Canada’s Greenhouse Gas Emissions Projections

March 16 2016
Canada’s climate is changing

• Canada has become warmer
  – The average temperature in Canada increased 1.6°C, twice the global average (1948-2013)
  – In the Arctic, average temperature has increased 2.2°C, nearly three times the global average (1948-2013)

• Precipitation patterns are changing
  – Annual average precipitation has increased about 19 percent (1948-2012)
  – Strong regional and seasonal variability

• Climate will continue to change and changes are expected to intensify over coming decades
Potential benefits of climate change policy

• Clean technology sector represents a global economic opportunity
  – Annual growth rate of the clean technology sector was 10% between 2008 and 2013 globally, 8% in Canada
  – Clean tech market is projected to grow to $2.5 trillion by 2022
  – Canadian clean tech market generated about $11.7 billion in revenues in 2013, and export account for half of these revenues. In 2013, the sector provided roughly 50,000 well paid jobs to Canadians

• Efficiency gains could provide cost savings

• Strong environmental policies can support market access for Canadian companies

• Well-designed policies can provide potentially significant co-benefits (e.g., coal-fired electricity regulations will improve the air quality and will result in health benefits)
Potential costs associated with inaction

• Economic costs due to climate change are expected to increase significantly

• Increasing incidence of severe weather, has become an important risk management issue for Canada’s insurance industry
  – Insured losses for weather related claims have been near or above $1 billion in each of the last six years (2009-2014)
  – Flood damage in southern Alberta and Toronto and an ice storm in southern Ontario and Eastern Canada pushed insured losses to a record $3.2 billion in 2013

• The World Economic Forum just ranked climate change as the most severe economic risk facing the world
Modeling Approach for Projections

- Environment and Climate Change Canada develops its projections using a detailed model of energy, emissions and economy.

- The starting point of projections is GHG emissions data from the 2015 National Inventory Report (2013 emissions).

- The foundation for ECCC projections is third party data and assumptions about the economy and energy markets.
  - For example, the National Energy Board for energy markets and Finance Canada for economic growth.

- Canada’s “with current measures” scenario includes policies and measures that were announced or put in place by federal, provincial and territorial governments as of September 2015.

- To address the inherent uncertainty in projections, sensitivity analysis is conducted around economic growth and energy markets.
Key Assumptions

- Reference case economic growth is based on Finance Canada’s March 2015 Private Sector Survey and “Update of Economic and Fiscal Projections–2014” and population growth is based on Statistics Canada medium growth scenario.
- Forecasts of major energy supply projects and prices are from the NEB’s 2015 Energy Futures report.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>2013 to 2020</th>
<th>2020 to 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Growth</td>
<td>Low</td>
<td>Reference</td>
</tr>
<tr>
<td>GDP</td>
<td>1.5%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Population</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Crude Oil Price: WTI (2013 US$/bbl)</td>
<td>52</td>
<td>75</td>
</tr>
<tr>
<td>Crude Oil Production (1000 bbl/day)</td>
<td>4,490</td>
<td>4,673</td>
</tr>
<tr>
<td>Natural Gas Production (billion cubic feet)</td>
<td>6,580</td>
<td>6,827</td>
</tr>
</tbody>
</table>
Emissions are projected to be 291 Mt or 9% above 2005 levels in 2030. Canada’s target is 30% below 2005 levels in 2030.
## Emissions by Sector and by Gas

