Electricity 101

The following slide deck contains information about Electricity Canada and the Canadian electricity industry. Unless noted otherwise, charts were prepared by Electricity Canada based on data from third-party sources, such as Statistics Canada, Environment and Climate Change Canada, the International Energy Agency and the World Bank.

Electricity Canada

Founded, in 1891, Electricity Canada is the national forum and voice of the evolving electricity business sector in Canada.

Mission: Electricity Canada is the national voice for sustainable electricity for its members and the customers they serve.

Regulatory

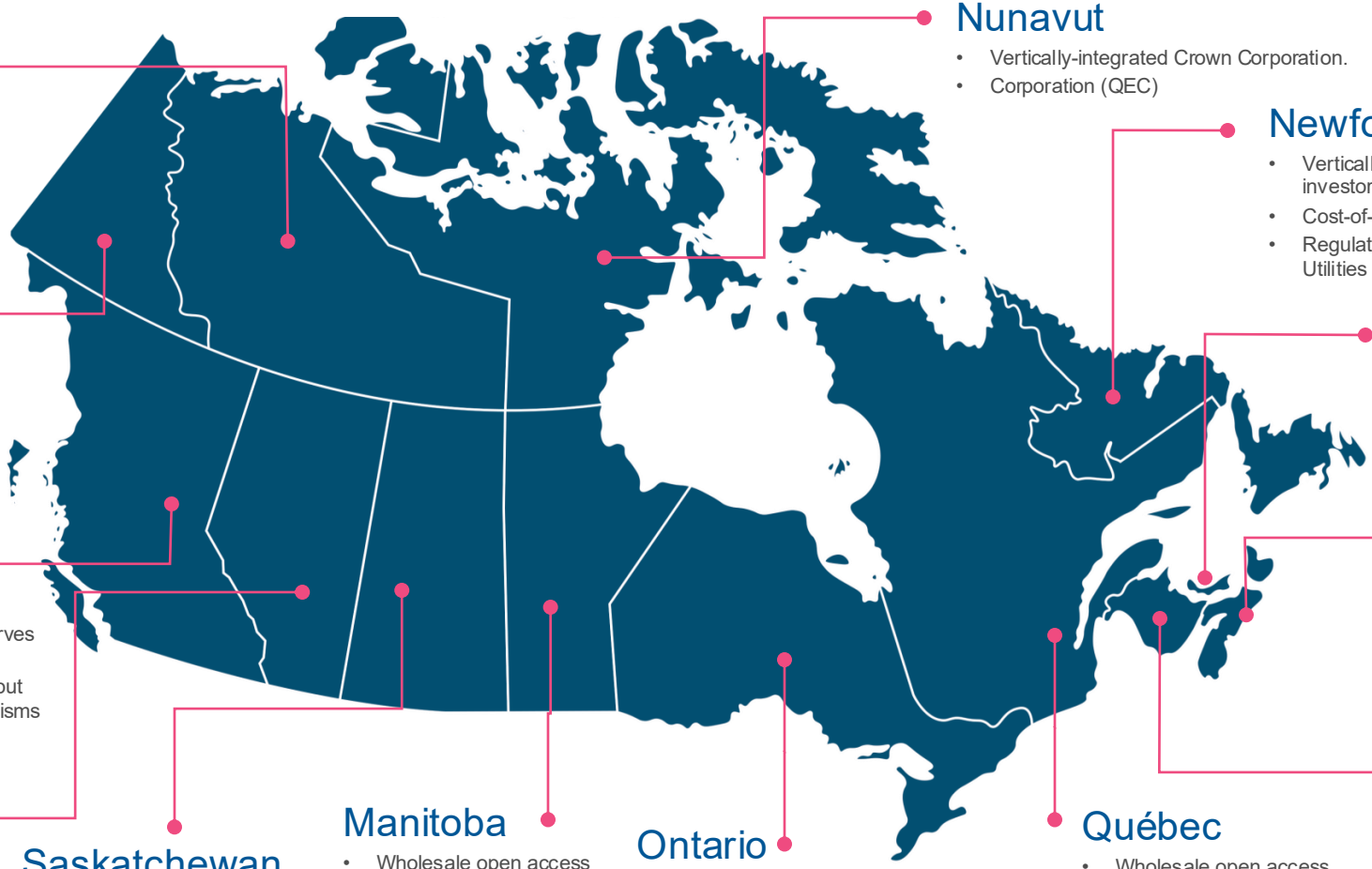
The electricity sector is strongly regulated in Canada.

- Multi-jurisdictional Environment
- Electricity Market Structure in Canada
- Regulatory Regime for Large Infrastructure Projects
- Integrated North American Grid
- North American Electric Reliability Corporation (NERC) Regions

Canada's Multi-Jurisdictional Environment

Jurisdictional Division of Responsibility	
Provincial/Territorial Governments	Federal Government
• Resource management within provincial boundaries • Intra-provincial trade and commerce • Intra-provincial environmental impacts • Generation and transmission of electrical energy • Conservation and demand response policies	• Resource management on frontier lands • Nuclear safety • Inter-provincial and international trade • Trans-boundary environmental impacts • Environmental impacts where federal lands, investment or powers apply • Codes, standards and labeling relating to conservation and demand • Other policies of national interest

Electricity Market Structure in Canada



NWT

- Vertically-integrated crown corporation
- Investor-owned distribution utility provides service in several communities
- Cost-of-service regulation
- Regulator: Northwest Territories Public Utilities Board (NWT PUB)

Yukon

- Vertically-integrated crown corporation.
- Investor-owned distribution utility provides service in several communities
- Cost-of-service regulation
- Regulator: Yukon Utilities Board (YUB)

BC

- Wholesale and industrial open access
- Vertically-integrated crown corporation serves 94% of customers
- Primarily uses cost-of-service regulation, but does have some incentive-based mechanisms
- Regulator: British Columbia Utilities Commission (BCUC)

Alberta

- Fully competitive wholesale market
- Wholesale & retail open access (2001)
- Uses PBR framework
- Independent Electricity System Operators
  Regulator: Alberta Utilities Commission (AUC)

Saskatchewan

- Wholesale open access
- Vertically-integrated crown corporation
- Cost of service methodology
- Regulator: Saskatchewan Rate Review Panel (SRRP)

Manitoba

- Wholesale open access
- Vertically-integrated crown corporation
- Cost-of-service regulation
- Regulator: Manitoba Public Utilities Board (PUB)

Ontario

- Industry unbundling (1998)
- Wholesale & retail open access (2002)
- Hybrid regulation and competition model
- Uses cost of service principles for rate setting, but also uses PBR
- Independent Electricity System Operators
- Regulator: Ontario Energy Board (OEB)

Québec

- Wholesale open access
- Vertically-integrated crown corporation
- Expanding IPP development
- Cost-of-service regulation
- Regulator: Régie de l'énergie du Québec

Nunavut

- Vertically-integrated Crown Corporation.
- Corporation (QEC)

Newfoundland

- Vertically-integrated Crown Corporation and investor-owned distribution utility
- Cost-of-service regulation
- Regulator: Board of Commissioners of Public Utilities (PUB)

PEI

- Procures electricity from New England market and long-term contracts with New Brunswick
- Regulator: Island Regulatory and Appeals Commission (IRAC)

Nova Scotia

- Wholesale open access
- Investor-owned utility regulated on cost-of-service
- Cost-of-service regulation
- Regulator: Board of Commissioners of Public Utilities (PUB)

New Brunswick

- Wholesale open access
- Vertically-integrated crown corporation
- Cost-of-service regulation
- Regulator: New Brunswick Energy and Utilities Board (NBEUB)

Canada's Regulatory Regime for Large Energy Projects

Planning & Consultation

- New Processes
  - Impact Assessment Act*
  - Canadian Energy Regulator Act*
  - Nuclear Safety and control Act*

Environmental Assessment Process

- New Processes
  - Species at Risk Act
  - Metal and diamond mining Effluent Regulations
  - Fisheries Act
  - Navigation Protection Act
- Ongoing Processes
  - Impact Assessment Act
  - Canadian Energy Regulator Act
  - Nuclear Safety and control Act

Permitting

- Ongoing Processes
  - Canadian Energy Regulator Act
  - Nuclear Safety and control Act
  - Species at Risk Act
  - Metal and Diamond Mining Effluent Regulations
  - Fisheries Act
  - Navigation Protection Act

Follow Up

- New Processes
  - Impact Assessment Act
- Ongoing Processes
  - Canadian Energy Regulator Act
  - Nuclear Safety and control Act
  - Metal and Diamond Mining Effluent Regulations
  - Fisheries Act
  - Navigation Protection Act

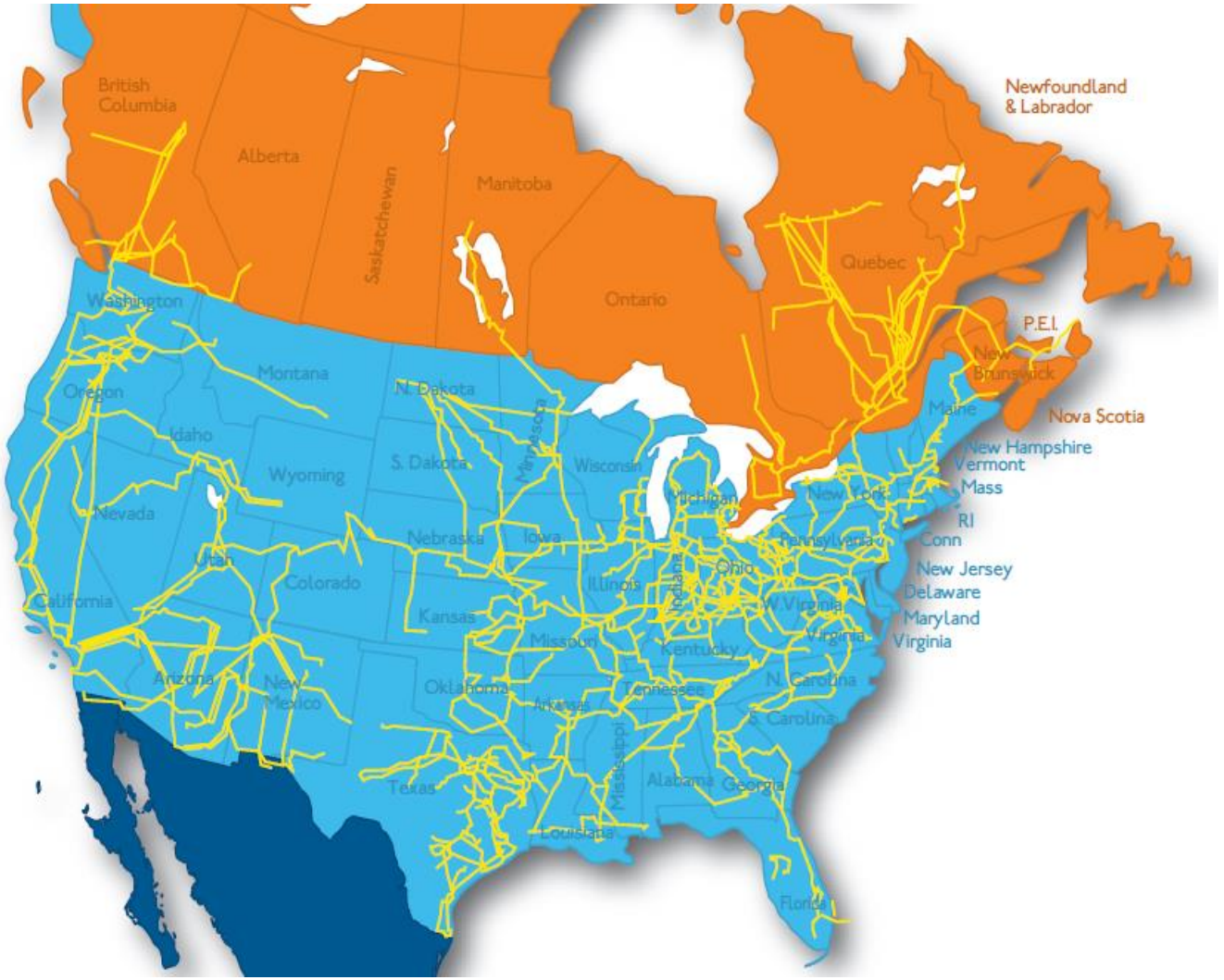
Throughout: Land Use Plans, Impact reviews (YESAA, MVRMA Land Plans /IAA/ NuPPAA) Innuvialuit Final Agreement*, Management Boards Territorial Lands/Water Act, MBCA/IBWTA/CPRA/Offshore Accords / CEPA

*Permits required under other Acts trigger IAA OGD participants | Illustrative – some components would not apply to same project

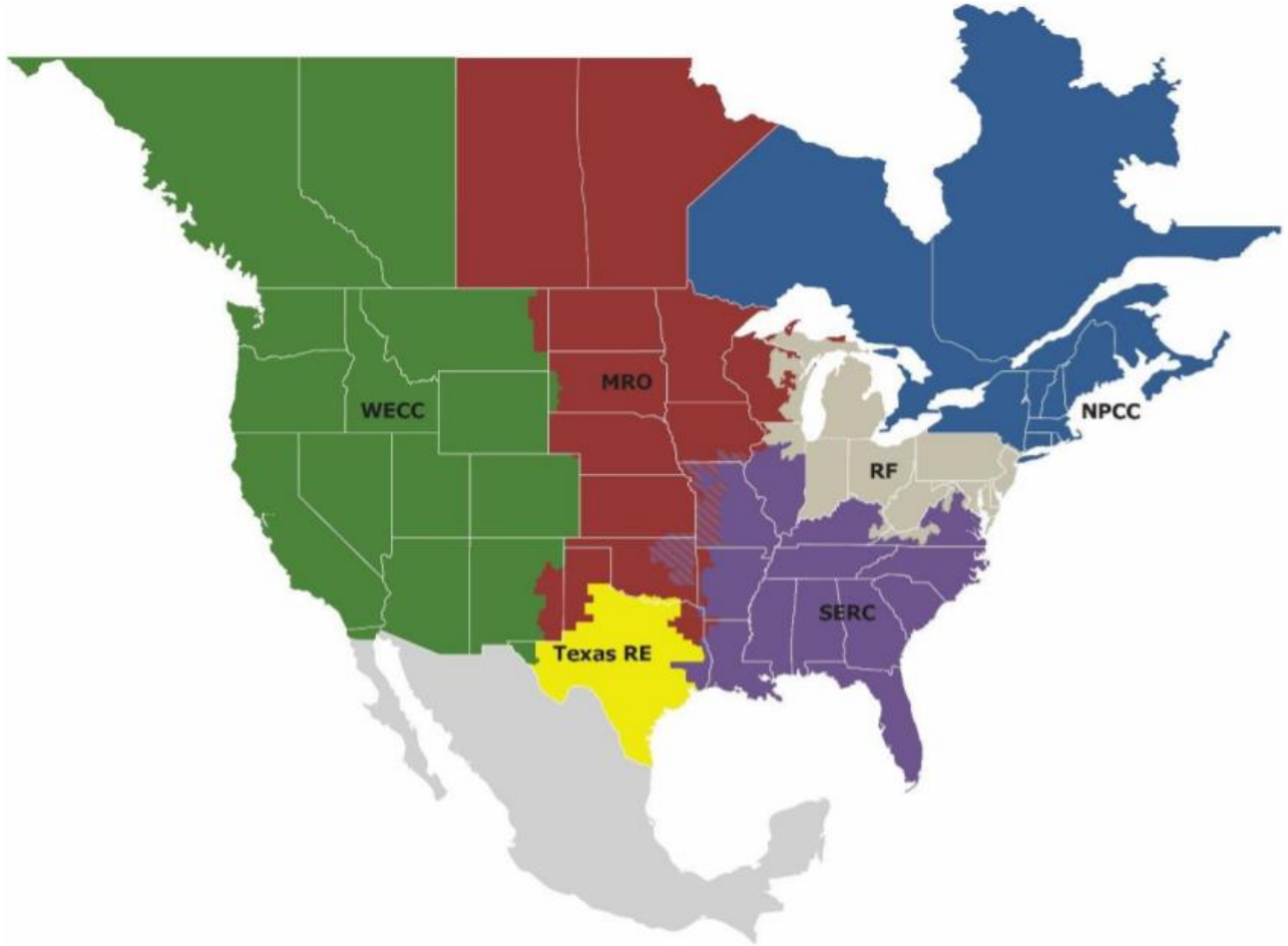
YESAA – Yukon Environmental and Socio-Economic Assessment Act / **MVRMA** – Mackenzie Valley Resource Management Act / **MBCA** – Migratory Birds Convention Act / **IBWTA** – International Boundary Waters Treaty Act / **CPRA** – Canadian Petroleum Resource Act / **Offshore Accords** – Canada – NS and NFLD Offshore Accords / **CEPA** – Canadian Environmental Protection Act / **NuPPAA** – Nunavut Planning and Project Assessment Act (NuPPAA)

The Integrated North American Grid

Details: Lines shown are 345kV and above. Transmission Lines under 345KV do not appear on this map



North American Electric Reliability Corporation Regions (NERC)



Acronym	Name
WECC	Western Electricity Coordinating Council
MRO	Midwest Reliability Organization
TRE	Texas Reliability Entity
SERC	Southeast Reliability Corporation
RFC	Reliability First Corporation
NPCC	Northeast Power Coordinating Council, Inc.

