Canadian Shale Gas & LNG in a North American Context

September 10, 2013
Canadian Unconventional Natural Gas Plays

North American Natural Gas Fundamentals

North American Demand and LNG Alternatives

Summary
BMO Financial Group and BMO Capital Markets

BMO Financial Group

Organization
- Canada's first bank: established in 1817
- Offers broad range of retail banking, wealth management and investment banking services
- One of the largest diversified financial services providers in North America

Key Operating Data
- Market Cap: C$38 billion
- Total Assets: C$525 billion
- LTM Revenue: C$16.3 billion
- Employees: 46,000
- Tier 1 Capital Ratio: 12.62%

Note: BMO financials – as of October 31, 2012

BMO Capital Markets – Global Investment Banking Operations

BMO Capital Markets’ Capabilities

ADVISORY SERVICES
- Acquisitions & Divestitures
- Mergers & Acquisitions
- Strategic Advisory
- Fairness Opinions
- Takeover Defense
- Share Buybacks
- Valuation Analysis

CORPORATE FINANCE
- Initial Public Offerings
- Follow-on Offerings
- Convertible Securities
- Mezzanine Lending
- High-Yield Debt
- Investment-Grade Debt
- Corporate Lending
- Securitization
- Private Placements

DISTRIBUTION & TRADING
- Institutional Sales
- Trading
- Equity Research
- Fixed Income Research
- Investor Marketing
- Investor Conferences
- Account Sponsorship
- Retail Distribution

TREASURY SERVICES
- Cash Management
- Risk Management
- Asset Management
- Foreign Exchange
- Trade Finance
## Investment & Corporate Banking Financial Solutions

### MERGERS & ACQUISITIONS
- Provider of premier M&A services to public and private clients of varying sizes
- Over 50 professionals globally
- Advised on $29 bn worth of E&P transactions in 2012 (ranked #1 in domestic E&P league tables)

### ACQUISITIONS & DIVESTITURES
- Provider of premier in-depth A&D services in Canada and the United States
- 13 professionals in Canada and 19 in the United States

### LOAN FINANCING
- Arranger, underwriter and provider of syndicated loan financing for M&A, leveraged finance, bridge facilities, project finance and general corporate purposes
- 125 professionals globally

### EQUITY CAPITAL MARKETS
- Equity underwriter for public and private companies through IPOs, follow-on common share and trust offerings, preferred shares, private placements and convertible debentures
- Over 19 professionals globally
- Ranked #1 in domestic equity E&P league tables via 10 book-run transactions in 2012

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**Complete suite of advisory and corporate banking solutions**
145+ Energy professionals with global reach
## Canadian Oil & Gas M&A

**Last Twelve Months**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Name</th>
<th>Transactions</th>
<th>Size (C$ mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BMO Capital Markets</td>
<td>6</td>
<td>$26,821</td>
</tr>
<tr>
<td>2</td>
<td>RBC Capital Markets</td>
<td>13</td>
<td>$21,587</td>
</tr>
<tr>
<td>3</td>
<td>Citi</td>
<td>2</td>
<td>$18,496</td>
</tr>
<tr>
<td>4</td>
<td>Goldman Sachs &amp; Co</td>
<td>1</td>
<td>$17,900</td>
</tr>
<tr>
<td>5</td>
<td>Bank of America Merrill Lynch</td>
<td>2</td>
<td>$6,147</td>
</tr>
<tr>
<td>6</td>
<td>HSBC Bank</td>
<td>2</td>
<td>$2,526</td>
</tr>
<tr>
<td>7</td>
<td>TD Securities</td>
<td>7</td>
<td>$1,528</td>
</tr>
<tr>
<td>8</td>
<td>GMP Securities</td>
<td>10</td>
<td>$1,309</td>
</tr>
<tr>
<td>9</td>
<td>Credit Suisse</td>
<td>3</td>
<td>$1,201</td>
</tr>
<tr>
<td>10</td>
<td>Evercore Partners</td>
<td>4</td>
<td>$7,546</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bloomberg (August 23, 2013); Canadian target or seller or acquirer; credit to acquirer or seller financial advisor only; announced and completed deals LTM; oil and gas E&P

**Leading Energy M&A Franchise**

- **$510 million**
  - Advisor on Sale of SE SASK Asset to TORC Oil & Gas
  - Pending

- **$6.0 billion**
  - Advisor on Sale to PETRONAS
  - December 2012

- **$424 million**
  - Advisor on Merger with WestFire Energy
  - October 2012

- **$183 million**
  - Advisor on Amended Proposal to Open Range
  - August 2012

- **$1.9 billion**
  - Advisor on sale to Pengrowth Energy
  - May 2012

- **$611 million**
  - Advisor on Acquisition of Wild Stream Exploration Inc.
  - March 2012

