

Canadian Hydropower and the Clean Power Plan

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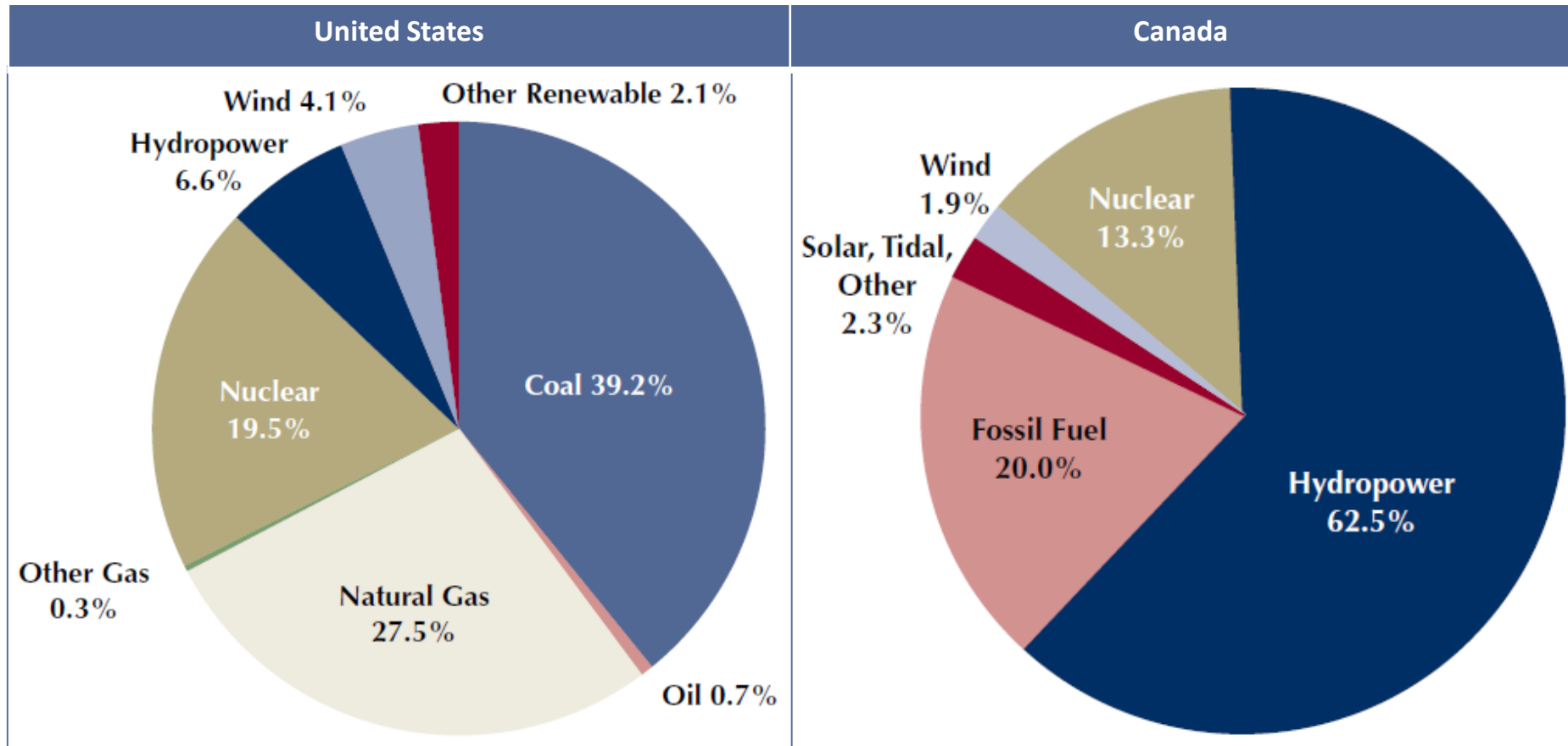


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- **US and Canada electricity mix**
- **Benefits and challenges of hydropower**
- **Hydropower forecast**
- **Clean Power Plan: Emission rate formula**
- **Emissions effect vs. generation effect**
- **Three possible approaches to imported RE generation**
- **Concerns**
- **Possible impact**

Hydropower in the electricity mix (2013)



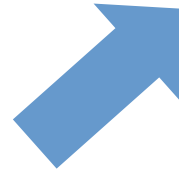
- Hydropower represented around 20 percent of the United States' zero-emission electricity, and a little more than 80 percent of Canada's zero-emission electricity in 2013.