Source: NERC
Updated: March 2025

Industry

The industry employs over 111,000 people.

- Industry Overview
- Top Electricity Infrastructure Projects
- Industry Labour Statistics in Canada
- Customer Reliability in Canada
- Severe Weather = Growing Risk
- GDP Contribution
- Utility Investments

Industry Overview

Electricity Industry Overview

Electricity supports quality of life, economic well-being, and a clean environment.

- **111,210** Employed
- **$36 Billion** Added GDP
- **619.98 TWh** Generation
- **99.89%** Customer Reliability
- **10.42 TWh** Net Exports
- **1.79 Billion** Net Trade Revenue
- **Over 82%** Non-Emitting
- **64%** GHG Emissions Reduction Since 2000

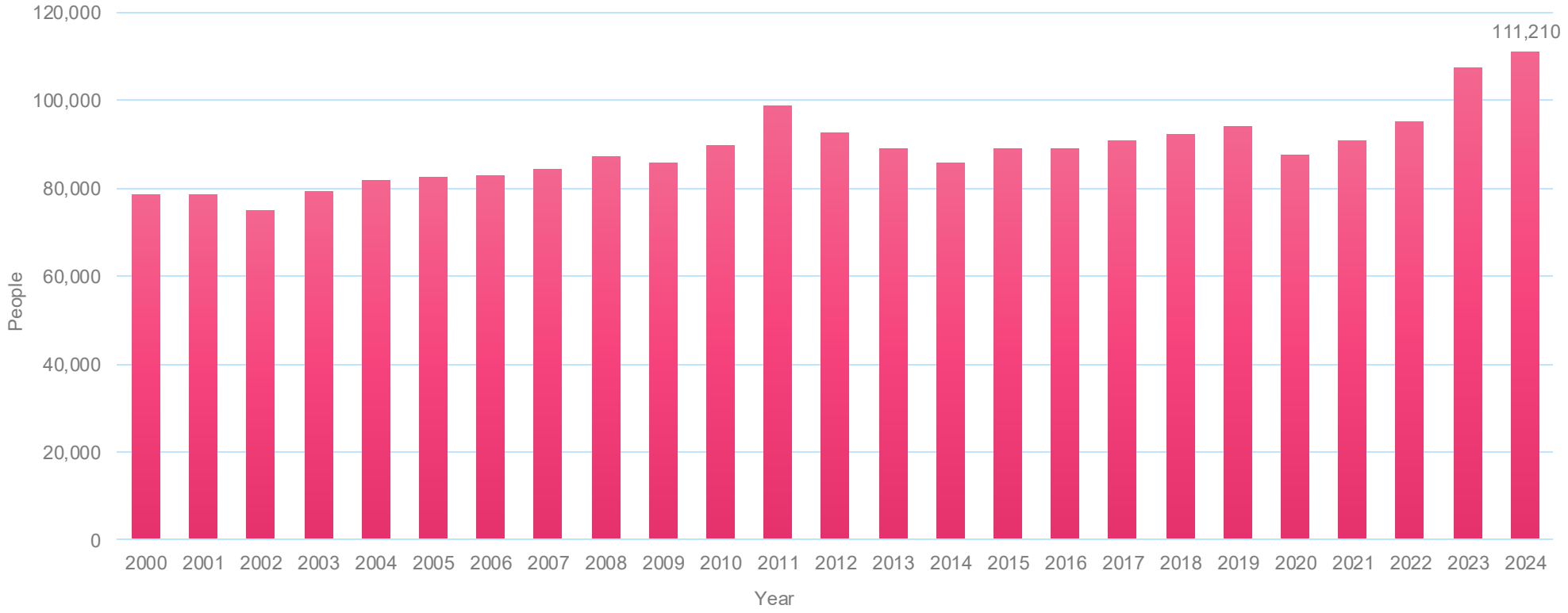
Top Electricity Infrastructure Projects - 2025

Nine of the largest 100 infrastructure projects in Canada are electricity-based and valued at $47.03 Billion

Project Title	Description	Project Owner	Project Type	Location	Value (Billions)	Estimated Completion
Site C Clean Energy Project	1,100 MW	BC Hydro	Hydro	BC	16	2025
Bruce Power Refurbishment	Refurbishment	Bruce Power	Nuclear	ON	13	2033
Darlington Nuclear Refurbishment	Refurbishment	OPG/Nalcor Energy	Nuclear	ON	12.8	2026
Wassigan Transmission Project	350 km Transmission line	Hydro One	Transmission	ON	1.2	2027
John Hart Dam Seismic Upgrade Project	Refurbishment	BC Hydro	Hydro	BC	0.92	2030
Oneida Energy Storage Project	250 MW /1,000 MWh energy storge	Oneida LP	Transmission	ON	0.9	2025
Aspen Power Station	370 MW power plant construction	SaskPower	Natural Gas	SK	0.85	2027
Carillon Generating Station Refurbishment Project	Refurbishment	Hydro-Québec	Hydro	QC	0.75	2027
Rapide-Blanc Generating Station Refurbishment Project	Refurbishment	Hydro-Québec	Hydro	QC	0.61	2026

Source: Renew Magazine Top 100 Projects List – 2025, : 2025 Ranking – Top100Projects
Data Updated: July 2025
Visual Created by Electricity Canada

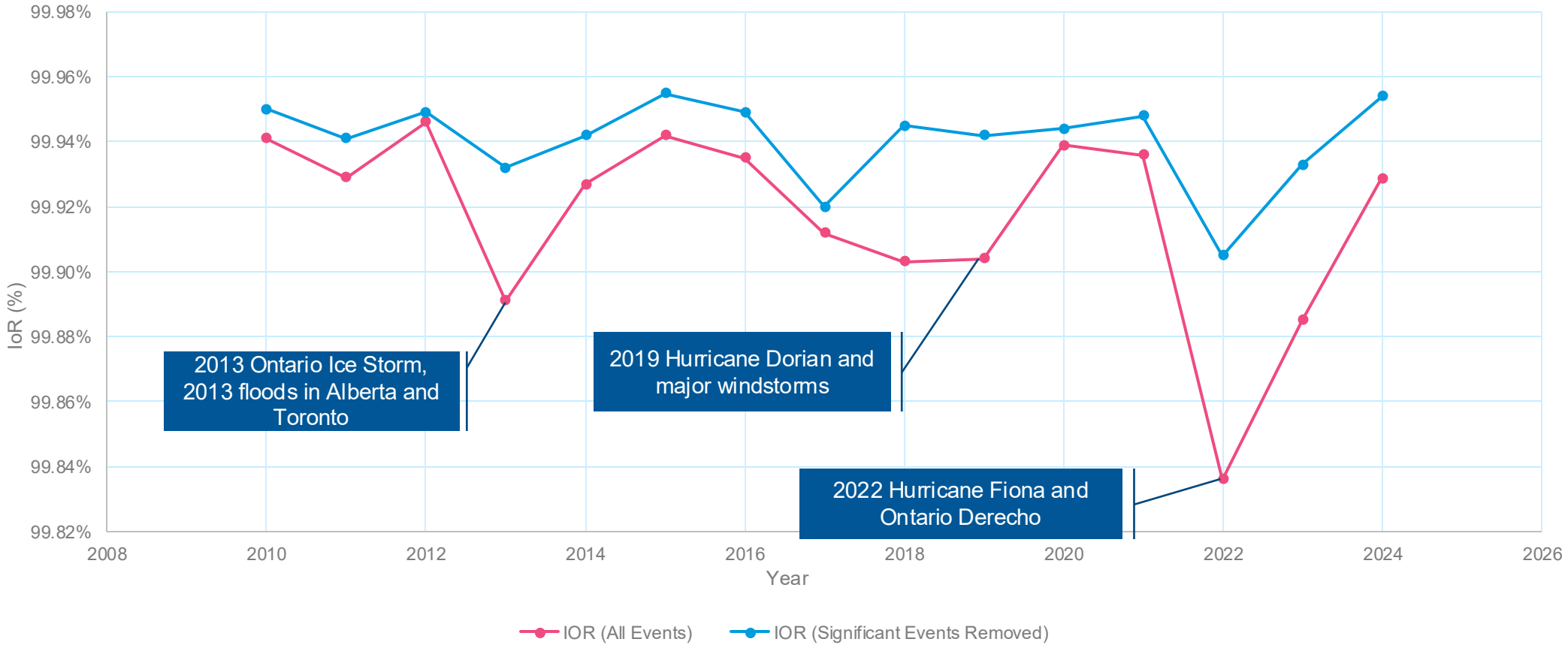
Industry Labour Statistics in Canada - 2024



Excludes consultants, vendors and related manufacturers dedicated to the industry

Source: Statistics Canada. Table 36-10-0489-01 Labour statistics consistent with the System of National Accounts (SNA), by job category and industry
Data Updated: May 2025
Visual Created by Electricity Canada

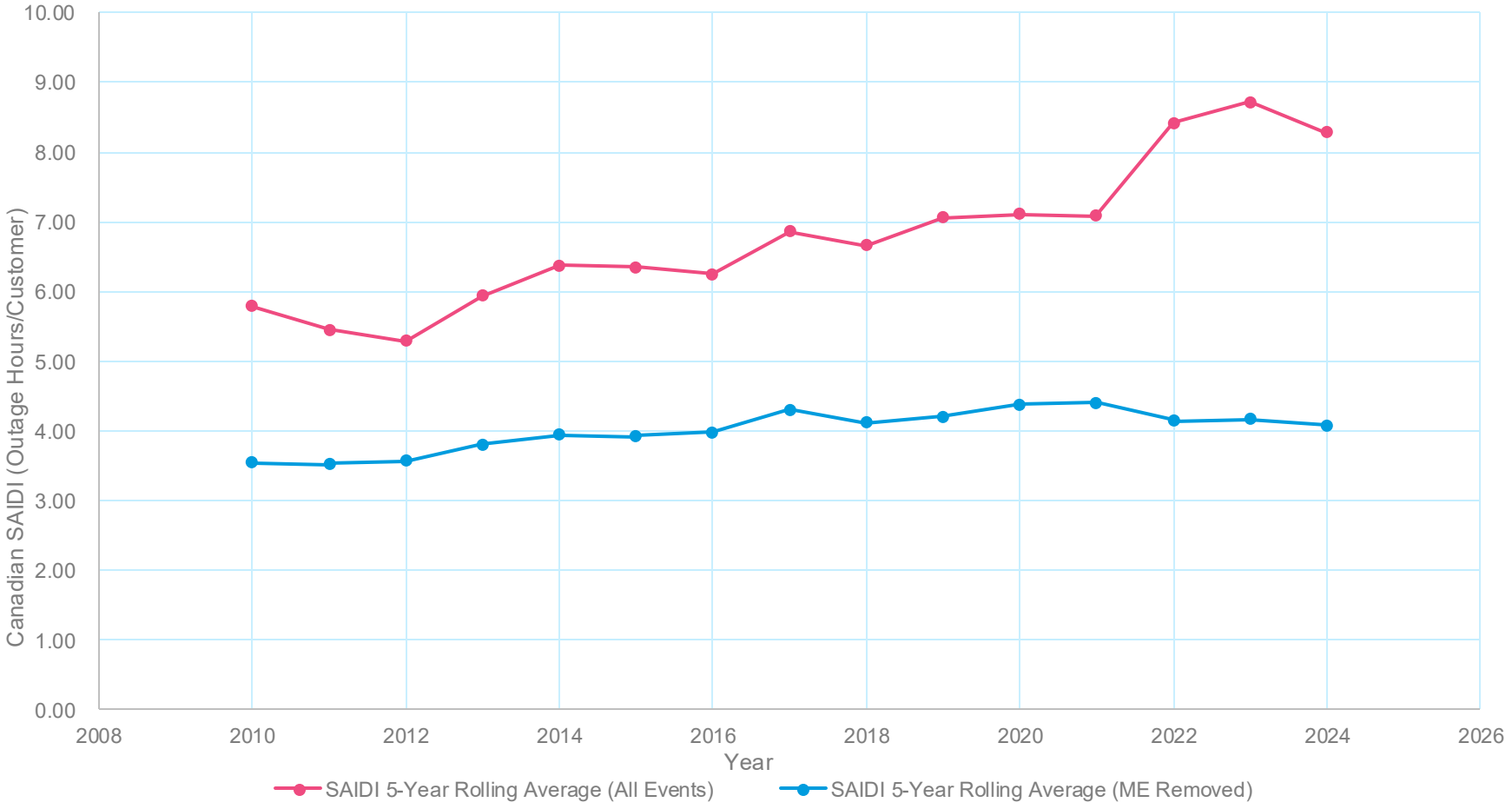
Customer Reliability in Canada



Significant events are catastrophic events that are outside the control of the utility and impact the Canadian index.

Source: Electricity Canada, Service Continuity Committee : Overall Interruption Statistics (sharepoint.com)
Data Updated: July 2025
Visual Created by Electricity Canada

Severe Weather = Growing Risk

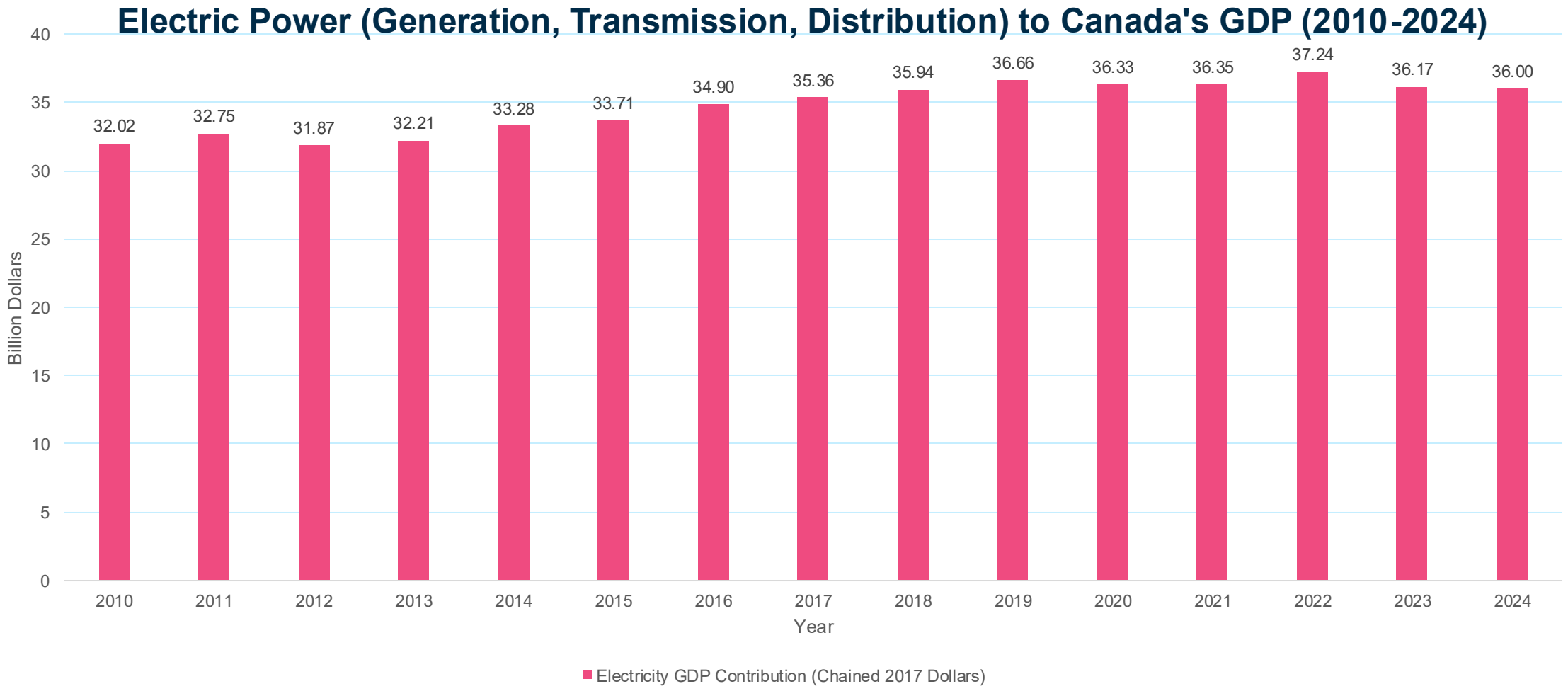


System Average Interruption Duration Index (SAIDI): The system average outage duration per customer

As more severe weather events occur, major event (ME) interruptions are on the rise.