- **US$2.2 billion**
  - Advisor on Acquisition of OPTI Canada Inc.
  - November 2011

- **US$17.9 billion**
  - Advisor on Acquisition of Nexen Inc.
  - February 2013

- **US$861 million**
  - Advisor on Acquisition of Ute Energy
  - November 2012

- **$1.1 billion**
  - Advisor on Montney Joint Venture with PETRONAS
  - August 2011

BMO Capital Markets is the #1 advisor to the Canadian energy sector
M&A Platform Combines Financial and Technical Expertise

- Strong synergies created by combining traditional investment banking with technically-focused A&D group
- Full platform of advisory and banking services offered within BMO Capital Markets
- Technical expertise allows BMO to effectively sell assets/corporations and support Investment Banking
- Extensive contact network of investment banking at C-suite levels supports technical expertise and business development contacts of the A&D group

Combination of technical and financial expertise to provide clients with a full service platform
BMO Capital Markets

Canadian Unconventional Natural Gas Plays

North American Natural Gas Fundamentals

North American Demand and LNG Alternatives

Summary
North America has a proliferation of unconventional / tight gas resource plays

3 plays are dominant in Canada
- Montney
- Horn River
- Duvernay
Canadian Unconventional Natural Gas Plays

West Coast Natural Gas Plays

YUKON NORTWEST TERRITORIES ALBERTA BRITISH COLUMBIA SASKATCHEWAN MANITOBA

Horn River:
Resource Potential: ~100 tcf
Current Production: ~0.6 bcf/d

Montney:
Resource Potential: ~130 tcf
Current Production: ~2.5 bcf/d

Duvernay:
Evolving liquids-rich gas opportunities with promising early stage results

<table>
<thead>
<tr>
<th></th>
<th>Initial Production(mmcf/d)</th>
<th>EUR/Well (bcf)</th>
<th>Condensate (bbl/mmcf)</th>
<th>NGL (Deep Cut) (bbl/mmcf)</th>
<th>Capital ($mm)</th>
<th>ROR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montney</td>
<td>3 - 10</td>
<td>3 - 8</td>
<td>0 - 60</td>
<td>7 - 70</td>
<td>4.5 - 8.5</td>
<td>20 - 100+</td>
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<tr>
<td>Horn River</td>
<td>5 - 12</td>
<td>6 - 14</td>
<td>0</td>
<td>0 - 2</td>
<td>12 - 18</td>
<td>0 - 25</td>
</tr>
<tr>
<td>Duvernay</td>
<td>2 - 6</td>
<td>2 - 5</td>
<td>3 - 300+</td>
<td>80 - 120</td>
<td>10 - 15</td>
<td>50 - 100+</td>
</tr>
</tbody>
</table>

Source: Wood Mackenzie
Western Canada Unconventional Gas Plays – Top Land Holders

**Top 15 Key Acreage Holders**

### Montney (Moderately Liquids-rich)

<table>
<thead>
<tr>
<th>Company</th>
<th>Net Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>PETRONAS</td>
<td>1,281</td>
</tr>
<tr>
<td>Encana</td>
<td>1,024</td>
</tr>
<tr>
<td>CNRL</td>
<td>1,011</td>
</tr>
<tr>
<td>Exxon</td>
<td>841</td>
</tr>
<tr>
<td>Long Run</td>
<td>694</td>
</tr>
<tr>
<td>ARC</td>
<td>688</td>
</tr>
<tr>
<td>Talisman</td>
<td>303</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>266</td>
</tr>
<tr>
<td>Briscoe</td>
<td>264</td>
</tr>
<tr>
<td>Metashari</td>
<td>256</td>
</tr>
<tr>
<td>Crewe</td>
<td>201</td>
</tr>
<tr>
<td>Murphy</td>
<td>195</td>
</tr>
<tr>
<td>Traumolina</td>
<td>195</td>
</tr>
<tr>
<td>Shippc</td>
<td>190</td>
</tr>
<tr>
<td>Shell</td>
<td>180</td>
</tr>
</tbody>
</table>

- Producers participating in west coast LNG projects

### Horn River (Dry Gas)

<table>
<thead>
<tr>
<th>Company</th>
<th>Net Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exponential</td>
<td>531</td>
</tr>
<tr>
<td>Encana</td>
<td>450</td>
</tr>
<tr>
<td>Apache</td>
<td>313</td>
</tr>
<tr>
<td>Devon</td>
<td>266</td>
</tr>
<tr>
<td>EQG</td>
<td>245</td>
</tr>
<tr>
<td>QuickSilver</td>
<td>203</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>156</td>
</tr>
<tr>
<td>Sunoro</td>
<td>148</td>
</tr>
<tr>
<td>CNRL</td>
<td>139</td>
</tr>
<tr>
<td>CNOOC</td>
<td>141</td>
</tr>
<tr>
<td>Storm Resources</td>
<td>138</td>
</tr>
<tr>
<td>Penn West</td>
<td>116</td>
</tr>
<tr>
<td>Pengrowth</td>
<td>113</td>
</tr>
<tr>
<td>Lightstream</td>
<td>84</td>
</tr>
<tr>
<td>KOGAS</td>
<td>72</td>
</tr>
</tbody>
</table>

