ATLANTICA CENTRE FOR ENERGY

Atlantic Canada's Electricity Future Discussion Series

Part 3: Electricity Costs

Discussion Series – Part III

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Executive summary

The purpose of the third discussion paper in Atlantic Canada's Electricity Future – Discussion Series is to help Atlantic Canadians better understand how government regulatory changes and policies aimed at achieving net-zero emission by 2050, as well as evolving consumer behaviours, will likely result in increased electricity prices across the Atlantic provinces relative to today.

As the first and second papers in this series used federal data publicly available through the Canada Energy Regulator's Energy Future 2021 report, this discussion paper will do the same to help illustrate electricity price forecasts leading up to 2050.

The first two papers outlined the growing gap between the supply and demand for increasingly clean electricity across Atlantic Canada until reaching net-zero emissions in 2050. While utilities in the region are actively planning to meet these challenges and opportunities, it is clear there are incredible investments needed to ensure our electricity supply can meet green targets for 2030, 2035 and beyond. At the same time, residents and businesses face high inflation, especially with energy prices, which is reenforcing the need for future electricity supply to remain affordable during this transition, in addition to maintaining the reliability and security customers depend on.

Modelling from the Energy Future 2021 (EF2021) report clearly shows electricity prices are expected to increase in each of the four Atlantic provinces over the next 28 years, more so in New Brunswick and Nova Scotia. Furthermore, the residential, commercial and industrial sectors all show price increases over this time, relative to 2021 dollars.

The EF2021 forecasts though have significant question marks around the potential accuracy given the many federal and provincial policies enacted since the corresponding assumptions were finalized in mid-2021. Specifically, the Evolving Policies Scenario (EPS) which was illustrated in the discussion paper does not phase out coal-fired electricity generation by 2030, other unabated fossil fuel generation by 2035 or reach next-zero emissions by 2050. Furthermore, the second discussion paper highlighted concerns the EPS demand forecasts were lower-than-expected.

It is also important to understand the reference points in the Energy Future 2021 data; the residential price estimates for 2021, for example, were higher than those delivered by NB Power by over 30 per cent[1].

These concerns withstanding, select findings from this price discussion paper, using current forecasts from the Canada Energy Regulator's Energy Future 2021 report, show:

- New Brunswick's residential electricity price is forecasted to increase by 44 per cent from 2020 to 2050 in 2021 dollars. The residential electricity price would be 23.7¢ per kWh in 2050.
- Nova Scotia's residential electricity price would increase by 36 per cent over the same period. The residential electricity price would be 24.2¢ per kWh in 2050 (the highest in Atlantic Canada).

- Residential electricity prices would rise by 18 per cent and 4 per cent in Newfoundland and Labrador and Prince Edward Island respectively over this period.
- Residential prices would be 21.1¢ per kWh in 2050 in Prince Edward Island and the lowest in Newfoundland and Labrador (18.8¢).
- Commercial rates would see relatively similar rises in the four provinces, however industrial rates in Newfoundland and Labrador would rise faster than those relative to Prince Edward Island.

It is still clear electricity rates across the region will increase on the path to net zero. Utilities must invest heavily, in too short of a time for rate increases to be anything but inevitable. However, the cost for end-users must be affordable. Atlantic Canadians already face the highest rates of energy poverty in Canada[2]. Many are struggling now with increased fuel costs and interest rates. The concern remains that Atlantic Canadians won't be able to take on the additional cost burden for electricity nor invest in technology to help reduce energy consumption. Similarly, Atlantic economies are reliant on trade and exports, and increased energy rates could put local businesses at a competitive disadvantage in the future and may have widespread economic ramifications.

This discussion paper will explore these considerations to help Atlantic Canadians better understand what net-zero policies mean for electricity prices in the region, how electricity price increases could impact household energy costs, and how electricity prices could impact Atlantic Canada's economy.

Without an affordable path forward for residents and businesses, the important transition to net-zero emissions will not gain the support it needs. We are already beginning to see elected officials intervening in planned energy price increases and investments in favor of keeping the cost to consumers lower in the short-term.

Seven recommendations are included on Page 18, which aim to help address concerns raised in this discussion paper for governments, utilities, and consumers. By reading this discussion paper on future electricity prices, as well as the two previous papers in this series, it is increasingly clear federal and provincial policies and regulations have significant impacts to the supply, demand, and price of electricity across Atlantic Canada. Better understanding future energy challenges and opportunities in Atlantic Canada can help us meet the important and ambitious goals to reach net-zero emissions in the most cost-effective ways possible.

Introduction

Transitioning Canada to net-zero emissions by 2050 continues to be one of the top priorities for the current federal government. For nearly eight years, there has been a corresponding shift in policymaking as governments at every level begin to plan for what actions are needed to reach the ambitious goal.

With the objective of producing no more greenhouse gas emissions than Canada can sequester, capture or use, it is abundantly clear that life for all Canadian households and businesses will undergo significant change through this transition to net-zero.

The federal government has deployed several policies, regulations and programs to help reach net-zero emission by 2050 including changing how we produce fuels and electricity, and how we use it. There are incremental emission reduction targets leading up to the overarching 2050 goals including the mandatory phase out of coal-fired electricity generation by 2030 and the proposed Clean Electricity Regulations which are currently being developed but will likely require net-zero electricity production across Canada by 2035. The four Atlantic provinces have also outlined steps to and goals to help meet this overarching target as well.

As the two previous papers in this discussion series described, these policies and others will require new non-emitting energy and transmission infrastructure across the Atlantic region to replace retiring generation assets while meeting increasing demand; this transition will be costly. For example, the federal government stated that the phase out of coal-generated electricity alone will cost Nova Scotia and New Brunswick $1.221 billion and $561 million respectively for just incremental costs[3]. For another example, the proposed Atlantic Loop, which could potentially import additional clean hydropower from Québec and Newfoundland and Labrador to the Maritime provinces, is estimated to cost $5 billion[4].

This third paper in *Atlantic Canada's Electricity Future – Discussion Series* looks at forecasted changes in the price for electricity across New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador until 2050 to help illustrate how current and incoming government policies could impact the price for electricity in particular.

However, this paper also helps provide a broader conversation regarding the implications of rising electricity prices in the region. Atlantic Canadians must understand their overall energy bills may not increase, especially as residents and businesses transition away from using fossil fuels to heat buildings and drive vehicles. Likewise, we must understand the implications for local businesses and our economies as a whole on the path to 2050.

Lastly, this discussion paper includes several recommendations for governments, utilities and consumers to better prepare for the transition to net zero in 2050 to ensure this important goal is feasible, supported by the public, and ensures no residents or businesses are 'left behind.'

Which regulations are shaping Canada's path to net-zero electricity?

In pursuit of reaching net-zero emissions by 2050, the federal and provincial governments have already developed several policies, regulations and funding programs to help reduce emissions and invest in new infrastructure and technologies. The first and second papers in this discussion series outlines several of the most influential policies and regulations in detail. However, since the last paper was released in September 2022, several of these policies and regulations have been updated, and other important components have been announced.

The following section outlines the policies and regulations which have changed since the second discussion paper was released. For more information on these policies and others, please refer to the *Atlantic Canada's Electricity Future – Discussion Series Part 1: Electricity Supply* and *Atlantic Canada's Electricity Future - Discussion Series Part 2: Electricity Demand*.

Carbon pricing and output-based pricing:

The federal government requires each province to price fossil fuels based on each fuel's relative greenhouse gas emissions. The emissions pricing will steadily increase each year from $50 per tonne of CO_2e in 2022 to $170/t in 2030[5]. For context, this means the carbon price on a litre of gasoline in 2030 will be roughly 38¢. On November 22, 2022, the federal government announced new carbon pricing agreements for the four Atlantic provinces[6]. Nova Scotia, Prince Edward Island and Newfoundland and Labrador will fall under the federal backstop plan effective July 1, 2023. New Brunswick will continue to operate under its own plan, which will see the next price increase effective April 1, 2023.

Industrial emitters in New Brunswick, Nova Scotia and Newfoundland and Labrador will operate under provincially designed Output-Based Pricing Plans (OBPS) from 2023 to 2030, and Prince Edward Island will continue to operate under the federal OBPS.

Canada's National Adaptation Strategy:

On November 24, 2022, the federal government launched Canada's National Adaptation Strategy for engagement and final consultations. The Strategy provides a "whole-of-society blueprint" for more coordinated action to prepare Canada to adapt to the effects of climate change[7]. Goals include improving disaster resilience and infrastructure to ensure reliable, equitable and sustainable services are delivered for all of society. The Strategy also includes $1.6 billion in new federal funding commitments to help implement the plan.

Select federal government funding programs:

In the 2022 Fall Economic Statement, the federal government announced new tax credits to enable green investments across the country and specifically address potential competitive disadvantages with the United States' *Inflation Reduction Act*. Specifically, the Investment Tax Credit for Clean

Technologies and the Investment Tax Credit for Clean Hydrogen will begin "as of the day of Budget 2023[8]."

On November 21, 2022, the federal government also announced a $250 million investment for the Oil to Heat Pump Affordability Grant under the Canada Greener Homes Initiative[9]. This fund will help low-income households with a stackable $5,000 grant to convert from oil home heating to a heat pump. This funding builds upon other federal and provincial programs including those under the federal Low Carbon Economy Fund for the same conversion.

Clean Electricity Regulations:

In July 2022, the federal government released the Proposed Frame for the Clean Electricity Regulations (formerly Clean Electricity Standard). The Proposed Frame will require the phase out of nearly all conventional fossil fuel electricity generation by 2035.

