

IMPACTS OF CARBON MANAGEMENT POLICIES ON CANADIAN ELECTRICITY PRICES



Executive Summary

The electricity sector is impacted by and is the target of, carbon management policies that are being implemented in Canada as well as in other countries. In Canada, the nature of the carbon management policy instruments and their stringency varies by province. These include direct pricing carbon emissions (e.g., carbon tax, carbon cap and trade systems), setting maximum levels of carbon emissions levels for power generating units (e.g., reduction of carbon dioxide emissions from coal-fired power generation and phasing out traditional coal-fired electricity), and requiring utilities to carry a minimum amount of zero-emission generation assets (e.g., renewable energy targets). These policies can have a direct effect on the cost of generating and transmission in Canada and consequently on electricity rates that are being paid by residential, commercial, and industrial customers. Since electricity is a vital energy source for all socioeconomic sectors, any increase in electricity rates will increase the cost of living and business operations.

The electricity sector in Canada has undergone considerable evolution over the years, and it continues to experience new developments. In the wake of emerging carbon management policies that may transform the way electricity sources are consumed in Canadian provinces, it is important to gain a clear understanding of the policies that may impact the electricity sector and assess their impacts on consumer electricity rates. This Canadian Energy Research Institute (CERI) study is designed to provide insights into impacts of carbon management policies on the electricity sectors in Canadian provinces. The main objectives of the study are as follows:

1. Provide an up-to-date review of carbon management policies that have been implemented or are expected to be implemented from 2018 to 2030, focusing specifically on their impacts on the electric power sector.
2. Identification of industries that would have the highest impact by increased electricity rates.
3. Assessment of effects on Canadian households due to increased electricity rates.

The study provides a detailed and up-to-date review of carbon management policies pertinent to the electricity sector that have been implemented by the federal, provincial and territorial governments. The review also summarizes international and regional policies that may impact the Canadian electricity sector. Depending on the type of policy instrument, the carbon management policies are divided into five categories and summarized, with all provincial and territorial electricity systems being subject to a multitude of policies and programs.

Carbon pricing is a central component of the Pan-Canadian Framework on Clean Growth and Climate Change. In 2016, the Government of Canada released the Pan-Canadian Approach to Pricing Carbon pollution – the benchmark outlining the criteria that carbon pricing systems implemented by provinces and territories need to meet. Only four provinces — Quebec, Ontario,

Alberta, and British Columbia — have legislated the mechanisms of their carbon pricing system. The federal government has announced the high-level details about the carbon pricing systems and proposed “carbon price backstop,” which is intended to be in place to enforce a fee on carbon emissions in the jurisdictions without carbon pricing. In case of the electricity sector, the federal backstop system is to adopt a hybrid pricing system that has an output-based allocation system and a carbon levy. Alberta has already legislated a hybrid pricing system. CERI estimated the impact of such a hybrid system on electricity rates in Canadian provinces and territories.¹

The analysis finds that only three provinces — Alberta, Saskatchewan, and Nova Scotia — will see a notable impact on electricity rates due to carbon pricing. All other provinces have electricity generation systems dominated by GHG emission-free generation technologies. As such, those provinces will not experience a net increase in electricity rates due to carbon pricing. In addition, Ontario will not see a price impact since it has already implemented measures that have priced carbon into the system. Table E.1 lists the net increase in electricity rates due to carbon pricing in Alberta, Saskatchewan, and Nova Scotia as estimated in this study. Compared to the last three-year average electricity rates² in Nova Scotia (10 cents/kWh for industrial and 16.2 cents/kWh for residential customers), the carbon pricing could increase the electricity rates by 4% for large industrial power users and by 2% for residential customers. The same comparison for Saskatchewan (using the last three-year average electricity rates of 8 cents/kWh for industrial and 15.2 cents/kWh for residential customers) yields a 6% rate increase for large industrial power users and a 3% rate increase for residential customers. There is uncertainty in this estimate as these provinces have not yet implemented their carbon pricing mechanisms. In Alberta, the net impact of carbon pricing on electricity rates is estimated to be less than 1% in the period 2018–2030, based on the last three-year average electricity rates of 6.2 cents/kWh for industrial and 11 cents/kWh for residential customers. In all three cases, those percentages present the average increase in electricity rates in the period of 2018–2030.