- Flexible
- Produce power on an as-needed basis
- Quick response
- Energy storage
- Flood control
- No direct GHG emissions

- Dams
- Changes for flora and fauna
- Reservoirs
 - Displacement
 - Biomass emissions
 - Land use change
- Water rights
- Mitigation
- Stakeholder engagement
- Stringent environmental reviews

- Both countries have a vast technical potential for additional hydropower capacity, but...
- EIA expects that around **2,300 MW** of hydro capacity will be added in the U.S. between now and 2040 under a business-as-usual scenario.
- The NEB expects hydropower to remain the dominant source of electricity supply in Canada out to 2035. In its business-as-usual scenario around **8,000 MW** of new capacity is added in the next 20 years.

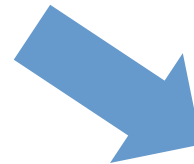
Emissions from covered sources



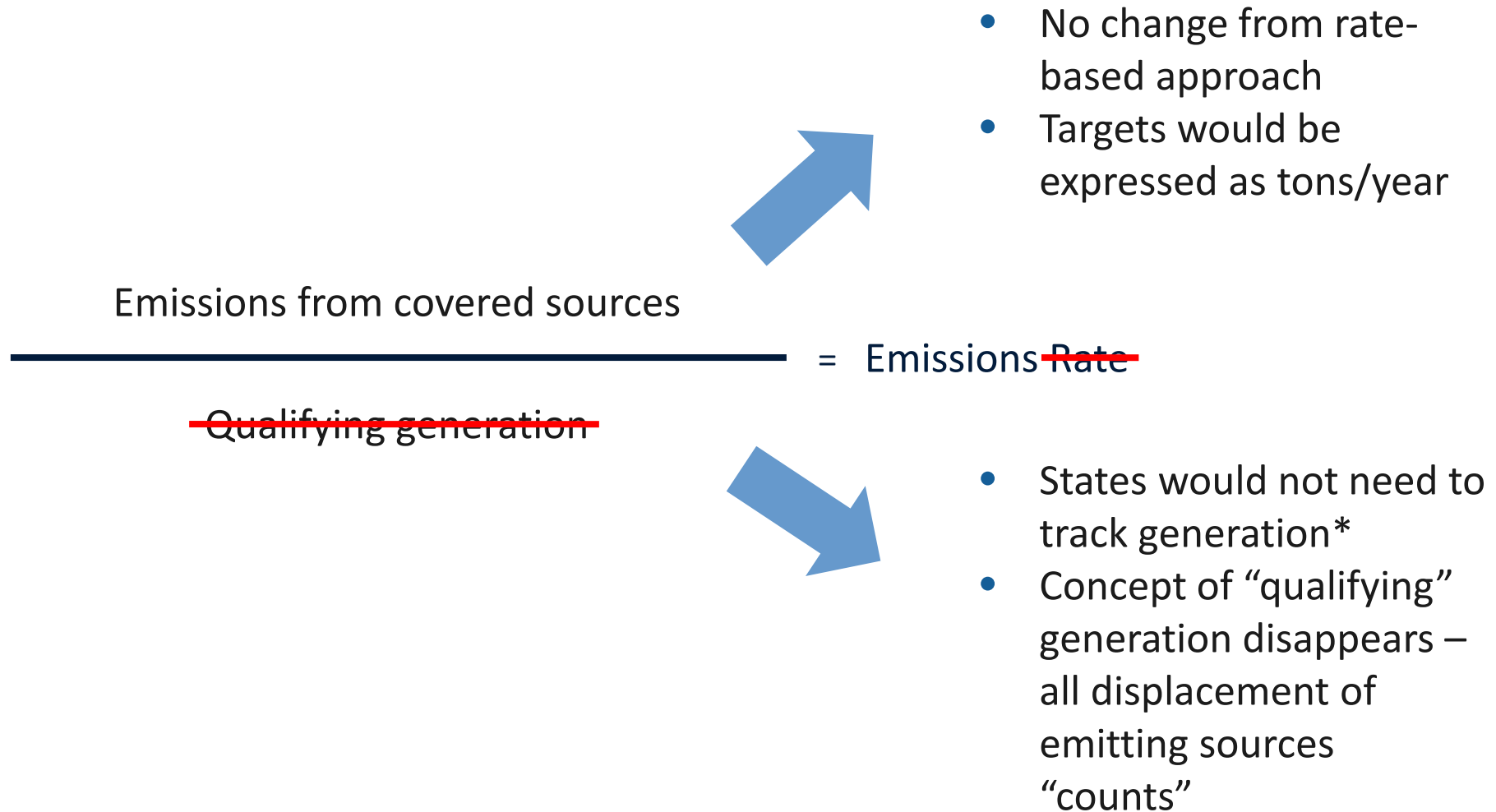
- Definition unlikely to change from proposal
- With possible exception of opt-ins, states will not have flexibility