- Producers participating in west coast LNG projects

### Duvernay (Liquids-rich)

<table>
<thead>
<tr>
<th>Company</th>
<th>Net Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache</td>
<td>1,000</td>
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<tr>
<td>CNRL</td>
<td>623</td>
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<tr>
<td>Talisman</td>
<td>563</td>
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<tr>
<td>Bowwest</td>
<td>400</td>
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<tr>
<td>Chevron</td>
<td>381</td>
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<tr>
<td>Encana</td>
<td>355</td>
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<tr>
<td>CNPC</td>
<td>340</td>
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<tr>
<td>Tillyf</td>
<td>225</td>
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<tr>
<td>Long Run</td>
<td>199</td>
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<tr>
<td>Shoppc</td>
<td>195</td>
</tr>
<tr>
<td>Exxon</td>
<td>172</td>
</tr>
<tr>
<td>Penn West</td>
<td>156</td>
</tr>
<tr>
<td>Lightstream</td>
<td>145</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>141</td>
</tr>
<tr>
<td>TAGA North</td>
<td>125</td>
</tr>
</tbody>
</table>

- Producers participating in west coast LNG projects

Source: Public Disclosure, GeoSCOUT
Montney Gas Production – Alberta and British Columbia

Montney Production Profile

- June 2013 production – 2.49 Bcf/d
- June 2013 well count – 3,144

Top 5 Producers
1. Encana - 612 mmcf/d
2. Shell – 287 mmcf/d
3. Arc – 267 mmcf/d
4. Murphy – 185 mmcf/d
5. Progress/Petronas – 147 mmcf/d

Top 5 Acreage Holders
- PETRONAS
- Encana
- CNRL
- ExxonImperial
- Long Run

Montney production has grown rapidly over the last 5 years

Q2 Canadian Montney production proximal to west coast LNG – 2.4 Bcf/d
Horn River Gas Production – British Columbia

Horn River Production Profile

- Horn River production surpassed 0.5 bcf/d in 2013
- Currently > 200 wells producing

Q2 Canadian Horn River production proximal to west coast LNG – 0.6 Bcf/d

Top 5 Producers
#1 Encana - 205 mmcf/d
#2 Nexen – 145 mmcf/d
#3 Quicksilver – 82 mmcf/d
#4 Apache – 42 mmcf/d
#5 Penn West – 34 mmcf/d

Top 5 Acreage Holders
- Exxon/Imperial
- Encana
- Apache
- Devon
- EDG

Well Location Map

- May 2013 production – 0.60 Bcf/d
- May 2013 well count - 205
Duvernay Gas Production - Alberta

Duvernay Production Profile

- June 2013 production – 18.0 MMcf/d
- June 2013 well count – 21

Top 5 Acreage Holders

- Athabasca
- CNRL
- Talisman
- Bonavista
- Chevron

Well Location Map

- Grande Prairie

Q2 Canadian Duvernay production proximal to west coast LNG – 18 MMcf/d

- Early stage development for the Duvernay play
- Current producing well count is low (~21 wells)
- Many wells drilling or coming on production (~64 wells)
Multi-stage fracs in unconventional reservoirs create large initial production rates with large initial declines followed by flattening production profiles.
<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMO Capital Markets</td>
</tr>
<tr>
<td>Canadian Unconventional Natural Gas Plays</td>
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<tr>
<td>North American Natural Gas Fundamentals</td>
</tr>
<tr>
<td>North American Demand and LNG Alternatives</td>
</tr>
<tr>
<td>Summary</td>
</tr>
</tbody>
</table>
As is now well known, the emergence of unconventional natural gas has significantly shifted down the supply cost curve and increased production.

Given the size of resource opportunity and lack of current export capability, gas prices are expected to remain trapped in the $3-$5/mcf range for the next several years.
Shale gas production has increased substantially and currently represents ~36% of U.S. dry gas production.
Total US shale gas production growth is flattening

Marcellus production is increasing while Haynesville production is declining

Source: EIA
Flat US total production is in contrast to sharply falling rig counts

- Higher efficiency of drilling rigs and completions (more production per rig)
- Tie in of existing wells and optimization of infrastructure

Source: Bloomberg, Baker Hughes, DOE
Unconventional gas represents 13% of total current Canadian production.
Natural Gas Fundamentals

Net U.S. Natural Gas Imports from Canada

- Canadian exports to the U.S. have decreased dramatically over the last 5 years (55%)
- Clearly new export markets (LNG) are required for Canadian production

Source: EIA
Unconventional shale plays have proliferated throughout North America.

