



## Greenhouse gas emissions

Across the country, hydropower is helping to combat climate change.

One of the best ways to reduce greenhouse gas (GHG) emissions is by using less fossil fuel – in transportation, buildings, and industrial processes – and using more renewable electricity instead.

Of the electricity Manitoba Hydro supplies, 98 per cent is generated from renewable hydropower. Hydropower produces no air pollutants and has ultra-low greenhouse gas emissions. In fact, hydropower's full life cycle greenhouse gas emissions are as low as wind power and in many cases even lower.

### How does Manitoba Hydro contribute to reductions in greenhouse gas?

In 2015, electricity exports from Manitoba reduced net global GHG emissions by an estimated 7,500 kilotonnes of carbon dioxide equivalent (CO<sub>2</sub>e). This is equivalent to removing nearly 1.6 million vehicles from the road.

### Greenhouse gas reduction through planning

Accurate GHG measurement helps Manitoba Hydro identify opportunities for further reductions, and helps Manitoba Hydro make sustainable resource choices.

To help evaluate different types of generation, long before any construction, Manitoba Hydro undertakes detailed life cycle assessments of the GHG implications of potential new generating facilities. Manitoba Hydro has worked with the Pembina Institute to assess the life cycle GHG implications of major projects including the Wuskwatim and Keeyask Generation Projects.

These scientific studies use a complete cradle to grave analysis of a project's GHG emissions including:

- Construction components and materials used (including emissions from raw material extraction, production, and transportation);
- Construction activities and equipment operation on site and worker transport (primarily vehicle fuel);
- Land clearing and other land-use change impacts (including reservoir formation);
- Operation throughout the life of the project including emissions associated with maintenance activities and the use of fossil fuels;
- Impacts associated with ultimately decommissioning the project.

## Studies prove ultra-low emissions for hydropower

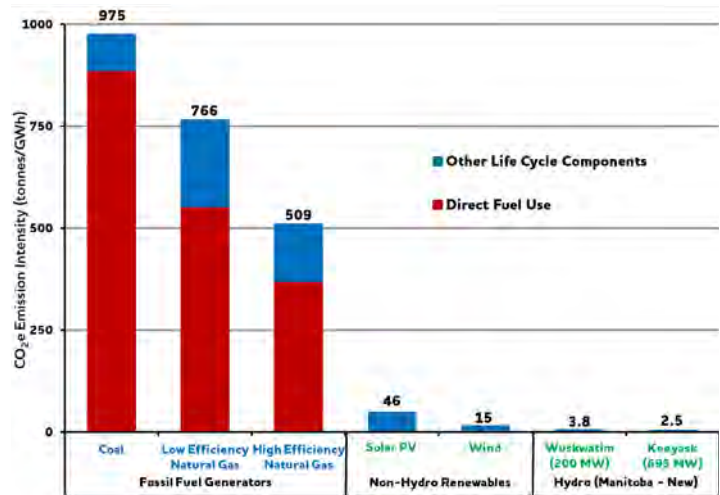
Life cycle GHGs for fossil fuel generators like coal and natural gas, are mainly emissions from the fuel needed to generate power. In comparison, for renewable sources such as wind and hydro, most life cycle GHGs are associated with the construction stage and land-use change. Life cycle emissions from Wuskwatim and Keeyask are equivalent per kilowatt hour to those of solar or wind power.

All bodies of water naturally produce varying levels of GHGs. If a significant amount of biomass is flooded during reservoir formation for hydropower projects, GHG emissions increase. However, scientific research shows that emissions are modest in northern ecosystems and return to natural levels within about 10 years.

The Pembina Institute's life cycle assessments, summarized in the figure on the right, include these implications and show that reservoir GHG emissions are small for Wuskwatim and Keeyask Generating Stations:

- The total lifecycle global warming related emissions per unit of delivered power from the 200 MW Wuskwatim Generating Station will be 290 times less than coal and 130 times less than even the most efficient natural gas generation technology.
- Currently under construction, the Keeyask Generating Project will produce 695 MW. To generate the same amount of electricity, a highly efficient combined cycle natural gas facility would produce more than double the GHG emissions in one year of operation than the Keeyask Generating Project would over its entire 100 year expected life.

## Comparison of life cycle GHG emissions

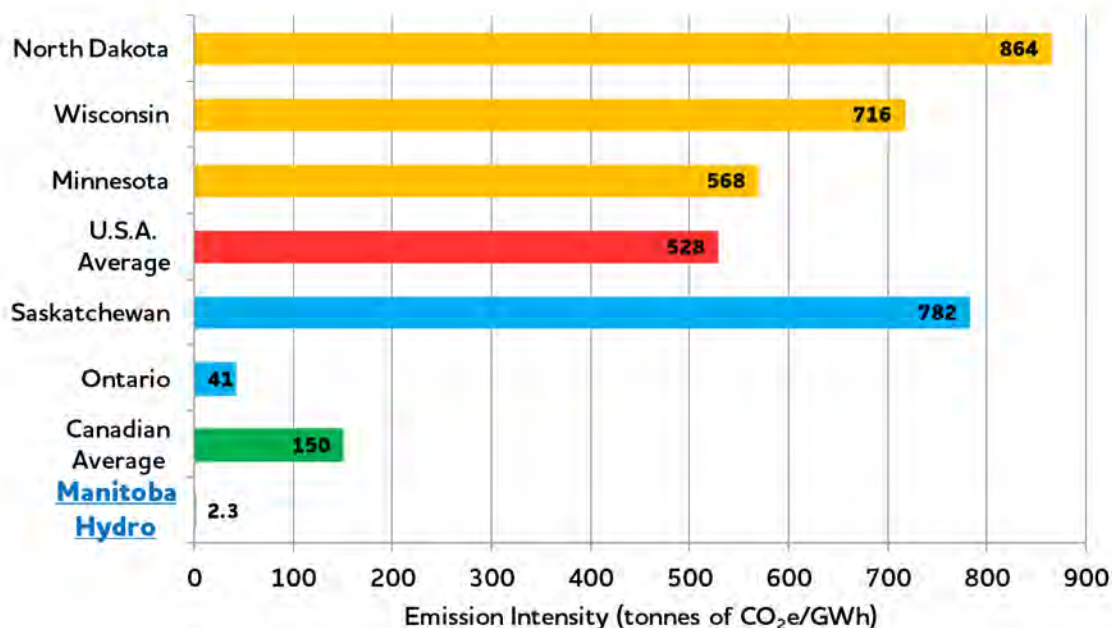


## Helping to reduce global GHG emissions

Manitoba Hydro's system often produces surplus electricity which can be sold to interconnected neighbouring jurisdictions. As a result, export sales also displace electric generation and associated emissions in interconnected regions.

Since Keeyask will displace coal and gas generation in the U.S. Midwest, it will contribute to substantial GHG reductions. The project is estimated to displace 30 million tonnes of carbon dioxide equivalent during the first 10 years.

## Greenhouse gas emission intensity comparison of electricity generation for 2014



As shown here, Manitoba Hydro's low emissions make their exports a valuable resource to help reduce global GHG emissions.

Source: Environment Canada, 2016; U.S. Energy Information Administration, 2016