


# Assessment of Incremental Utility Revenues for Northwest Territories

Prepared for: The Government of the Northwest Territories

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# 1. EXECUTIVE SUMMARY

Providing fuel-switching incentives through targeted rate design programs is common across North American utilities. The benefits are two-fold: fuel-switching can better utilize surplus capacity in off-peak hours and reduce emissions.

Similarly, targeted fuel-switching and other rate designs in the Northwest Territories (NWT) can provide incremental revenues and help reduce or mitigate rate increases going forward by increasing consumption, consequently offsetting the need for higher rates to account for flat or declining energy consumption in recent years. The NWT currently has surplus hydroelectric capacity in most months of the year – and in some locations year-round surpluses – that can be used to target fuel-switching investments that result in incremental consumption without incurring system-wide costs. The result is a reduction in overall rates for all consumers in the NWT, given the fixed cost nature of the grid. Updated rate design can also be used for economic development purposes by providing reduced charges or rates for businesses that invest in the NWT.

Fuel-switching also provides an environmental benefit for the NWT by utilizing emissions-free hydroelectric energy for space and water heating as opposed to propane or heating oil.

The incentive for fuel-switching can be implemented through a combination of rate design and utility-led on-bill financing for small and large-volume consumers. By utilizing rate design and on-bill financing, the need for government funding can be limited – although additional funds and government-financed grants can further increase adoption and subsequent revenues. NWT can also update its current interruptible rate on the Taltson Grid for space heating to make it more attractive for customers and increase adoption – and consider implementing a similar program on the Snare Grid.

Given various levels of adoption and rates offered to customers that pursue incremental load investments, the increased revenue could reach more than $1.2 million annually. This is incremental revenue that can used to offset rate increases for all customers.

| | Incremental Load (MWh) | Incremental Revenue |
|---|---|---|
| Low | 5,351 | $160,518 |
| High | 42,613 | $1,278,382 |

In order to achieve the incremental revenues, the Government of NWT (GNWT) should consider a range of rate design modifications to act as an incentive. Power Advisory offers five recommendations that specifically focus on new rate designs that can incent incremental load growth while limiting any additional costs to the grid:

***1) Implement a utility-led fuel switching program, focusing on rate design for space and water heating;***

***2) Provide on-bill financing for metering and grid investments;***

***3) Offer development rates and other incentives for industrial and commercial customers;***

***4) Consider changes to the interruptible rate to increase its adoption;***

***5) Provide discounted rates for electric vehicle owners.***

# 2. INTRODUCTION AND PURPOSE OF REPORT

Over the last decade, many jurisdictions across North America have experienced flat or declining demand for electricity, while the cost to serve customers has continued to grow. The combination of falling demand and growing, fixed utility-wide costs has resulted in many customer rate classes facing electricity price increases that have been greater than the rate of inflation.

The Northwest Territories (NWT) is no different. Over the last 10 to 20 years, electricity demand growth has, to a large extent, failed to materialize, particularly in the industrial sector, while the overall cost of maintaining the grid and serving existing customers has continued to grow. As such, customers have faced annual price increases to pay for the fixed costs of an electricity system that – notably in terms of installed hydroelectric generation capacity – is in most months of the year greater than the current demand requires. As discussed in the report, the South Slave hydroelectric grid ("Taltson grid") has surplus capacity and energy throughout the entire year. The North Slave hydroelectric grid ("Snare grid") has surplus capacity for the majority of the year, with a limited number of hours when diesel generators are dispatched.

In response to price increases, the NWT energy regulator, the Public Utilities Board (PUB), has increasingly mandated that the crown-owned Northwest Territories Power Corporation (NTPC) find operational and financial efficiencies to reduce system costs. While NTPC is not the only utility in the NWT, it is the largest and continues to own all of the installed hydroelectric facilities and a majority of the transmission assets.

Financial and operational efficiencies have mitigated a portion of price increases for customers. However, they are unlikely to fully offset the combination of falling demand and maintaining and servicing installed generating capacity. One option to address this situation is to focus on the demand side of the equation. Given the fixed costs that are incurred by growing customer load in hours when there is surplus capacity, NTPC and other utilities can lower the per unit cost of energy for all customers. Load growth programs have been employed by utilities for many decades as a means of increasing revenues and lowering the per unit cost of energy.

The Government of the Northwest Territories (GNWT) retained Power Advisory LLC ("Power Advisory") to provide recommendations on the potential for targeted rate design proposals that incent demand growth and, subsequently, revenue growth for electric utilities in the NWT, particularly NTPC. Power Advisory's review of potential revenue streams includes a jurisdictional scan of North American utilities to fully capture best practices and lessons learned. These programs are compared with the load growth policies currently in place in the NWT and inform additional rate designs programs that could be implemented based on the NWT's unique electricity grid and geography. As part of this assessment, Power Advisory reviewed factors that have limited the uptake of the interruptible power rate for heating in the NWT's Taltson grid and assessed the revenue potential for a similar interruptible electric heating rate in the Snare grid. While there are a number of remote communities served mostly by diesel generators in the NWT, Power Advisory has limited its assessment to the two aforementioned hydroelectric grids. Targeted load growth programs in these grids offer the most meaningful rate reductions and broader public benefits such as emissions reductions that will contribute to NWT's climate targets.

