</td>
<td>$432</td>
<td>$17</td>
<td>$209</td>
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<tr>
<td>Sub-Total</td>
<td>$3,190</td>
<td>$128</td>
<td>$1,612</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Total US</th>
<th>Average per Year</th>
<th>Total Compensation of Employees ($ Millions)</th>
<th>Average per Year</th>
<th>Employment Created or Preserved (Person-Years)</th>
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</thead>
<tbody>
<tr>
<td>$148,636</td>
<td>$5,945</td>
<td>$70,813</td>
<td>$2,833</td>
<td>1,637,000</td>
<td>65,480</td>
</tr>
</tbody>
</table>
West Coast Pipelines

**Northern Gateway (Enbridge)**
- $5.5 billion
- 1,177 km
- 36 inch, 525,000 bpd crude oil
- 20 inch, 193,000 bpd condensate
- Kitimat
  - 3rd largest port in BC
  - Aluminum smelter
  - 2 LNG proposed LNG terminals

**TransMountain Expansion (Kinder Morgan)**
- Since 1957
- 1,150 km
- To Vancouver, Anacortes and Ferndale
- 300,000 bpd
- Proposed expansion +400,000 bpd
- Proposed Northern Expansion would link to Kitimat (400,000 bpd)
West Coast Access

Far East  
Target Markets  
U.S West Coast

Competitive travel distances for Canadian supply to both markets

Persian Gulf

Korea

China

Taiwan

Japan

Prince Rupert/Kitimat

Los Angeles

Santa Cruz

Jose/La Cruz

~ 4,500 N Miles

~ 8,600 N Miles

~ 1,400 N Miles

1,790 Miles

5,400 N Miles
Canadian oil in U.S. supply
Alaska and California Production

Crude Oil Production

MbbI
70,000

60,000
50,000
40,000
30,000
20,000
10,000
0


Source: U.S. Energy Information Administration
Eastern Canada Pipelines

- Western Canadian oil flows only as far East as Sarnia, Ontario.

- Refineries in Eastern Ontario, Quebec and Maritimes provinces served by East Coast production and imports.

- Enbridge Line 9 originally flowed East but reversed in 1999.

- Enbridge has applied to NEB to reverse direction between Sarnia and Westover, has indicated intention to apply for reversal to Montreal.

- Full reversal of the line would allow Western Canadian (and Bakken) production to reach tidewater at Portland, Maine.