





## Hydropower

- Canada is the world's 3<sup>rd</sup> largest hydropower generator and could still more than double its current installed capacity
- 4 out of 5 of Canada's largest infrastructure projects are hydropower projects (ReNew Magazine)
- A quiet—but significant—economic contributor (2013 figures):
  - >\$12 billion in hydroelectricity infrastructure investment & expenditures on production, transmission & distribution
  - >\$21 billion in revenues from production, transmission & distribution
  - >\$30 billion contributed to Canada's GDP
  - 135,000 jobs across Canada
- New opportunity: Obama's Clean Power Plan allows imported Canadian renewable electricity to qualify for compliance
- Canadian hydropower exports to the United States are significant to Canada but represent less than 1% of overall US electricity consumption – strong room for growth



## Marine Power

- The marine renewable energy market is relatively new, but has strong growth prospects: estimated \$1,000 billion market by 2050.
- Canadian companies are poised to compete: aim to capture 30% of global industry by 2020; 50% by 2030—a \$2 billion opportunity
- Nova Scotia's Bay of Fundy has attracted world leading tidal energy developers
  - 5 utility-scale and 3 community-based projects under development with FIT approval for 25 MW
  - Engagement of over 150 local businesses; ~70% local content
  - \$175+ million in expenditures over next 3 years
  - Goal of 300 MW developed by 2020
- Strategic R&D is underway to realize untapped wave, river, and tidal energy opportunities
  - West Coast Wave Initiative in British Columbia
  - Canadian Hydrokinetic Test Centre in Manitoba





## Wind Power

- Canada is 7<sup>th</sup> largest wind energy producer in the world
- Wind energy has been the largest source of new electricity generation in Canada over the last 5 years
- 1,500 MW of new wind energy in 2015 (36 projects in 5 provinces)
- Wind energy can now compete on cost with all forms of electricity generation in Canada
- Electricity demand growth is stagnant—new development opportunities will be driven by the phase-out of fossil fuels, clean energy exports and increased electrification
- Recent commitments:
  - Alberta is looking largely to wind energy to replace 2/3 of coal fired generation by 2030
  - Saskatchewan wants to increase wind energy generation 10-fold by 2030



## Solar Power

- Fastest growing electricity generation technology in Canada
  - Approaching 3 GW of installed solar capacity
- Ontario in top three solar North American jurisdictions annually since 2013
  - Industry will invest over \$5.5 billion in the province of Ontario between 2010 and 2020.
  - Projects completed in Ontario in 2015 created equivalent of 12,000 job years.
- Capital costs have decreased by more than 65% since 2009
- Recent Commitments:
  - Ontario to contract 140 MW of utility and over 250MW of distributed solar in 2016.
  - Saskatchewan to begin to contract 60 MW of utility solar in 2016.