At $4.0/mcf, 13 shale gas plays could economically deliver (half cycle) ~800 tcf of recoverable gas at PV10.

This translates to an 80 year supply at current shale gas rates or 30 years at current North American production rates.

Montney is very competitive compared to other plays.

Duvernay is expected to be very competitive due to high liquids content.
There are several opportunities to acquire land / production in Canadian unconventional plays:

**Montney**
- Canadian Natural Resources
- Canbriam – Private Company
- UGR – Private Company
- Painted Poiny
- Canadian Spirit
- Birchcliff
- Advantage

**Horn River**
- Devon
- Quicksilver
- Spoke Resources – Private Company
- Ramshorn

**Duvernay**
- Talisman
- Penn West
- Athabasca
- Longview
<table>
<thead>
<tr>
<th>BMO Capital Markets</th>
</tr>
</thead>
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<td>North American Natural Gas Fundamentals</td>
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<td>North American Demand and LNG Alternatives</td>
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<tr>
<td>Summary</td>
</tr>
</tbody>
</table>
- Increased consumption due to a structural shift toward generating more electricity from natural gas-fired power plants from coal fired power plants
- Other factors include weather, relatively low natural gas prices, and higher Industrial consumption
- 2012 gas consumption for power generation was an unusual increase versus previous years
- This was due to hot weather and fuel switching from coal to natural gas

Source: EIA
Note: 2013 data includes a projection from July – December

Increased natural gas consumption for power generation took off in 2012
Coal to Gas Price Equivalency

- Coal to gas fuel switching economics dominated H2 2011 and all of 2012
- Current coal prices are ~8.9% lower than 2011
- Current prices would indicate that coal and gas are close to equivalent from fuel cost perspective

Source: BMO Capital Markets Research
North American vs. Asian (LNG) Gas Prices

Rising and strong spread between North American and Asian market gas prices driving interest in North American LNG projects

Implied LNG and NYMEX Gas Price Comparison

Note: Implied LNG price calculated as Japanese Customs Cleared crude oil price (JCC) * 14.5%
Source: Bloomberg

Spread

Asian vs N.A. price premium ~$12 / mmbtu
LNG Supply “Tightness” Expected to Develop

Global LNG Supply and Demand – Major Drivers and Implications

1. Post-Fukushima Asian requirements and strong emerging markets are increasing demand and tightening the market

2. New supply is drifting out in time
   (a) Delays in Australian projects
   (b) Development challenges faced in other regions

3. The inability of some projects to maintain stable and reliable supply is likely to tighten the market in the near term and is a material concern in the long term

Market tightening ~ 2016 – 2018 as demand nears capacity
Robust pipeline of liquefaction projects announced; not all will be built

Source: PIRA, Wood Mackenzie
Note: Supply reflects liquefaction capacity available; does not account for projects that may decline due to depletion of upstream resource
Highly unlikely that non LNG linked North American producers will materially benefit from the price arbitrage

Asian and Indian buyers saying they no longer want liquids-based (JCC) based pricing for LNG – tools to challenge linked pricing:

- Canada and U.S. LNG projects
- Japan to launch LNG futures trading on Tokyo Commodity Exchange in 2014
- Establishment of an Asian natural gas trading hub
46 bcf/d (345 mmtpa) of North American LNG projects announced

Brownfield projects have time and cost advantage over greenfield projects
## Canadian LNG
### Competitive Landscape – Large Scale (>1 bcf/d) Proposed Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Ownership</th>
<th>Start Year</th>
<th>Capacity</th>
<th>Cost Estimate (Liquefaction Only)</th>
<th>Status / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>West Coast - Larger Scale Projects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNG Canada</td>
<td>Kitimat (Cenovus Site)</td>
<td>Shell / KOGAS / Mitsubishi / CNPC</td>
<td>2019</td>
<td>24.0</td>
<td>3.2</td>
<td>$24.0 NEB approved; CEA underway</td>
</tr>
<tr>
<td>Pacific Northwest LNG</td>
<td>Prince Rupert (Lelu Island)</td>
<td>PETRONAS / JAPEX</td>
<td>2018</td>
<td>19.7</td>
<td>2.6</td>
<td>$10.0 NEB application filed; FID (2014); CEA underway; FEED study awarded</td>
</tr>
<tr>
<td>WCC LNG</td>
<td>Kitimat / Prince Rupert</td>
<td>Exxon / Imperial</td>
<td>2021</td>
<td>30.0</td>
<td>4.0</td>
<td>TBA NEB application submitted</td>
</tr>
<tr>
<td>Kitimat LNG</td>
<td>Kitimat (Bish Cove)</td>
<td>Chevron / Apache</td>
<td>2017</td>
<td>10.0</td>
<td>1.3</td>
<td>$9.5 NEB approved; Chevron took lead role in Dec 2012</td>
</tr>
<tr>
<td>Prince Rupert LNG</td>
<td>Prince Rupert (Ridley Island)</td>
<td>BG Group</td>
<td>2020</td>
<td>21.6</td>
<td>2.9</td>
<td>TBA Feasibility stage (2013/14); FID (2015); CEA filing &amp; NEB application submitted</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td>105.3</td>
<td>14.0</td>
<td>16.6 43.5</td>
</tr>
<tr>
<td><strong>East Coast</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goldboro LNG</td>
<td>Nova Scotia</td>
<td>Pieridae Energy</td>
<td>2018</td>
<td>10.0</td>
<td>1.3</td>
<td>$5.0 NEB application pending; 20-year offtake with E.ON (5 mtpa)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>115.3</td>
<td>15.4</td>
<td>18.2 48.5</td>
</tr>
</tbody>
</table>

