Canada Energy Regulator | Régie de l'énergie du Canada

Canada

# Hourly Projections from *Canada's Energy Future 2019*

## Energy Modeling Initiative National Forum Workshop, December 17-18

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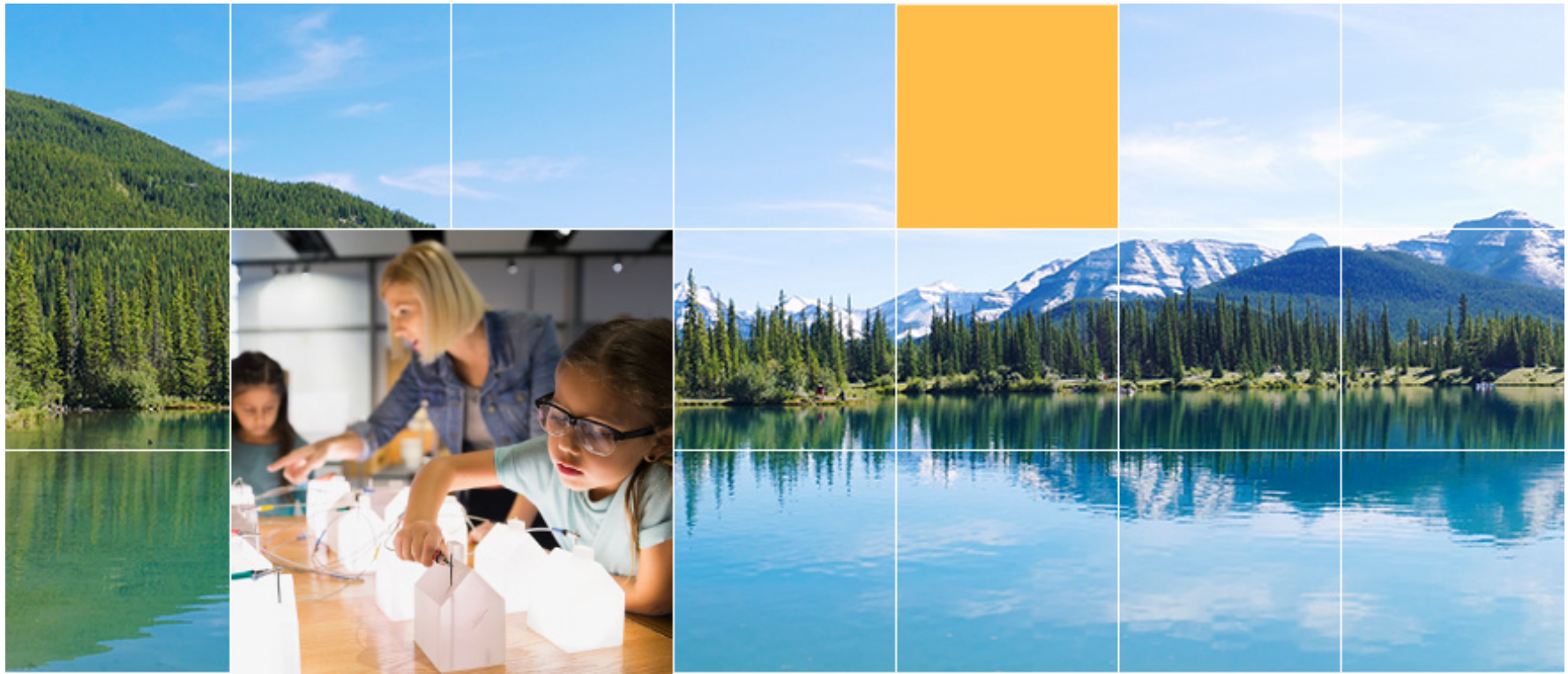
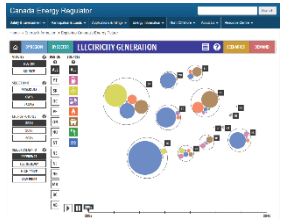


# What is *Canada's Energy Future*

**Long-term outlook of Canadian energy supply and demand, produced regularly by the National Energy Board, now Canada Energy Regulator**