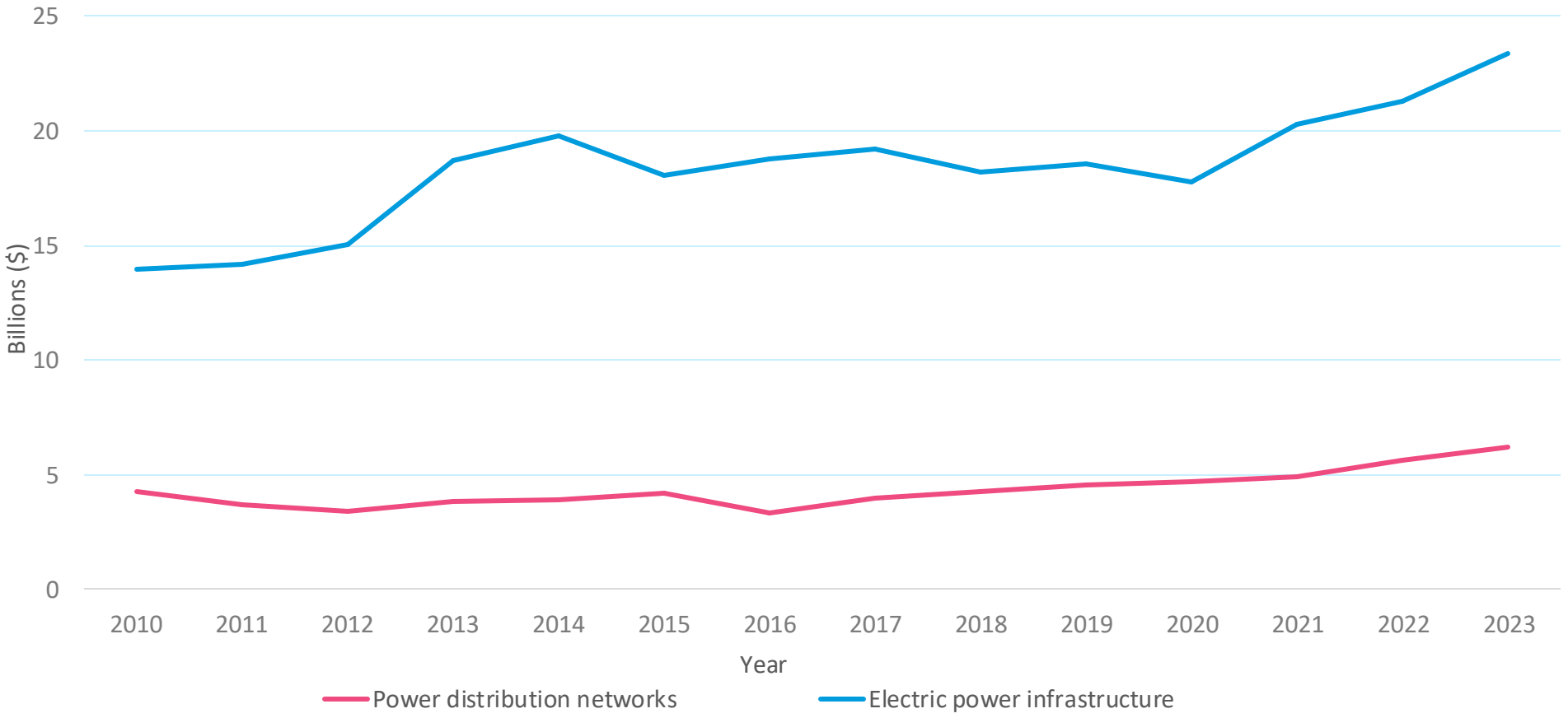
Source: Electricity Canada, Service Continuity Committee
Data Updated: July 2025
Visual Created by Electricity Canada

GDP Contribution



Data Source: Statistics Canada. Table 36-10-0434-06 Gross domestic product (GDP) at basic prices, by industry, annual average, industry detail (x 1,000,000)
Data Updated: March 2025; Visual Created by Electricity Canada

Utility Investments



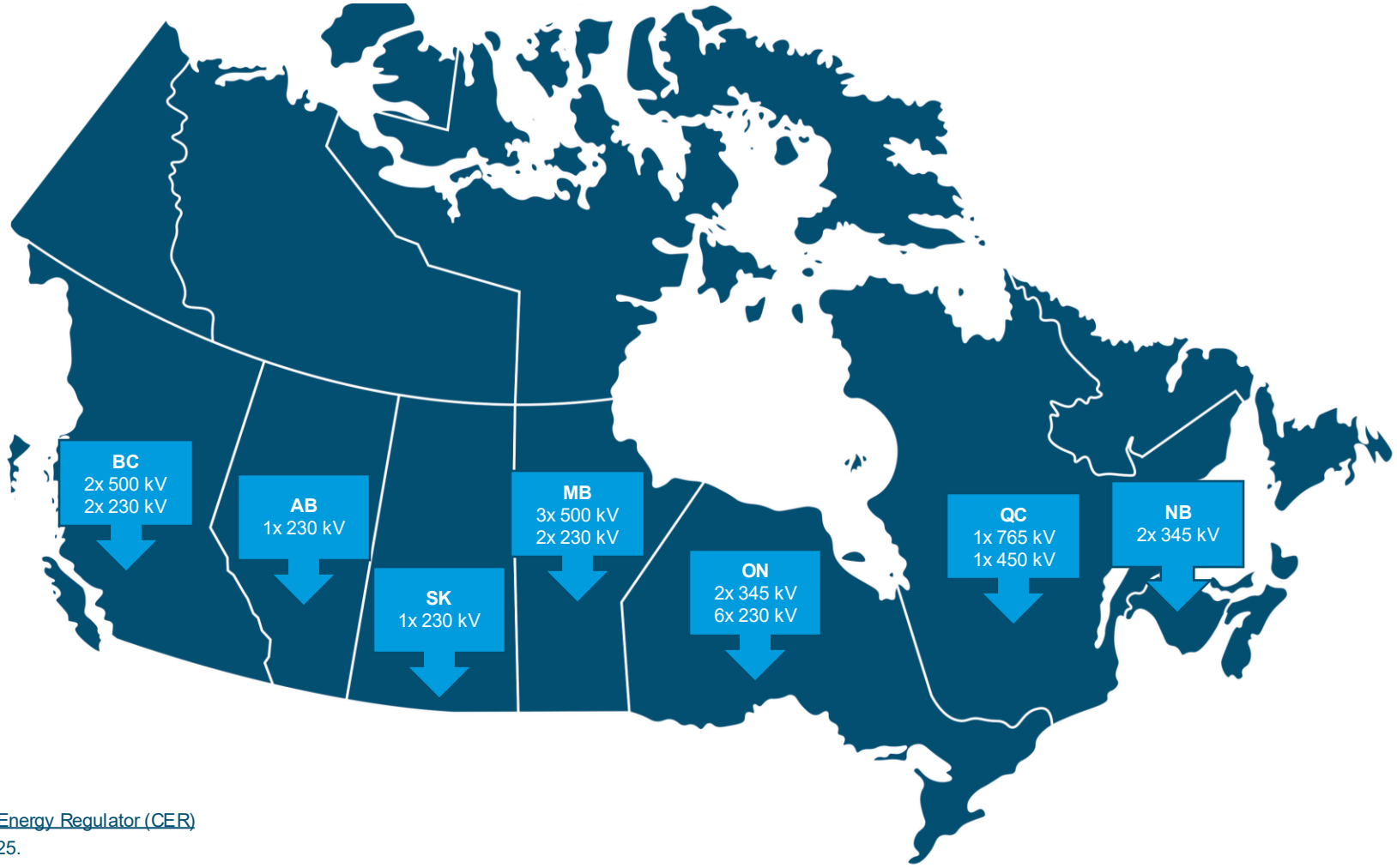
Data Source: Statistics Canada. Table 34-10-0063-01 Capital expenditures, non-residential tangible assets, by type of asset and geography (x 1,000,000)
Data Updated: July 2024; Visual Created by Electricity Canada

Trade

Electricity trading between Canada and the U.S. began in 1901.

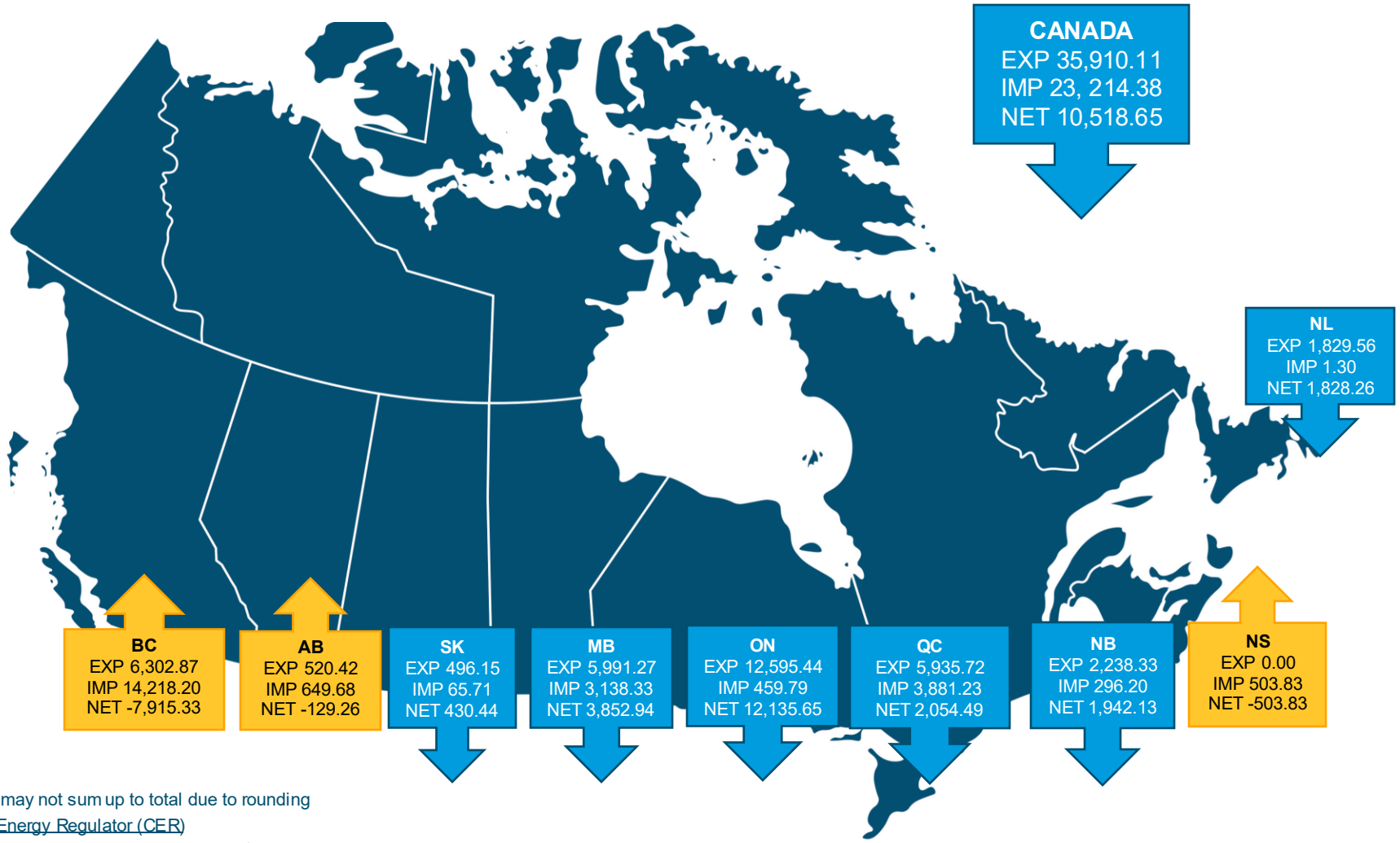
- Major Canada-U.S. Transmission Connections
- Canadian Exports-Imports by Region
- Trade Volume
- Trade Prices
- Trade Revenue

Major Canada-U.S. Transmission Connections



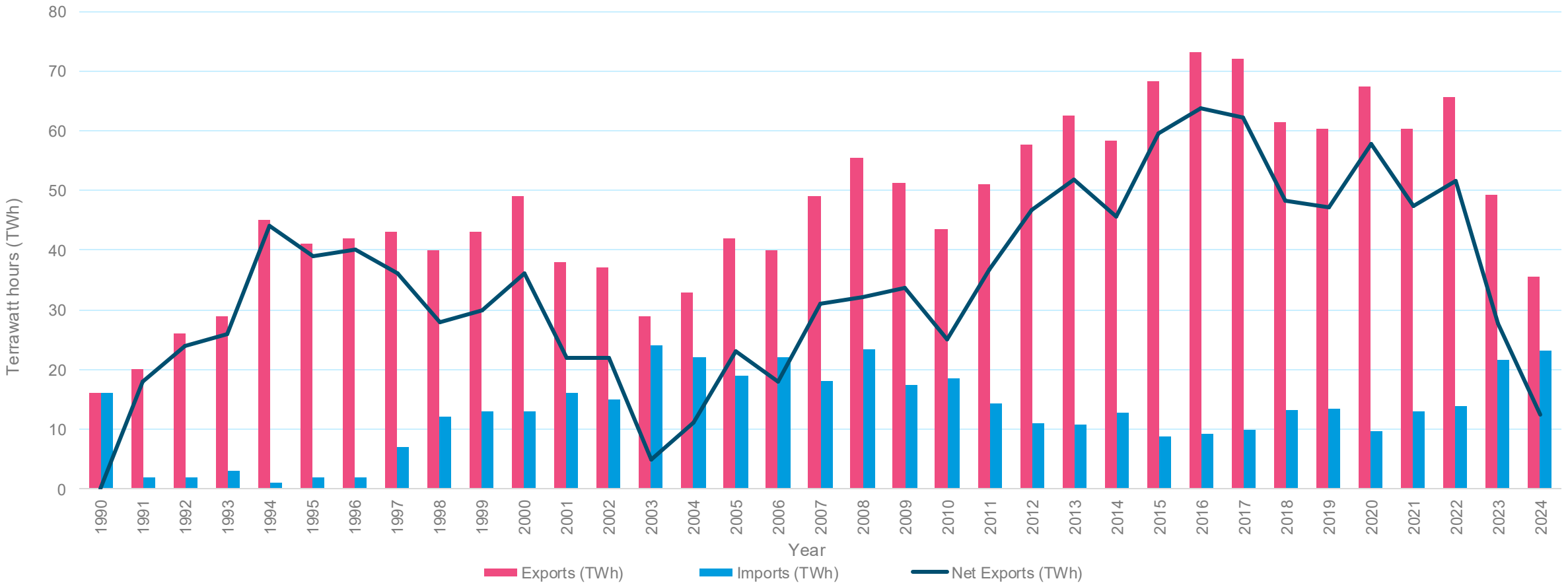
Data Source: Canada Energy Regulator (CER)
Data Updated: July 2025.