The proposed regulations are expected to be published in the Canada Gazette, Part I, by the end of 2022, followed by a 75-day public comment period[10]. For more information on the Proposed Frame for the Clean Electricity Regulations and the potential implications for Atlantic Canada, read the Atlantica Centre for Energy's Submission.

Nova Scotia rate hearing intervention:

On November 9, 2022 the Government of Nova Scotia passed legislation to cap select electricity rate increases for 2023 and 2024[11]. Minister Tory Rushton stated: "Fuel costs are unavoidable – they have to be paid. But we are protecting ratepayers as best we can by controlling what we can control on other costs." Under the legislative amendments, the Nova Scotia Utility and Review Board will not be allowed to approve increases beyond the utility's costs except those for fuel and improving reliability of the grid. Any increases related to reliability cannot be more than 1.8 per cent over two years.

These changes effectively limit the amounts Nova Scotia Power can charge ratepayers for the following two years. The Utility responded by outlining concerns the changes will limit "planned investment and the amount of storm preparedness and system hardening" in the province[12]. Furthermore, the Utility was "disappointed and concerned" the legislation would "override what is meant to be a politically independent process."

Understanding the forecasts

This discussion paper uses the latest data publicly available through Canada's Energy Regulator (CER). The CER regulates energy development, trade and pipelines across Canada. The information collected is from CER's latest Canada's Energy Future 2021 report (EF2021). The EF2021 report uses data primarily from Statistics Canada, Environment and Climate Change Canada, and Natural Resources Canada, as well as provincial data sources[13].

All graphs are included in the Appendices and will be referenced based on the Evolving Policies Scenario (EPS) forecast. Prices are referenced in dollars per kilowatt-hour and were converted from the original format (dollars per gigajoule) provided by the EF2021 dataset. All prices from the EF2021 report have been indexed to reflect 2021 dollars.

- Canada's Energy Future 2021 – Report[14]
- Canada's Energy Future 2021 – Open Data Portal[15]
- Canada's Energy Future 2021 – Key Assumptions for the Evolving Policies Scenario[16]
- Canada's Energy Future 2021 – Detailed Domestic Policy Assumptions for the Evolving Policies Scenario[13]
- Canada's Energy Future 2021 – Overview of the Energy Futures Modeling System[17]

Appendices 1.1, 1.2 and 1.3 provide regional forecasts for residential, commercial and industrial electricity prices forecasts until 2050, by province. Québec is included with the other four Atlantic provinces to provide readers with context for economic considerations, and because the proposed Atlantic Loop project would rely in-part on additional capacity provided from Québec.

Appendices 1.4 – 1.7 provide three forecasts for each Atlantic province. The three rate classes are provided to help readers understand the relative rates between the different classes, and to illustrate how relative rates between the classes are maintained moving toward 2050.

The EF2021 report's Evolving Policies Scenario assumes policy actions to reduce greenhouse gas emissions continue to increase at a pace similar to recent history. For example, the federal price on carbon continues to increase by $15/t annually from $170/t of CO_2e in 2030 to $470/t by 2050. This scenario does not model climate goals or targets, so "significant GHG emission reductions will be realized, but ambitious goals such as net-zero by 2050 are unlikely to be met[2]." All policies included in this scenario were announced by August 1, 2021[13,14].

The electricity projections for the EF2021 report were developed using ENERGY2020, which was created by Systematic Solutions Incorporated. This modelling tool relies on historical energy data and assumes future trends where necessary such as economic growth, prices and investment. These ENERGY2020 projects use the hourly electricity module which would be necessary given the high electricity peaks across Atlantic Canada by time of day and by season.

It is important to note these price forecasts under the EPS model do not explicitly include sales taxes on electricity, which are applied to rates we currently pay. It is also important to note these price forecasts relate closely to the EPS the forecasts for generation, capacity and interprovincial trade, which are detailed in first and second discussion papers.

Last, but not least, stakeholders from across the Atlantic region raised questions and concerns regarding the accuracy of some assumptions in the Energy Future 2021 report. While the EF2021 report provides a wealth of publicly available information to all Canadians, the Atlantica Centre for Energy does not expect the electricity price forecasts to be completely accurate.

Forecast limitations

In the Evolving Policies Scenario (EPS), there is a short-coming of assumptions given the current policy and regulatory environment in December 2022. As noted in the previous two discussion papers, this is not a criticism of the team developing the Energy Futures report. Instead, it is clear federal and provincial policies aimed at decarbonizing are advancing quickly, and several important policies have not been incorporated into the EPS as a result.

The previous two discussion papers found EPS forecasts for future electricity generation and demand were likely lower than reasonably expected for the four Atlantic provinces. Especially given the EPS does not reach net-zero emissions for the Atlantic region by 2050, it is likely residents and businesses must become increasingly electrified to reach this goal, while the supply of electricity both increases and decarbonizes at a rate greater than forecasted.

The EPS specifically lists four key uncertainties for the model's electricity generation forecasts: future cost declines of generating technology; renewable enabling technologies; electricity demand growth; and export market developments[14]. While the EPS reasonably assumes costs for clean technologies will decrease over time, many factors will influence the rate of this occurring. For example, several renewable energies face supply chain challenges and accelerated global demand, which may increase prices. Technological innovation such as smart grids, battery technology or advanced small modular reactors may provide opportunities to incorporate more renewable energy onto the grid, depending on how quickly these technologies develop and at what cost for utilities.

Export demand growth is particularly interesting for Atlantic Canada given the significant integration already in place across the provinces and with Maine. Projects like the potential Atlantic Loop could enable additional clean dispatchable electricity imports for Nova Scotia and New Brunswick, if there is additional export capacity available from Québec.

The Centre believes several additional variables may play influential roles in determining the future price of electricity in the Atlantic region. Given the number of new federal and provincial policies, especially the requirements to phase out coal-fired electricity generation by 2030 and the incoming Clean Electricity Regulations, will force many changes in the grids to be made on accelerated timelines, which could potentially lead to cost increases on the corresponding projects. The seven remaining years to phase out coal is a relatively short time to design, permit and build and/or import new, likely clean, dispatchable generation in the region.

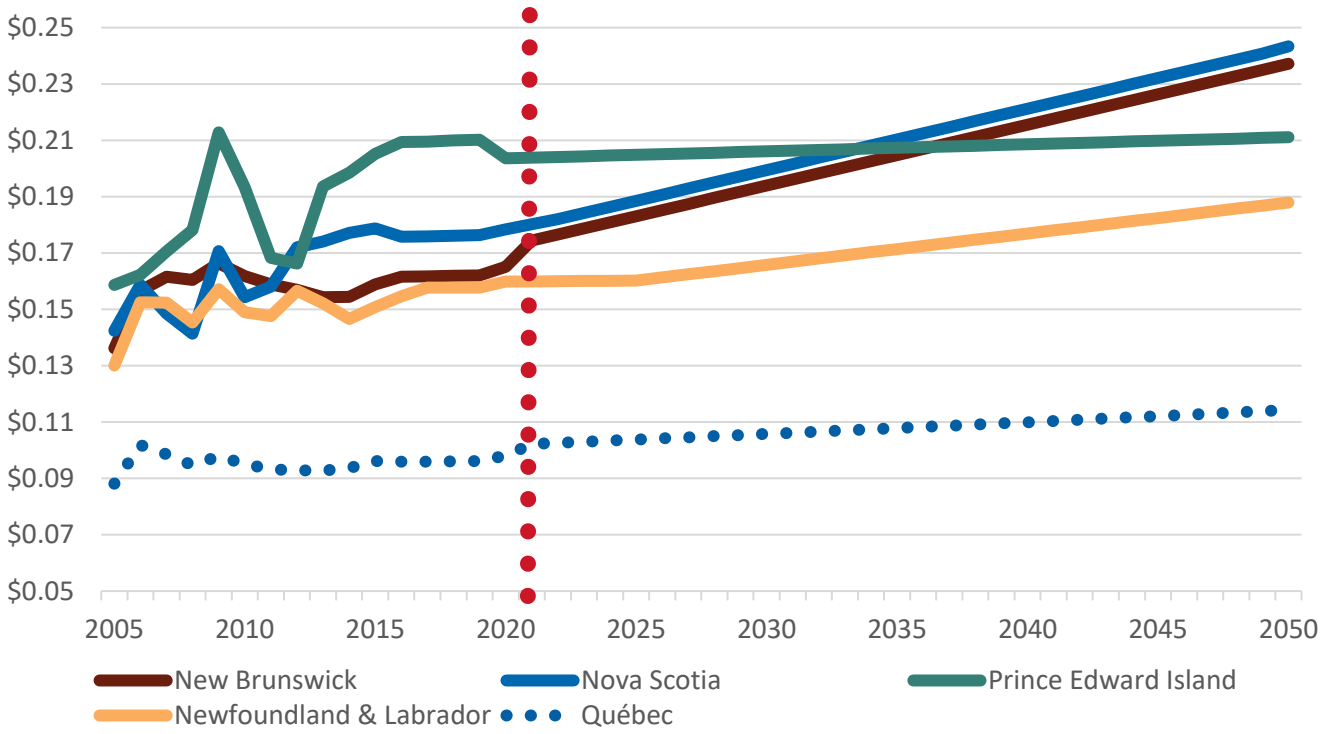
In contrast, greater demand-side management and evolving consumer behaviours may help curb future demand peaks. The Atlantic utilities are already working hard to incorporate new technologies and improve customer awareness.