¹ Since the federal backstop system is still under development, and Alberta’s hybrid system has more complexity than is explored in the study, this analysis represents an illustrative example of a hybrid pricing system.

² Here, average electricity rates refers to all costs where energy, delivery, and administrative charges are factored in. However, federal and provincial taxes are excluded.

Table E.1: Estimated Net Impact of a Carbon Pricing System Designed with Output-based Allocation on Electricity Rates in Nova Scotia, Saskatchewan and Alberta, 2020-2030

Year	Estimated Net Impact (cents/kWh)		
	Nova Scotia	Saskatchewan	Alberta
2020	0.38	0.36	0.27
2021	0.78	0.76	0.27
2022	0.91	0.69	0.23
2023	0.40	0.74	0.23
2024	0.11	0.71	0.23
2025	0.21	0.52	0.23
2026	0.26	0.47	0.23
2027	0.29	0.43	0
2028	0.33	0.39	0
2029	0.16	0.30	0
2030	0.17	0.28	-0.28

Source: CERI calculations

In addition, there is a multitude of carbon management policies that could generally lead to higher electricity rates than estimated above. There are also many policies and programs that are very difficult to cost, but their cost could dwarf the direct carbon pricing policy impact. Taking reliable estimates of the impact of carbon management policies on electricity rates is complicated by overlapping policies and the need for a system level analysis. This study took an alternative approach and estimated the potential impacts of higher electricity rates in Canadian households and industries by utilizing the provincial Supply and Use Tables (SUT) published by Statistics Canada. This analysis uses the detailed level (236 industries, 278 categories of final demand, and 496 product categories) provincial SUTs and associated multipliers for the year 2014, which is the most recent dataset available. The assessment uses SUT data to estimate the impacts of a 1% increase in electricity rates on households and industries.

The electricity intensity of household spending³ in Canadian provinces is estimated to be in the range of 1-3%. Consequently, the increase in household spending due only to a 1% increase in electricity rates is estimated to be 0.01-0.03%. Since electricity is central to all production and delivery processes, it is, however, plausible that a rise in electricity rates would increase the overall cost of goods and services. Therefore, the net increase in household spending could be higher than the value calculated above.

The study calculated the GDP impacts resulting from the reduction of industrial output due to a 1% increase in electricity cost. Table E.2 presents the total potential annual GDP reduction due to the top 10 industries by contribution to the GDP, in each province. The main industry sectors that will be impacted the most by an increase in electricity rates include paper and pulp, mining,

³ Includes net spending on electricity including energy, delivery, and administrative charges.

chemical manufacturing, iron, steel and metal production manufacturing, and non-conventional oil extraction. The non-conventional oil extraction sector of Alberta is one of the highly impacted sectors due to higher electricity rates, since large industry is grid connected and exposed to pool price and transmission costs.

Table E.2: GDP Reduction in Canadian Provinces Due to Impacts of Higher Electricity Rates on the Top Ten GDP Contributors

Province	GDP Reduction (\$CAD)	Total Provincial GDP (\$CAD)
Newfoundland and Labrador	355,169	32,242,272,000
Prince Edward Island	125,332	5,366,135,000
Nova Scotia	714,556	36,345,950,000
New Brunswick	955,856	29,896,384,000
Quebec	12,159,546	347,997,276,000
Ontario	8,155,762	682,041,940,000
Manitoba	1,516,796	60,419,730,000
Saskatchewan	4,248,469	79,541,943,000
Alberta	13,193,862	366,524,342,000
British Columbia	5,682,75	227,878,061,000

Data Sources: (Statistics Canada 2018a, 2018b), CERI calculations. Table by CERI.

Future carbon management policies applied to the electricity sector should be evaluated against this benchmark of economic impact. This will facilitate an evidence-based assessment of costs and benefits of different policies. In most cases, however, the low emitting nature of most Canadian electricity systems suggest that carbon management policies will have minimal impacts on retail electricity prices.