= Emissions Rate

Qualifying generation



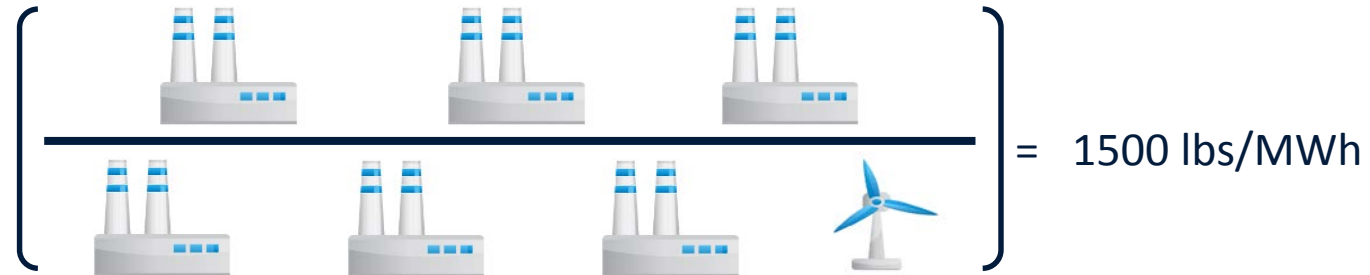
- Definition likely to change: existing nuclear, existing hydropower, imported hydropower
- States can further restrict