It will also be important to consider what future energy reliability and security will be required given a shift in reliance on electricity, especially with climate change in mind. New electricity infrastructure, especially for transmission and distribution, will not only need to be affordable, but more reliable

based on customers' current expectations, and the increasing frequency and severity of storms with damaging winds and floods become progressively more common.

It is surprising that price forecasts under the EPS increase relatively linear for each province and with each rate class. It is highly unlikely that each province will see consistent growth year-over-year given the costly assets which will be retiring and constructed, especially over the next thirteen years. For example, rates in the five provinces illustrated are all very volatile year-over-year before 2021 (which used historic prices) (see Figure 1).

Figure 1: Regional residential electricity rate forecasts ($/kWh) – pre 2021 rate volatility



Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Other, more specific challenges with the EPS forecasts include concerns about the validity of electricity prices in base years. For example, NB Power's residential rate comparison of select provinces and lists Québec's costs at 7.64¢ per kWh on average (excluding taxes), 13.32¢, in Newfoundland and Labrador, 13.33 in New Brunswick, 17.02 in Nova Scotia and 17.14 in Prince Edward Island for a residential customer using 1,350kWh per month in September 2022 (see Table 1)[1]. The 1,350kWh monthly usage for NB Power's cost estimate is slightly higher than the average monthly Canadian household consumption (919 kWh per month in 2019[18]). Regardless, the EPS estimate is much higher than the forecasted prices in 2022 for the five provinces (17.7¢ in New Brunswick, 18.2¢ in Nova Scotia, 20.4¢ in Prince Edward Island, 16.0¢ in Newfoundland and Labrador, and 10.3¢ in Québec).

Table 1: Comparison of residential electricity prices in 2022 (¢ per kWh)[2,18]

	Québec	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland & Labrador
NB Power Data (Sept. 2022)	7.64¢	13.33¢	17.02¢	17.14¢	13.32¢
EF2021 EPS Model Forecast	10.3¢	17.7¢	18.2¢	20.4¢	16.0¢

EPS modelling input costs listed are different than those publicly available through Nova Scotia Power's 2022 Evergreen Integrated Resource Plan Updated Assumptions, although are within reason[13,19]. However, the potential cost of an Atlantic Loop has not been modeled in the EPS, and it is uncertain whether significant upgrade investments, such as those needed to refurbish the Mactaquac Dam, have been incorporated.

For Prince Edward Island, which currently relies on imported electricity from New Brunswick Power, it is unsure what, if any, impacts imports from New Brunswick will play in future prices. It is surprising (and unlikely) that forecasted prices in PEI remain flat relative to those in New Brunswick, despite the electricity trade between the provinces. While discussing the EPS data with several electricity experts across the region, it was also outlined that Prince Edward Island relies on the other Maritime provincial grids to help balance their load. These discussions also raised concerns that the price growth rates forecasted for Newfoundland and Labrador should be closer to those in New Brunswick and Nova Scotia.

Two further social considerations must be recognized. First, most energy models assume technologies will be switched as soon as an alternative becomes more affordable. This will not necessarily be the case in reality, as there are many social considerations that politicians, regulators and utilities must incorporate. For examples, there are social (and environmental) considerations for not refurbishing the Mactaquac Dam or later the Point Lepreau Nuclear Generating Station, aside from costs. In Nova Scotia, there has been no recent discussions on the potential for nuclear-generated electricity, even if it could provide a clean and affordable alternative to coal-fired generation. In Prince Edward Island, residents in the City of Summerside may accept paying higher electricity rates if it means they reduce their emissions faster than the province as a whole.

Lastly, and possibly most important, the public must tolerate electricity price increases. It cannot be assumed that just because the cost of electricity is increasing in the future, prices will be passed on equally to all customers. Costs, debt, or regulatory requirements are all subject to change without public support for meeting out important net-zero goals. Even though electricity prices across Atlantic Canada are highly regulated, there have already been instances of government interference in the rate setting proceedings and planned interference in a utility's planned infrastructure investment[11,20].

Forecast notes

These notes refer to Appendices 1.1 to 1.7.

It is important to note that rate class designs vary across the Atlantic provinces. It appears no rate designs have been changed for the three classes outlined for the duration of the EPS forecast (residential, commercial and industrial).

Regional residential rates:

In Appendix 1.1, residential electricity prices across the across the Atlantic region increase at steady rates in the respective provinces from 2022 to 2050. While residents should expect more price volatility than the forecasts predict, it is important to note the rates in Nova Scotia and New Brunswick, and to a lesser degree Newfoundland and Labrador, increase faster than those in Québec and Prince Edward Island.

While the price for residential electricity in Québec begins and ends the period lower than the four Atlantic provinces, the gaps between Québec relative to New Brunswick, Nova Scotia, and Newfoundland and Labrador grows.

It is important to recognize some overall cost savings may be realized for residents in Prince Edward Island, Newfoundland and Labrador and Nova Scotia, in particular, given the number of dwellings left to convert from home heating oil to electric heat pumps in the three provinces[21,22,23]. However, absent of this, it appears household energy costs may become increasingly more expensive in for most Atlantic Canadian relative to those in Québec on the path to net zero in 2050.

Regional commercial rates:

Similar to the trends seen with residential rates, Appendix 1.2 shows the increasing gaps between Nova Scotia, New Brunswick and Newfoundland and Labrador relative to the lowest cost provider in Québec. Rates in Nova Scotia and New Brunswick also increase faster relative to those in Newfoundland and Labrador. It is therefore concerning for those small-and medium-sized businesses in Nova Scotia and New Brunswick which are trade-exposed and energy intensive, like in manufacturing. Absent of other considerations, it appears the competitiveness of these businesses will erode relative to businesses operating in some neighbouring provinces.

Interestingly, relative to the higher cost of residential rates in Prince Edward Island in 2020 than in the other provinces studied, commercial rates on the Island are roughly equal to those in New Brunswick and Nova Scotia by the early 2020s.

Regional industrial rates:

Similar to the trends seen in Appendices 1.1 and 1.2, industrial rates in Nova Scotia, New Brunswick and Newfoundland and Labrador rise faster than those in Québec. This trend may be especially concerning for the New Brunswick economy. As discussed in the second paper in this series, a greater share of New Brunswick's end-use energy demand comes from industrial sector (53%) than the other Atlantic provinces[24]. In contrast, combined energy demand by the industrial sectors in Newfoundland Labrador, Nova Scotia and Prince Edward Island were 42 per cent, 20 per cent and 19 per cent respectively[25,26,27]. Many industrial businesses are expected to electrify as tool to help decarbonize incrementally by 2030 and beyond, this could place New Brunswick industry at a competitive disadvantage.

It is interesting to note from Appendix 1.3 that industrial rates in Prince Edward Island are forecasts to be the lowest in Atlantic Canada beyond roughly 2032. This is a departure from what is seen in Appendices 1.1 and 1.2 with residential and commercial rates, where Prince Edward Island industrial rates are lower than those in Nova Scotia and New Brunswick in 2022, and just slightly above those in Newfoundland and Labrador.

What do net-zero policies mean for electricity prices in Atlantic Canada?

Federal and provincial policies aimed at reducing emissions are driving change in the electricity sector across Canada. This is especially true in Atlantic Canada, as evident in the first two discussion papers in this series. The demand for electricity will increase on the path to net-zero emissions in 2050, and the Atlantic provinces, especially New Brunswick and Nova Scotia, must build cleaner generation while growing capacity to meet this growing demand.

Debate remains regarding whether significant federal emission reduction regulations such as the requirement to phase out coal by 2030 or the proposed Clean Electricity Regulations provide the most cost-effective path to net-zero emissions for the Atlantic provinces. Regardless, the cost of reaching net zero will be significant.

For context, RBC's Thought Leadership report: The $2 Trillion Transition, estimates Canada will spend roughly $5.4 billion each year on average to decarbonize the electricity grid by 2050[28]. Of this amount, roughly $1.8 billion would be spent each year on renewables, while $3.6 billion would be spent on storage. The report also stated hydro and nuclear will remain key to producing clean power in Canada, and natural gas will be needed in the foreseeable future.

Deloitte's Bright futures report forecasts Canada must invest $59.1 billion each year in electricity-generating capacity for SMRs, biomass, renewables and storage in order to achieve net zero by 2050[29].