Source: Company Disclosure, NEB, PIRA, Platts, Wood Mackenzie  
Note: Mcf equivalent of LNG per day (48.7 mcf / tonne)  
1. LNG produced at plant outlet.  
2. Estimated feed gas requirement at the well head (48.7 mcf / tonne, 8% liquefaction loss, 8% field processing loss).  

Large scale announced Canadian LNG projects total 115 mmtpa or 15.3 bcf/d
## Canadian LNG
### Competitive Landscape – Smaller Scale (<1 bcf/d) Proposed Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Ownership</th>
<th>Start Year</th>
<th>Capacity</th>
<th>Outlet Gas (bcf/d)</th>
<th>Field Gas (bcf/d)</th>
<th>Cost Estimate (Liquefaction Only)</th>
<th>Status / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AltaGas / Idemitsu Kosan JV</td>
<td>Prince Rupert</td>
<td>AltaGas / Idemitsu Kosan</td>
<td>2017</td>
<td>2.0</td>
<td>0.3</td>
<td>0.3</td>
<td>TBA</td>
<td>Feasibility study expected to be completed by 2014; considering FLNG</td>
</tr>
<tr>
<td>Douglas Channel Energy</td>
<td>Kitimat</td>
<td>LNG Partners / Haisla / Golar / Unnamed Asian</td>
<td>2015</td>
<td>1.8</td>
<td>0.2</td>
<td>0.3</td>
<td>$0.5</td>
<td>NEB approved; Golar offtake and up to 25% ownership; FID Q3-13</td>
</tr>
<tr>
<td>LNG Direct Rail</td>
<td>Hart, B.C.</td>
<td>Adastra Energy</td>
<td>TBA</td>
<td>1.5</td>
<td>0.2</td>
<td>0.2</td>
<td>$1.9</td>
<td>Initial consultation, preliminary planning</td>
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<tr>
<td>Woodfibre</td>
<td>Squamish B.C.</td>
<td>Pacific Oil &amp; Gas</td>
<td>TBA</td>
<td>2.1</td>
<td>0.3</td>
<td>0.3</td>
<td>TBA</td>
<td>Has 35% interest in Jiangsu Rudong regas facility in China Fortis to twin existing right of way and Spectra to provide 25 cm pipe support</td>
</tr>
<tr>
<td>Discovery</td>
<td>Campbell River, B.C.</td>
<td>Quicksilver</td>
<td>2019</td>
<td>TBA</td>
<td>TBA</td>
<td>TBA</td>
<td>TBA</td>
<td>Regulatory process to begin before the end of 2013</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>7.4</td>
<td>1.0</td>
<td>1.2</td>
<td>$2.4</td>
<td></td>
</tr>
</tbody>
</table>

Source: Company Disclosure, NEB, PIRA, Platts, Wood Mackenzie

Note: Mcf equivalent of LNG per day (48.7 mcf / tonne)
1. LNG produced at plant outlet.
2. Estimated feed gas requirement at the well head (48.7 mcf / tonne, 8% liquefaction loss, 8% field processing loss).
3. BMO research estimate.