Effect of hydropower on emissions rate

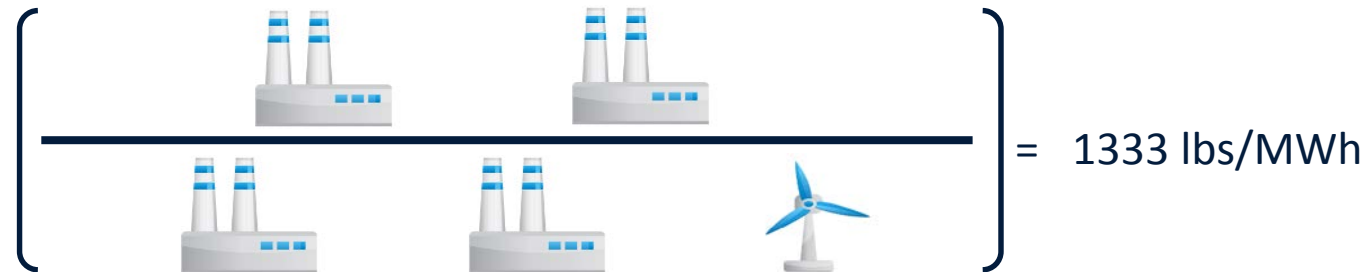


**Rate 1:
Baseline**



+ unqualified
hydro

**Rate 2:
Emissions
effect**



+ qualified
hydro

**Rate 3:
Emissions and
generation
effect**



Each icon represents 1,000 MWh

Each  icon represents 2,000,000 lbs CO₂

- **“In particular, stakeholders have asked whether RE resources from Canada can be used to contribute to meeting a jurisdiction’s goal. The EPA is soliciting comment on all aspects of the treatment of RE...generation across international boundaries in a section 111(d) plan, considering the components for approvable plans...including any mechanisms that could be used to ensure that the low or non-emitting generation was in fact offsetting fossil-fuel-fired generation in the jurisdiction that would use it to meet its goal.” 79 Fed. Reg. 65496 (November 4, 2014)**
- **“We also request comment on the option of allowing states to take into account only those CO₂ reductions occurring in its state.” 79 Fed. Reg. 34922 (June 18, 2014)**

1) Treat international hydropower like interstate hydropower

- Hydropower generation is qualifying if from a facility built after June 2014 or is the result of a facility upgrade made after June 2014
- Option supported by many stakeholders, including state environmental agencies and environmental advocacy groups

2) Do not allow international hydropower to count as qualifying generation

- International hydropower would never be qualifying, regardless of the facility's age
- Of the dozens of sets of comments reviewed, no stakeholder supported this option

3) Fully credit new imports from existing plants in some cases

- In addition to allowing full credit for generation from new facilities and upgrades, EPA may want to allow full credit for marginal generation from existing plants that result from new transmission projects
- This would encourage states to take actions that would result in additional hydropower

- **Double counting**

- Same unit of Canadian hydropower counted for compliance in more than one jurisdiction (state or province)
- Would result in variation between accounted emissions and actual emissions

- **Displacing domestic fossil generation**

- “The EPA is soliciting comment on...mechanisms to ensure that the low or non-emitting generation was in fact offsetting fossil-fuel-fired generation in the jurisdiction that would use it to meet its goal.” (Clean Power Plan Proposal)

- **Leakage**











- Result of Canada exporting relatively more hydropower while increasing domestic fossil generation
- For compliance purposes states would report fewer emissions, but on a net basis across both countries' emissions would remain constant or rise
- As with double counting, would result in variation between accounted emissions and actual emissions