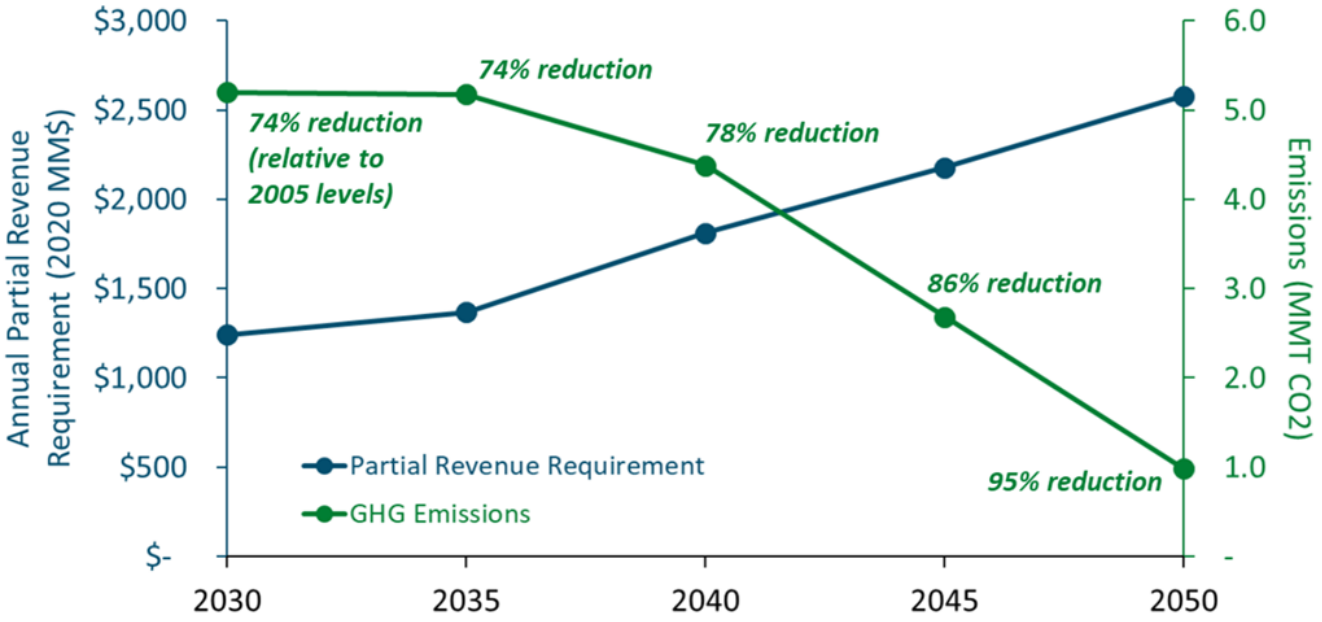
This is not surprising if you look around the Atlantic provinces as a few select projects proposed over the next decade (roughly). It is unclear whether the Mactaquac Generating Station refurbishment was

included in the EF2021 report data, but this project alone was estimated to cost between $2.9 billion and $3.6 billion in 2016[30].

The federal government's requirement to phase out coal-fired generation by 2030 was forecasted to cost Nova Scotia $1.221 billion and New Brunswick $561 million[3]. This is the added amount to the utilities above the based scenario and does not include recent fuel price increases, nor does it reflect significant embedded costs. As mentioned earlier in this discussion paper, the proposed Atlantic Loop is estimated to cost $5 billion to mainly support Nova Scotia and New Brunswick[4].

Looking more broadly across Atlantic Canada, the Clean Power Planning Committee (a group of Atlantic provincial governments, the federal government and local utilities) released its Clean Power Roadmap for Atlantic Canada in March, 2022. The Roadmap details information and recommendations from data provided by Energy+Environmental Economics, from its July 2021 report: Potential Benefits of Regional Coordination in a Low-Carbon Future: Ensuring Electric Reliability[31,32].

Figure 2: Annual partial revenue requirement - 95% GHG reduction by 2050 (reference case)



Source: Energy+Environmental Economics, Potential Benefits of Regional Coordination in a Low-Carbon Future: Ensuring Electric Reliability (July, 2021).

The report provides several scenarios to forecast future demand and costs, including the deployment of an Atlantic Loop to enable more electricity trade across the region (see Figure 2). The estimate of annual partial revenue requirements increases as GHG emissions are reduced in the reference case. The annual costs include new resource buildout (capital) costs, fixed operating costs and maintenance costs, as well as ongoing fuel and operating costs[32].

Costs in the reference case rise steadily from 2035 to 2050 as electricity sector emissions are reduced from 74 per cent to 95 per cent. From 2035, the annual partial revenue requirement increases from roughly $1.25 billion to over $2.5 billion in 2050 (in 2020 dollars)[32]. However, the refence case forecasted does not include a coal phase out by 2030, nor a phase out of unabated oil and gas-fired generation by 2035 (likely required under the proposed Clean Electricity Regulations). As a result, it is reasonable to expect the phase out of coal and the Clean Electricity Regulations could accelerate electricity price increases before 2035.

In summary, federal and provincial policies are driving future emission reduction and electricity costs with it. These are largely inescapable facts. Finding the most prudent path forward is critical; one that relies on regional collaboration. This means that our provinces and utilities should work closely together and with the federal government to enable significant investments, a faster regulatory environment, and a future regional grid that is interconnected while relies on each provinces' strengths. Regulatory agility and government cooperation were explored in more detail in the first paper in this series.

Alberta Electric System Operator Forecasts[33]

For comparison with another province, although not a direct comparable, the Alberta Electric System Operator (AESO) released its Net-Zero Emissions Pathways Report in June, 2022. The Report forecasts the annual average electricity cost to 2041 compared to the AESO's Long-term Outlook released in 2021.

The newer Net-Zero Range forecasts electricity costs in a range of up to roughly 19¢ per kWh in 2041, compared to up to roughly 13.5¢ cents per kWh in 2041 under the previous Long-Term Outlook. The Net-Zero Range added $44 billion to $52 billion (nominal, undiscounted) to revenue requirements related to the Long-Term Outlook baseline.

As the report summarizes: "*one cost outcome is that a net-zero transition which simultaneously increases electricity demand and requires the existing capital stock to be replaced or supplemented with higher capital cost net-zero emitting alternatives could impose significant cost increases in the electricity sector*."

Our governments should also prepare to work closely with the private sector and community groups (Indigenous groups, municipalities, etc.) to bolster the investments needed to fund this net-zero transition. Without these collaborative efforts, Atlantic ratepayers should brace for electricity prices that are even higher than we forecast today.

How could electricity prices impact Atlantic Canada's economy?

The forecasted industrial electricity costs in New Brunswick, Nova Scotia and Newfoundland and Labrador diverge from the rate in Québec between 2022 and 2050.

In 2050, the forecasted prices in New Brunswick and Nova Scotia would be nearly twice the rate in Québec.

It is expected some sectors will see greater economic growth as a result of a transition to net-zero emissions by 2050, while others will see contraction over this period. Research from the Ecology Action Centre, prepared by EnvironEconomics and Navius Research, forecasts significant growth in the electricity generating sector, moderate growth in manufacturing (especially after 2040) in Nova Scotia[34]. In contrast, the paper sector GDP would shrink in the province between 2030 and 2040. In New Brunswick, which has a greater share of industrial operations, could see contraction.

Mercedes to build its own wind farm[35,36,37]

In September 2019, the auto-manufacturer Mercedes-Benz announced plans to build a wind farm at its test track in northern Germany. The wind farm will produce more than 100MW and will cover more than 15 per cent of the manufacture's annual electricity demand in Germany.

Mercedes-Benz later announced an agreement with a company to source energy from a wind park in the Baltic sea beginning in 2027. In total, the two projects will cover 40 per cent of Mercedes-Benz's needs in the mid to long-term.

***But why*?**

In part this transition is to please customers and shareholders looking for climate action. But this move is also likely to add energy security and affordability in a volatile European energy market. As the CEO Ola Kallenius stated: "[wind], if you take just the cent per kilowatt-hour that it costs to produce, that is actually some of the cheapest energy that you can have in the world."

***Would this work in Atlantic Canada*?**

Likely in mid to long-term future, similar projects could provide cost-effective electricity to industry in the Atlantic provinces. However, regulatory changes remain in some provinces regarding distributed generation, especially if it must be connected to the larger provincial grid system. For context, Nova Scotia recently announced a commercial net-metering program which increased the ability for businesses to self-generate electricity to 1MW. These are challenges needing collaborative solutions to ensure industry can remain competitive in the transition to net zero.

Many small-and medium-sized businesses (SMEs) in the Atlantic region will face similar challenges or opportunities. According to research from the Atlantic Provinces Economic Council, two-thirds of small business owners are concerned about their ability to respond to climate risks. Several key barriers impeding Atlantic SMEs from adopting clean technology include limited access to capital and skilled staff, inconsistent regulations across provinces, and technology costs[38].

Research from Quest Canada and The Conference Board of Canada predict new jobs (nearly 50%) will be created in areas of clean transportation, clean power and heating, and with low-carbon buildings, but without robust training programs, labour shortages can create a significant bottleneck for the net-zero transition, both across provinces and sectors[39].

The net-zero transition must ensure businesses, especially those which are trade-exposed and/or have high energy consumption, can continue to operate competitively across Canada and with the United States. Current electricity prices in the Atlantic provinces are competitive with those in the much of the northeastern United States[40]. It is important local industrial and commercial rates remain consistent despite operating under different regulatory environments between the two countries. It is uncertain which economic assumptions were used in the Canada's Energy Future 2021 modelling.

According to research from Herb Emery and Kent Fellows, Environment and Climate Change Canada currently relies on Computable General Equilibrium (CGE) modeling to forecasts economic impacts and GHG reductions relating to the implementation of new federal policies and regulations[41]. However, the CGE model does not account for economic losses from province to province, only the national economy as a whole.

As Emery and Fellows noted: "*Under a different set of assumptions that more reasonably represent what we know about subnational regional economic adjustment, the model could generate sizeable, and potentially economically devastating, economic impacts of climate policies for smaller, periphery provincial economies and sizeable gains for the larger core economy provinces like Ontario*[41]."

It is also important for federal data to better reflect the economic and industrial differences across individual provinces to ensure incoming net zero policies do not have unintended economic consequences in the Atlantic provinces, in particular. Similarly, provinces should work closely with their industrial leaders and SME owners to understand what regulatory changes could allow them to remain competitive in the transition to net zero, and what financial and educational supports can ensure local businesses are as equipped to compete in a net-zero economy.

How could electricity prices impact Atlantic Canadians' household energy costs?