### Projected GHG emissions with current measures (Mt CO₂ eq)

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil and Gas</th>
<th>Transportation</th>
<th>Buildings</th>
<th>EITE</th>
<th>Agriculture</th>
<th>Waste and Others</th>
<th>Hydrofluorocarbon</th>
<th>Nitrous Oxide</th>
<th>Methane</th>
<th>Perfluorocarbon</th>
<th>Sulphur-Hexafluoride</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>54</td>
<td>84</td>
<td>75</td>
<td>71</td>
<td>89</td>
<td>76</td>
<td>88</td>
<td>170</td>
<td>171</td>
<td>169</td>
<td>171</td>
</tr>
<tr>
<td>2013</td>
<td>121</td>
<td>84</td>
<td>75</td>
<td>71</td>
<td>89</td>
<td>76</td>
<td>88</td>
<td>170</td>
<td>171</td>
<td>169</td>
<td>171</td>
</tr>
<tr>
<td>2020</td>
<td>74</td>
<td>54</td>
<td>74</td>
<td>90</td>
<td>96</td>
<td>103</td>
<td>107</td>
<td>109</td>
<td>117</td>
<td>107</td>
<td>107</td>
</tr>
<tr>
<td>2025</td>
<td>62</td>
<td>56</td>
<td>76</td>
<td>98</td>
<td>103</td>
<td>164</td>
<td>164</td>
<td>164</td>
<td>103</td>
<td>164</td>
<td>164</td>
</tr>
<tr>
<td>2030</td>
<td>58</td>
<td>59</td>
<td>76</td>
<td>107</td>
<td>109</td>
<td>242</td>
<td>242</td>
<td>242</td>
<td>104</td>
<td>242</td>
<td>242</td>
</tr>
</tbody>
</table>

### Projected GHG emissions with current measures by gas (Mt CO₂ eq)

<table>
<thead>
<tr>
<th>Year</th>
<th>Carbon Dioxide</th>
<th>Hydrofluorocarbon</th>
<th>Nitrous Oxide</th>
<th>Methane</th>
<th>Perfluorocarbon</th>
<th>Sulphur-Hexafluoride</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>580</td>
<td>41</td>
<td>117</td>
<td>107</td>
<td>103</td>
<td>170</td>
</tr>
<tr>
<td>2013</td>
<td>570</td>
<td>41</td>
<td>107</td>
<td>103</td>
<td>104</td>
<td>171</td>
</tr>
<tr>
<td>2020</td>
<td>608</td>
<td>40</td>
<td>103</td>
<td>104</td>
<td>42</td>
<td>171</td>
</tr>
<tr>
<td>2025</td>
<td>625</td>
<td>42</td>
<td>104</td>
<td>42</td>
<td>42</td>
<td>171</td>
</tr>
<tr>
<td>2030</td>
<td>643</td>
<td>42</td>
<td>42</td>
<td>42</td>
<td>42</td>
<td>171</td>
</tr>
</tbody>
</table>
Oil and Gas

Drivers: Emissions growth is driven by increased oil sands production while conventional oil production is expected to decrease to 2030.

Existing measures include:

- Provincial flaring and venting reduction regulations and guidelines (AB, BC, SK, NL)
- Federal and Alberta fiscal incentives for Carbon Capture and Storage
- Energy efficient technology development and deployment
- Federal actions to reduce fossil fuel subsidies
- Provincial carbon pricing
Drivers: Emissions falling due to coal phase out, switch to natural gas and growth in non-emitting generation.

Existing measures include:

- Federal Coal Fired Electricity regulation
- Ontario Coal Phase-Out
- Provincial Renewable Portfolio Standards (NB, NS)
- Provincial Feed-in Tariffs (ON, PEI, NS)
- Provincial Net metering programs (SK, MB, ON, QC, NB, NS, PEI)
- SK carbon capture and storage
- NS Electricity Emissions Cap
- Various federal and provincial Energy Efficiency Programs
- Provincial carbon pricing
Drivers: Freight transportation projected to increase with overall economic growth; passenger vehicle emissions to decline.

Existing measures include:

- Federal car & light truck GHG Regs (LDV1 & LDV2) – model years 2011 to 2025
- Federal heavy duty vehicles regulation for model years 2014-2018
- Federal and provincial renewable fuels requirements
- Federal information programs (Energuide, Fuel Consumption Guide, AutoSmart, FleetSmart etc.)
- Federal marine and rail initiatives
- Provincial/municipal actions (e.g., mandatory speed limiters, Transit Plans for alternative fuel buses)
- Provincial carbon pricing
Drivers: Emissions are expected to increase as the economic output of the sector grows. Varying level of emission reduction potential among sectors, some very limited.