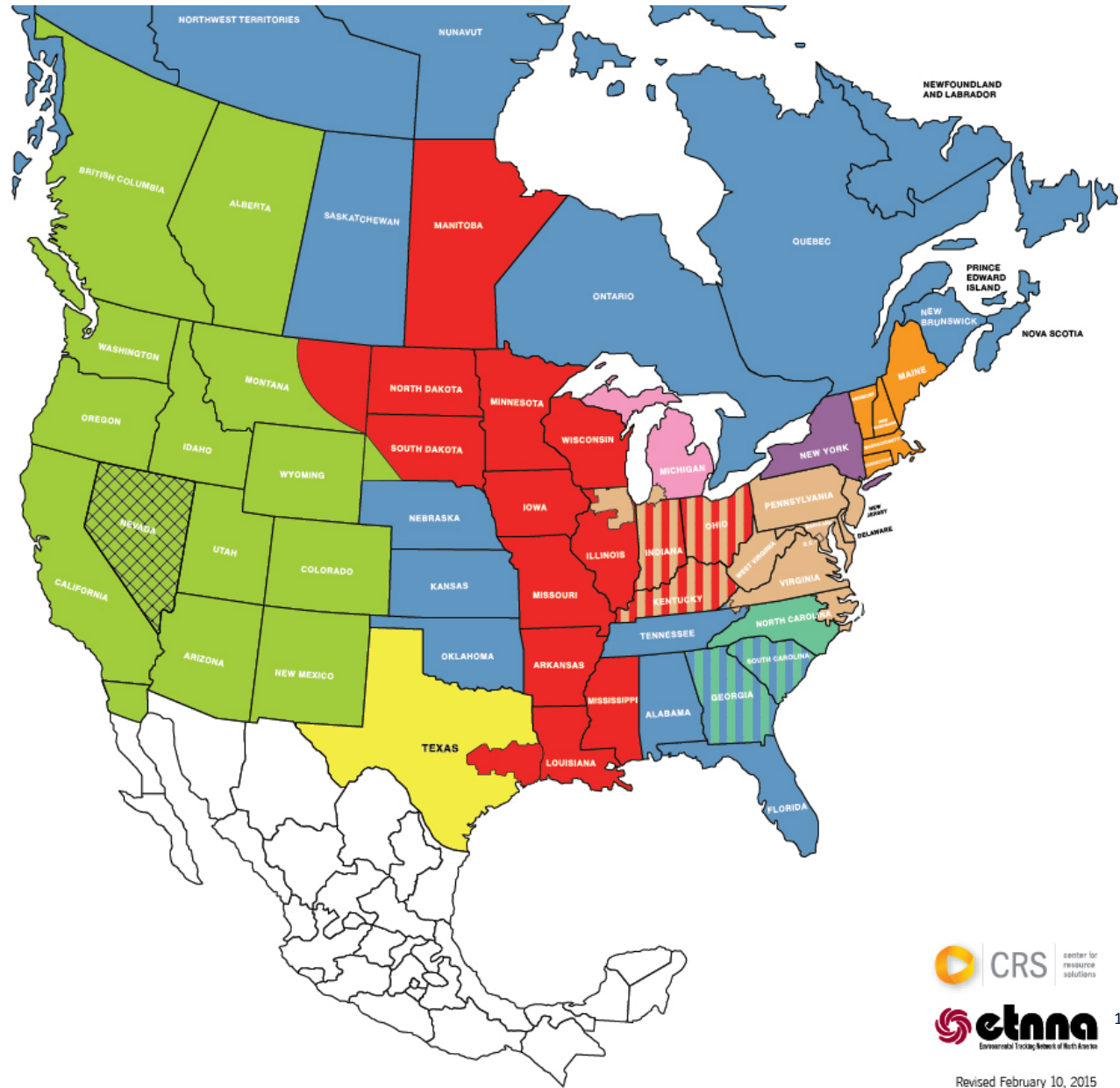
- **Not unique to international context – also present in the Renewable Portfolio Standard (RPS) and voluntary market contexts**
- **Renewable Energy Certificate (REC) tracking registries already established in North America for compliance with RPS as well as voluntary efforts. RECs enable the renewable characteristic to be decoupled and traded separately from the actual electricity.**
- **These tracking systems, or a novel system, could track the renewable characteristics of imported Canadian renewable generation, including hydropower, to avoid double counting**
- **One critical concern: RECs in a mass-based system. In a jurisdiction with a mass-based system that consumes renewable electricity, the RECs from this electricity cannot be decoupled from the consumption. Decoupling here would result in double counting.**

Renewable Energy Certificate Tracking Systems in North America



KEY

-  **ERCOT:** Electric Reliability Council of Texas
-  **MIRECS:** Michigan Renewable Energy Certification System
-  **M-RETS:** The Midwest Renewable Energy Tracking System
-  **NAR:** North American Renewables Registry
-  **NC-RETS:** North Carolina Renewable Energy Tracking System
-  **NEPOOL-GIS:** New England Power Pool Generation Information System
-  **NVTREC:** Nevada Tracks Renewable Energy Credits
-  **NYGATS:** New York Generation Attribute Tracking System (in development)
-  **PJM-GATS:** PJM's Generation Attribute Tracking System
-  **WREGIS:** WECC's Western Renewable Energy Generation Information System



- EPA proposed a requirement that renewable generation displace fossil generation in order to count for compliance does not exist in the domestic context
- It is unclear why a state or power company aiming to comply with the Clean Power Plan would put measures in place to import additional renewable energy if it did not displace existing fossil generation or demand for new fossil generation
- This is supported by a Brattle Group study, which found that Manitoba Hydro exports would not displace carbon-free sources for the next 20 years
- Regardless, if the importing state is accurately accounting for all generation, it is unclear why a special requirement would be needed to track whether imported renewable generation is displacing domestic fossil generation. If domestic fossil generation is not being displaced, it would appropriately remain in the state's emission rate calculation.