- Small Canadian LNG projects account for ~6% of the total announced Canadian LNG volumes
West Coast B.C. LNG Supporting Pipelines

$18.5 bn of proposed pipelines to transport ~11 bcf/d
Canadian LNG
Relative Comparison

Supply Cost (Regional)

$/mmult

Canadian projects generally cost competitive relative to other global developments

Source: Street Research, Wood Mackenzie
BMO Capital Markets

Canadian Unconventional Natural Gas Plays

North American Natural Gas Fundamentals

North American Demand and LNG Alternatives

Summary
Summary

Canadian Unconventional Gas

- 3 Dominant plays in Canada – Montney, Horn River, and Duvernay
- Economically competitive with other North American plays
- Opportunities exist to acquire significant positions in each of these plays

North American Liquefaction Gaining Momentum

- Recent years have seen the announcement of numerous LNG liquefaction projects both in Canada and the U.S.
  - Global LNG market participants have been seeking out new sources of supply to fulfill existing obligations and to meet future increased demand
    - North America is quickly emerging as one of these sources as the recent shale gas boom has left the continent awash in natural gas; not long ago North America was planning on importing LNG
- 11 projects announced in Canada (122.7 mmtpa, 16.4 bcf/d), some of which are integrated greenfield developments tied to upstream assets
  - Several other, as yet unannounced, projects also being developed
- 17 major projects announced in the U.S. (218.4 mmtpa, 29.1 bcf/d), a number of which are brownfield developments which will leverage existing regasification facilities

Canada an Attractive LNG Supply Source

- Close proximity to end-use market
  - Shipping time from Canada to Asia comparable with Australian LNG
  - Significantly closer than the U.S.
- Better ability to participate in integrated projects
Recent North American LNG Developments

**Conoco (Freeport)**
- DOE recently approved Conoco’s Freeport LNG application – the first approval in 2 years
  - Many other projects are waiting on DOE decisions before moving forward

**Chevron / Apache (Kitimat LNG)**
- Chevron entered the Canadian LNG game by taking out EnCana and EOG in the Kitimat LNG project – Chevron will operate the facility with Apache as its partner operating the production
  - Crude-linked pricing remains primary obstacle

**Pacific Oil & Gas (Woodfibre)**
- Pacific Oil & Gas also announced a new project at Squamish, BC
  - 200 mmcf/d facility on Howe Sound
  - Fortis and Spectra will build required pipeline
  - This is a brownfield site with an existing deep water port

**AltaGas / Idemistu JV**
- AltaGas partnered 50/50 on a joint venture with Idemistu, to explore LNG export opportunities with potential all-in investment in the $2-5 bn range (feasibility study currently underway)

**PETRONAS / JAPEX (Pacific Northwest LNG)**
- Progress (PETRONAS) announced the selection of TransCanada to build its pipeline to Prince Rupert (remember TransCanada is also building the pipeline for Shell to Kitimat)

**BG Group (Prince Rupert LNG)**
- Canadian Environmental Assessment Agency currently reviewing BG Group’s proposed 3.3 bcf/d Prince Rupert LNG export project proposal (construction to commence in 2016 with Phase 1 completion targeted by 2021)
Other Potential Canadian LNG Projects

Grassy Point Project(s) – Expressions of Interest (EOI) Process

- March 2013 BC government sought expressions of interest for LNG projects on Crown land at Grassy Point near Prince Rupert
- Proponents required to:
  - Identify financial capacity, LNG experience, and natural gas source plan
  - Provide project description, aboriginal and community engagement and consultation, and potential to work with other companies/projects
- Eligible EOs received from:
  - Nexen/CNOOC/INPEX/JGC
  - Woodside Petroleum
  - SK E&S
  - Imperial Oil Resources/ExxonMobil
- Eligible EOI undergoing evaluation by government to determine how many projects Grassy Point can accommodate

Quicksilver (Discovery)

- Quicksilver purchased Elks Falls industrial site in Campbell River, B.C. (Vancouver Island) from Catalyst Paper to develop LNG export facility
  - Regulatory process expected to begin before the end of 2013
Canadian LNG Considerations

- Federal Department of Transport working on report regarding shipping and infrastructure (radar and other) needs to facilitate more shipping capacity

- Potential “black swans” (for example, Russia building natural gas pipe to South Korea)

- BC government proposing LNG-funded Prosperity Fund
  - $100 to $260 billion to be generated from LNG royalties and business taxes
  - Intended to wipe out BC debt and eliminate sales tax

- Increasing aboriginal assertion of ownership rights and entitlements (including right of consent)

- Local west coast (Kitimat) First Nations groups supportive of LNG development
  - “The Haisla people look forward to a long partnership with Kitimat LNG. The economic opportunity that comes with the project will benefit our people for a very long time.”
    - Chief Councilor Dolores Pollard (Haisla Nation)

- Significant new-build electrical supply will be required to support the NEBC projects
  - Christy Clark is adamant that her province will “not allow the lack of power supply to stand in the way of further important steps in LNG.”
    - Christy Clark (B.C. Premier)
North American Liquefaction
Canada vs. United States

Canadian Liquefaction Developing as Integrated Model

- Canadian liquefaction development primarily occurring in NEBC; a relatively shallow and less liquid market than the U.S. GOM
  - Announced west coast liquefaction projects are expected to require ~19 Bcf/d of feed gas which is in excess of B.C’s current production by 4-5x
    - EOI projects could push excess much higher
  - In order to secure supply for Canadian liquefaction projects, liquefaction parties are moving into the upstream by way of joint ventures with Canadian producers and/or outright asset purchases

- Potential to provide higher heat content gas; a characteristic that is preferred in certain markets, including Japan

Political Environment

- Energy export is more “politically charged” in the U.S. relative to Canada
  - The U.S. is traditionally an energy importer vs. Canada as an exporter
  - Potential U.S. LNG exports receiving push back from special interest groups
    - Many issues dealt with by DOE in Freeport permit

- December 2012 – DOE commissioned NERA report which concluded that LNG exports are of a net benefit to the U.S.

