

# Energy State of Play

## Summary for Expert Steering Committee (ESC)

### Purpose

The purpose of this summary is to highlight the most current state of play of the Energy sector in Canada. This includes a summary of the state and importance of the sector, a current list of impacts, barriers and drivers, state of play on adaptation activities in the energy sector, and other additional details on overall performance of the mining sector (Economic, social, environmental performance). This document is intended for members of the Energy PN Expert Steering Committee to gain an overall summary of the state of the energy sector as it relates to adaptation actioning and implementation and helps set the tone when leading the Energy PN for CanAdapt.

### Importance of the Energy Sector, Recent Developments and Future Projections

Canada as of now has worked towards accelerating the phase out of coal, implemented natural gas regulations, and put a price on carbon pollution. **Canada already has one of the world's cleanest electricity grids**, with about 80% of its power coming from non-emitting sources. Still, electricity remains the fourth-largest contributor to national GHG emissions, mainly due to coal and diesel use. Canada's path to a clean growth economy centers on transforming the electricity sector by expanding renewables, improving transmission, modernizing the grid, and reducing diesel dependence—especially in Indigenous and remote communities.

Resource: [Complementary actions to reduce emissions - Canada.ca](#)

The electricity sector has been Canada's fastest-decarbonizing sector, with emissions dropping from **118 Mt CO<sub>2</sub> eq in 2005** to **52 Mt in 2021**—a 56% reduction, primarily due to the **coal phase-outs in Ontario and Alberta**. Emissions are projected to fall to **20 Mt** under the Reference Case and **6 Mt** under the Additional Measures Scenario by 2030. They drop further to **13 Mt (Reference)** and **just 5 Mt (Additional Measures)**, with electricity generation simultaneously increasing from **543 TWh (2005)** to **816 TWh (2035)** by 2035. Electricity demand is projected to rise **26% from 2005 to 2030**, and another **4% by 2035**, driven by electrification in buildings and transport. Other projections for 2035 include:

- Wind and solar together to jump from **7% in 2021** to **37% of generation in 2035**.
- Hydroelectricity remains dominant but grows slowly.
- Natural gas declines sharply, especially with enhanced policy actions.
- Overall electricity production reaches **919 TWh** in 2035 (vs. 634 TWh in 2021)

Canada has funded several programs to meet demands for clean electricity which includes the introduction of:

- \$964 million Smart Renewable Electrification Pathways Program
- \$99 million Smart Grids program and the \$200 million Emerging Renewable Power Program.
- The launch of Small Modular Reactors (SMR) through the SMR Action Plan to advance technological innovation to reduce emissions. Canada has also provided \$340 million to fund projects to support the transition off diesel fuel in rural and remote Indigenous communities.
- Developing [Clean Electricity Regulations \(CER\)](#) to achieve a net-zero electricity grid by 2035

Resource: [Canada's 2023 Greenhouse Gas and Air Pollutant Emissions Projections](#)

Resource: [2030 Emissions Reduction Plan – Sector-by-sector overview - Canada.ca](#)

## Barriers to Climate Change Adaptation

### Barriers

1. **Dependence on Fossil Fuels:** Despite efforts to diversify, Ontario's energy consumption heavily relies on fossil fuels. Natural gas, gasoline, and diesel dominate the energy mix, posing challenges for emission reductions.
2. **Infrastructure Limitations:** Ontario's natural gas supply has shifted from Western Canada to increased imports from the U.S., particularly from the Appalachian Basin. This shift underscores the province's reliance on external sources and the need for robust infrastructure to ensure energy security .([ontario.ca](#))

3. **Electrification Challenges:** While electrification is a key strategy for reducing emissions, transitioning sectors like transportation and heating to electric sources requires significant investment and technological advancements.

Resource: [Archived - Module 1: Additional information about fuels and supply | Fuels Technical Report | ontario.ca](#)

4. Energy retrofits, RNG adoption, and clean technology investments often involve **high upfront costs**, even when long-term benefits are recognized (Quebec and Ontario documents).
5. **Climate Vulnerability of Hydro Systems:** Heavy reliance on **hydropower** (especially in Quebec and BC) raises concern about droughts and changing precipitation patterns affecting generation reliability.
6. **Limited Industrial Decarbonization:** Reports such as the *Mining Sector Performance Report* indicate mining and heavy industries are **carbon-intensive** and difficult to decarbonize quickly. Barriers include **cost, lack of clean tech readiness**, and infrastructure.
7. **Cost and Financing Barriers:** Energy retrofits, RNG adoption, and clean technology investments often involve **high upfront costs**, even when long-term benefits are recognized (Quebec and Ontario documents).
8. **Policy Fragmentation:** Provinces pursue **different standards and timelines** for things like clean fuels, EV adoption, and energy efficiency. Lack of unified federal-provincial coordination slows broader transition efforts.

Resource: [The State of Energy in Quebec](#)

## State of Play of Adaptation Activities

Key actions include:

- **Phasing out coal by 2030**, with major progress already in Ontario, Alberta, and Manitoba.
- **Boosting renewables** like wind, solar, and hydro; wind alone grew 20-fold from 2005–2015.

- **Grid modernization**, including smart-grid tech and storage systems, to support reliability and integration of intermittent renewables.
- **Cross-border and interprovincial transmission expansion** to deliver clean power where it's needed.
- **Support for Indigenous and remote communities** via hybrid systems (like solar-diesel-battery), microgrids, and community-led clean energy projects.

Notable initiatives include Ontario's 2014 coal phase-out, Alberta's coal-to-renewables plan, and projects like the **Colville Lake hybrid system** and **Ramea Wind-Hydrogen-Diesel project**, which reduce diesel use and emissions. These efforts offer not only climate and health benefits but also **economic opportunities**—such as job creation in clean tech and increased clean electricity exports to the U.S.