## 2.1 Organization of Report

This report is organized around seven chapters. The first and second chapters introduce the purpose and scope of the report. Chapter 3 consists of an overview of the NWT electricity grid including the hydroelectric systems' load and generation profiles, recent grid studies and policy recommendations, and identifies the existing load growth programs to provide appropriate context. Chapter 4 is a summary of the North American jurisdictional scan of load growth programs, focusing on comparable utilities to the degree possible. Chapter 5 discusses the various rate incentives that should be considered and a high-level overview of their financial impact. Chapter 6 provides a review of the current interruptible rate on the Taltson grid and potential changes that should be considered to increase its adoption. This chapter also provides recommendations related to an interruptible rate on the Snare Gird. Chapter 7

provides recommendations for an Electric Vehicle rate. Appendix A provides the detailed jurisdictional scans in table format. Appendix A and B are jurisdictional scans focused on interruptible and heating rates as an area of interest for the NWT.

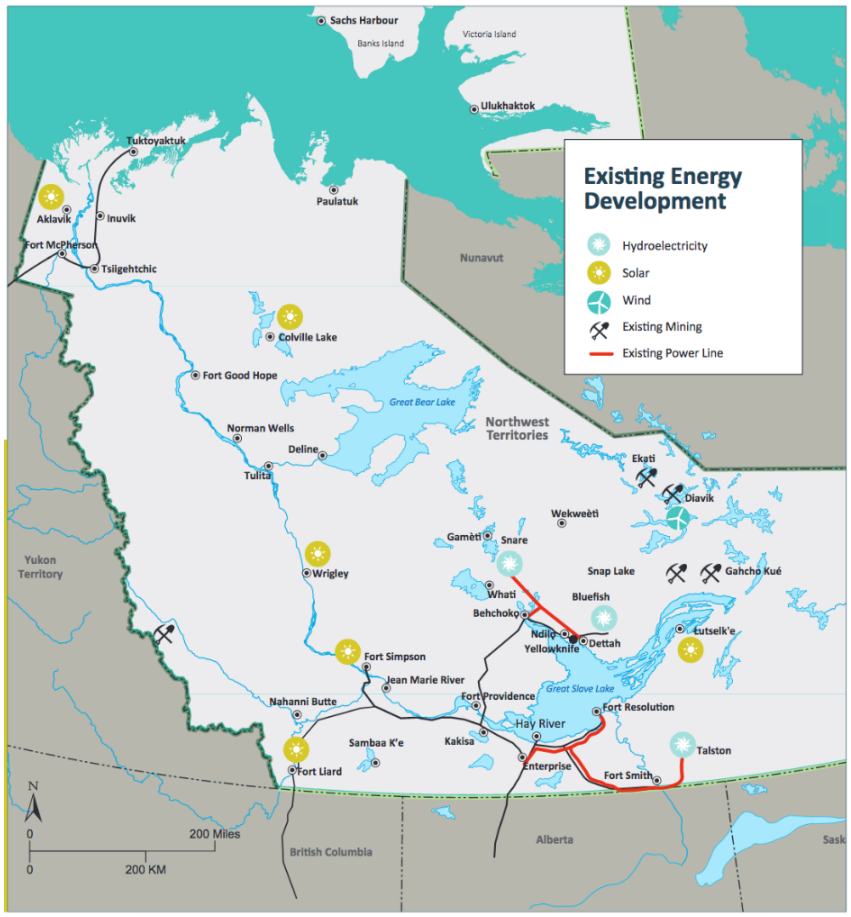
# 3. OVERVIEW OF NWT ELECTRICITY GRID AND ASSESSMENT CONTEXT

The NWT grid has a number of characteristics that, in many ways, make it unique compared to most electricity grids across North America. Most notably, it has a small population spread over a large geographic area, with extreme temperatures and several "islanded" grids served by hydroelectric and diesel generators.

## 3.1 High-level Overview of NWT Grid

The NWT electricity system is comprised mainly of two separate regional transmission networks (indicated as red lines in following map) that together supply approximately 75% of NWT's load with the remaining 25% being served by 20 independent and isolated systems spread throughout the NWT. The two regional systems are known as the Snare grid located North of Great Slave Lake and the Taltson grid located South of Great Slave Lake. These two grids are connected to NWT's largest sources of electricity generation, being the three hydroelectric facilities: Snare (28 MW) and Bluefin/Yellowknife River (8 MW ) in the North and Taltson (18 MW) in the South.

**Figure 1: Map of Northwest Territories Electricity Grid**




Source: Government of Northwest Territories, "Energy Strategy: A Path to More Affordable, Secure and Sustainable Energy in the Northwest Territories," May 2018, p. 36.

All hydroelectric facilities – along with two regional transmission networks – are owned and operated by the Northwest Territories Power Corporation (NTPC), which is a crown corporation of the Government of the Northwest Territories (GNWT) that is regulated by the PUB. NTPC also owns and operates 5.6 MW of natural gas-fired

generation supplying Inuvik, and 65 MW of diesel-fired generation. Originally, the Inuvik facility was supplied with natural gas from the nearby Ikhil gas field, but since 2013 has shifted to Liquified Natural Gas (LNG) imports delivered by truck from Alberta and British Columbia.

As the largest electric utility in NWT, NTPC also owns and operates 565 km of transmission lines and 375 km of distribution lines to supply end-use customers throughout 26 of 33 communities in the NWT. Northland Utilities Ltd. (NUL), a joint partnership between ATCO and a consortium of 27 First Nations of NWT represented by Denendeh Investments Inc. is the second largest electric utility operating in NWT. NUL generates and distributes electricity to customers in Yellowknife and 5 other communities, including Hay River. NUL owns and operates 8 MW of diesel generation and purchases energy from NTPC to supply its customers. Imperial Oil also produces and sells energy from its 15 MW natural gas-fired facilities in Norman Wells, a petroleum and natural gas production area.