Canadian Electricity Imports and Exports by Region in GWh, 2024



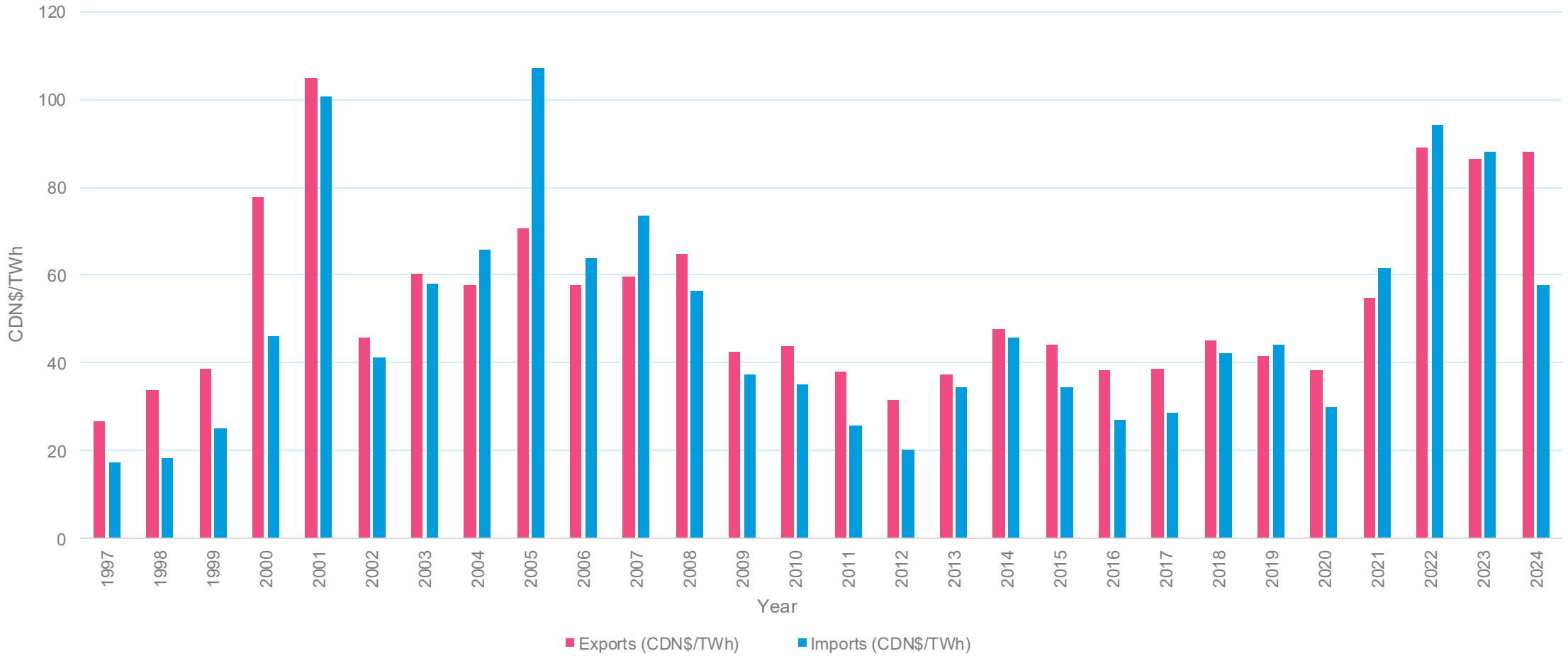
(1) Provincial numbers may not sum up to total due to rounding
Data Source: Canada Energy Regulator (CER)
Data Updated: July 2025; Visual created by Electricity Canada

Trade Volume



Source: Canada Energy Regulator (CER), CER – CER – Electricity Trade Summary (cer-rec.gc.ca)
Data Updated: July 2025; Visual Created by Electricity Canada

Trade Prices



Source: Canada Energy Regulator (CER) , CER – CER – Electricity Trade Summary (cer-rec.gc.ca)
Data Updated: July 2025; Visual Created by Electricity Canada

Trade Revenue

Source: Canada Energy Regulator (CER); apps.cer-rec.gc.ca/CommodityStatistics/Statistics.aspx?language=english
Data Updated: July 2025; Visual Created by Electricity Canada

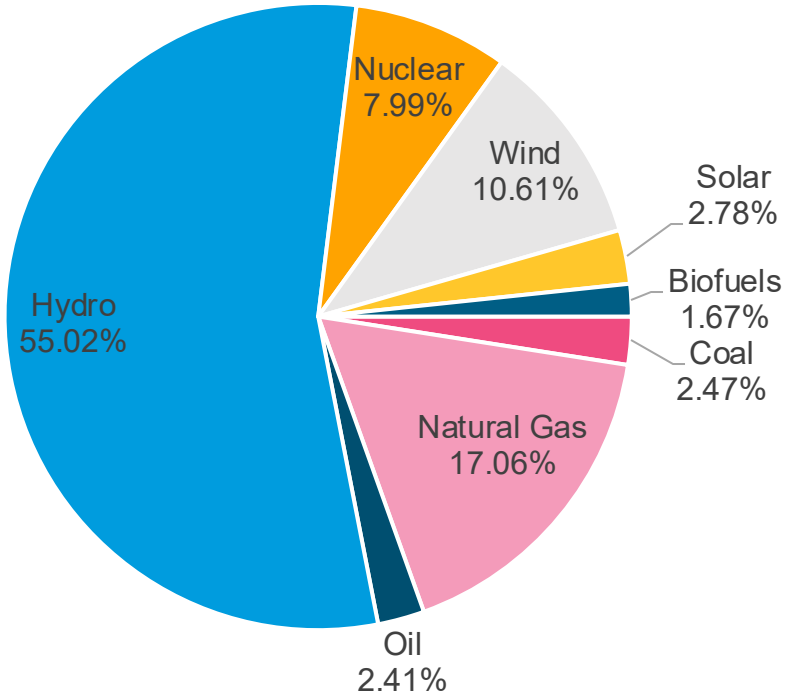
Supply and Demand

The electricity industry is over 80% non-emitting

- Generating Capacity (Canada vs. United States)
- Canada's Generating Capacity
- Electricity Demand by Sector in Canada Trends
- Electricity Demand by Sector in Canada
- Electricity Generation by Fuel Type
- Supply, Industry and Utilities by Province

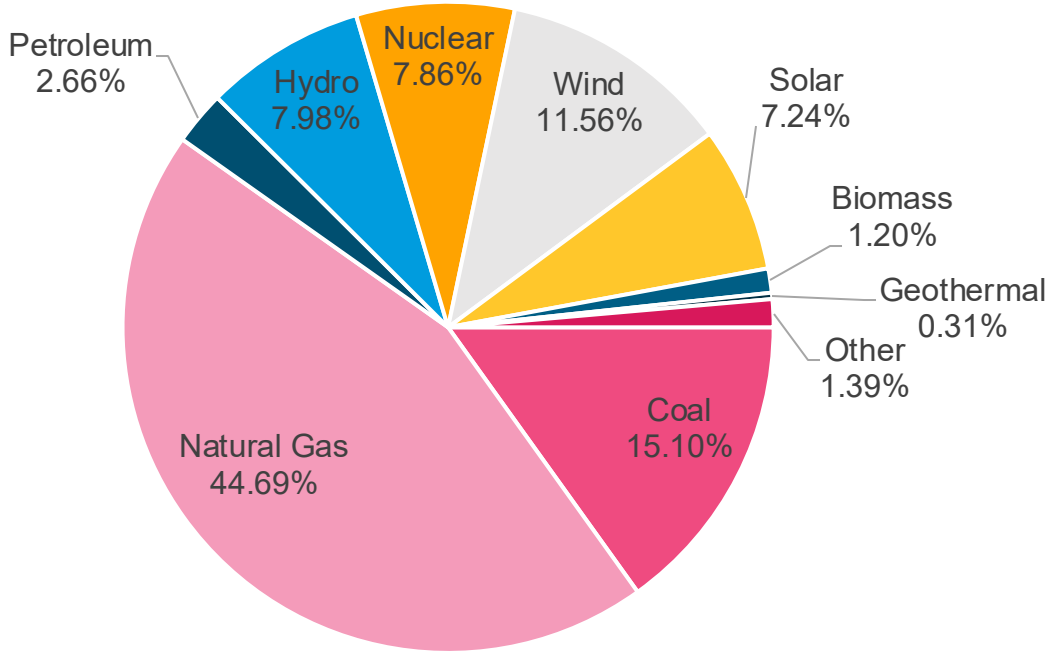
Generating Capacity

Canada, 2023



Generating Capacity
152 GW

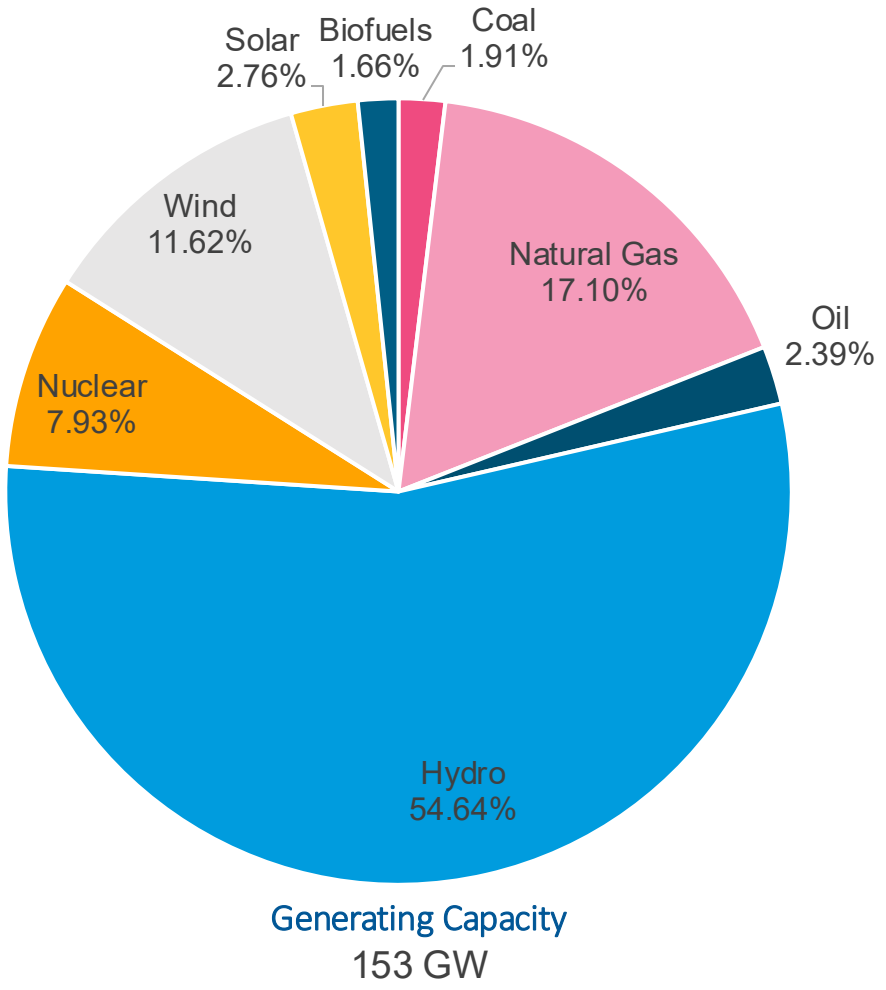
United States, 2023



Generating Capacity
1,281 GW

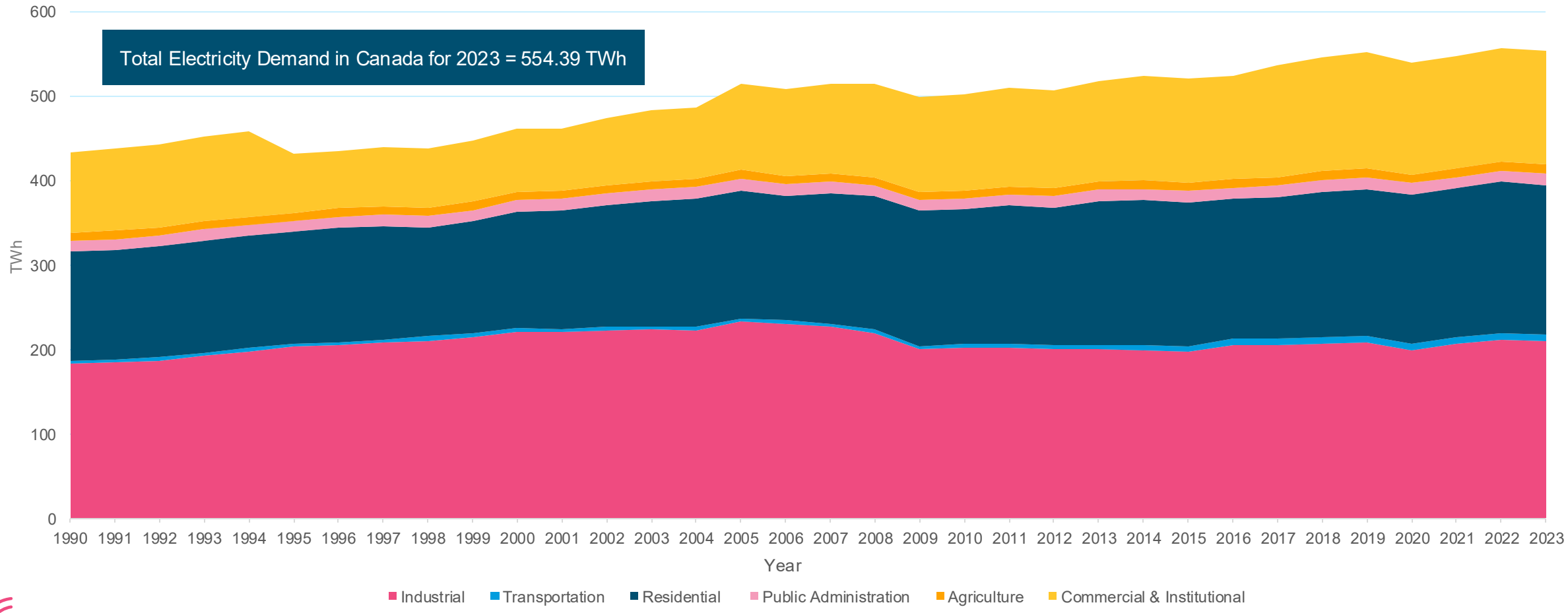
Source: Canadian data from Statistics Canada, Table 25-10-0022-01, CER – Canada's Energy Future 2021 Fact Sheet : Electricity (cer-rec.gc.ca)
U.S. data from the U.S. Energy Information Administration, SAS Output (eia.gov)
Data Updated: May 2024.; Visual created by Electricity Canada