Existing measures include:

- Federal and provincial equipment energy efficiency initiatives targeting lighting, motors, heating and ventilation
- Federal industrial voluntary energy efficiency targets
- Provincial carbon pricing
Drivers: Emissions growth is driven by expected population and floor space growth. In addition, the impact of the expected growth in HFCs is seen in this sector.

Existing measures include:

- Provincial/Municipal Residential Building Code for energy efficiency (EnerGuide-80 or R-2000 level)
- Federal and provincial residential and commercial sector appliance efficiency standards
- Provincial incentives for renewable space heating/cooling, hot water heating
- Provincial carbon pricing
Drivers: Agriculture emissions are expected to remain flat in the future. Although output from farms is expected to increase, the hectares of farm land are expected to remain stable, pointing to significant productivity improvements.

Existing measures include:

- Federal and provincial actions targeting livestock systems, e.g. manure management, grazing and feeding strategies
- Federal and provincial actions for cropping systems: wetland and zero tillage management
- Federal and provincial actions to improve irrigation and drainage practices
Drivers: While waste emissions grow with increased population, landfill gas capture has helped to limit emissions increase in this sub-sector. Emissions from Light Manufacturing and other industry are driven by expected economic output.

Existing measures include:
- Provincial landfill gas regulations (ON,QC, BC)
- Provincial recycling targets and policies
- Federal and provincial energy efficiency in light manufacturing sectors (e.g., motors, lighting, process improvements)
Recent provincial and territorial announcements will lower emissions in 2030

- Provinces/territories are taking a wide range of climate measures
  - In 2015, more than half of the PTs announced 2030 targets

- Four provinces made significant announcements since October:
  - Alberta’s new Climate Leadership Plan, including the phase out of coal-fired electricity, a cap on oil sands emissions and a carbon price applied across all sectors
  - Ontario and Manitoba’s cap and trade systems to be linked with Quebec through the Western Climate Initiative
  - Saskatchewan’s plan to generate 50% of its electricity using renewable energy by 2030

- Carbon pricing has been implemented or is planned in provinces representing more than 80% of Canada’s 2013 emissions

- However, further work is needed to reach our collective commitments
International Context

• Paris agreement set world on a path for deeper reductions

• Countries agreed to take action – including China, India and all major emitters. Most peer countries set ambitious targets

• One comparison by Bloomberg New Energy Finance shows that Canada’s 2030 target is slightly more ambitious than the targets of the U.S. and EU
  – The Bloomberg study showed that the required change in emissions intensity to meet the announced targets (from 2010) is:
    ▪ -51% by 2030 for Canada
    ▪ -48% by 2030 for the EU
    ▪ -43% by 2025 for the U.S.
According to the Biennial Reports submitted to date, progress to 2030 targets varies

- With existing measures, almost all countries will need to take significant additional action to reach targets

<table>
<thead>
<tr>
<th>Country</th>
<th>2030 Target</th>
<th>Projections in Target Year Current Measures Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>26-28% below 2005 by 2030</td>
<td>Not provided</td>
</tr>
<tr>
<td>European Union</td>
<td>40% below 1990 by 2030</td>
<td>29% below 1990</td>
</tr>
<tr>
<td>Japan</td>
<td>26% below 2013 by 2030</td>
<td>23% below 2013</td>
</tr>
<tr>
<td>New Zealand</td>
<td>30% below 2005 by 2030</td>
<td>2% above 2005</td>
</tr>
<tr>
<td>U.S.</td>
<td>26-28% below 2005 by 2025</td>
<td>11% below 2005</td>
</tr>
<tr>
<td>Canada</td>
<td>30% below 2005 by 2030</td>
<td>9% above 2005</td>
</tr>
</tbody>
</table>

The U.S. also presented a scenario that includes additional measures, some of which are announced but not yet implemented

- Under this scenario, the U.S. indicates that it is on track to meet its 2020 and 2025 targets