NWT has a small amount of wind generation, with 9 MW of wind turbines owned and operated by, and supplying the Diavik Diamond Mine since 2013. A number of mines have generators on site – typically diesel or gas generation. Lastly, there is a negligible amount of solar PV supplying less than 1% of NWT, which is mostly scattered throughout remote communities and used to offset some of the diesel generation for which these communities would otherwise be 100% dependent on and consequently alleviating some of the high costs that come from diesel generation. The GNWT, in its *2030 Energy Strategy*, has indicated interest in the further buildout of wind and solar energy to further offset diesel generation.[1]

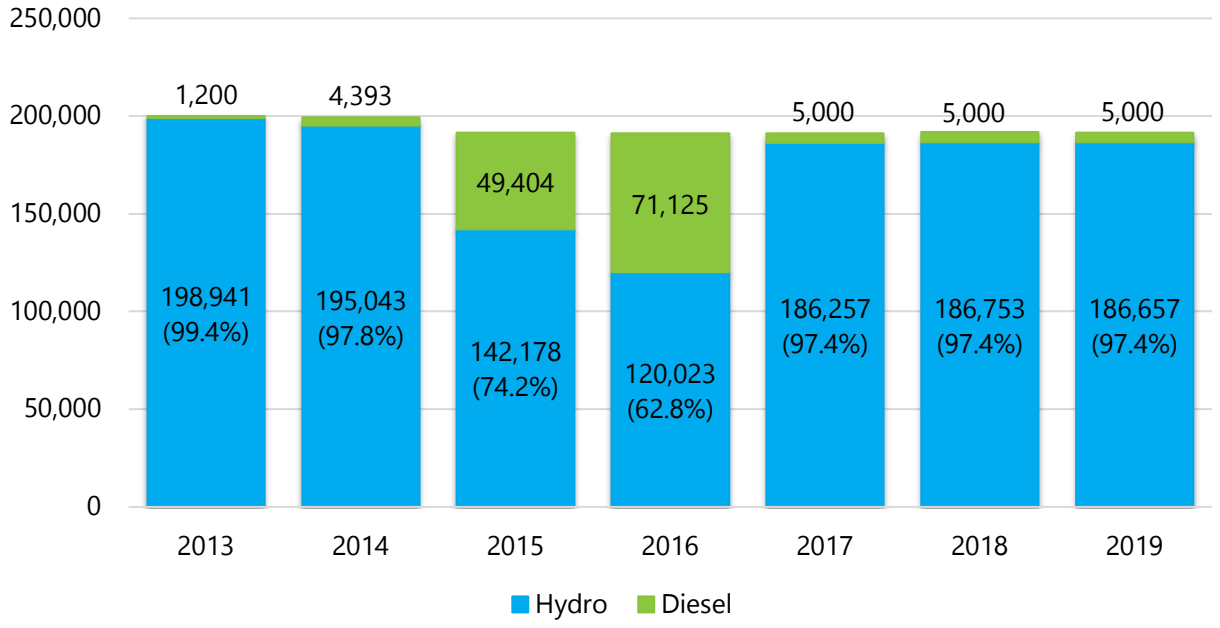
### 3.1.1 *Hydroelectric Generators Remain the Dominant Resource in NWT*

Under normal supply conditions, hydroelectric generation supplies about 75% of NWT's community energy needs followed by diesel and natural gas-fired generation. The Snare and Taltson grids' energy consumption is almost wholly served by hydroelectric output. As with all hydroelectric systems, the output of facilities is limited by annual water levels and seasonal variations. In the Snare grid, annual hydroelectric output has averaged 186 GWh (or 186,000 MWh) over the 2017-2019 time period.[2] Other fuel types – predominantly diesel generators – provide the remaining share of generation in NWT. As discussed, the remote, "islanded" grids across the territory are primarily served by diesel generation. The "islanded" grids are excluded from the scope of this study.

[1] Government of Northwest Territories, "2030 Energy Strategy: A Path to More Affordable, Secure and Sustainable Energy in the Northwest Territories," May 2018 https://www.inf.gov.nt.ca/sites/inf/files/resources/gnwt_inf_7272_energy_strategy_web-eng.pdf.

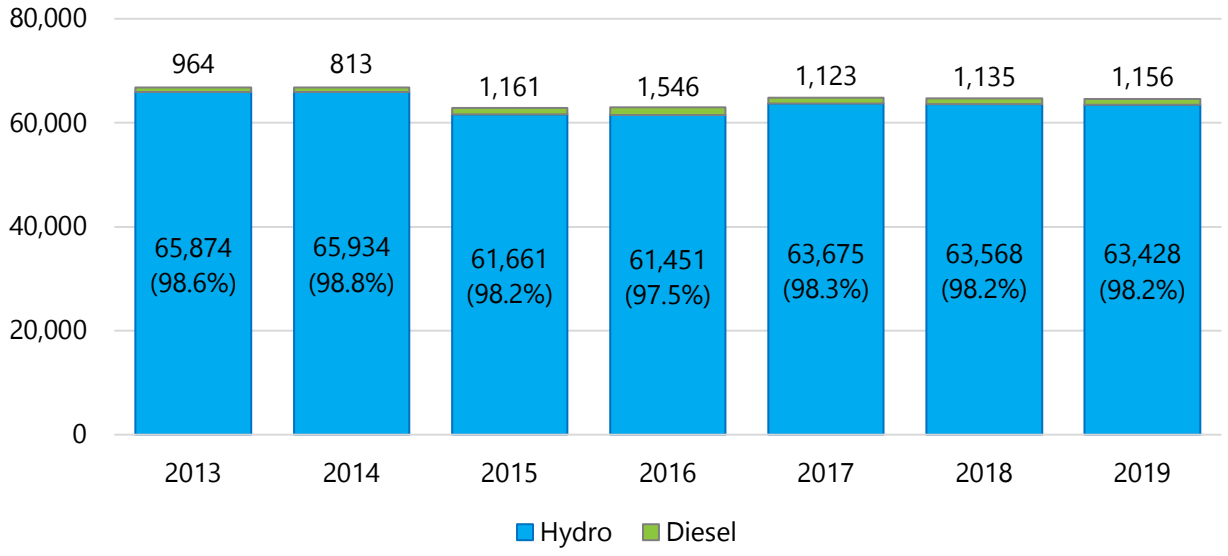
[2] Note that Power Advisory did not have access to detailed output data and relied on figures from NTPC's most recent rate filing to the PUB.