- **Canadian Federal Policy**

- Same international commitment as the United States: 17 percent below 2005 emission levels by 2020
- Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations:
- New power plants subject to a limit of 925 lbs CO₂ / MWh
- Existing coal plants must shutter at the end of their “useful life” (45-50 years), which would leave very few plants operational after 2020
- All power plants not meeting this standard would have to be shuttered by 2030
- **There is a legitimate risk of leakage at the seam of a rate-based and a mass-based state. A rate-based state could export electricity to a mass-based state without necessarily being reflected in the emissions calculation of either. This type of leakage would not be exacerbated in the international context.**

- **Quebec: 43% of exports**

- No coal generation
- Cap-and-trade program covers power sector (~\$12.00 US per metric ton)

- **Ontario: 27% of exports**

- No coal generation
- Developing cap-and-trade program

- **Manitoba: 16% of exports**

- Only one coal plant that can only be used in emergencies and is being phased out
- Carbon tax for coal and petroleum coke in place (\$14.27 Canadian per metric ton and up)

- **British Columbia: 11% of exports**

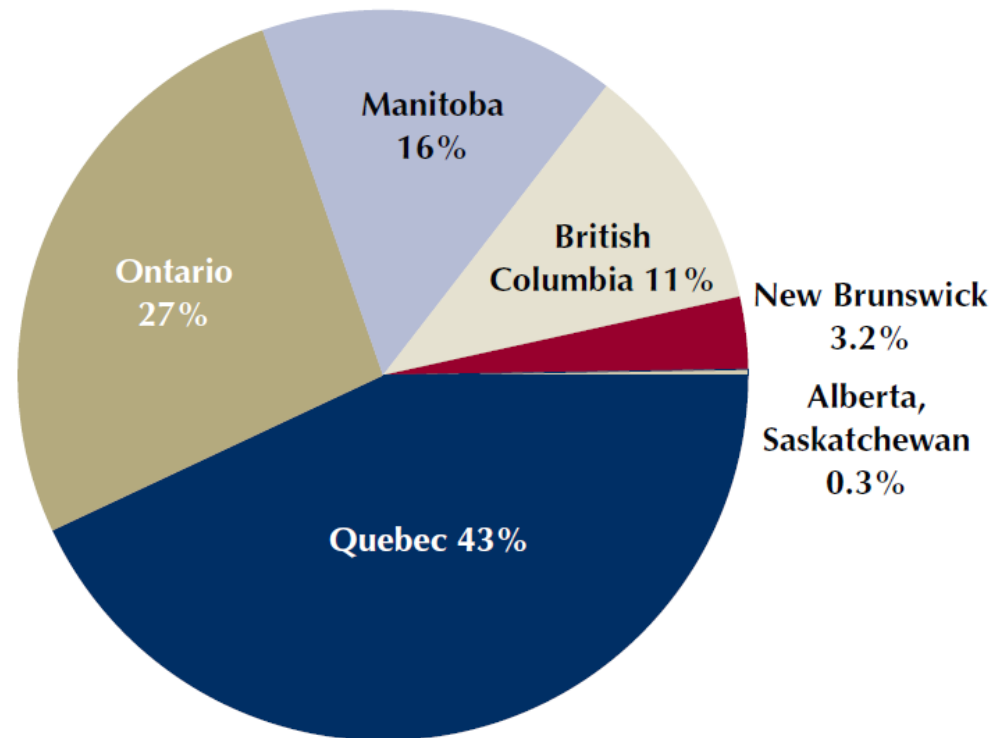
- Carbon tax in place (\$30 Canadian per metric ton)

- **New Brunswick: 3.2% of exports**

- No carbon price in place

- **Alberta: <0.3% of exports**

- Carbon tax in place (\$15 Canadian per metric ton over facility limit, or reduce intensity by 12%, or purchase offsets)