## Leading the shift to renewable electricity

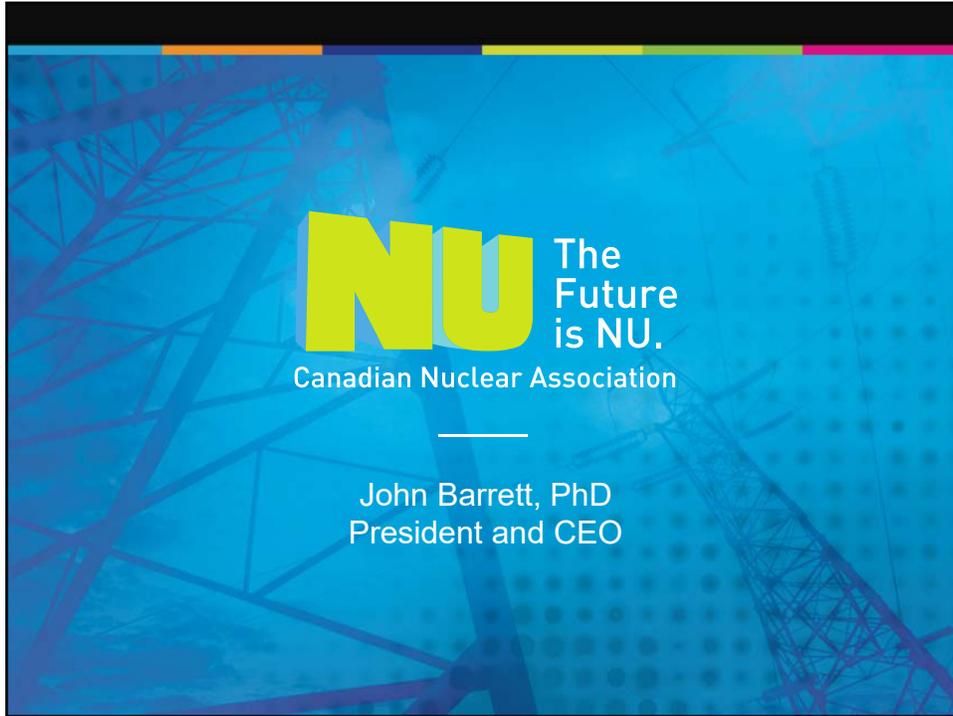


*With abundant and diverse renewable  
electricity resources distributed across the  
country, Canada has the potential to lead  
the world.*

*And when Canada leads, Canada wins.*



**CANADIAN COUNCIL ON RENEWABLE ELECTRICITY** **CONSEIL CANADIEN SUR L'ÉLECTRICITÉ RENOUVELABLE**



## A Major Economic and Technology Driver

One of the World's Largest Investments in Low-Carbon Energy --  
from Canada's Own Science, Engineering, Education, Manufacturing,  
Construction and Mining Capabilities

|                                   | Refurbishment  | Operations     | Total Impact   |
|-----------------------------------|----------------|----------------|----------------|
| Employment                        | 10,636         | 16,640         | 27,276         |
| Labour Income                     | \$1,248 m      | \$2,073 m      | \$3.3 b        |
| Fuel Cost                         | Not Applicable | \$518 m        | \$518 m        |
| Equipment, materials and supplies | \$1,890 m      | \$1,241 m      | \$3.1 b        |
| <b>TOTAL</b>                      | <b>\$3.1 b</b> | <b>\$3.8 b</b> | <b>\$6.9 b</b> |

Source: CME

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# GHGs Avoided

- An average CANDU or CANDU-derived nuclear power generating unit delivers over 5 TWH/yr of electricity
- This displaces about 4.3 million tonnes of GHGs per year (if the alternative is coal) or 2.4 million tGHG/yr (if natural gas)
- Assuming coal, the four CANDUs in Korea alone have displaced some 300 MILLION TONNES of GHG emissions.

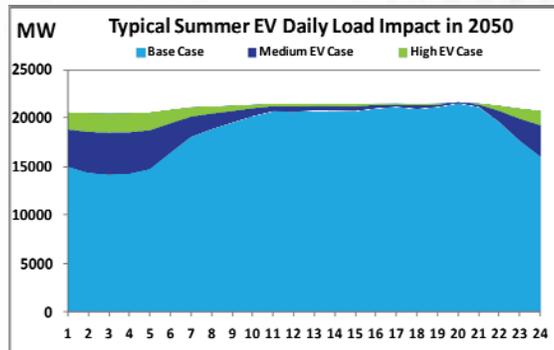
|             | Average lifecycle GHG emissions (tonnes/GWh) | Emissions produced from generating 2518 TWh of electricity | Additional emissions avoided through use of nuclear electricity in place of fossil fuel |
|-------------|--|--|---|
| Lignite     | 1054   | 2654 million tonnes CO <sub>2</sub>                        | 2581 million tonnes CO <sub>2</sub>   |
| Coal        | 888  | 2236 million tonnes CO <sub>2</sub>                        | 2163 million tonnes CO <sub>2</sub>   |
| Oil         | 733  | 1846 million tonnes CO <sub>2</sub>                        | 1773 million tonnes CO <sub>2</sub>   |
| Natural Gas | 499  | 1256 million tonnes CO <sub>2</sub>                        | 1183 million tonnes CO <sub>2</sub>   |
| Nuclear     | 29   | 73 million tonnes CO <sub>2</sub>                          | -   |

Source: WNA

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# Electric Vehicle Adoption

- If widely adopted, EVs change our power needs – not just how much we need, but when
- Night-time charging will flatten the daily cycle
- This is a powerful argument for more base-load generation



Source: CNA/OPG

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