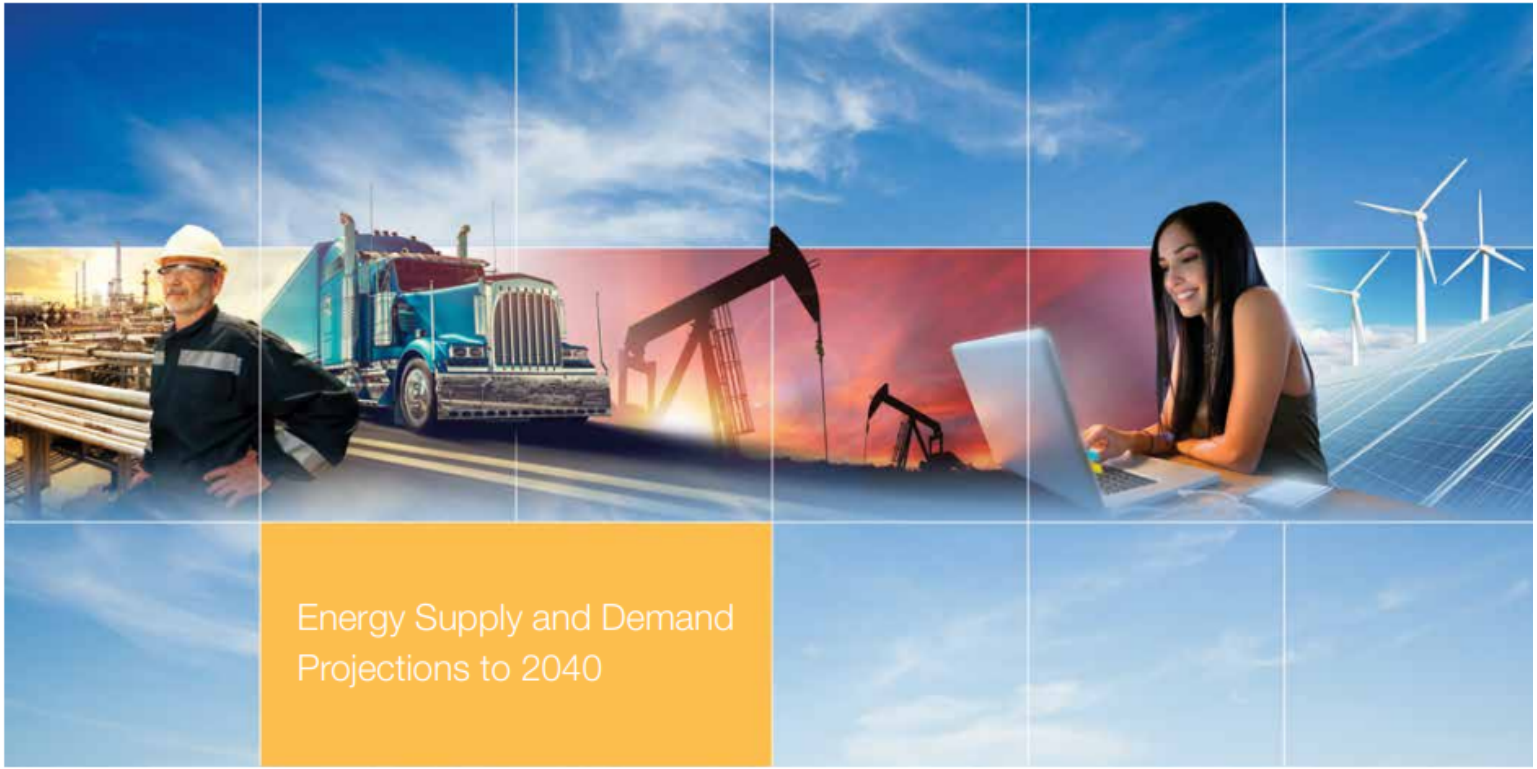
- Covers:
  - All energy commodities
  - All provinces and territories
  - All economic sectors
- Large datasets publically available in numerous formats
- Typically includes a baseline Reference Case and relevant scenarios/sensitivities

# Canada's Energy Future 2019

Our most recent release, and first Energy Futures report from the CER, is *Canada's Energy Future 2019 (EF2019).*

Released December 3rd, it includes an update to the baseline Reference Case outlook.



# Our EMI Project: Hourly Electricity Projections from *Canada's Energy Future 2019*

**Looks at EF2019 electricity projections for 2040, but from an hourly perspective**

- EF projections typically annual, with limited time slices (peak/average/minimum load, 2 seasons)
- We know there can be substantial variation hour-to-hour, especially with increasing levels of variable renewable energy
- When accounting for this variability, are the 2040 projections still reasonable?