Canada’s 2024 Generation Capacity



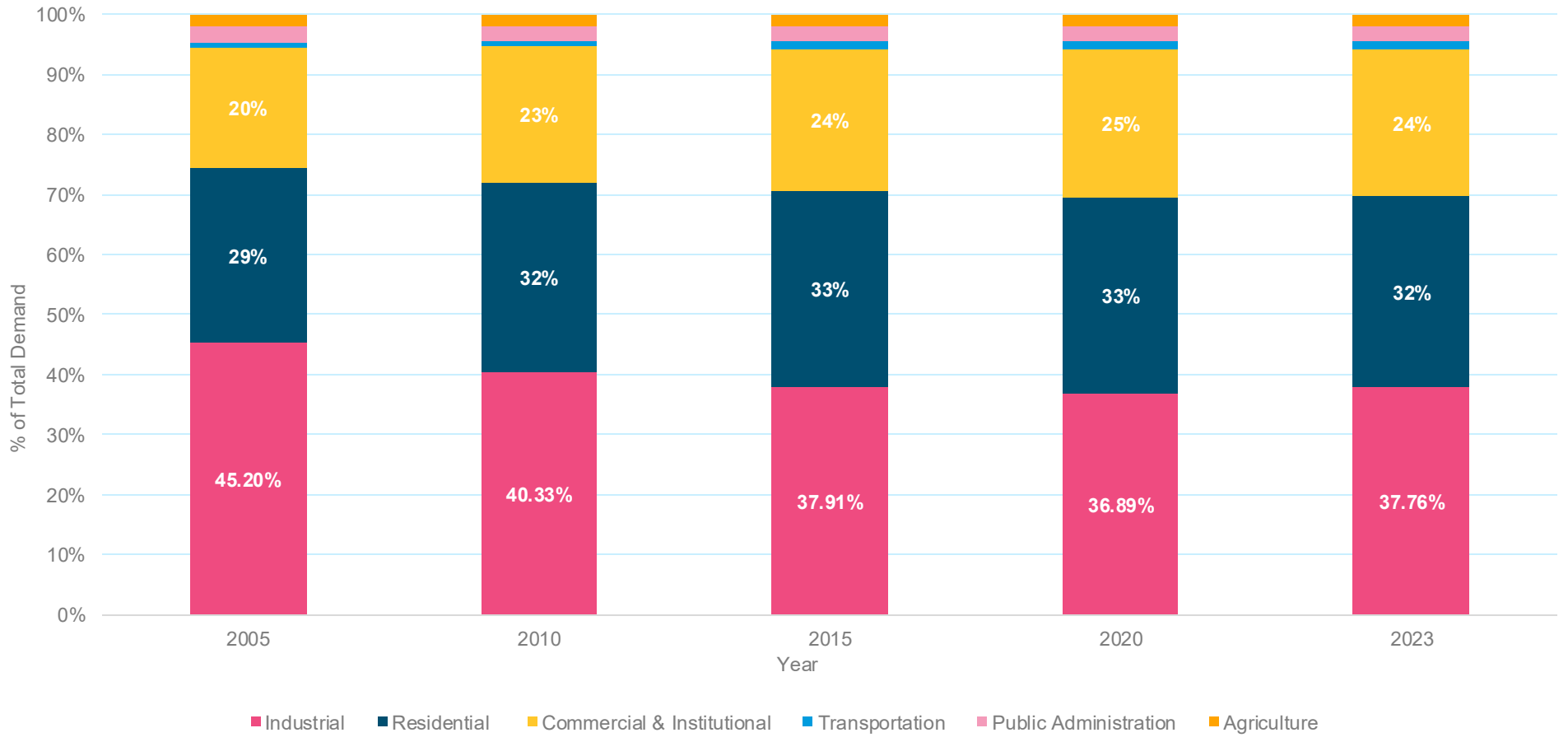
Source: Canadian data from Statistics Canada, Table 25-10-0022-01, CER – Canada’s Energy Future 2021 Fact Sheet : Electricity (cer-rec.gc.ca)
Data Updated: July 2025.; Visual created by Electricity Canada

Electricity Demand by Sector in Canada, 1990-2023



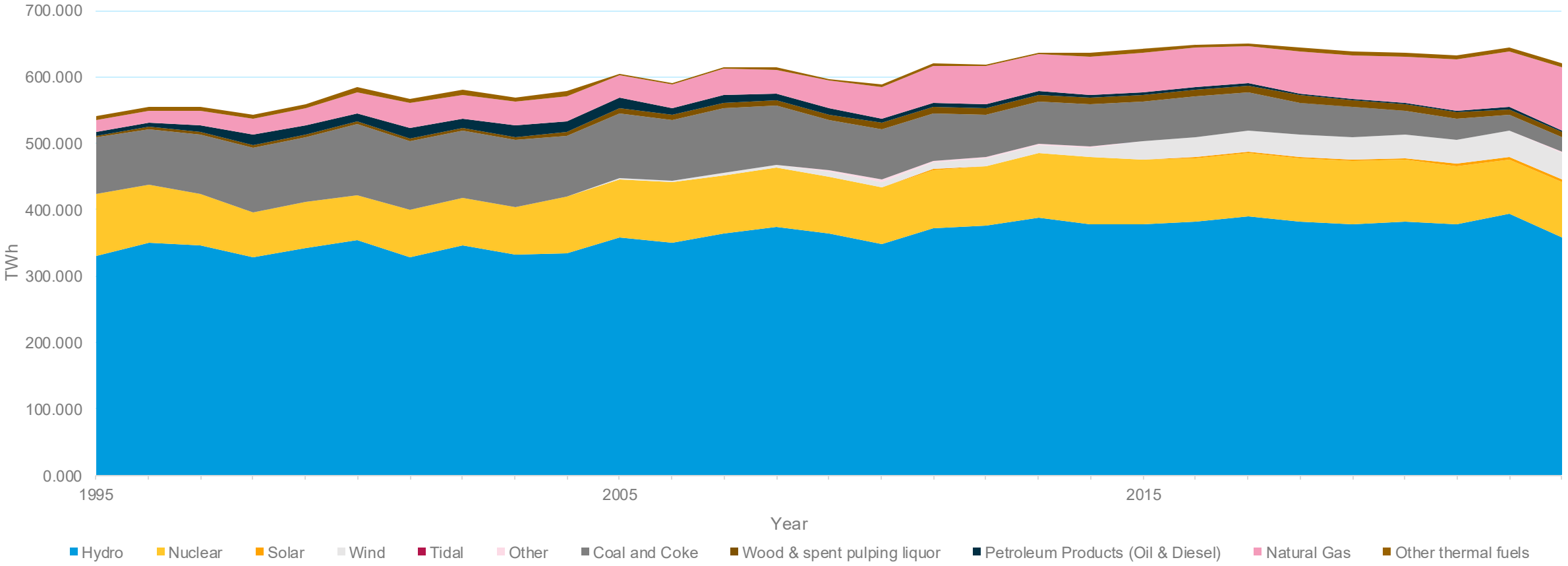
Source: Statistics Canada, Table 25-10-0030-01
Data Updated: May 2024; Visual created by Electricity Canada

Electricity Demand in Canada by Sector



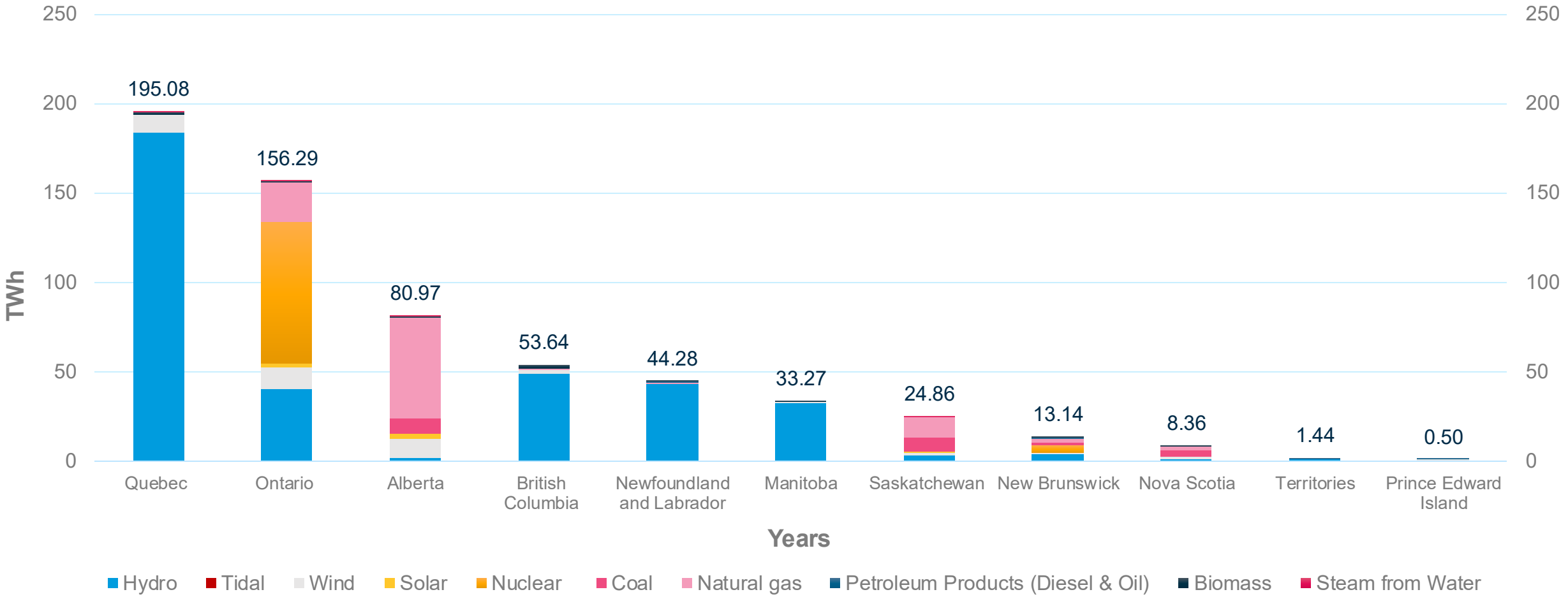
Source: Electricity Canada calculations based on Statistics Canada data, Table 25-10-0030-01
Data Updated: May 2024; Visual created by Electricity Canada.

Electricity Generation by Fuel Type, 1995-2023



Source: Statistics Canada, Tables 25-10-0020-01, and 25-10-0084-01
Data Updated: July 2024.; Visual Created by Electricity Canada.

Supply by Province



Source: StatsCan, Table: 25-10-0020-01, Table 25-10-0084-01
Data Updated: March 2024; Visual Created by Electricity Canada.

Environmental Sustainability

In 1997, the electricity industry was one of the first major industries in Canada to establish an environmental stewardship initiative.

- Low Emissions and Sustainable Technologies
- Nitrogen Oxide Emissions, Sulphur Oxide Emissions, Mercury Emissions, Particulate Matter Emissions
- GHG Equivalent Emissions from the Electricity Industry
- Emissions by Economic Sector
- Emission by Economic Sector Trends
- Canadian Coal Fleet Profile by 2040
- U.S. Greenhouse Gas Emissions

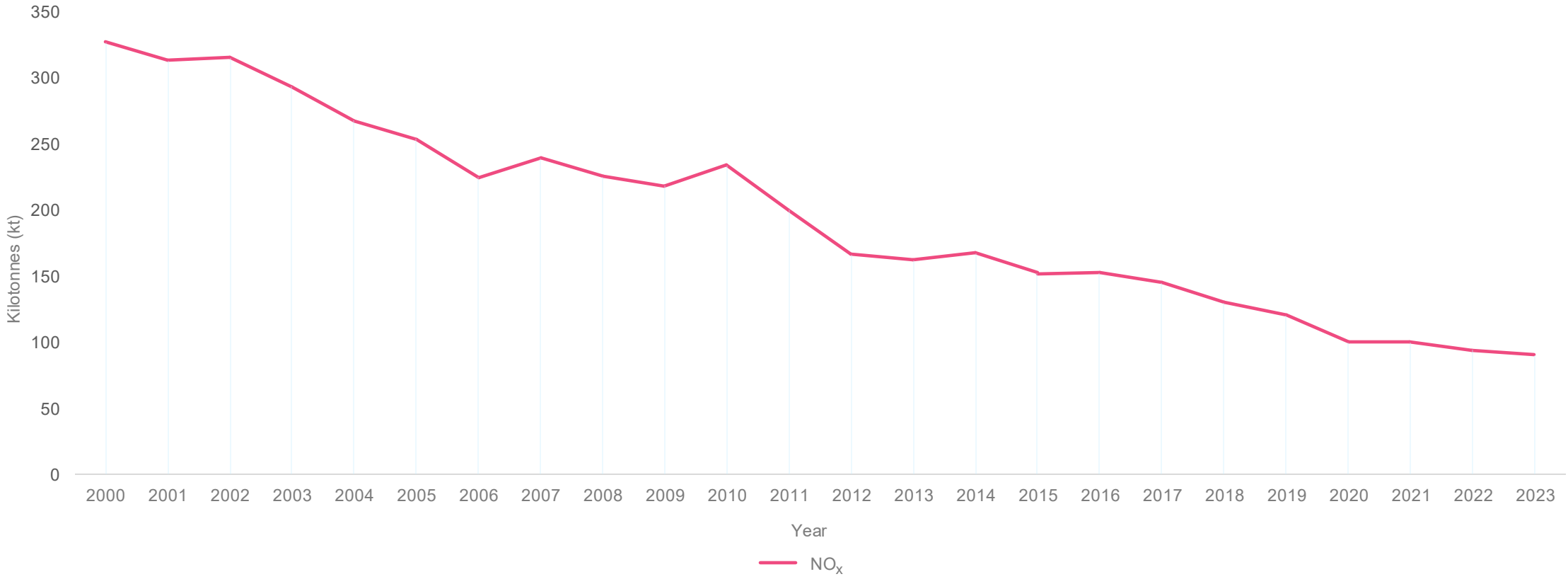
Low Emission and Sustainable Technologies

Resource	Advantages	Challenges
Biomass	Biomass fuel – including landfill gas, wood pellets, forestry slash and various waste products – can be burned to create electricity. Where fuel sources are renewable, the GHG emissions can be negligible, and there is potential for negative (below-zero) GHG emissions where carbon capture, utilization and sequestration are employed.	High capital equipment and fuel costs. Significant investments may be needed to build infrastructure to supply sufficient biomass. Large biomass generators require a large land area to supply enough biomass for continuous operation.
Fission	Existing units provide large amounts of safe, reliable baseload electricity with little to no carbon emissions. New designs for small modular reactors (SMRs) promise greater flexibility and lower cost. Fuel supply chains are secure.	High up-front capital costs for existing large units. Spent fuel requires storage and eventual disposal.
Fossil Fuel	Modern fuel-based combustion technologies (such as natural gas, coal, and oil) are well suited for on-demand electricity generation, and complement variable renewables like wind and solar. Fuel supply chains are secure. For high-utilization (“baseload”) units, carbon capture, utilization and sequestration (CCUS) can be added to prevent climate change-inducing carbon dioxide emissions from entering the atmosphere.	Fossil fuel development, extraction and use has environmental consequences, including contributing to climate change. CCUS is not feasible for every type of thermal generating unit. CCUS projects can have high up-front costs and require infrastructure to transport and sequester CO_2 in products or in appropriate geological formations.
Geothermal Energy	Reliable source of power, low fuel and operating costs, clean and renewable source of energy. Very low land requirements, and feasibility studies have shown promising sites in many provinces and territories.	Geothermal is relatively new in Canada, with few projects under development. Technical challenges remain. Depending on where the resource is located, connecting to the grid can be difficult.

Low Emission and Sustainable Technologies

Resource	Advantages	Challenges
Ocean Energy	Tides and wave energy can provide predictable energy with little to no associated greenhouse gas emissions. Canada has a large coastline with many potential sites.	The technology has not yet reached commercial scale. There is the potential to impact marine ecosystems. While the energy is predictable, it is not available on-demand.
Small Hydro	There are relatively low capital costs, many potential sites in Canada, well established technology. Small hydro is able to meet small incremental capacity needs, with near-zero GHG emissions and good reliability characteristics.	Regulatory approval and gaining access to the grid can be costly, time consuming and uncertain. There can be significant opposition to new development, and there are impacts on fish, wildlife and local water systems.
Solar Photovoltaic (PV)	Needing no fuel, after the initial capital investment solar PV has a near-zero marginal cost of energy and essentially zero emissions or waste products from operation. Costs for the equipment continue to decline.	Times of peak sunshine often do not correspond with times of peak electricity demand, especially in winter. Grid connections can be problematic, and additional equipment is needed to mitigate power quality problems when connecting to a grid.
Wind Power	Needing no fuel, after the initial capital investment wind has a near-zero marginal cost of energy and essentially zero emissions or waste products from operation.	Electricity production from wind is variable and requires additional equipment to manage power quality. Potential impacts on avian populations, as well as noise, visual and land use concerns.