A report from the Ecology Action Centre, prepared by EnviroEconomics and Navius Research detailed the changes in total energy costs as a share of household expenditures in the transition to net zero by 2050. Forecasts for Nova Scotia and New Brunswick were included in the report[32]. Household expenditures included in the report include operating and capital spending on dwellings and vehicles.

For Nova Scotia, total energy costs as percentage of household expenditures in 2025 rose by 0.4 per cent for the low income category and remained consistent in the average and high income groups. In 2030, the spending share decreased significantly for each group, before increasing in 2035. In total, the forecast predicts Nova Scotia households will spend a lesser share on energy costs than today[32].

In New Brunswick, the total share of expenditures on energy rose for average income households in 2025. All categories decreased the share in 2030, but to a lesser degree than in Nova Scotia. However, the share of expenditures on energy continued to decrease in 2035 for each group[32].

It is not surprising to see total relative expenditures on energy decreasing in Nova Scotia or New Brunswick. Switching to electric vehicles can drive savings today, and there are several retrofit programs available from the federal and provincial governments to help minimize costs to decarbonizing homes. While this is encouraging, it is critical for these forecasts to hold true, especially in Atlantic Canada.

The cost of home retrofits[42]

Recent research from the C.D. Howe Institute estimates Canada will need to retrofit 423,000 dwellings each year to fully electrify all by 2050 to meet net-zero goals. The current 2030 emission reduction target would require even more aggressive action.

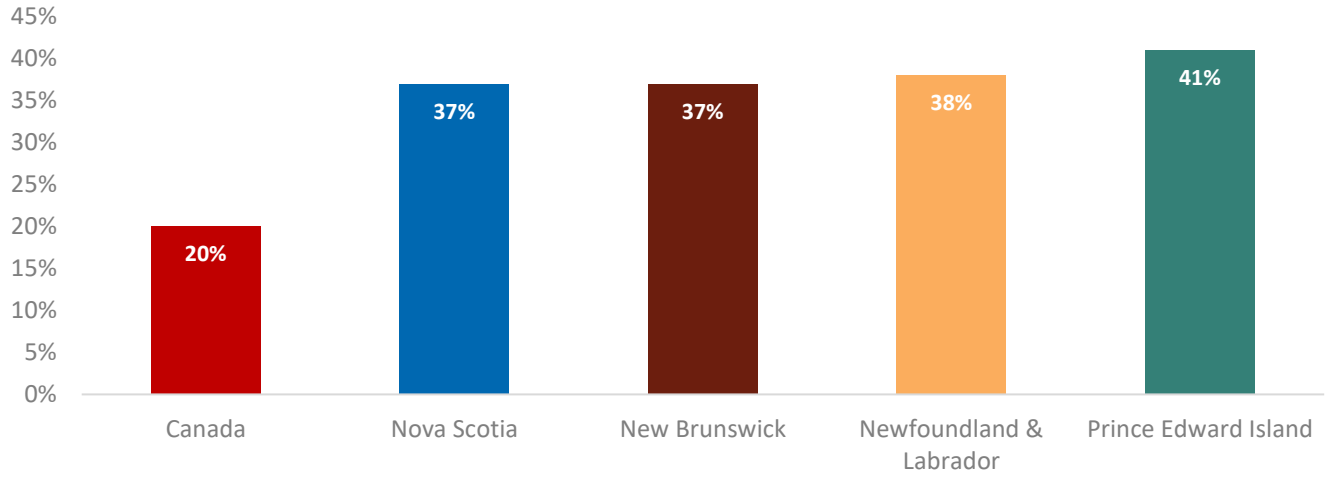
As Canadians electrify their lives, converting homes to electric heating and become more efficient will be important especially in Prince Edward Island, Nova Scotia and Newfoundland and Labrador. These retrofits can be expensive; the C.D. Howe Institute report estimates the cost for a single detached home to be $18,000. In total this could cost between $4.5 billion to $6.3 billion each year across Canada.

Fortunately, there are several provincial and federal programs in place and coming next year to help cover some of these retrofit costs, especially for lower-income households. However, much of the funding is provided after the projects are completed, which makes the large up-front costs challenging for too many households.

According to research from QUEST and The Conference Board of Canada, net-zero transitions will cause significant disruptions in the labour market, housing sector and transportation networks, among other sectors. These disruptions will impact household spending, and costs will likely be borne disproportionately by already disadvantaged households and communities[39].

The Atlantic provinces already have the four highest levels of energy poverty in Canada. Energy poverty occurs when households spend more than 6 per cent of their after-tax income on home energy service (or roughly twice the national median) (see Figure 3)[2]. According to 2019 research from the Canadian Urban Sustainability Practitioners, each of the Atlantic provinces have roughly twice the share of households experiencing energy poverty as any other province or territory[2].

Figure 3: Energy poverty in Canada vs Atlantic Canada



Source:** Energy Poverty in Canada: a CUSP Backgrounder **(October, 2019).

Concerningly, some cost considerations were not likely factored into this research on total energy costs. In particular, taxation tied to fossil fuels may need to be recuperated in other ways by provinces in particular. As residents switch electric vehicles in particular, governments across the Atlantic region will lose hundreds of millions of dollars in fuel taxes each year, which is used to help fund municipalities, climate change initiatives and to fund transportation costs, among others. It will therefore be incredibly important for Atlantic provincial governments and the federal government to help avoid or mitigate total energy household energy costs from increasing in the transition to net zero by 2050. While some households may be able to afford more, the transition must be equitable for everyone.

Other costs from the electric vehicle transition[43,44]

Electric vehicles are required to make up all new light-duty sales by 2035. While many EVs today are expensive, there are government rebates to help lower purchase costs, and the savings from fossil fuels compared to using electricity can be significant depending on how much your drive. However, there are important costs not accounted for in the EV sales pitch: *what happens when fuel tax revenue disappears as less gasoline and diesel are sold*?

In New Brunswick, for example, the provincial government will collect over $400 million dollars in 2022 in fuel tax revenues ($206 million from the Carbon Emitting Products Tax and $202.5 million from the Gasoline and Motive Fuels Tax). This revenue doesn't include additional fuel tax revenues from sales taxes or the federal Excise Tax. We must also consider added costs to pay for the new charging infrastructure needed at stations across the region.

Herb Emery from the University of New Brunswick, stated: "*We may see "congestion charges" for charging at high-demand times or locations. And governments still need to pay for roads, so there should still be a "road tax" applied to prices for charging vehicles."*

Recommendations

The transition to net-zero electricity by 2035 and net-zero emissions by 2050 requires collaborative effort between the Atlantic provinces and federal government. The Atlantica Centre for Energy proposed thirteen recommendations in the previous two discussion papers in this series. The Centre offers the following additional policy recommendations to help guide governments, utilities, post-secondary institutions, and the public in better managing net-zero transitions:

RATE MODELS: Encourage regulated utilities and regulatory boards to continue investigating the deployment of different rate structures designed to accurately allocate costs while helping curb electricity usage during peak demand.

GENERATION MODELS: Investigate the impact of policy changes required to unlock private sector investments in new non-emitting electricity generation to meet growing demand across the region and replace fossil fuel-fired capacity. Such models could help reduce investment for regulated utilities and develop generation projects faster.

EQUITABLE TRANSITION: The cost of the transition to clean electricity and net-zero emissions must be shared fairly across all provinces and territories, between rural and urban centres and across demographics. Federal funding programs must reflect the varying impacts federal regulations have on different provinces and allocate funding support accordingly.

FUNDING FOR ATLANTIC CANADA: The future of the Atlantic Loop project is rumored to be announced soon but must include significant support from the federal government. However, federal funding for this project must not come at the expense of other important investments which also require funding support. Other projects under consideration in the region include the developing dispatchable generation via advanced Small Modular Reactors and additional generation such as off-shore and onshore wind. Proportionate funding should also be available to help SMEs decarbonize.

FUNDING INDIVIDUAL RATEPAYERS: Most federal and provincial funding programs currently in place for residents and businesses rely on paying back investments, as opposed to providing funding up front. Given the cost of many clean technology investments such as heat pumps, home retrofits or electric vehicles, funding in advance may help more Canadians to invest in reducing their emissions.

WORKFORCE DEVELOPMENT: Given the number of infrastructure projects which must be built and technologies to be integrated into daily lives over the next 27 years, governments and post-secondary institutions should prepare to train the workforce for tomorrow. Skills upgrading must be accessible and more new training programs must be developed to ensure we have the labour needed to implement these important emission reduction goals.

TRANSPARENT COSTS: Governments at all levels should provide more publicly available data on the overall energy costs facing residents and businesses in a net-zero future. This data should not only include the cost of electricity, but for transition costs, as well as the taxation needed to pay for roads and other infrastructure impacted by climate change.

Closing thoughts and next steps

To draw from Deloitte's report *Bright futures: A prosperous lower-carbon outlook for Canada*, "reaching net-zero will be neither easy nor inexpensive[29]." The real price of electricity will increase on the path to net-zero emissions in 2050, but there is the potential for many Atlantic Canadians to be better off financially relative to today, if we can work together quickly as a region to make the most pragmatic investments for our electricity grid.

The Centre has learned from the three discussion papers in this series, and from conversations with informed energy stakeholders from across the region. Atlantic Canada must establish the right conditions for this clean energy transition; conditions where governments and utilities are working together, where regulatory environments can move faster, where different community stakeholders are engaged from the outset, and where we enable the private sector to invest in our clean energy future. Importantly, the federal government must ensure that financial support for this energy transition is directed proportionately to those areas most affected, and provide better data to help residents and businesses understand the challenges and opportunities with reaching net zero in 2050.