- May 2013 the DOE released Freeport NFTA export permit and confirmed:
  - Non-FTA export decisions on a case-by-case basis
  - DOE to take “measured approach” to granting permits
  - Will assess cumulative impact each successive request will have on public interest (including U.S. gas supply/demand)
  - Permits not to be issued unless developer shows there are / will be facilities to handle exports and gas supply (commercial maturity test)
  - Secretary of Energy, Ernest Moniz, saying DOE “will expeditiously work through the remaining (LNG permit) applications”
The U.S. Gas Market is Deeper & More Liquid than Canada’s

- The U.S. market is significantly larger and more liquid than the Canadian market, in particular in the Gulf of Mexico (GOM) region where the majority of north American liquefaction projects are being proposed
  - GOM region (Texas, Louisiana and federal offshore) production is ~35 Bcf/d vs. 3 Bcf/d in B.C.

Existing Regas Infrastructure Allows for Brownfield Development in the U.S.

- The U.S. currently has 17 Bcf/d of LNG regasification infrastructure that is almost completely unutilized (~5% in 2011)
  - In addition to greenfield development, the majority of existing regas terminals are developing liquefaction capabilities and leveraging existing storage and regulatory approvals (brownfield)
  - Canada has only one regas facility that could facilitate brownfield development (Canaport – New Brunswick)

U.S. Liquefaction Developing With Long-Term Agreements

- LNG buyers entering into long-term arrangements to guarantee access to LNG
  - Not obligated to take LNG, thus protected against Henry Hub price volatility
    - But still pay on use-or-pay facilities agreements
- Facilities are being underpinned by long-term tolling/processing agreements (i.e., Cheniere SBP, Sempra Cameron)
- Upstream participants not economically integrated in U.S. liquefaction model
## Canadian LNG Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Feed Gas Requirements (1)</th>
<th>Resource vs. Required Gas</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily (bcf/d)</td>
<td>Total (25 Yr) (tcf)</td>
<td>Fill (2)</td>
</tr>
<tr>
<td>Announced</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>LNG Canada</td>
<td>3.8</td>
<td>34.5</td>
<td>[ ]</td>
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<tr>
<td>Pacific Northwest LNG</td>
<td>3.1</td>
<td>28.3</td>
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<tr>
<td>WCC LNG</td>
<td>4.7</td>
<td>43.2</td>
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<tr>
<td>Kitimat LNG</td>
<td>1.6</td>
<td>14.4</td>
<td>[ ]</td>
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<tr>
<td>Prince Rupert LNG</td>
<td>3.4</td>
<td>31.1</td>
<td>[ ]</td>
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<tr>
<td>AltaGas / Idemitsu Kosan</td>
<td>0.3</td>
<td>2.9</td>
<td>[ ]</td>
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<tr>
<td>Douglas Channel</td>
<td>0.3</td>
<td>2.6</td>
<td>[ ]</td>
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<tr>
<td>Goldboro LNG</td>
<td>1.6</td>
<td>14.4</td>
<td>[ ]</td>
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<tr>
<td>Other / Potential (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nexen (CNOOC) / Inpex / Japan Gas</td>
<td>1.9</td>
<td>17.3</td>
<td>[ ]</td>
</tr>
<tr>
<td>Woodside</td>
<td>1.9</td>
<td>17.3</td>
<td>[ ]</td>
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<tr>
<td>SK E&amp;S</td>
<td>1.9</td>
<td>17.3</td>
<td>[ ]</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24.5</strong></td>
<td><strong>223.3</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Estimated well head gas assuming 8% liquefaction loss and 8% field processing loss.
2. BMO estimate of liquefaction feed gas requirements vs. resource currently held.
3. Assumed project size of 12 mmtpa.
Is There Enough Gas?

The continent is “awash” in natural gas with the U.S. and Canada having 1,916 and 535 tcf of remaining resource, respectively.

- Illustratively, U.S. and Canada could sustain production rates of 53 and 16 bcf/d for 100 years, respectively.

Given that western Canada’s proven resource only accounts for ~10% of the total (57 tcf, or 6 bcf/d over 25 years) LNG exports will be relying on probable / undiscovered resources to meet the potential demand.