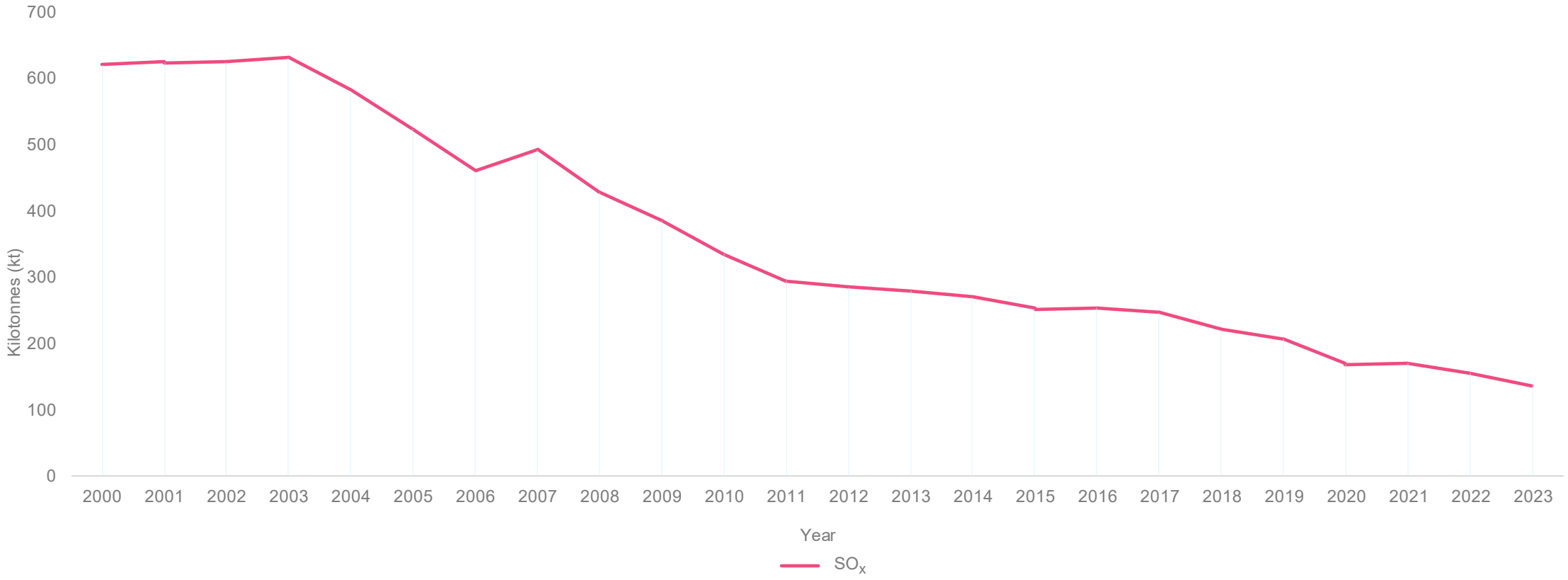
Nitrogen Oxide (NO_x) Emissions Canadian Electricity Sector, 2000-2023



Since 2000, the Canadian electricity industry has reduced its NO_x emissions by 72.5%.

Data Source: Environment and Climate Change Canada, Air pollutant emissions - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

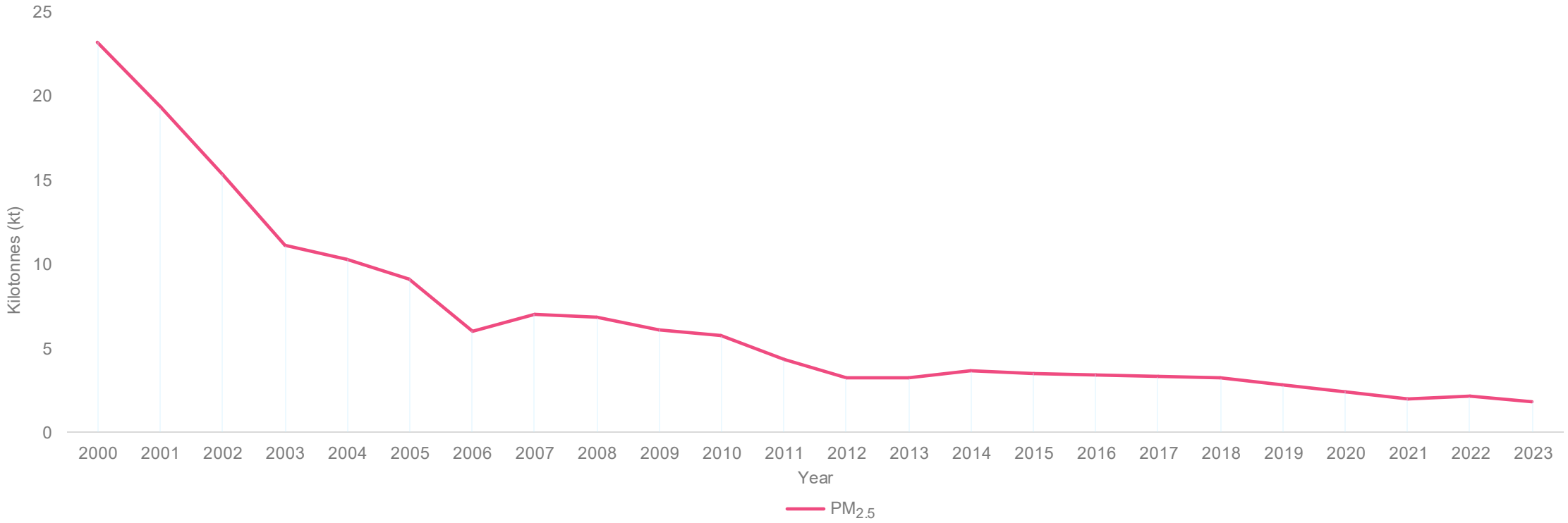
Sulphur Oxide (SO_x) Emissions Canadian Electricity Sector, 2000-2023



Since 2000, the Canadian electricity industry has reduced its SO_x emissions by 79%

Data Source: Environment and Climate Change Canada, Air pollutant emissions - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

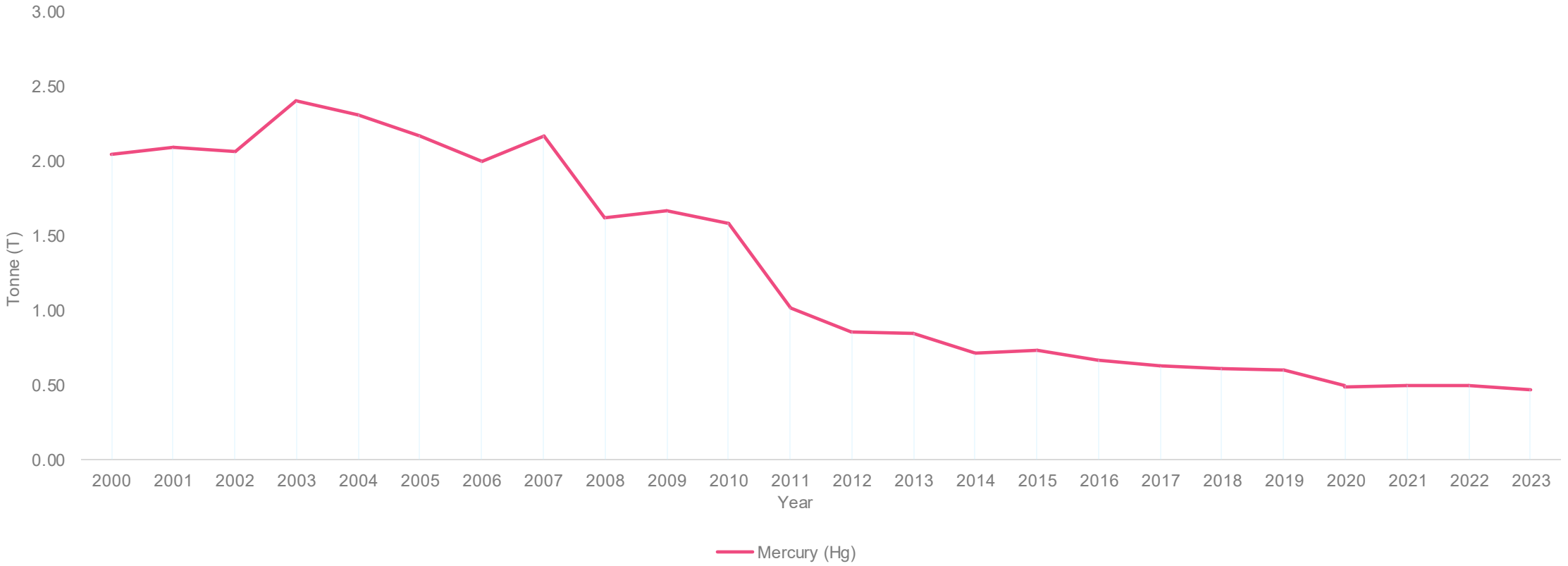
Particulate Matter ($PM_{2.5}$) Emissions Canadian Electricity Sector, 2000-2023



Since 2000, the Canadian electricity industry has reduced its particulate matter emissions by 92.2%

Data Source: Environment and Climate Change Canada, Air pollutant emissions - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

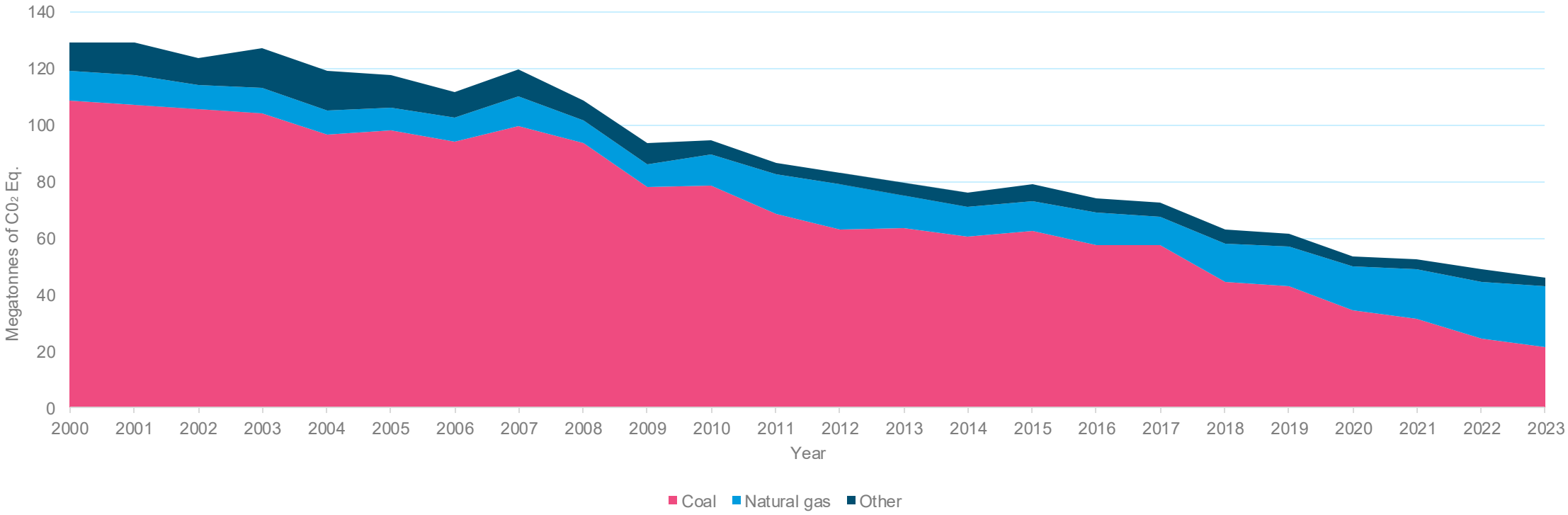
Mercury (Hg) Emissions
Canadian Electricity Sector, 2000-2023



Since 2000, the Canadian electricity industry has reduced its Hg emissions by 77%

Data Source: Environment and Climate Change Canada, Canada's Air Pollutant Emissions Inventory Report 2023: chapter 2.9 - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

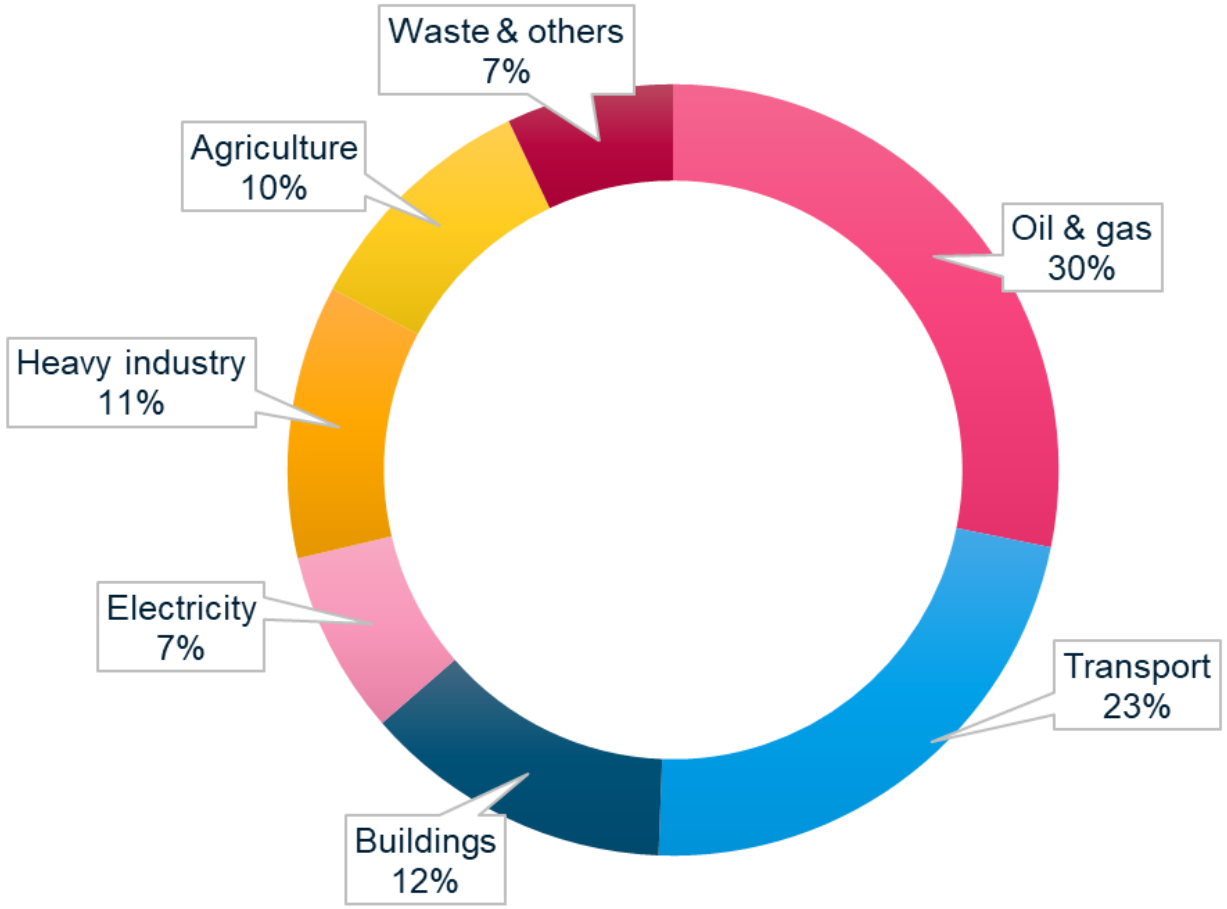
Greenhouse Gas (GHG) Emissions Canadian Electricity Sector, 2000-2023



Since 2000, the Canadian electricity industry has reduced its GHG emissions by 64%

Data Source: Environment and Climate Change Canada, Greenhouse gas emissions - Canada.ca
Data Updated: July 2024; Visual created by Electricity Canada.