There is, of course, a potential outcome where many Atlantic residents and businesses are unable to afford electricity rate increases or invest in the clean technologies to reduce their respective reliance on fossil fuels for heating and transportation. This outcome must be avoided at all costs. Without public support, we cannot meet these important net-zero goals.

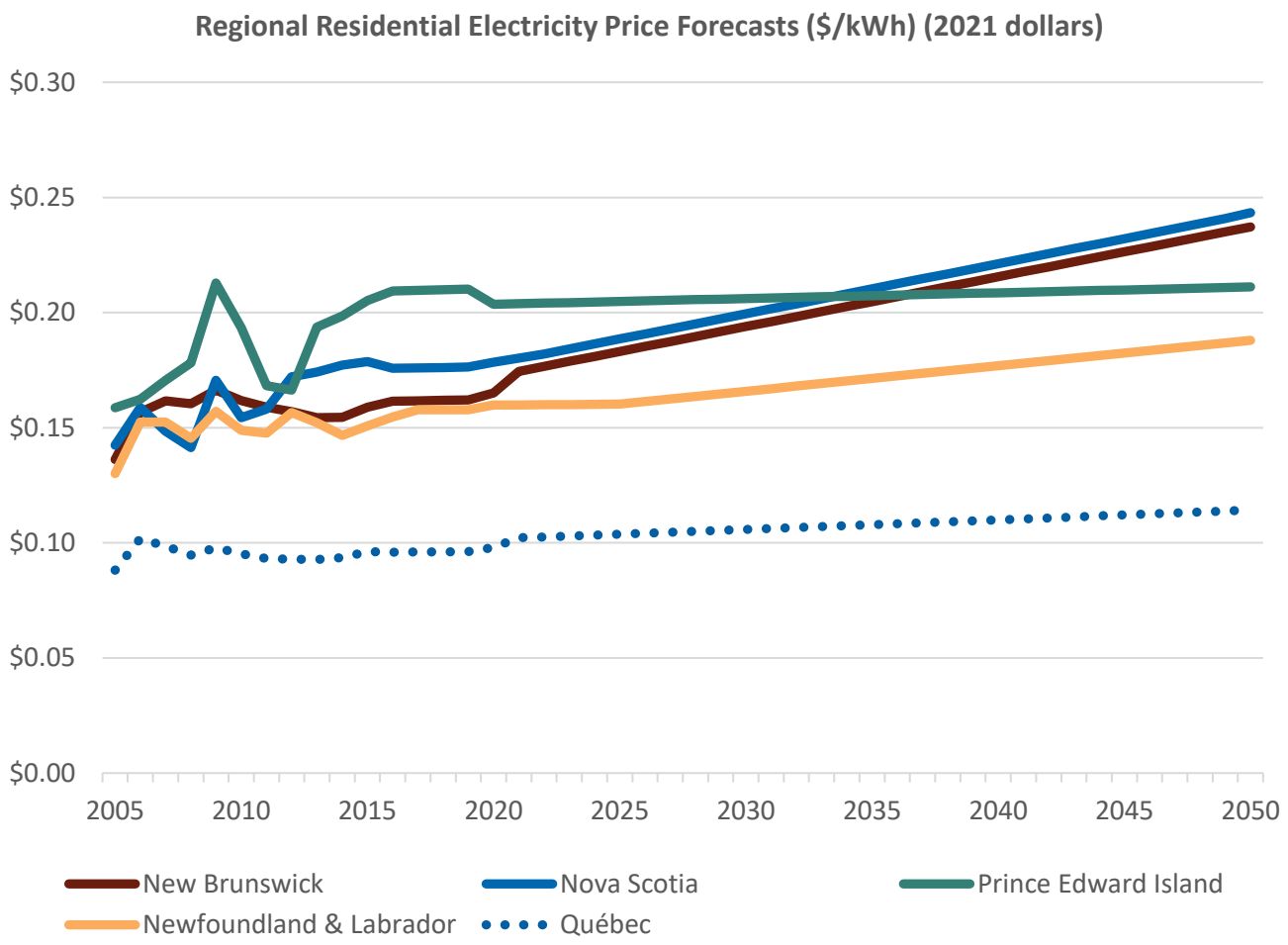
It is clear federal and provincial policies are having impacts on the supply, demand and price of electricity in Atlantic Canada. It is important that each additional layer of the regulatory environment is studied carefully to understand and communicate the cumulative impact on system planning. Ensuring federal and provincial regulations and policies better balance emission reduction goals with affordable pathways, can help ensure the transition to net zero is as affordable as possible for Atlantic Canadians and local businesses. For example, the incoming Clean Electricity Regulations must strike the right balance where reducing emissions is paramount, but leaves flexibility for utilities to take the most affordable path forward to a net zero electricity grid.

While federal research such as the Canada's Energy Future 2021 report offer a good start to help provide needed education to the public on the challenges, opportunities, and costs of the transition to net zero, the EF2021's Evolving Policies Scenario is too incomplete to provide an accurate representation of Atlantic Canada's electricity future. It is incumbent on the federal government to publicly release detailed forecasts when considering significant net-zero energy policies and regulations, in advance of public consultation.

It is encouraging that the CER team is working on the next iteration of the report (Canada's Energy Future 2023), which will model how Canada's energy system could reach net-zero emissions by 2050[44]. This new CER research must complement new Integrated Resource Plans currently being developed by NB Power and Nova Scotia Power, among other research, to help better understand Atlantic Canada's electricity future given recent federal and provincial regulatory changes.

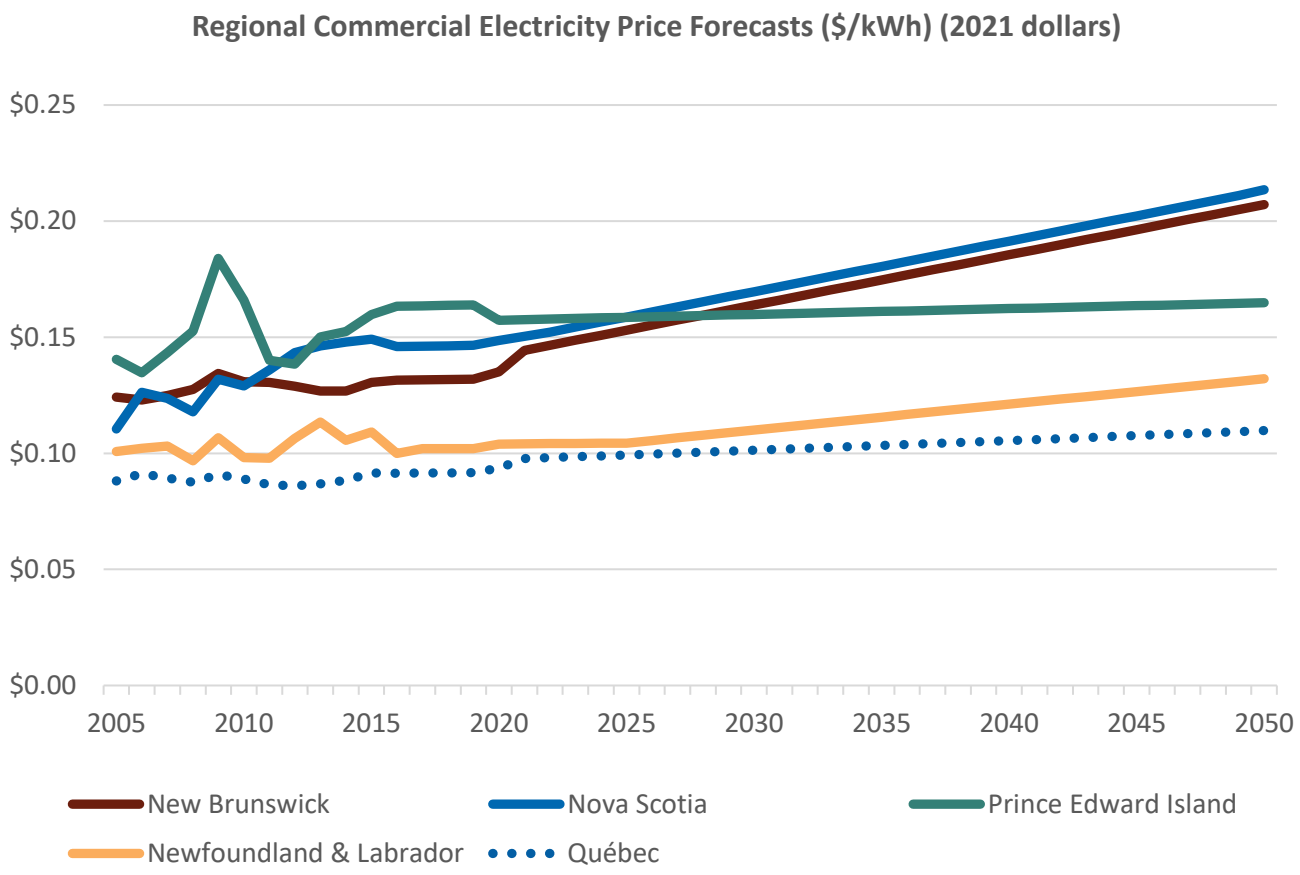
While this third discussion paper is the last in this series, the Atlantica Centre for Energy will continue to research and share opinion on federal and provincial regulations and policies as they relate to the clean energy transition. Please follow the Centre's website, social channels and monthly newsletter for the latest information on the local energy sector and how it impacts Atlantic Canadians.