- Geological plays such the Montney, Duvernay, and Horn River have been identified by industry as the likely sources of feed-gas for LNG.
  - With 132 tcf of resource the Montney could sustain production levels of 14 bcf/d for 25 years.
Overall, it is not a question of do we have the gas, but rather what gas (plays) will be developed to meet the demand.

Factors such as heat content and proximity will largely influence which plays are developed for LNG export.

Source: Ziff Energy Group
Significant new production required to support LNG developments

Source: Wood Mackenzie
## U.S. LNG Competitive Landscape – Major Project Development

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Ownership</th>
<th>Start Year</th>
<th>Capacity</th>
<th>Cost Estimate (Liquefaction Only)</th>
<th>Status / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sabine Pass</td>
<td>Louisiana</td>
<td>Cheniere</td>
<td>2016</td>
<td>27.0</td>
<td>4.3</td>
<td>$10.0</td>
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<tr>
<td>Freeport</td>
<td>Texas</td>
<td>Conoco, Micheal Smith</td>
<td>2018</td>
<td>21.0</td>
<td>3.3</td>
<td>$10.0</td>
</tr>
<tr>
<td>Lake Charles</td>
<td>Louisiana</td>
<td>BG, Southern Union</td>
<td>2018</td>
<td>15.0</td>
<td>2.4</td>
<td>TBA</td>
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<tr>
<td>Cove Point</td>
<td>Maryland</td>
<td>Cove Point LNG</td>
<td>2017</td>
<td>5.8</td>
<td>0.9</td>
<td>TBA</td>
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<tr>
<td>Cameron</td>
<td>Louisiana</td>
<td>Sempra</td>
<td>2017</td>
<td>12.0</td>
<td>1.9</td>
<td>$6.0</td>
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<tr>
<td>Jordan Cove</td>
<td>Oregon</td>
<td>Veresen</td>
<td>2017</td>
<td>6.0</td>
<td>0.9</td>
<td>$5.4</td>
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<td>Oregon LNG</td>
<td>Oregon</td>
<td>Oregon LNG</td>
<td>2017</td>
<td>9.6</td>
<td>1.5</td>
<td>$6.3</td>
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<tr>
<td>Corpus Christi</td>
<td>Texas</td>
<td>Cheniere</td>
<td>2017</td>
<td>13.5</td>
<td>2.1</td>
<td>$10.0</td>
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<td>Excelerate</td>
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<td>Excelerate Energy</td>
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<td>10.0</td>
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<td>$4.8</td>
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<td>Gulf Coast LNG Export</td>
<td>Texas</td>
<td>Gulf Coast LNG</td>
<td>2018</td>
<td>21.0</td>
<td>3.3</td>
<td>$12.0</td>
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<td>Elba Island LNG</td>
<td>Georgia</td>
<td>EPB/Shell</td>
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<td>TBA</td>
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<td>Gulf LNG Liquefaction Co.</td>
<td>Mississippi</td>
<td>El Paso</td>
<td>TBA</td>
<td>11.5</td>
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<td>TBA</td>
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<td>CE FLNG</td>
<td>Louisiana</td>
<td>CE FLNG</td>
<td>2018</td>
<td>8.0</td>
<td>1.3</td>
<td>TBA</td>
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<td>Golden Pass</td>
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<td>Qatar Petroleum</td>
<td>TBA</td>
<td>15.6</td>
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<td>ST LNG Project</td>
<td>Texas</td>
<td>Pangea LNG (North America) Holdings</td>
<td>2017</td>
<td>8.0</td>
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<td>TBA</td>
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<tr>
<td>Magnolia LNG (Lake Charles)</td>
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<td>LNG Limited</td>
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<td>8.0</td>
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<td>Main Pass</td>
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<td>Freeport McMoRan</td>
<td>TBA</td>
<td>24.0</td>
<td>3.8</td>
<td>TBA</td>
</tr>
</tbody>
</table>

### Non - FTA Approved

### Non - FTA In Process

### Other

### Total / Average

<table>
<thead>
<tr>
<th>LNG</th>
<th>Outlet Gas</th>
<th>Field Gas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>218.4</td>
<td>29.1</td>
<td>34.4</td>
<td>$78.9</td>
</tr>
</tbody>
</table>

Source: Company Disclosure, NEB, Wood Mackenzie, PIRA, Platts

1. LNG produced at plant outlet.
2. Mcf equivalent of LNG per day (48.7 mcf / tonne).
3. Estimated feed gas requirement at the well head (48.7 mcf / tonne, 8% liquefaction loss, 8% field processing loss).
4. In order of non-FTA application processing per DOE.
The U.S. would have to increase production in order to meet LNG exports, should they occur.
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