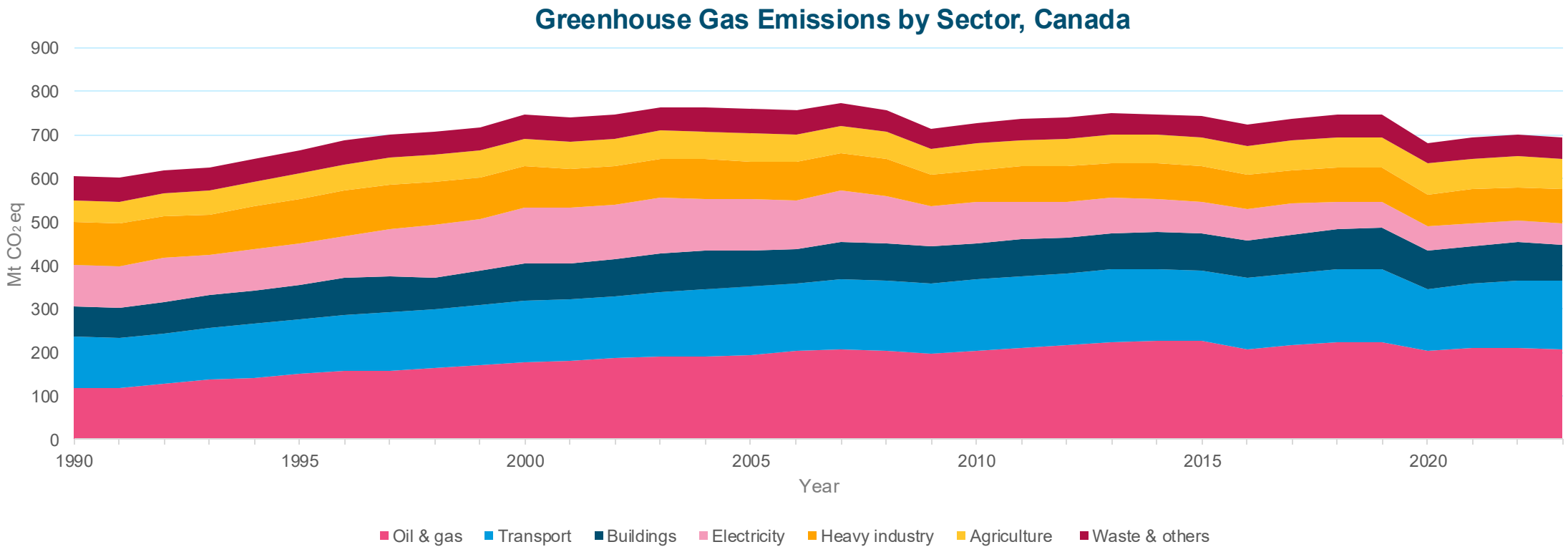
Greenhouse Gas (GHG) Emissions by Economic Sector in Canada, 2023



In 2023, GHG emissions in Canada totaled 694 megatonnes of CO_2 eq

Data Source: Environment and Climate Change Canada, Greenhouse gas emissions - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

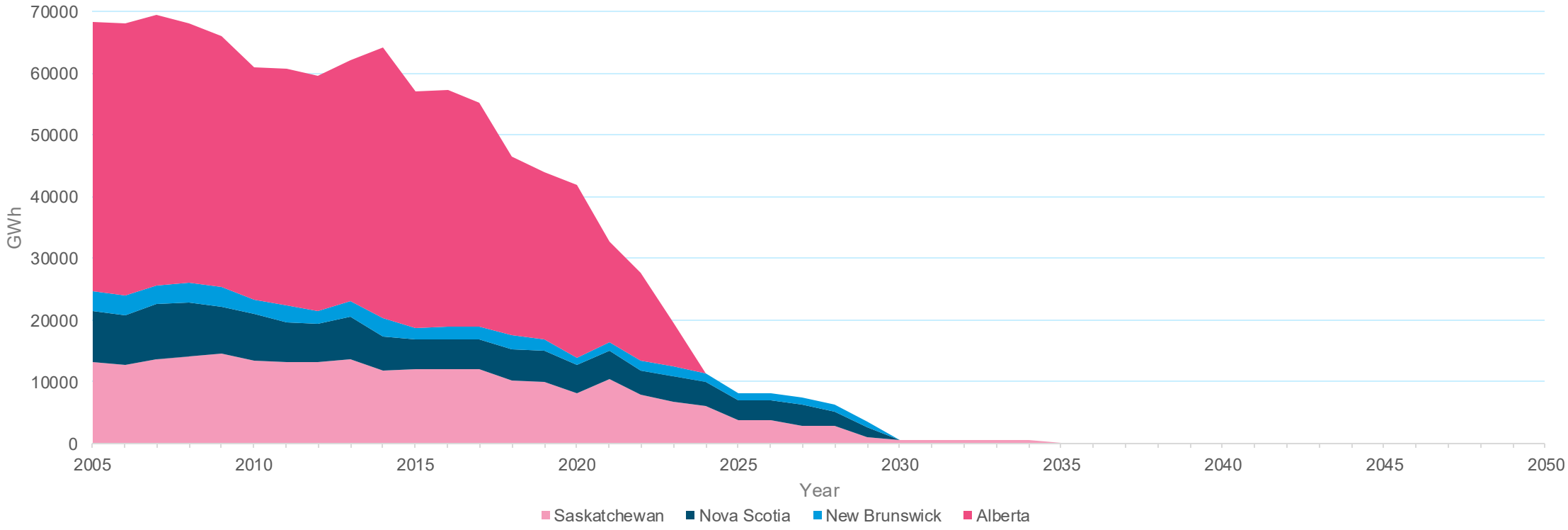
Greenhouse Gas Emissions by Canadian Economic Sector (1990-2023)



In 2023, GHG Emissions by Sector totaled 694 Mt CO_2 eq

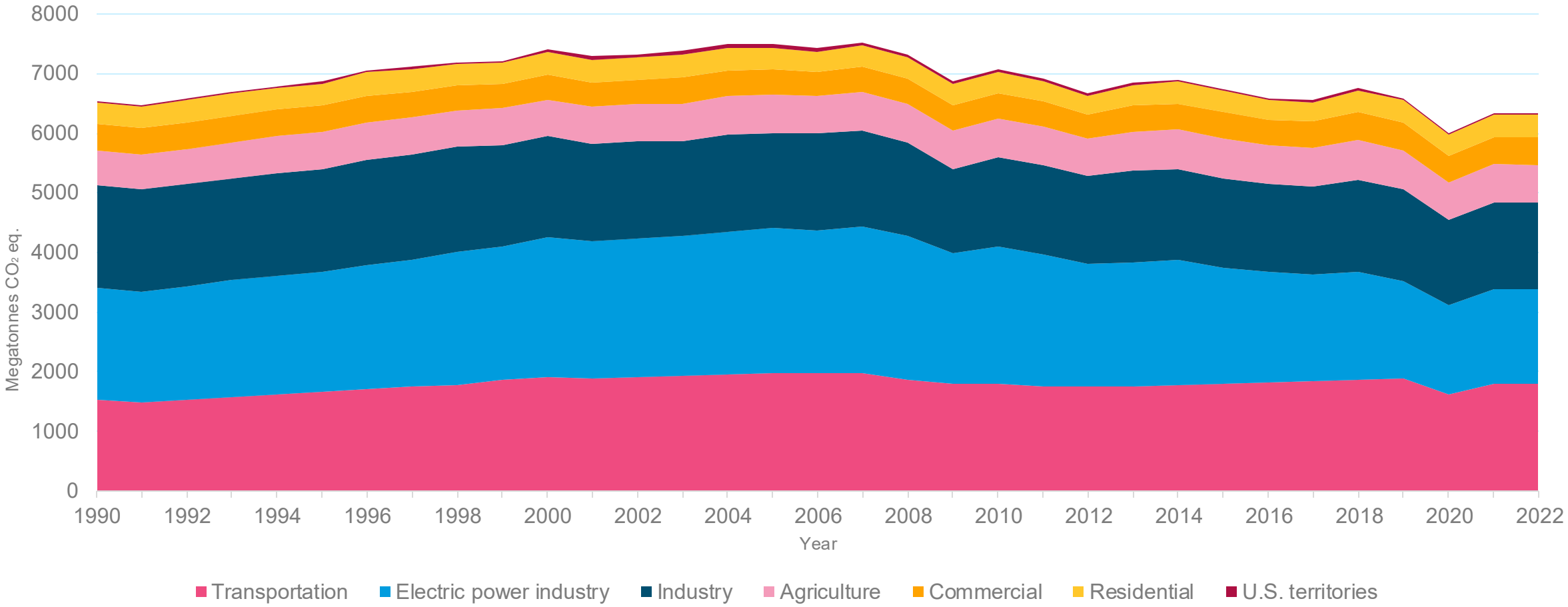
Data Source: Environment and Climate Change Canada, Greenhouse gas emissions - Canada.ca
Data Updated: March 2024; Visual created by Electricity Canada.

Coal Fleet Profile
Canadian Coal Electricity Generation by Region to 2050



Source: CER (Canada Energy Regulator), Macro Indicators - Canada.ca (cer-rec.gc.ca)
Data Updated: March 2024; Visual created by Electricity Canada

U.S. Greenhouse Gas Emissions Trends(1990-2022)



Source: U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions Allocated to Economic Sectors (1990-2021): Greenhouse Gas Inventory Data Explorer | US EPA

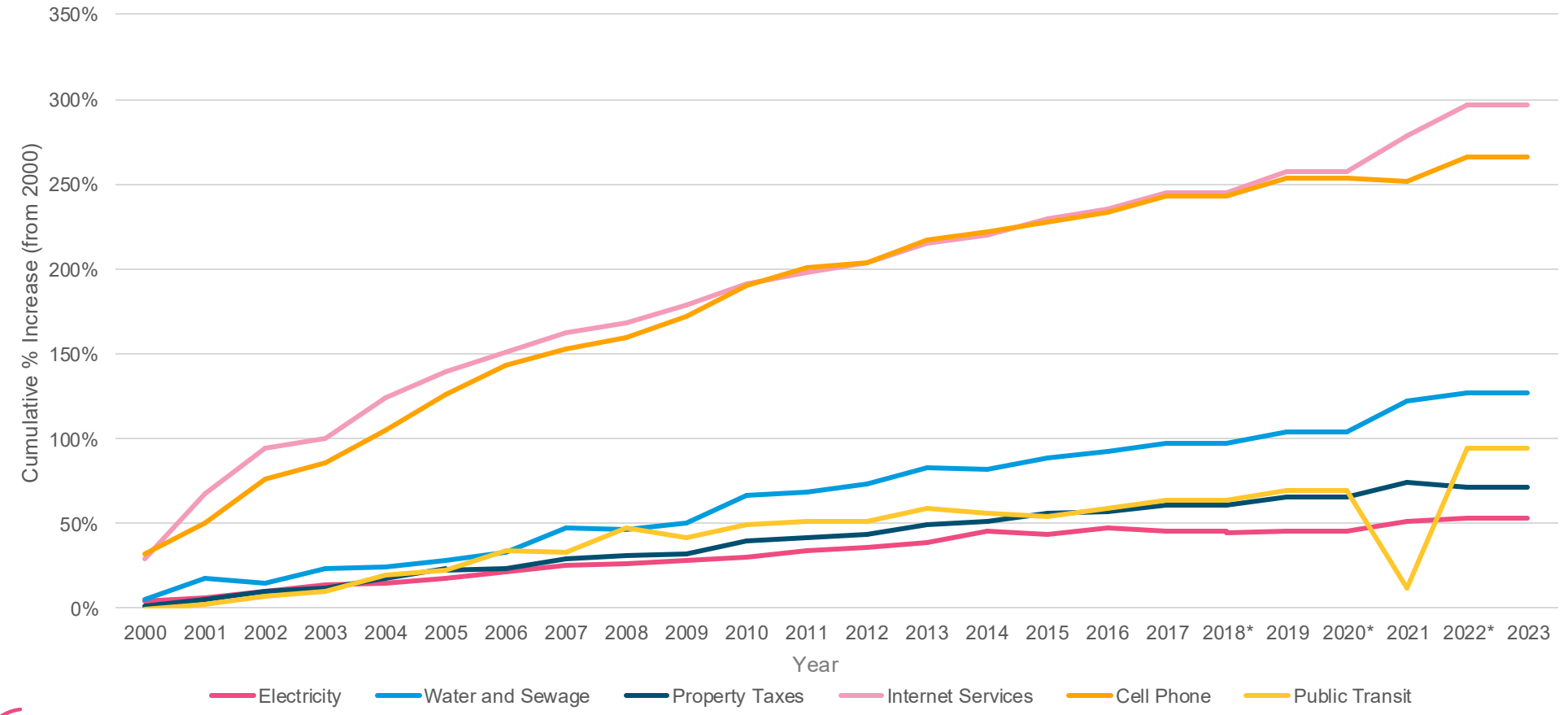
Data Updated: March 2023; Visual created by Electricity Canada

Price and Customers

There is a fundamental cost for provisioning electricity for a nation.

- Household Spending, 1999-2019
- Household Spending, 1999 vs. 2019
- Household Spending, 2010 vs. 2019
- Multinational Residential Pricing Canadian Urban Centre Prices
- Multinational Industrial Pricing
- Electric Vehicle Sales

Household Spending (2000-2023)



Direct change spending per household from **2000-2023**

Internet Services 1413%

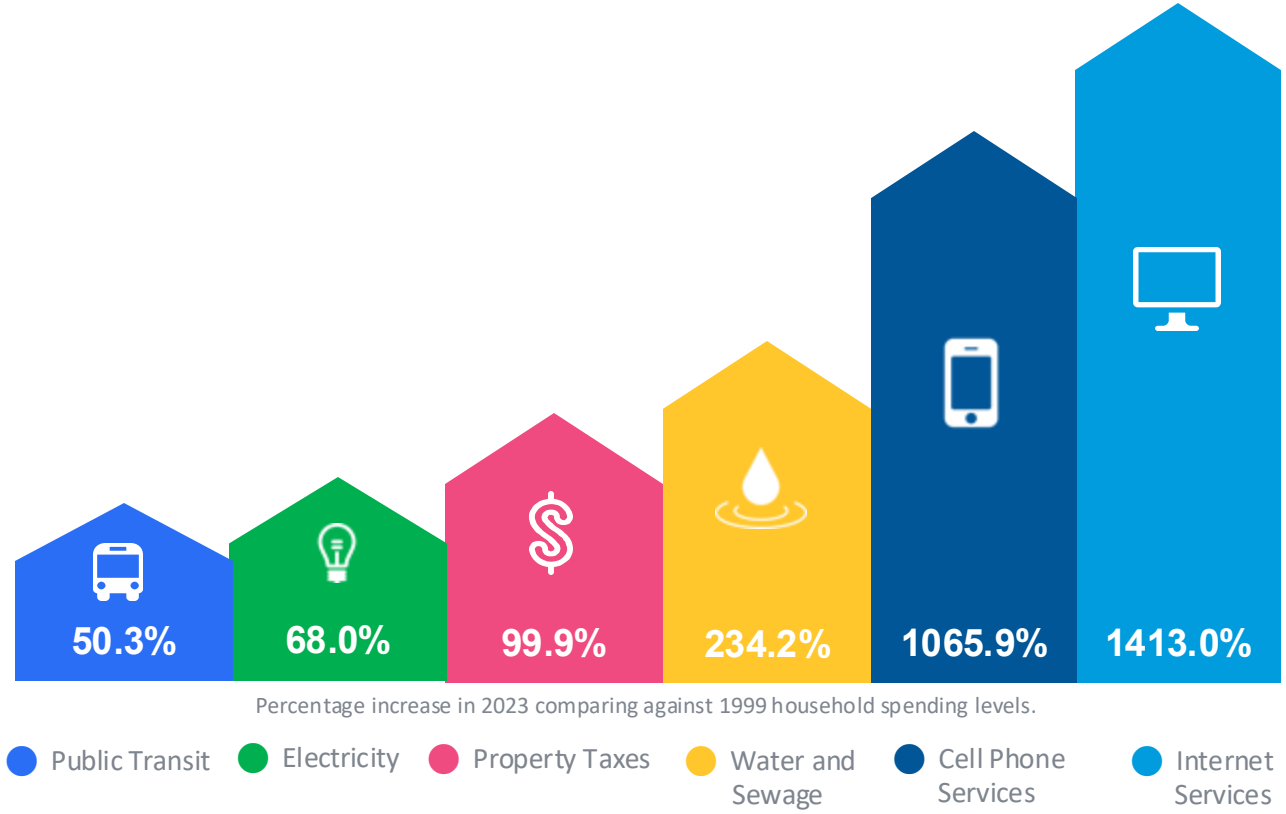
Electricity 68%

Data Source: StatsCan, Table: 11-10-0222-01

* No data available from Statscan in 2018 & 2020, marked as unchanged from 2017 in chart