Appendix 1.1: Atlantic region residential electricity price forecasts, by province



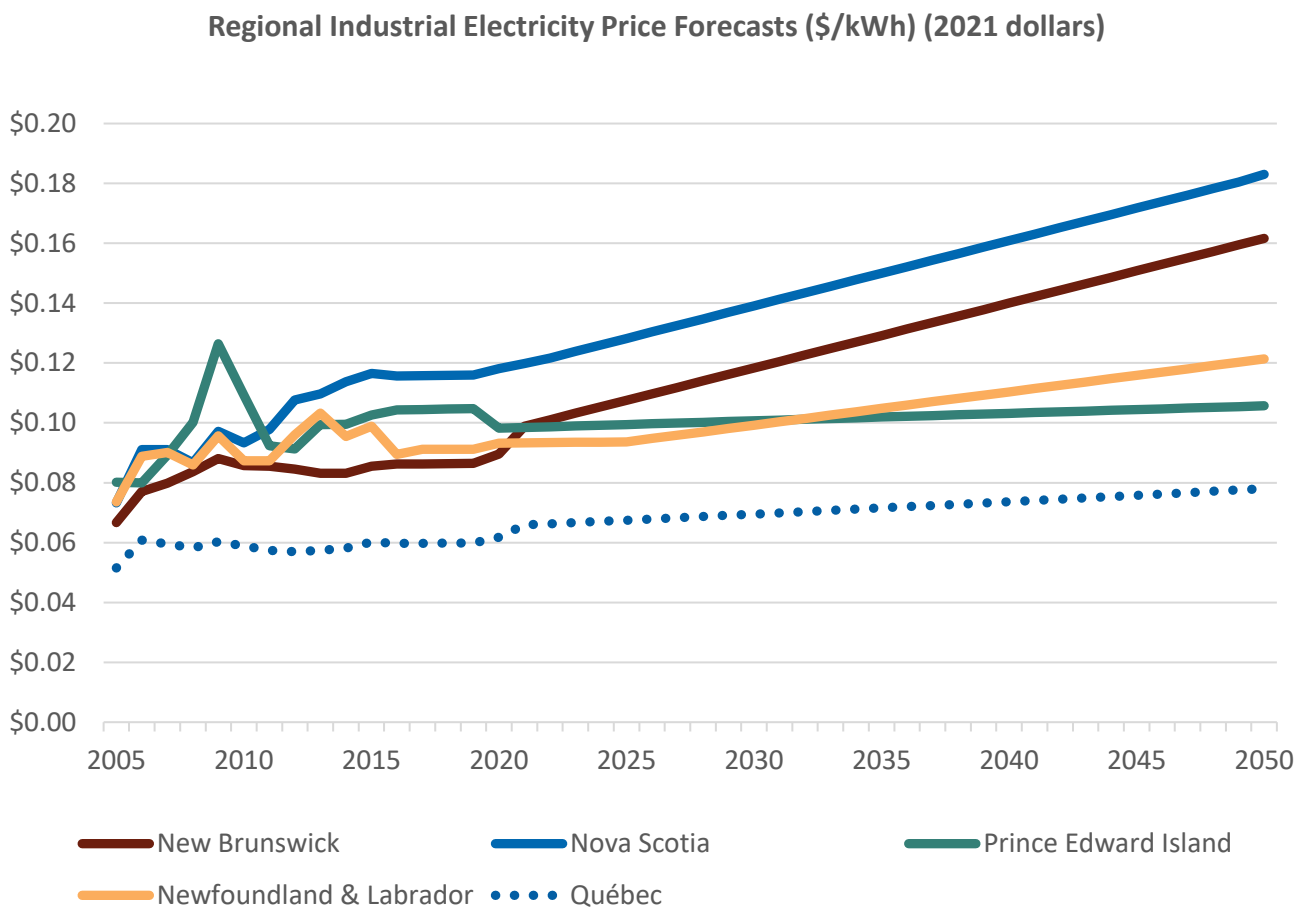
Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.2: Atlantic region commercial electricity price forecasts, by province



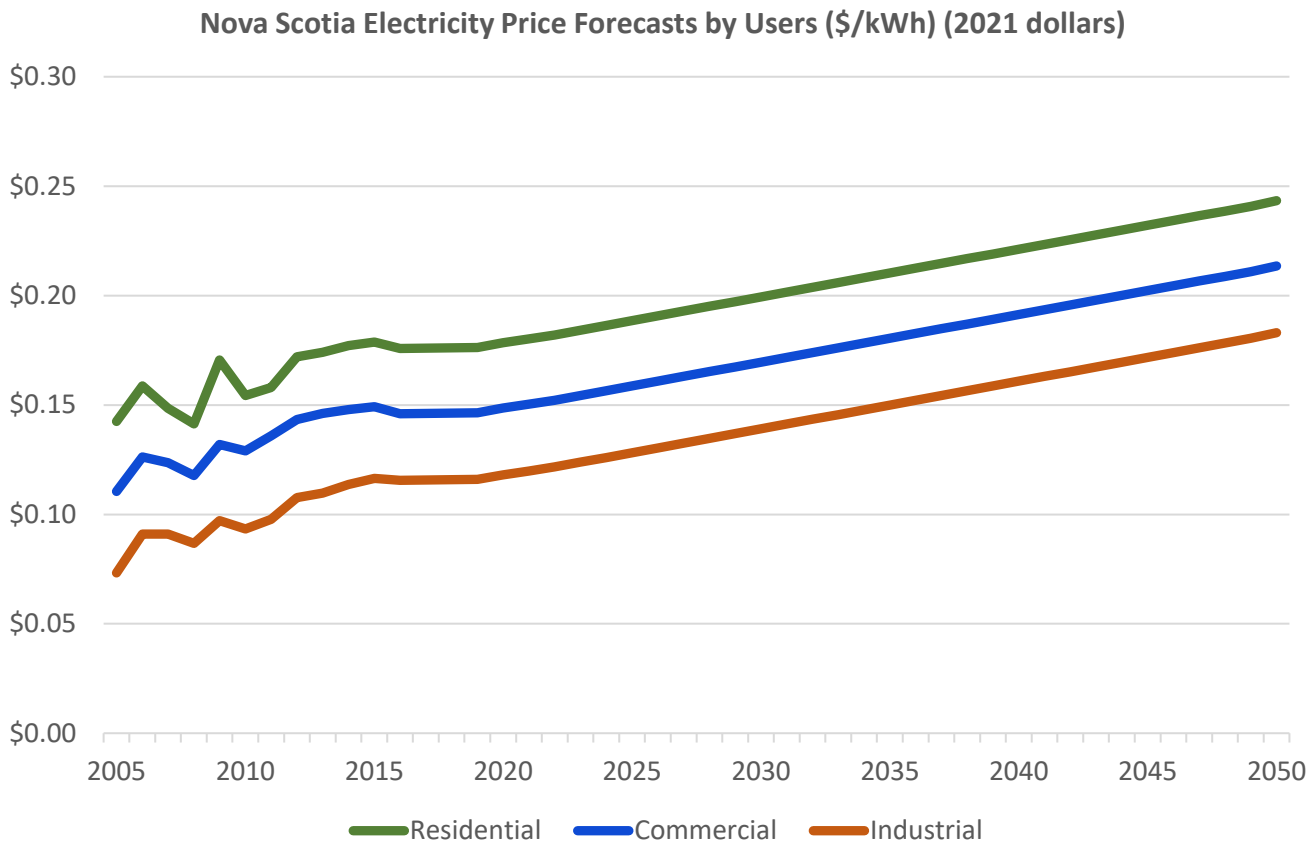
Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.3: Atlantic region industrial electricity price forecasts, by province



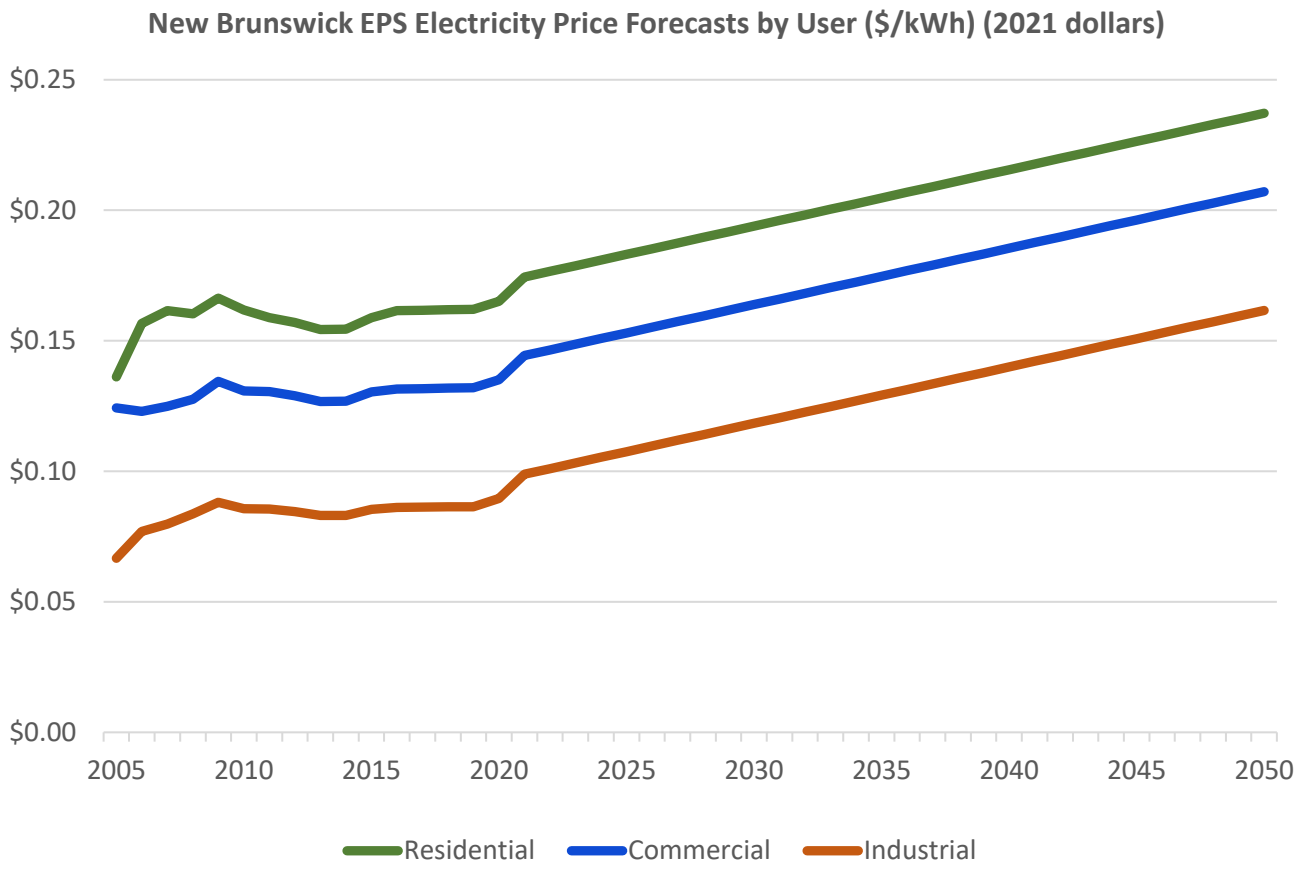
Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.4: Nova Scotia forecasts