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# Approach and Data

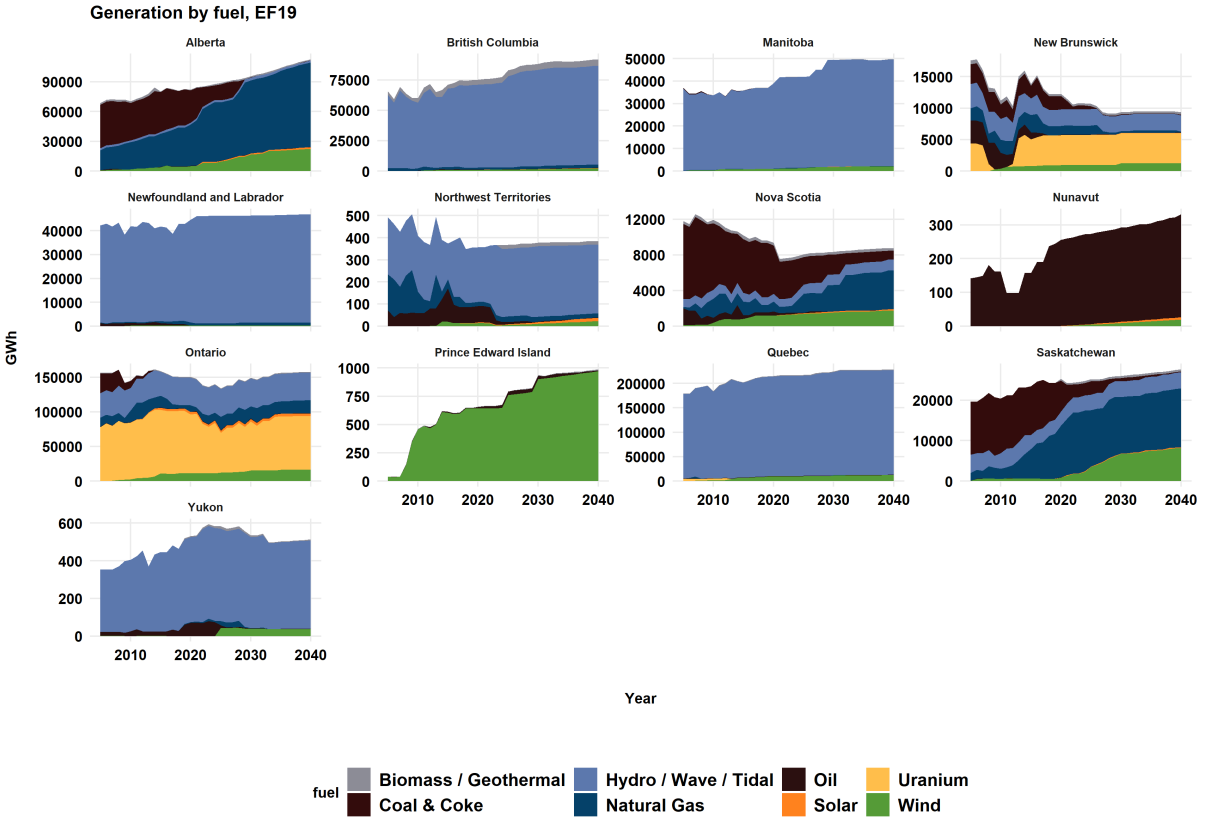
## Methodology

- Energy Futures Modeling System uses the energy system model *ENERGY2020* for projections of electricity demand, supply, and trade
- We compliment this with the open-source model *Python for Power Systems Analysis* (PyPSA) for hourly (8760) projections for a given year. (https://github.com/PyPSA/PyPSA)
- Specifically, we simulate 2040 generation and trade based on capacity and peak load projections from ENERGY2020, and historical load shapes

