Value of Biogas and Canada’s Transition to a Low Carbon Economy

Standing Senate Committee on Energy, the Environment and Natural Resources
May 5, 2016 in Ottawa

Building the Biogas Sector With You
Executive Summary

• Biogas can support up to 10% of Canada’s 300 Mt CO$_2$ reduction target by 2030

• Canada can transition to a low-carbon economy by embracing biogas and providing:
  – a Renewable Fuel Standard for transportation
  – a national strategy to green the natural gas grid
  – mandates to optimize use of carbon sources, and maximize the energy and nutrient value of these material
  – recognition and value assigned to environmental attributes resulting from biogas activity, particularly reduction in methane emissions
  – inclusion of biogas and RNG in Canada’s energy and climate strategies
What is Biogas?

• Basic terminology:
  – **Biogas** is a renewable source of methane gas
  – **Anaerobic digestion** is the biological process of breaking down organic matter to create biogas
  – **Renewable Natural Gas** is a carbon neutral, upgraded form of biogas
  – **Digestate** is a nutrient rich bi-product resulting from the anaerobic digestion process
Biogas Sources

- 70% Agriculture
- 12% Landfill Gas
- 6% Residential Source Separated Organics
- 6% Commercial Source Separated Organics
- 6% Wastewater Treatment

Building the Biogas Sector With You
Biogas Energy Applications
Energy Comparison of Fuels

- Return-to-base fleets converting to natural gas
- Can supplement with RNG to reduce GHG emissions
  - 10% blend adds ~5 cents/litre, keeping economic case strong

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Price</th>
<th>GHG Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline and diesel</td>
<td>~$1.00/litre</td>
<td>Base case</td>
</tr>
<tr>
<td>Compressed natural gas</td>
<td>~$0.60/litre</td>
<td>25% lower than base case</td>
</tr>
<tr>
<td>Compressed RNG</td>
<td>~$1.00/litre</td>
<td>90% lower than base case</td>
</tr>
<tr>
<td>CNG/RNG blend (90%/10%)</td>
<td>~$0.65/litre</td>
<td>31% lower than base case</td>
</tr>
</tbody>
</table>
## Biogas Energy Potential

<table>
<thead>
<tr>
<th></th>
<th>Agriculture</th>
<th>Landfill Gas</th>
<th>SSO Res</th>
<th>SSO Com</th>
<th>Waste-water</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity (MW)</td>
<td>550</td>
<td>95</td>
<td>48</td>
<td>54</td>
<td>60</td>
<td>807</td>
</tr>
<tr>
<td>RNG (Mm³/year)</td>
<td>1,650</td>
<td>290</td>
<td>140</td>
<td>160</td>
<td>180</td>
<td>2420</td>
</tr>
<tr>
<td>% of Canada’s Electricity Demand</td>
<td>0.87%</td>
<td>0.15%</td>
<td>0.08%</td>
<td>0.09%</td>
<td>0.10%</td>
<td>1.28%</td>
</tr>
<tr>
<td>% of Canada’s Natural Gas Demand</td>
<td>2.06%</td>
<td>0.36%</td>
<td>0.18%</td>
<td>0.20%</td>
<td>0.23%</td>
<td>3.03%</td>
</tr>
</tbody>
</table>
GHG Emissions Reduction

• Biogas reduces CO$_2$ and CH$_4$
• Canada can achieve GHG reductions of up to 37.5 Mt CO$_2$ eq from all biogas sources
• RNG can reduce GHG emissions from transportation by up to 90% from diesel or gasoline*

* Sourced from California Air Resources Board, Canadian Gas Association and Statistics Canada
Biogas Benefits

• Methane abatement
  – methane capture and utilization to energy from livestock, residential and commercial food waste, and municipal landfills

• Renewable energy opportunities
  – 3% of Canada’s natural gas demand (2,420 Mm3/year) or 1.3% of its electricity demand (810MW)
  – renewable heat, electricity, pipeline quality gas for transportation, household heating, industrial, commercial and institutional processes

• Waste management solutions
  – diversion of organic materials from landfill, maximizing energy and nutrient value

• Green jobs and economic development
  – 1,800 separate construction projects
  – $7 billion capital investment, $21 billion economic spin off to the Canadian economy
## Biogas Economic & Social Benefit

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<th>SSO Com</th>
<th>Wastewater</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction jobs (for one year)</td>
<td>10,200</td>
<td>2,000</td>
<td>1,800</td>
<td>1,700</td>
<td>1,000</td>
<td>16,700</td>
</tr>
<tr>
<td>On-going operating jobs</td>
<td>1,320</td>
<td>120</td>
<td>500</td>
<td>460</td>
<td>250</td>
<td>2,650</td>
</tr>
<tr>
<td>Capital investment ($Billions)</td>
<td>$3</td>
<td>$0.3</td>
<td>$1.7</td>
<td>$1.3</td>
<td>$0.6</td>
<td>$7.0</td>
</tr>
<tr>
<td>Indirect economic spinoff ($Billions)</td>
<td>$9.3</td>
<td>$1.0</td>
<td>$5.1</td>
<td>$4.0</td>
<td>$1.7</td>
<td>$21.0</td>
</tr>
</tbody>
</table>
Policy Across Canada and U.S.

- **British Columbia**
  - voluntary RNG program, carbon tax, low carbon fuels standard

- **Alberta**
  - carbon price and emitters regulation, biogas offset protocols, localized organics bans, Bioenergy Producer Credit Program

- **Ontario**
  - feed-in-tariff for electricity, cap and trade regulation, climate change initiatives with potential to foster RNG opportunities, organic strategy discussions

- **Quebec**
  - ban on organics in landfill by 2022, municipal capital incentives, carbon tax, RNG momentum project by project

- **Nova Scotia**
  - ban on organics in landfill, community feed-in-tariff program (on hold)

- **U.S.**
  - renewable portfolio standards (RPS), renewable fuels standard (RFS) for transportation, California low carbon fuels standard
  - markets for RNG have been established in competitive jurisdictions within the US, such as California
  - Canada’s largest landfill in Quebec started selling RNG to California in 2015
Biogas – A Winning Solution

• Biogas supports a low carbon economy in Canada with proven, cost-effective technology
• Biogas offers Canada a multi-faceted solution to:
  – Mitigating methane emissions
  – Effectively utilizing carbon sources and recycling nutrients
  – Generating renewable energy
  – Protecting our air, water and soil resources
  – Creating new and expanded economic opportunities
• Industry and federal/provincial governments need to work together to provide:
  – Renewable Fuel Standard in Canada for transportation
  – Mandates for RNG to green the natural gas supply
  – Mandates to optimize use of carbon sources
  – Value and recognition for methane emission reductions from biogas
  – Biogas and RNG incorporated into Canada’s energy and climate strategies.
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