**Figure 2: Snare Grid Output by Fuel Type (MWh)[3]**




In the Taltson grid, demand is almost exclusively served by output from the 18 MW Taltson hydroelectric dam.

**Figure 3: Taltson Grid Output by Resource Type (MWh)**

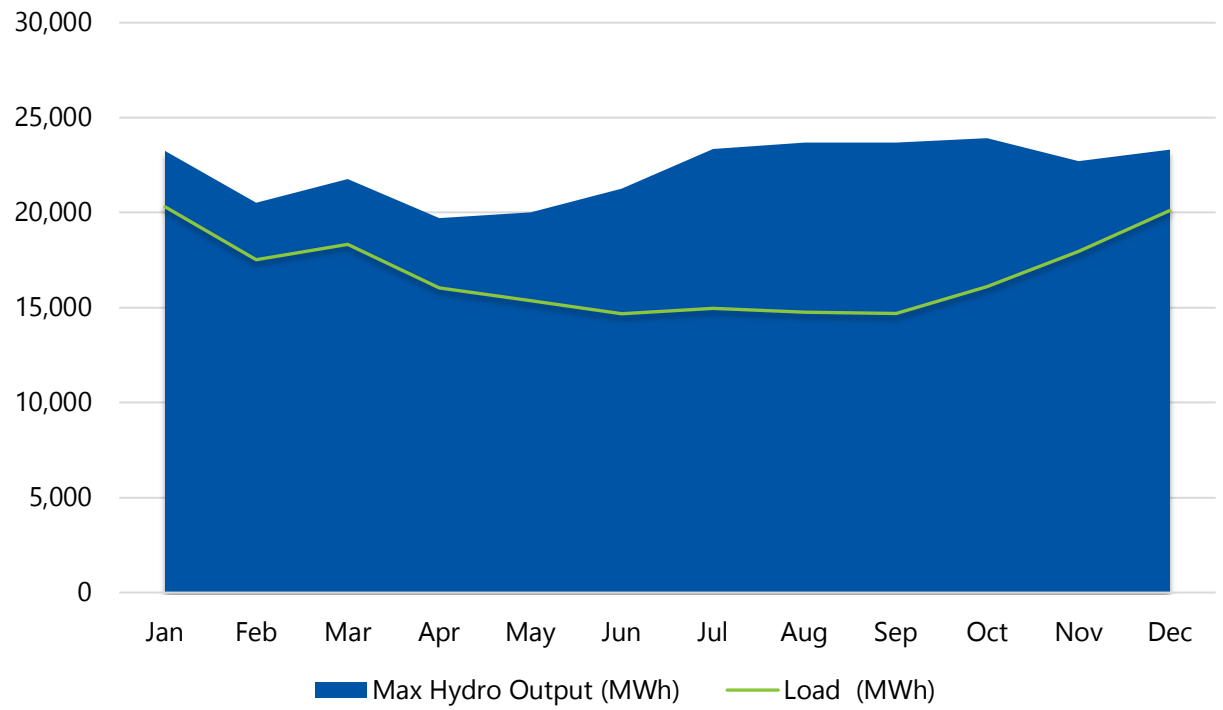



Both the Snare and Taltson grids continue to have significant surplus capacity in most months of the year and NWT remains a winter-peaking jurisdiction. Output from the NWT's hydroelectric assets is fairly stable throughout the

[3] Power Advisory was not provided with detailed historical output figures for the 2017-2019 time period. As such, the figures included in this chart are from NTPC's most recent General Rate Application.

year, with limited months and hours when demand is expected to meet or exceed potential hydroelectric capacity. Given current demand/supply conditions, diesel generators in both the Snare and Taltson grids provide backup for planned and forced outages or extreme weather conditions.