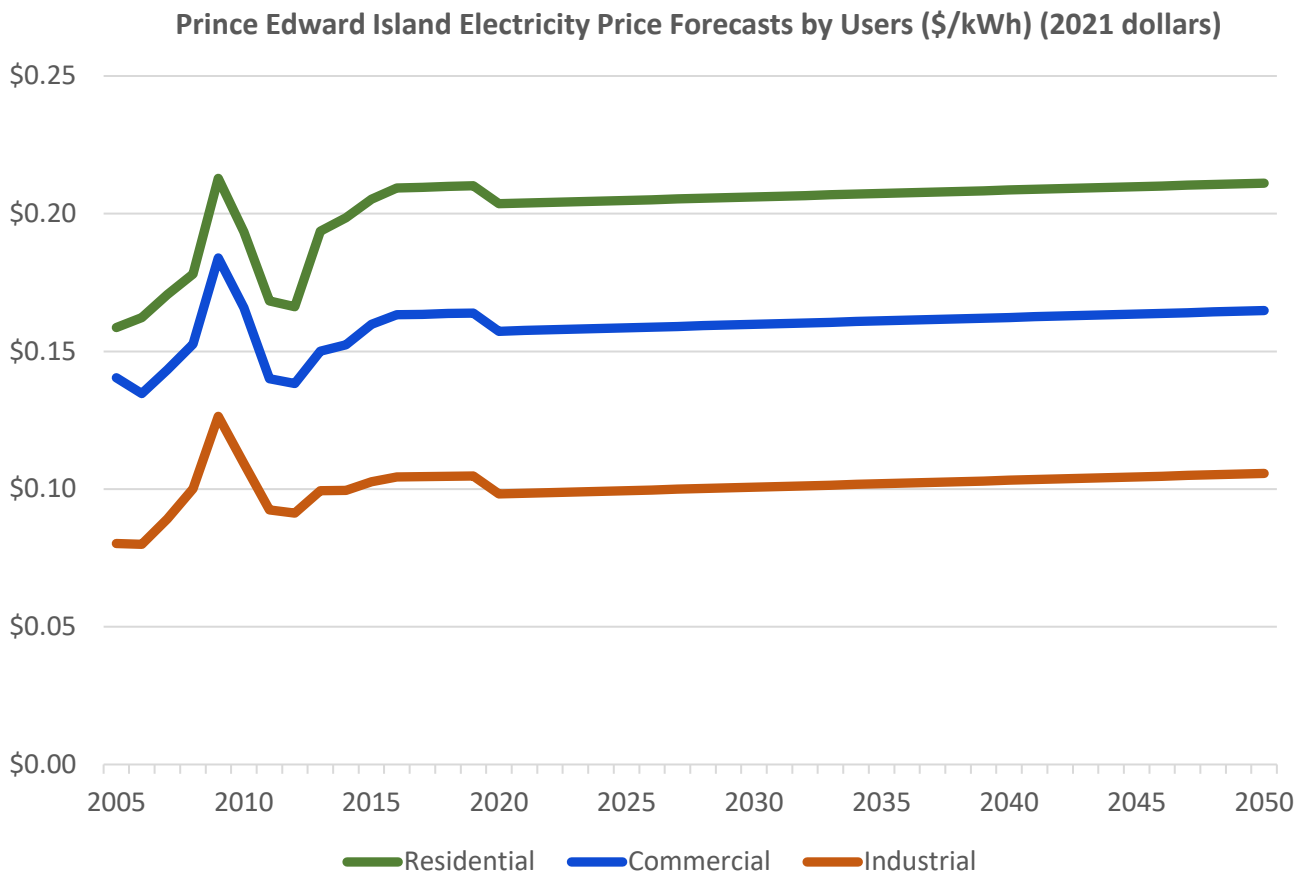
Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.5: New Brunswick forecasts



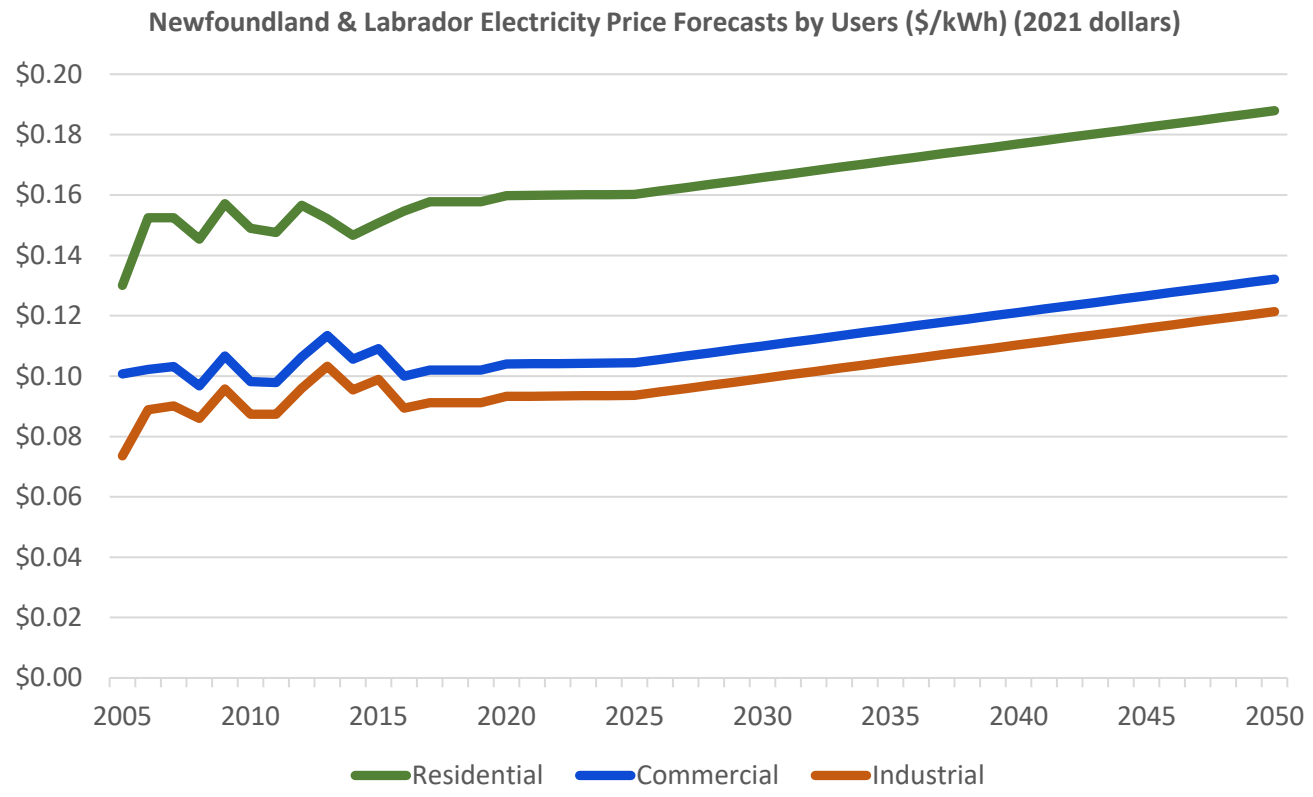
Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.6: Prince Edward Island forecasts



Source: Canada Energy Regulator, Canada's Energy Future 2021, Evolving Policies Scenario.

Appendix 1.7: Newfoundland and Labrador forecasts



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This discussion paper was produced by the Atlantica Centre for Energy.

The Centre provides a unique forum for government, the education and research sectors, industry, and the community at large to foster partnerships and proactively engage in energy-related issues in Atlantic Canada. Energy education is an important priority.

More information about the Centre is available at www.atlanticaenergy.org.

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