---

## Ontario State of Play

### Environmental Performance

Ontario has made notable strides in improving its environmental performance:

- **Coal Phase-Out:** The elimination of coal-fired electricity generation led to a substantial decrease in coal use, from 12% of fuels energy in 2005 to less than 1% in 2015 [.\(ontario.ca\)](https://www.ontario.ca)
- **Biofuel Adoption:** Ethanol use, primarily for blending with gasoline, nearly tripled between 2005 and 2015, indicating progress toward cleaner fuel alternatives [.\(ontario.ca\)](https://www.ontario.ca)
- **GHG Emissions Reduction:** The decline in fuel consumption contributed to a reduction in greenhouse gas emissions, aligning with broader climate change mitigation goals.

---

## General State of Play

The energy landscape in Ontario is characterized by both progress and ongoing challenges:

- **Energy Demand:** Overall fuel energy demand decreased over the decade, with significant reductions in the electricity generation sector. However, residential and transportation sectors saw modest increases, highlighting areas needing targeted efficiency measures .([ontario.ca](https://www.ontario.ca))
- **Fuel Diversity:** While natural gas, gasoline, and diesel remain predominant, there's a growing presence of alternative fuels, including propane, wood, biomass, and biofuels, catering to diverse energy needs across sectors .([ontario.ca](https://www.ontario.ca))
- **Policy Initiatives:** Ontario's commitment to increasing renewable content in fuels, such as the Cleaner Transportation Fuels regulation aiming for 15% renewable content in gasoline by 2030, reflects proactive steps toward a sustainable energy future .([ero.ontario.ca](https://ero.ontario.ca))

---

## State of Play: Quebec's Energy System (2019)

### Key Context

- Quebec is on an **energy transition path**, guided by its **2030 Energy Policy (QEP)** and the **2018–2023 Master Plan** of Transition énergétique Québec (TEQ).
- It aims for a **40% reduction in petroleum product use by 2030 (vs. 2013)** and **16 Mt CO<sub>2</sub>e reduction in energy-related GHG emissions**.
- As of 2016:

- **GDP increased by 62%** since 1990, while **energy use grew by only 15%**—indicating decoupling of economic growth from energy consumption.
  - **GHG emissions from energy dropped 7%**, and **non-energy emissions dropped 19%**.
- 

## Quebec State of play

### Relevance for Climate Adaptation

#### 1. Sector-Wide Transition Challenges

- **Petroleum Products:** Still make up **40% of total energy use**, especially in transportation.
  - *Issue:* Sales of gasoline and diesel **rose by 12.7% from 2013 to 2017**, making QEP targets difficult to meet.
  - *Implication:* Requires systemic reduction of fossil fuel reliance, especially for freight and personal vehicles.
- **Electricity Use:** 95% of electricity comes from **hydropower**, making Quebec's grid clean but vulnerable to **hydroclimatic variability** (e.g., droughts, extreme cold).
- **Bioenergy & RNG (Renewable Natural Gas):**
  - Currently underdeveloped but holds **strategic potential** for decarbonizing off-grid and industrial sectors.
  - RNG's technico-economic potential estimated at **25.8 million GJ in 2018**, rising to **182 million GJ by 2030** at \$10–\$20/GJ.

- *Adaptation link:* Diversifies supply and reduces vulnerability to fossil fuel volatility.
- 

## 2. Energy System Vulnerabilities and Efficiency

- Quebec **loses 54% of energy produced** due to inefficiencies in transformation, transmission, and use.
    - *Figure 3 (Page 11)* illustrates Quebec's energy flow; only 46% reaches end-use.
    - *Practitioner note:* Energy efficiency remains one of the **lowest-hanging adaptation opportunities**.
  - Transportation: **70% of petroleum use** is in this sector. Despite EV incentives:
    - **Light truck sales surged 246% since 1990**, while car sales fell 28%.
    - *Implication:* Transitioning fleets, incentivizing modal shifts, and building EV charging infrastructure are critical adaptation actions.
  - Buildings:
    - Residential and commercial sectors consume **30% of energy**.
    - Despite energy efficiency gains, **larger dwellings and commercial space** increase overall demand.
    - *Strategy:* Retrofit programs, code modernization, and distributed energy systems needed for long-term resilience.
-

### 3. GHG Emissions and Climate Goals

- **Energy use accounts for 72% of Quebec's GHG emissions.**
    - The province is **not on track** for its **37.5% emissions reduction below 1990 by 2030** without major acceleration.
    - *Adaptation relevance:* Mitigation and adaptation must be integrated to support dual resilience—cutting emissions while preparing for climate impacts.
- 

### 4. Governance and Market Signals

- The province uses **carbon pricing via cap-and-trade**, now in partnership with California.
  - New regulations require:
    - **1% RNG in gas pipelines by 2020**, increasing to **5% by 2025**.
    - Greater **zero-emission vehicle mandates**—aiming for **20% of vehicle sales to be EVs by 2025**.
  - *Actionable policy lever:* Align adaptation investments with these **regulatory and pricing frameworks**.
- 

## Takeaways for Practitioners

Area	Action for Adaptation & Resilience
Transport	Accelerate EV adoption, decarbonize freight, improve urban design to reduce VKT



<b>Buildings</b>	Deep retrofits, expand district energy, enhance grid-interactive buildings
<b>Industry</b>	Fuel switching to RNG and electricity, waste heat recovery
<b>Bioenergy</b>	Tap RNG from waste streams; scale second-gen biofuel plants
<b>Governance</b>	Use pricing and policy signals to embed resilience in planning