**Figure 4: Snare Grid Potential Hydroelectric Output Typical Year (Monthly, MWh)[4]**



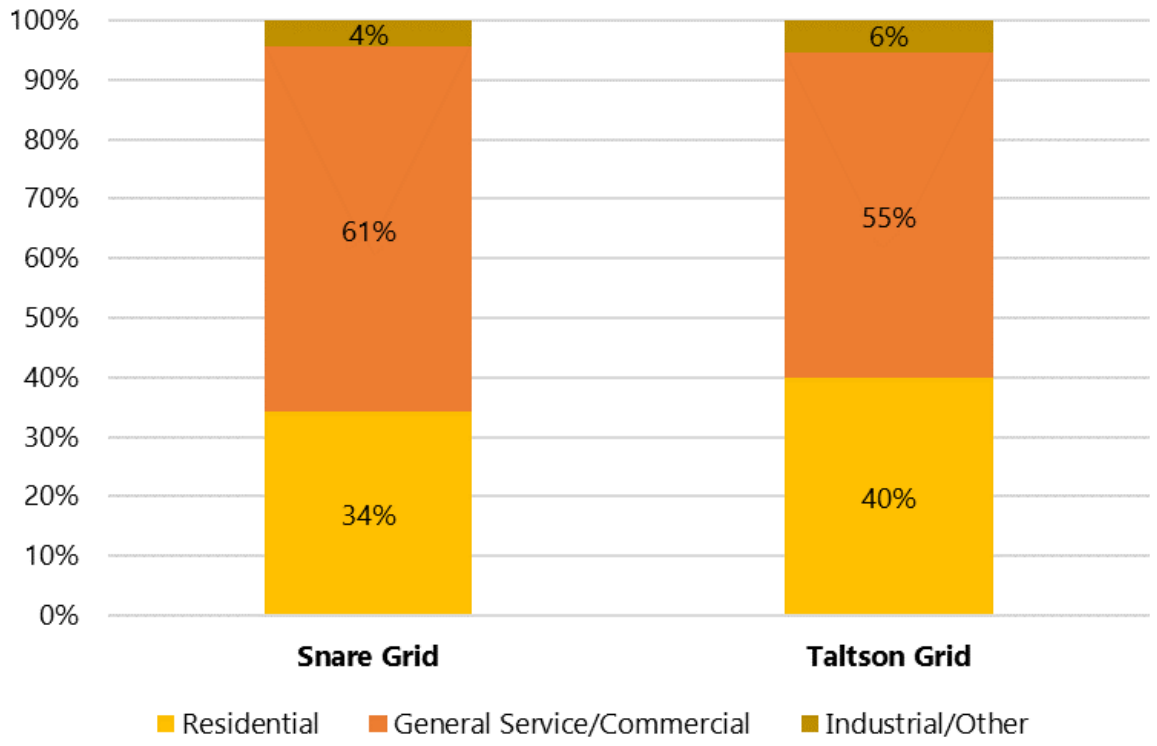

The Taltson grid has a higher percentage of available hydroelectric output compared to actual demand and is largely able to run at full output most hours of the year – although prevailing water conditions may impair its output. Taltson's capacity surplus is largely a result of the closure of a mining facility (Pine Point) whose demand has not been replaced by new large industrial or commercial load. As is discussed in other parts of this report, when demand is lower – as a result of reduced industrial activity, for example – while the overall cost of the system remains the same, the cost per unit to ratepayers increases.

### 3.1.2 *NWT Has Minimal Grid-Connected Industrial Load*

NWT has a minimal amount of large-scale, grid-connected industrial load in both the Snare and Taltson hydroelectric grids. The Taltson hydro grid currently has no large-scale industrial load customers.

[4] Power Advisory was not provided detailed, historical output or hydrological data. The hydroelectric data included in this graph comes from the North Slave Resiliency Study. All river systems differ in flows and capacity – both of which will impact maximum capacity. These figures are provided for reference only and could change depending on weather conditions (i.e., low and high water years).

**Figure 5: Snare and Taltson Hydro Grid Load Percentage by Rate Class**




### 3.1.3 *NWT Electricity Costs Compared to Other North American Jurisdictions*

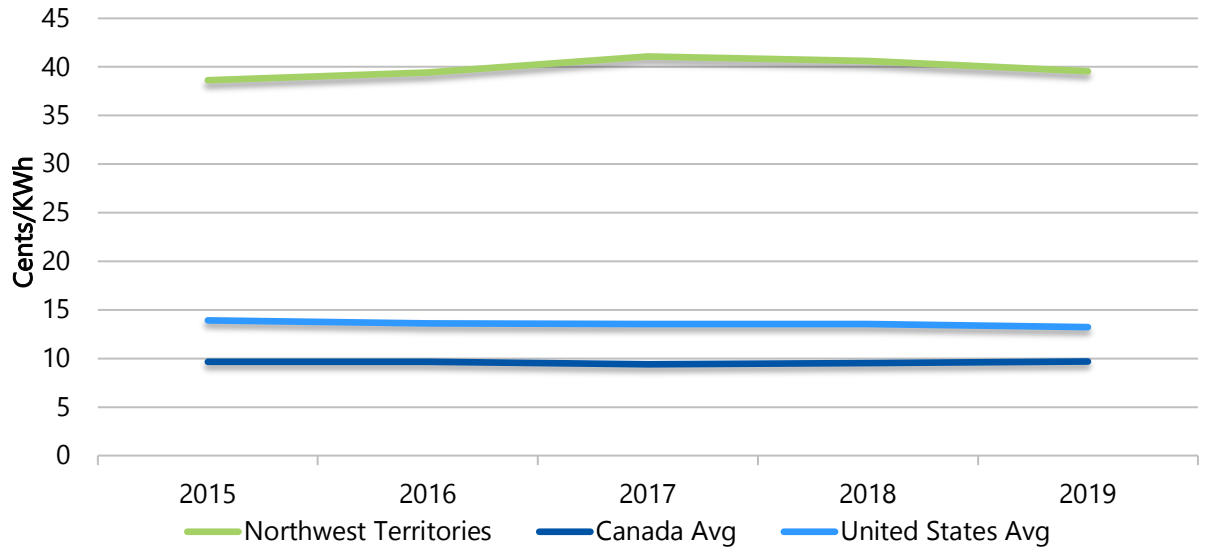
NWT continues to have some of the highest electricity rates in Canada. NWT electricity rates are also significantly higher than those in the vast majority of the United States. The reasons for high rates is largely a function of high system costs as a result of its extreme geography and low customer density.

The lack of interconnections between the Snare and Taltson systems – along with the many "islanded" communities – reduces opportunities for economies of scale, while resulting in a large amount of redundancy across NWT.[5] Additionally, both the system assets and personnel are exposed to extreme climate and harsh weather conditions, contributing to higher operation and maintenance (O&M) costs for its hydroelectric and thermal generating resources.[6]

[5] There are currently proposals to connect the Snare and Taltson hydroelectric grids, which would increase the overall efficiency of the grid. Power Advisory has not reviewed the cost/benefit analysis of that proposal.

[6] For comparison, Hydro One, which delivers energy to a majority of the Ontario's most remote customers, has some of the highest charges for its rural and remote rate class. Ontario currently offers rural customers a discount in delivery charges through its Rural and Remote Rate Protection (RRRP).