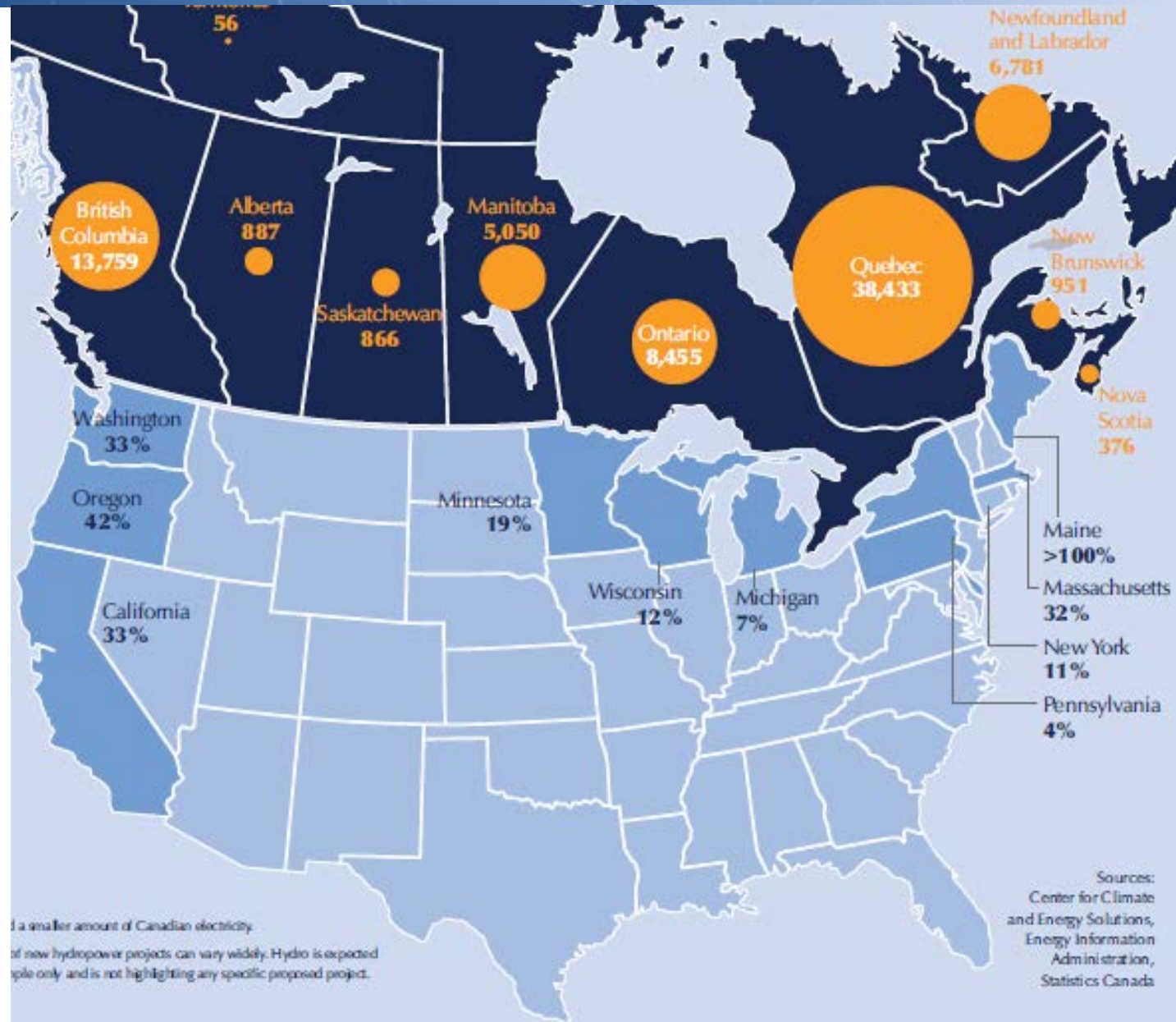


No coal and/or carbon price: 97%

Potential impact on selected states



- These states already import at least 100,000 MWh of hydropower annually
- New 250 MW project (hypothetical)
- Assumes coal is displaced, where available
- Orange: Current hydropower generation
- Percentages: How far a state could move toward its 2030 goal
- Illustrative only – does not account for changes in demand or the specific generation displaced





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