## Data

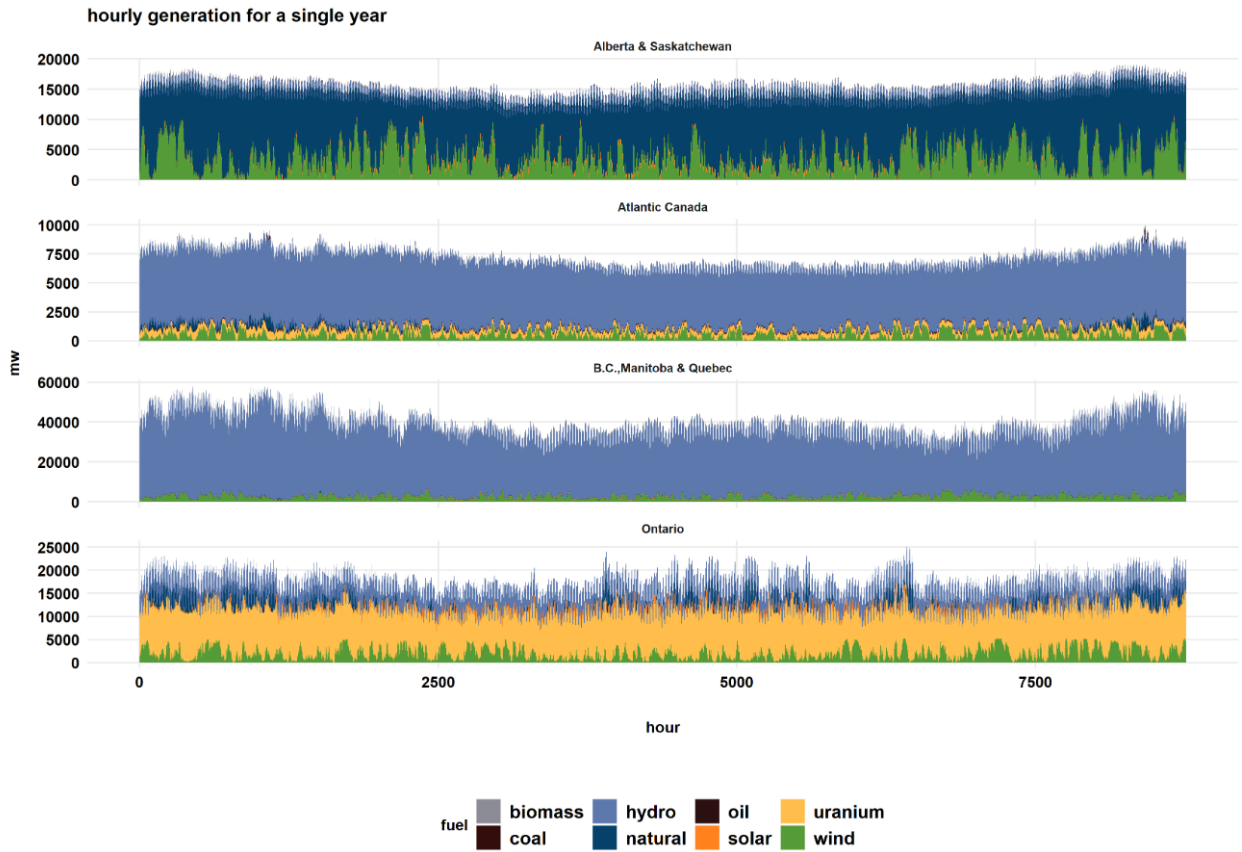
- Hourly load, trade, and generation data gathered from a variety of sources including:
  - Provinces
  - System operators
  - NERC submissions