Data Updated: March 2024; Visual Created by Electricity Canada

Household Spending Increases From 1999-2023



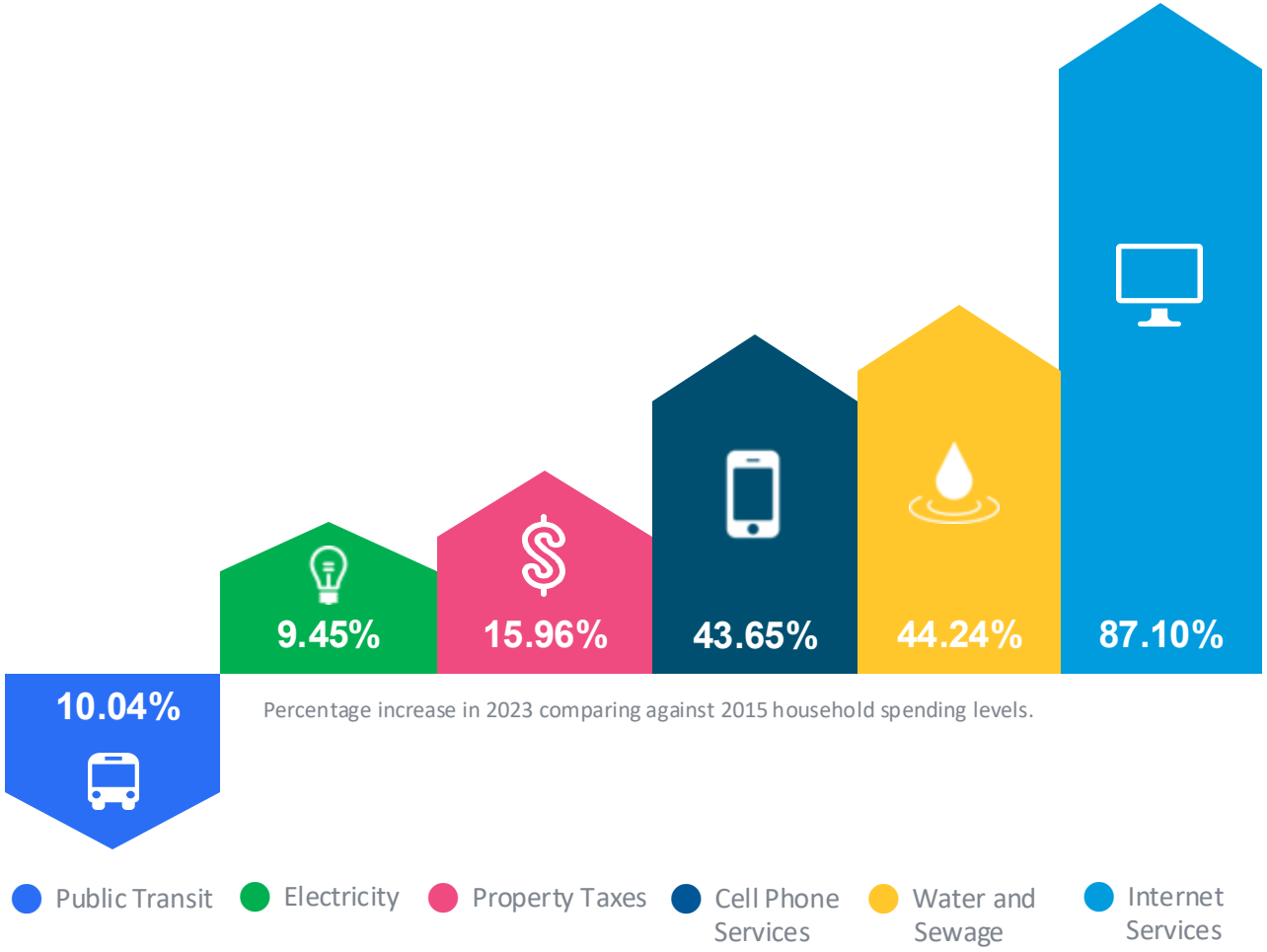
133.3 TWh
Residential Demand in 1999

176.9 TWh
Residential Demand in 2023

Data Source: StatsCan, CANSIM Table 203-0021

Data Updated: May 2024; Visual Created by Electricity Canada

Household Spending Increases From 2015-2023



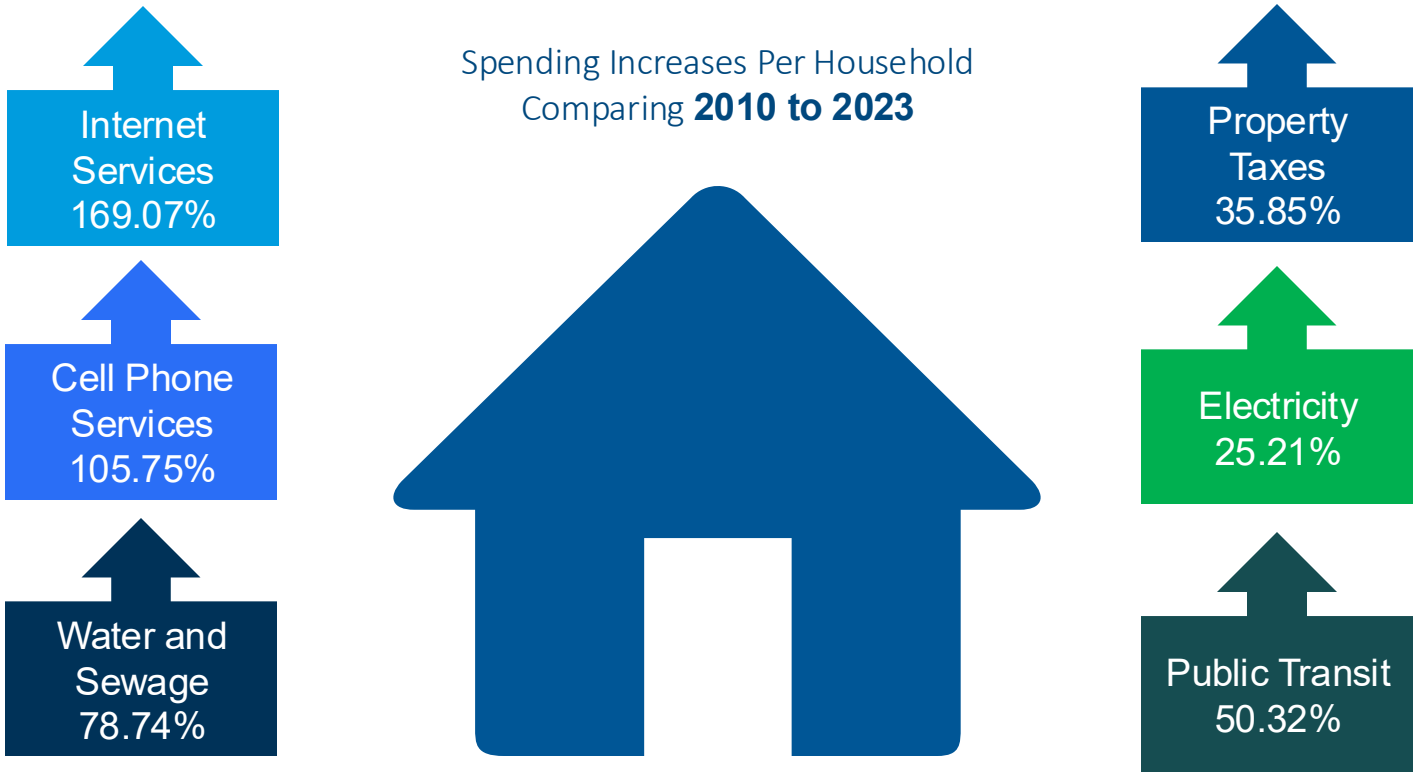
170.39 TWh
Residential Demand in 2015

176.9 TWh
Residential Demand in 2023

Data Source: StatsCan, CANSIM Table 203-0021

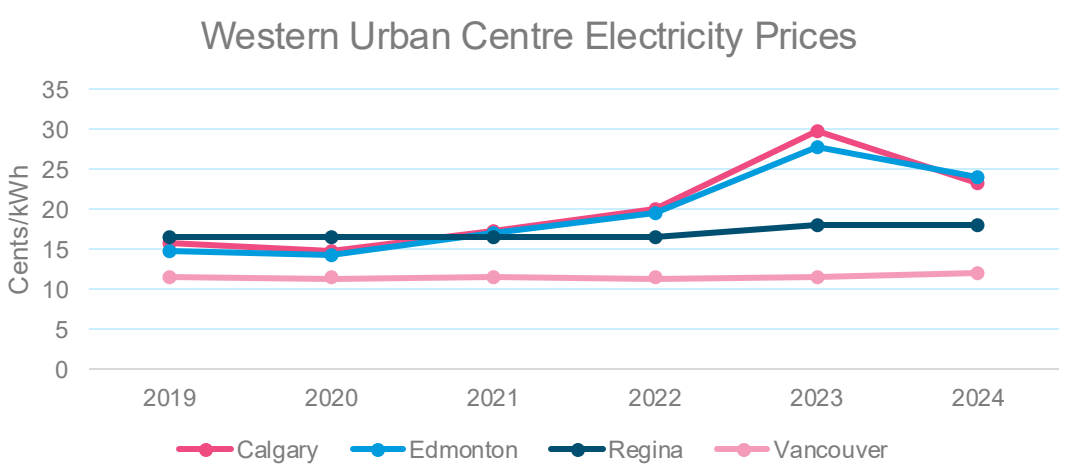
Data Updated: May 2024; Visual Created by Electricity Canada

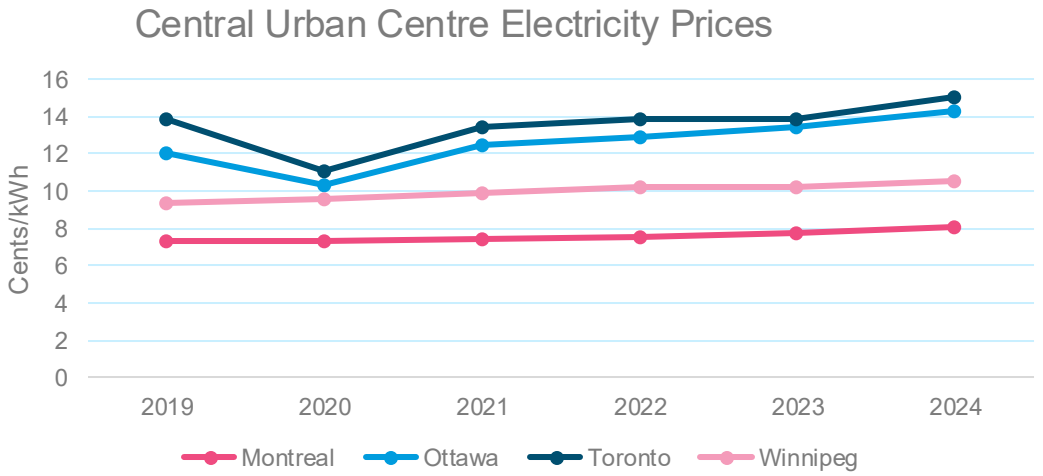
Household Spending (2010 vs. 2023)



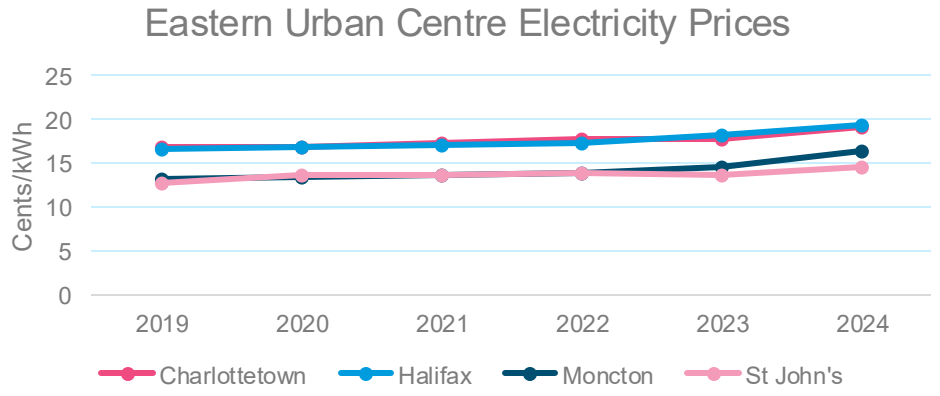
Data Source: StatsCan, CANSIM Table 203-0021
Data Updated: May 2025; Visual Created by Electricity Canada

Canadian Urban Centres Residential Pricing (1000 kWh consumption, 2019-2024)





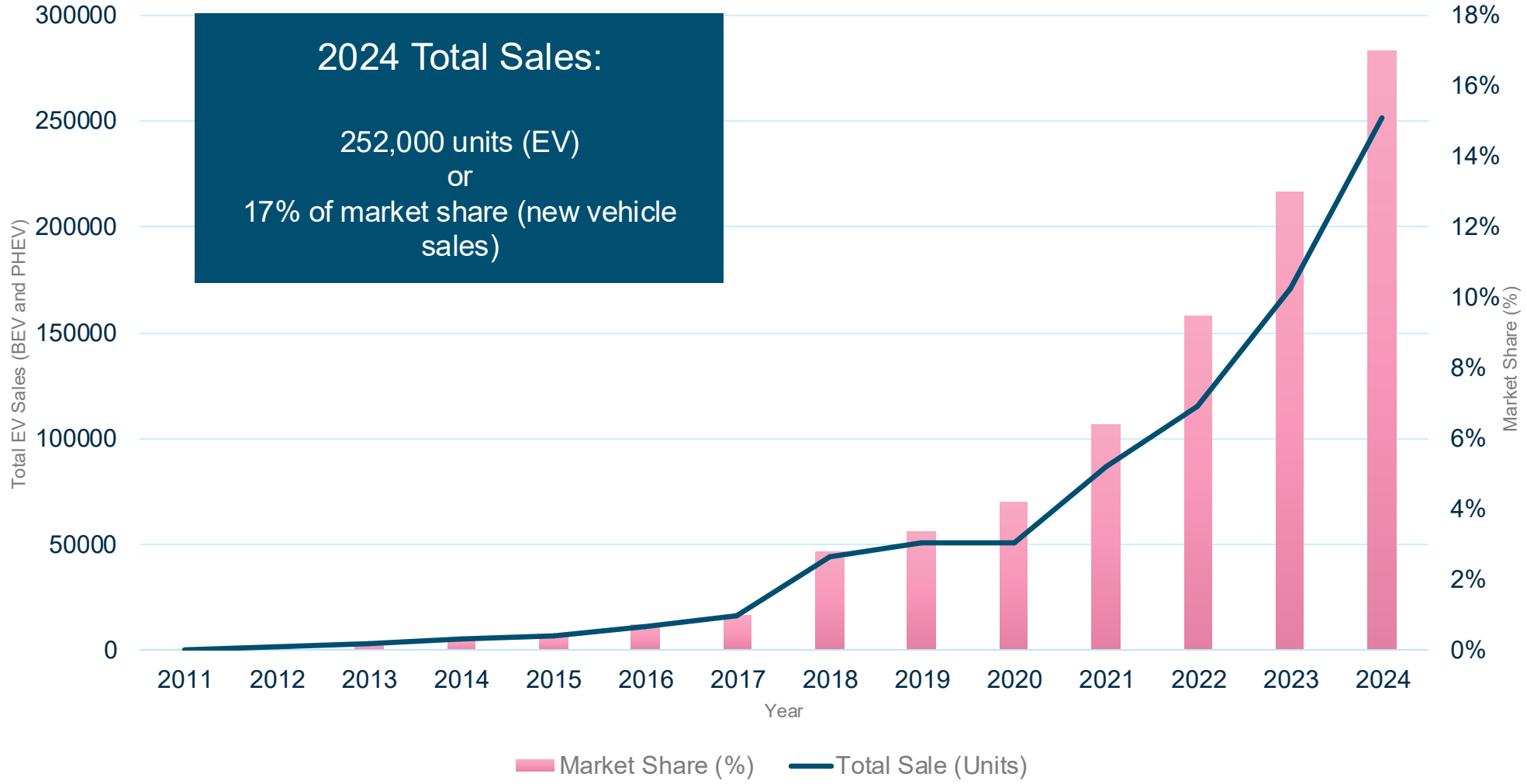
Residential rates, industrial rates, and all other electricity rate classes are provincially regulated. Price changes are based on the judgment of the regulator. Justifications for a change in price could include an increase in revenue requirement, new capital projects, significant weather events, and more.



Data Source: 2024 Edition Comparison of Electricity Prices in North America in Major North American Cities, Hydro-Québec, Comparison of Electricity Prices in Major North American Cities 2024

Data Updated: March 2025; Visual Created by the Electricity Canada

Electric Vehicle Sales (Canada)



Data Source: Electric Mobility Canada. Electric Vehicle Sales in Canada.
Data Updated: March 2025; Visual Created by the Electricity Canada

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