Economic Impacts in Canada and the US of Canadian Oil and Gas Production

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Overview

Founded in 1975, the Canadian Energy Research Institute (CERI) is an independent, registered charitable organization specializing in the analysis of energy economics and related environmental policy issues in the energy production, transportation, and consumption sectors.

Our mission is to provide relevant, independent, and objective economic research of energy and environmental issues to benefit business, government, academia and the public.

CERI publications include:

• Market specific studies

• Geopolitical analyses

• Commodity reports (crude oil, electricity and natural gas)

In addition, CERI hosts an annual Petrochemicals Conference, and Energy Forum.
CERI receives financial support from its core funders which include Natural Resources Canada, Alberta Energy and the Canadian Association of Petroleum Producers.

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- Advisian Worley Parsons Group
- Petroleum Services Association of Canada
- Lithuanian Energy Institute
- Deloitte Canada Ltd.
Presentation Outline

- Background
- Methodology and Assumptions
- Production and Investment Forecasts
- Canadian Results
- US Results
Background: Trade

• In 2016, the US was the largest trading destination for Canada while Canada was the US’s second-largest trading partner – after China.

• Canada and the US share the world’s largest bilateral trading relationship, with trade totaling C$752 billion at the end of 2016.

• Canadian exports to the US at end-2016 are C$392 billion and imports from the US are $360 billion. A significant component of Canada’s exports to the US are its exports of crude oil, crude bitumen and natural gas.

• In 2016, crude oil exports accounted for C$51.5 billion while natural gas accounted for C$8.5 billion, only slightly behind the exports of passenger cars and light trucks.

• This study examines the economic impacts of the Canadian oil and natural gas industry on both Canadian and the US economies, at the provincial and state levels.
Background: Energy Exports

US Imports from Canada by Crude Type

- 2016 US Imports from Canada = 3,264 Mb/d
- Exports of heavy crude have been doubled in volume from just over 1 to almost 2 MMb/d in 2016
- Total imports from the US in 2016 were 411.8 Mb/d, destined for Ontario, Quebec, and Alberta

- PADD 2 region’s imports are almost solely sourced from Canada and predominant crude is heavy sour bitumen
- While PADD 3 is currently a small market for the Canadian exports, at just above 300,000 b/d, Canadian market share is growing
The largest net exports by state in 2016: Idaho (1,975 MMcf/d), Montana (1,351 MMcf/d), North Dakota (1,351 MMcf/d) and Washington (1,189 MMcf/d).

Most natural gas entering Canada comes in from Michigan and New York. There are several large pipelines in the Sarnia, Ontario area, to the Dawn, Ontario market hub.
Methodology: Models

- Economic impacts of the Canadian oil and gas industry development on the Canadian economy as well the US economy are estimated using a General Equilibrium model, which evaluates the impact of economic or policy shock in the economy.

- The results of this study are computed using CERI’s UCMRIO 4.0 Model, a computable version of the Walras General Equilibrium model, as well as the US IMPLAN model for the forecast period of 2017-2027.

- The forecasted values of investment and operations are used to estimate demand for the various goods and services and labour used in both phases.

- Economic impacts under consideration include economy-wide impacts such as value-added GDP, jobs created and preserved (given in thousands of person-years) and various forms of government tax revenues.
Assumptions: Crude and Oil Sands Production

- Conventional crude production excludes small production from ON, NB, and the Territories.
- Total production will remain flat, with slight declines in AB being offset from an increase in production from SK’s Bakken.
- Off shore NL oil production will also increase—albeit slightly—over the study period.

- Oil sands production is forecast to grow to 3.3 MMb/d by 2020.
- Mined production will peak in near term (2022) and steadily decline.
- In situ production continues to be higher than mined volumes.
Natural gas production forecast excludes a small amount of gas from Eastern Canada.

Total production is driven by AB and BC; increase in production in 2020 is driven by an assumption of LNG projects being built in BC. Revised production forecast due in January 2018 will eliminate LNG impact until 2025 of approximately 3 Bcfd.
Assumptions: SK Capital Investment and Operations

Saskatchewan Operations and Capital Investment

- Capital Investment, M $CAD
- Operations, M $CAD


Total Operations
Oil Capital Investments
Natural Gas Capital Investment
Assumptions: MB Capital Investment and Operations

Manitoba Operations and Capital Investment

- Capital Investment, M $CAD
- Operations, M $CAD


Total Operations
Oil Capital Investments
Assumptions: NL Capital Investment and Operations

Newfoundland Operations and Capital Investment

- Capital Investment, M $CAD
- Operations, M $CAD


- $1,200
- $1,000
- $800
- $600
- $400
- $200
- $-

- $14,000
- $12,000
- $10,000
- $8,000
- $6,000
- $4,000
- $2,000
- $-

Total Operations
Oil Capital Investments
Canadian Results: Oil Sands

2017-27 Oil Sands Investment and Operations Impacts:

<table>
<thead>
<tr>
<th></th>
<th>2017-27 Investment and Operations</th>
<th>Federal (Mln CAD$)</th>
<th>Provincial (Mln CAD$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>138,800</td>
<td>81,985</td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td>4,503</td>
<td>3,096</td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td>599</td>
<td>615</td>
<td></td>
</tr>
<tr>
<td>New Brunswick</td>
<td>215</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>Newfoundland/Labrador</td>
<td>105</td>
<td>114</td>
<td></td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>200</td>
<td>193</td>
<td></td>
</tr>
<tr>
<td>Nunavut</td>
<td>10</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>35</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td>9,751</td>
<td>8,131</td>
<td></td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>15</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Quebec</td>
<td>2,723</td>
<td>3,291</td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>819</td>
<td>777</td>
<td></td>
</tr>
<tr>
<td>Yukon Territory</td>
<td>17</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Total Canada</td>
<td>157,792</td>
<td>98,468</td>
<td></td>
</tr>
</tbody>
</table>

Taxes Collected ($CAD Million):

- Federal Corporate Tax
- Federal Indirect Tax
- Federal Personal Tax
- Provincial Corporate Tax
- Provincial Indirect Tax
- Provincial Personal Tax
Canadian Results: Oil (excl. oil sands) and Gas

2017-27 Oil & Gas Investment and Operations Impacts:
- Total Direct: 451,498 jobs
- Total Indirect: 798,335 jobs
- Total Induced: 1,238,063 jobs

2017-27 Investment and Operations:

<table>
<thead>
<tr>
<th>2017-27 Investment and Operations</th>
<th>Federal (Mln CAD$)</th>
<th>Provincial (Mln CAD$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>44,597</td>
<td>11,389</td>
</tr>
<tr>
<td>British Columbia</td>
<td>16,394</td>
<td>5,924</td>
</tr>
<tr>
<td>Manitoba</td>
<td>1,978</td>
<td>752</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>178</td>
<td>84</td>
</tr>
<tr>
<td>Newfoundland/Labrador</td>
<td>6,389</td>
<td>1,298</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>193</td>
<td>80</td>
</tr>
<tr>
<td>Nunavut</td>
<td>4</td>
<td>2</td>
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<tr>
<td>Northwest Territories</td>
<td>12</td>
<td>10</td>
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<tr>
<td>Ontario</td>
<td>5,541</td>
<td>2,834</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Quebec</td>
<td>1,856</td>
<td>998</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>9,533</td>
<td>5,409</td>
</tr>
<tr>
<td>Yukon Territory</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Canada</strong></td>
<td><strong>86,700</strong></td>
<td><strong>28,797</strong></td>
</tr>
</tbody>
</table>
US Employment Results: OS, Oil, NG

Employment impacts are measured in total number of jobs created or sustained. State of Alaska is not shown in the map and has an employment impact of 28 jobs.
### US top 10 Results: OS, Oil, NG

<table>
<thead>
<tr>
<th>State</th>
<th>Total Jobs</th>
<th>Total GSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td># of Jobs</td>
<td>Mn 2016 US$</td>
</tr>
<tr>
<td>Texas</td>
<td>113,414</td>
<td>$14,270</td>
</tr>
<tr>
<td>California</td>
<td>39,281</td>
<td>$4,814</td>
</tr>
<tr>
<td>Illinois</td>
<td>33,272</td>
<td>$3,133</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>22,932</td>
<td>$2,156</td>
</tr>
<tr>
<td>Ohio</td>
<td>16,986</td>
<td>$1,899</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>12,182</td>
<td>$1,438</td>
</tr>
<tr>
<td>Colorado</td>
<td>10,609</td>
<td>$1,257</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>11,406</td>
<td>$1,134</td>
</tr>
<tr>
<td>Wyoming</td>
<td>2,962</td>
<td>$995</td>
</tr>
<tr>
<td>Florida</td>
<td>9,660</td>
<td>$925</td>
</tr>
</tbody>
</table>
## Overall Results

<table>
<thead>
<tr>
<th>Category</th>
<th>2016 CAD$</th>
<th>2016 US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capital Investment</td>
<td>$380,133</td>
<td>$45,592</td>
</tr>
<tr>
<td>Total Operations</td>
<td>$1,832,568</td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>$2,715,497</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>6,572,030</td>
<td>405,833</td>
</tr>
</tbody>
</table>

- Canada employment – 1 direct, 2 indirect and 3 induced
- US employment – 1 direct, 1 indirect and 1 induced
- Difference relates to size of sector to the economy
Thank You for Your Time

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UPCOMING STUDIES:
An Economic Assessment of Electricity Generating Options
Economic Impacts and Market Challenges for the Methane to Derivatives Petrochemical Sub-Sector

UPCOMING CONFERENCE:
Petrochemical Conference: June 10-12 2018, Kananaskis, AB

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