# Results: Annual Generation by Fuel for each Province and Territory

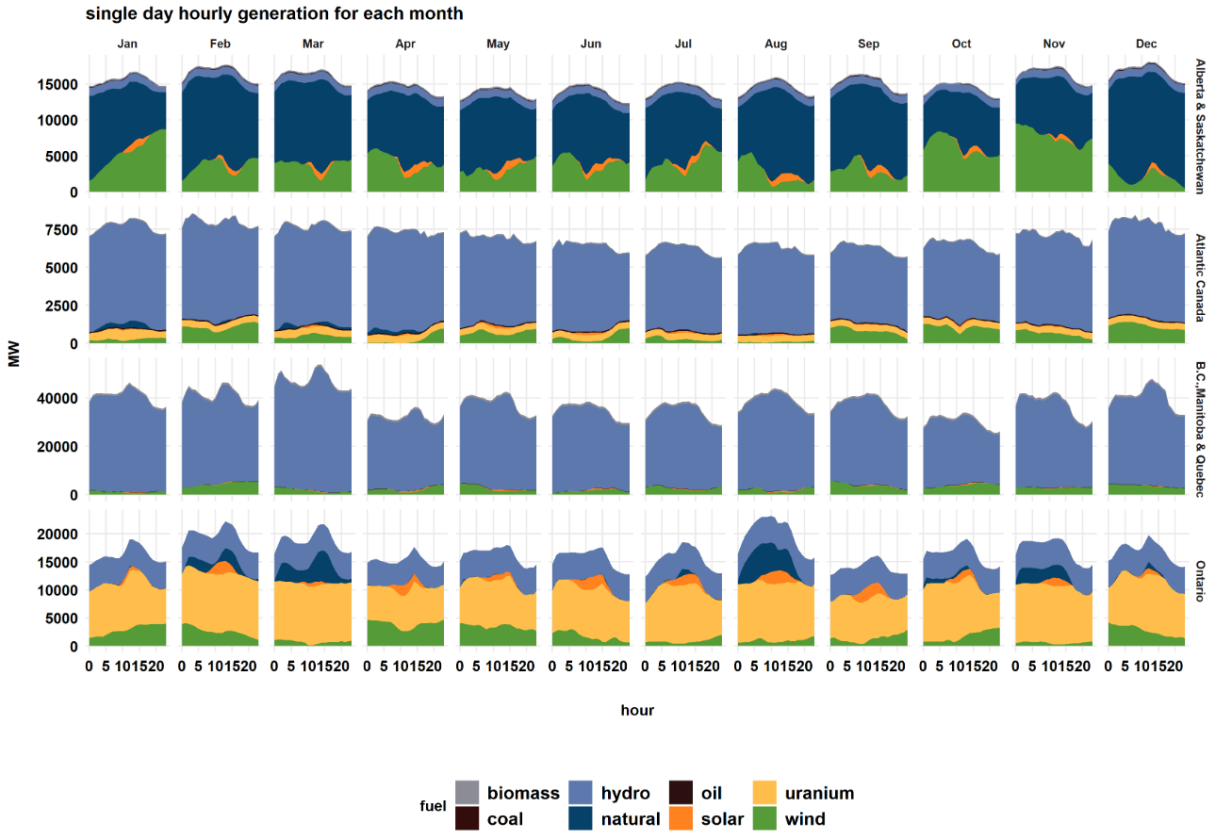


# Hourly Generation by Region

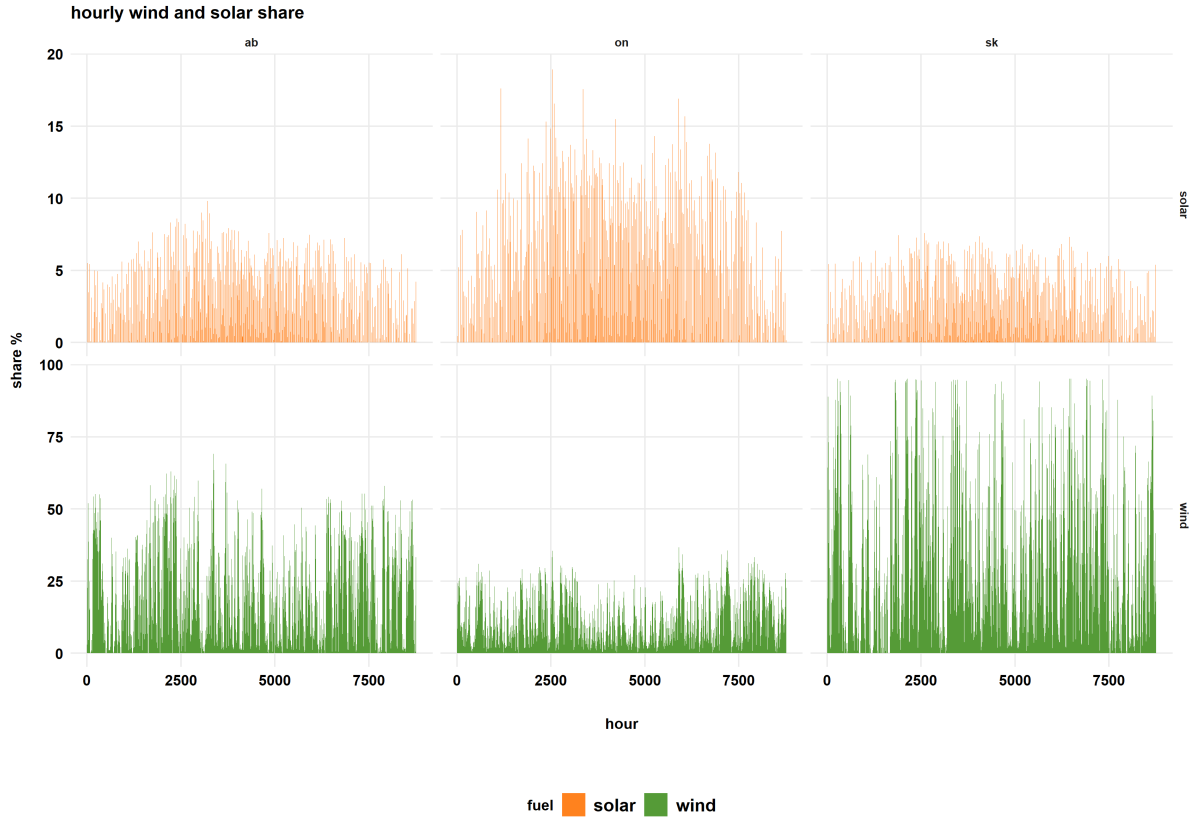
Large hydro provinces grouped together because of similar fuel mix