**Figure 6: Electricity Rates in NWT Compared to Canada and United States Averages[7]**




In order to provide rate relief, the NWT Government provides two main subsidies to customers living in the thermal zones, covering a portion of electricity costs to make them more affordable.[8] The Territorial Power Subsidy Program (TPSP) is applied to all residential customers outside of Yellowknife and subsidizes the cost to those customers to those for Yellowknife customers for the first 1000 kWh consumed in the winter and 700kWh in the summer. Meanwhile, the GNWT Rate Equalization Program applies to NUL's non-governmental residential and commercial customers, which equalizes the energy charges to NTPC's thermal zones.[9]

NWT households and businesses consume less *electricity* than nearly every other province, with consumption per capita in 2017 being the second lowest in Canada and nearly 50% below the national average. Electricity for home heating is limited in NWT, with most homes and businesses relying on fuel oil, propane and wood (biomass) or some combination of the three.[10] One reason for the low electricity consumption is the low level of electric spacing heating and air conditioning. For space heating, electricity must be cost competitive with fuel oil and other heating sources, which has typically not been the case. The current Taltson interruptible heating rate is specifically designed to be a discount to fuel oil, but there has been little uptake in the program. For example, the current rate of fuel oil in

[7] The figures come from the EIA and the Canadian Centre for Energy Information. The figure for NWT is an average electricity rate including both the thermal and hydroelectric communities. The weighted average rate for the hydro communities is around 20 cents per KWh.

[8] See the PUB approved rate schedule that details the equalization energy rates:

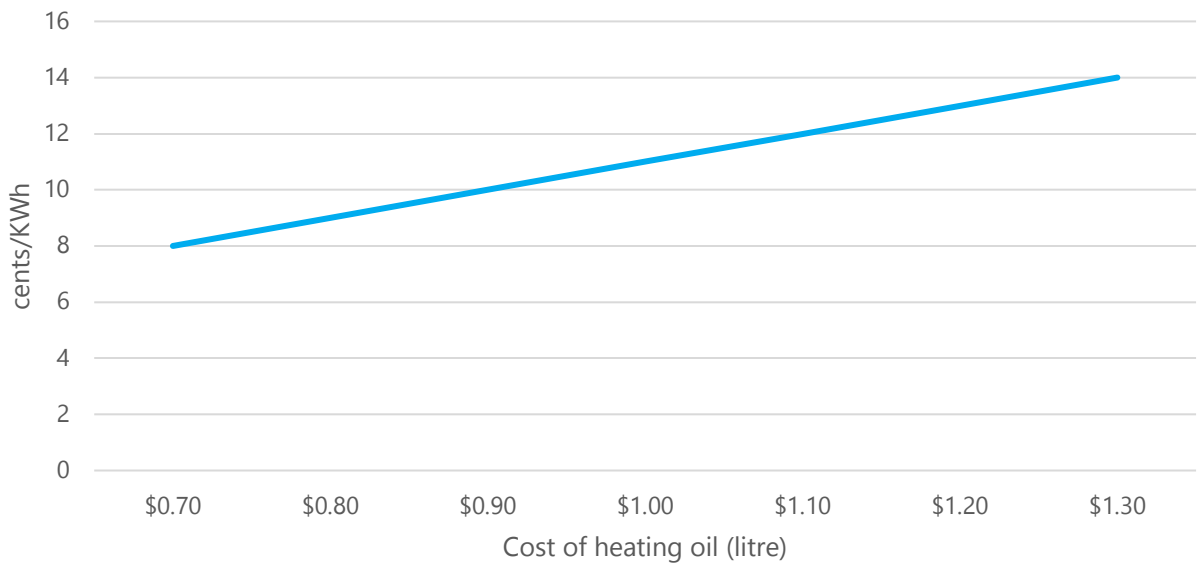
Northland Utilities (NWT) Limited, "Rate Schedules," Effective 2016-07-01
https://www.nwtpublicutilitiesboard.ca/sites/default/files/attachments/Northland%20%28NWT%29%20Rate%20Schedules%20effective%20July%201%2C%202016.pdf

[9] Government of Northwest Territories, "Energy Prices and Costs in the NWT," May 2016
https://www.inf.gov.nt.ca/sites/inf/files/resources/energy_prices_and_costs_in_the_nwt.pdf

[10] A number of communities in the NWT are not connected to the Snare and Taltson hydroelectric grids. These communities are serviced by high marginal cost diesel generators.

Yellowknife (January 2021) is nearly $1.00 per liter, which converted to the cost of electricity heating is around 11 cents per kwh (see figure below).

**Figure 7 Cost Heating Oil in KWh[11]**




## 3.2 Recent Studies and Policy Recommendations for NWT Electricity Sector

The GNWT has conducted and commissioned several studies over the past decade to gain a better understanding of the economic drivers of system costs and identify possible remedies – political or regulatory – that could be pursued to alleviate these high costs while meeting broader policy objectives (e.g., GHG reductions). A scan of the GNWT's policies over the last decade reveal consistent areas where cost reductions were sought:

- Rate restructuring to move towards sharing costs equally across the territories as a whole (essentially inter rate class subsidies)
- Government subsidies to equalize costs across the territories
- Displacing diesel generation by (a) end-use fuel switching and (b) energy efficiency and conservation programs
- Reducing costs associated with utility regulation and industry structure

Below is a high-level overview of recent reports:

- In 2009, a dedicated team appointed by the GNWT conducted an Electricity Review and presented its recommendations to Cabinet in a report titled *Creating a Brighter Future: A Review of Electricity Regulation, Rates and Subsidy Programs in the Northwest Territories.* Cabinet in turn published its response in 2010 in a document titled *Efficient, Affordable and Equitable: Creating a Brighter Future for the Northwest Territories' Electricity System.* The most significant recommendations made in the Electricity Review were restructuring

[11] Based on a boiler with 85% efficiency.

rates throughout the thermal and hydroelectric zones and reviewing the accessibility and application of government subsidies.

- In 2011, the Ministerial Energy Coordinating Council (MECC) published its *NWT Energy Report* to provide an overview and summary of energy programs, projects and initiatives undertaken pursuant to the GNWT's *Energy Plan* (2007) and accompanying *Energy Priorities Framework* (2008). The report effectively took a two-pronged approach to addressing system cost: displacing diesel generation through the expansion of renewable resources (e.g., hydro, biomass, wind, solar) thereby reducing the need to import expensive diesel fuel and pursuing energy efficiency and conservation programs.[12]

- Similar to the Electricity Review mentioned above, in 2012 a due diligence study into the cost pressures facing NTPC was commissioned by the GNWT and published by Ostergaard Consulting Group. In its report titled *A Review of Cost Pressures Facing the Northwest Territories Power Corporation,* many recommendations were made that aimed at NTPC's corporate structure, capital structure, return on equity, and other financial restructuring initiatives. However, the report also recognized the opportunity to increase revenues by explicitly targeting the sale of surplus hydroelectric capacity of the Snare and Taltson systems. Noting the existing Taltson interruptible rate offered to government customers, the report supported expanding the program and implementing a similar one on the Snare system.

- Taking cue from the results of the Electricity Review and the GNWT's response, and the Ostergaard report, Davis LLP published in 2013 its report titled *A Review of the Policy Basis for the Public Utilities Act of the Northwest Territories,* focusing on how to improve NWT's regulatory framework for the electric industry.

- In 2018, the GNWT published its *2030 Energy Strategy,* which articulated six strategic objectives. The most pertinent objective related to cost reductions is to increase the share of renewable energy used for space heating to 40% (objective #4). However, given that the vast majority of space heating in NWT is non-electric, increasing the share of renewable energy means shifting from fossil fuels such as heating oil and propane to wood pellets (i.e., biomass). Electric heating is limited in NWT, with most electric heating load situated in the hydro zones, where only about 3% of all heating is supplied by hydroelectricity.

### 3.2.1 *Recent Rate Applications by NTPC and NUL*

NTPC's latest general rate application (GRA) highlights the utility's increasing cost structure (e.g., rate increases averaging 4% every year for 2016-2019). Indeed, NTPC has taken a number of drastic cost cutting measures, including lowering its rate of return on equity and replacing its corporate board of directors with deputy ministers in an effort to make the requested rate increases more palatable.

The main drivers of the cost increases are related to two issues. First, NTPC's load has stagnated or even declined since 2013-2014, with sales for 2016-2017 forecasted at the time of filing to be 14 GWh lower than forecasted in the previous GRA (2012-2014), which is further exacerbated by inflation and little to no economic or population growth. Second, the cost of providing service is increasing due to aging infrastructure, increased asset management, and preventative maintenance. In many cases the generating assets are decades old and require significant upgrades.

[12] Although the original language of the MECC report distinguished between conventional (e.g., hydro, natural gas) and alternative (e.g., solar, wind, biomass, geothermal) energy, this report uses the term renewable energy to better reflect current thinking, which excludes natural gas.

## 3.3 Existing NWT Load Growth Programs

NWT already has a number of policies in place to support incremental load growth, which are reviewed below.

- Heat Incentive Program - Funded by the governments of NWT and Canada and administered by the Arctic Energy Alliance (AEA), the South Slave Electric Heat Incentive Program provides a financial contribution towards investments in electric heating systems to displace fossil fuel-based systems. This program is exclusive to the South Slave communities situated on the Taltson hydroelectric system and specifically applies to the prescribed customer types of non-profit organizations, businesses, and indigenous and non-indigenous governments. The funding is capped at 50% of project cost or $50,000 per organization.

- Reduced Electric Heat Rate - Similarly, South Slave customers of either NTPC or NUL connected to the Taltson system can access a discounted rate for interruptible service on the condition that it is incremental to existing consumption for the exclusive purposes of space or process heating. This rate is available exclusively to general service and industrial customer classes and is contingent on the availability of surplus hydroelectric generating capacity. Customers must also meet other conditions including separate metering of the interruptible service, new/incremental load with sufficient surplus distribution system capacity, and the availability of a viable alternative fuel source in the event of indefinite service interruptions. The interruptible heating rate offers discounted pricing, which fluctuates based on the weighted price of heating oil (e.g., amount of heating oil versus amount of electricity required to generate the same amount of heat).

- Electric Vehicle Incentive Program - Also administered by the AEA, the electric vehicle incentive provides rebates towards reducing the cost of purchasing and using an EV in the NWT. The Program is available to residents, businesses, indigenous and non-indigenous governments, and non-profit organizations so long as they are connected to a hydroelectric system. Rebates can be redeemed towards the purchase of new battery or plug-in hybrid electric vehicles (up to $5,000) and Level 2 charging infrastructure ($500).

# 4. LOAD GROWTH PROGRAMS ACROSS NORTH AMERICA

Power Advisory completed a jurisdictional scan of load growth programs offered by utilities across Canada and the United States to help identify incremental utility revenue opportunities for the NWT. About 25 utilities across the two countries were selected to be surveyed, including both private and publicly owned electric utilities of various sizes as determined by number of customers, capacity and load. Other potentially shared characteristics with the Northwest Territories such as climate, geography, scope of utility business, demographics, generation mix, and system isolation were also considered. The scans and key findings are reviewed at a high-level in this chapter.