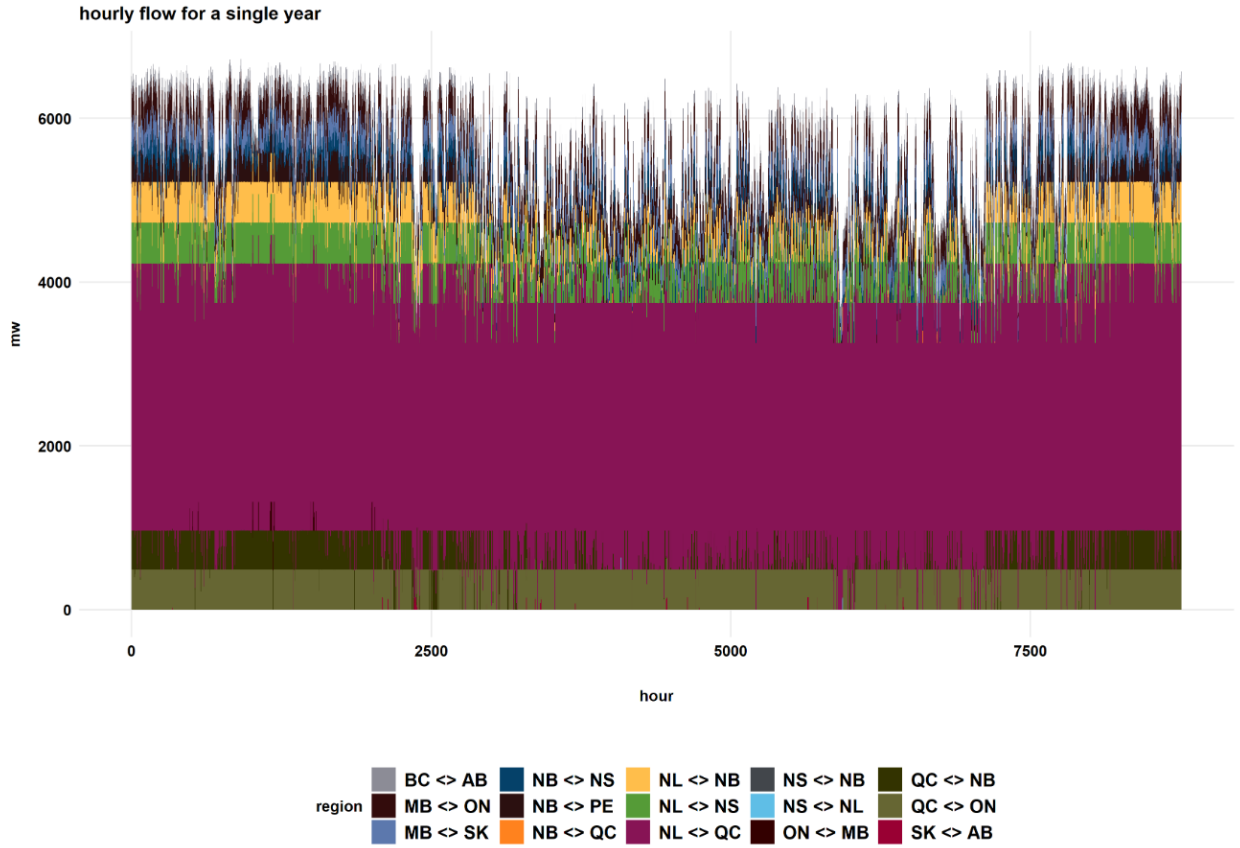
# Simulated day for each month, by fuel and region



# For Alberta, Saskatchewan, and Ontario, VRE can be a significant share of generation



# Interprovincial trade dominated by large hydro movements, but substantial hourly variation



# Next steps

**Hourly generation Simulations:**

- Incorporate this into regular public releases
- Make data available in similar formats to other *Energy Futures* projections
- Integrate this approach into other scenarios/sensitivities

**Going further:**

- Enhanced U.S. trade
- Enhanced demand-side granularity

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