## 4.1 Load Growth Programs Definition

For the purposes of this report "incremental utility revenue streams" is defined to mean electric utility programs to increase electricity consumption. Incremental utility revenues are synonymously referred to as load growth programs.

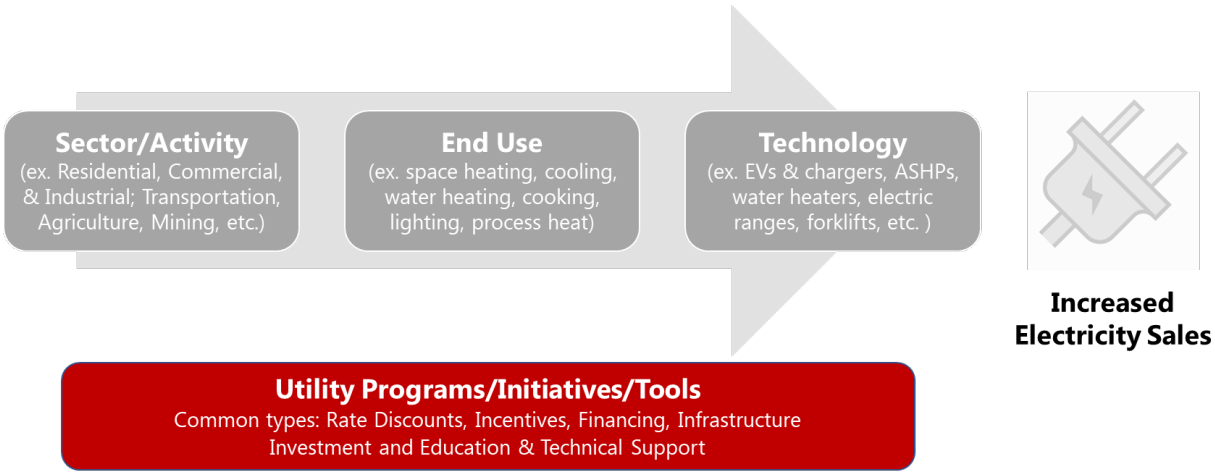
The intent of the GNWT in commissioning this report is not to increase electricity consumption without regard to system costs, operational constraints and emissions. It is important for the public interest where, what level, and when (seasonal, monthly and diurnally) the incremental electricity demand is added to the grid, particularly in the capacity-constrained Snare grid. In addition, programs that upgrade existing electricity end uses to more efficient technologies would have a net effect of reducing sales so "fuel switching" – replacing thermal-based heating, for example, with electric space heating – is key. The other energy uses which could be displaced include direct fossil fuel use such as propane, heating oil as well as biomass – reducing the territory GHG emissions as well as providing an additional revenue to lower per unit costs.

Another common type of load growth program is economic development, which focuses on the attraction and expansion of economic activity for broader public policy objectives. Economic development programs can be consistent with beneficial electrification, but are typically distinct. For this reason, "load growth" is used for the rest of the report to encompass both beneficial electrification and economic development programs.

The following figure illustrates how load growth programs can be designed for different sectors, end uses and technologies. In the case of a broad economic development program, a discounted rate for all electricity consumption may be offered for a pre-defined period, such as 5-years or longer, to businesses that newly locate or significantly expand operations. Such rates can be offered to all economic activities or specific sectors.

Electrification programs can be much broader – ranging from programs focused solely on a single space heating technology in government buildings to broad rebates or other incentives for all customer types and multiple end uses and technologies. The many permutations of load growth programs are apparent in the detailed jurisdictional scans.

**Figure 8: Conceptual Framing of Load Growth Programs**

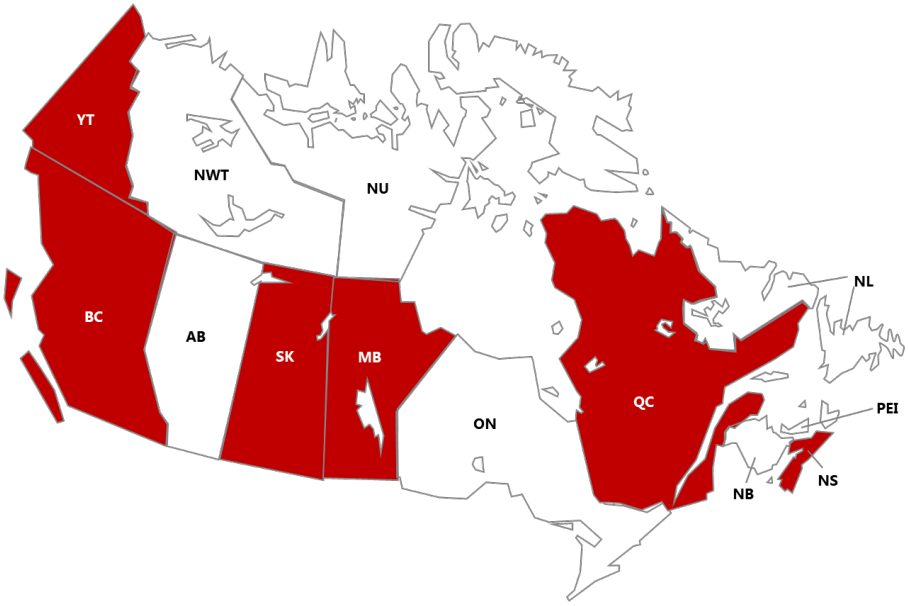



Source: Power Advisory

## 4.2 Canada Jurisdictional Scan[13]

Power Advisory reviewed six jurisdictions in Canada. Alberta and Ontario were not considered due to different market structure (i.e., a competitive wholesale market compared to a vertical utility structure). Yukon shares the most characteristics with NWT of the jurisdictions reviewed, although rural communities a number of provinces may be comparable.

**Figure 9: Canadian Jurisdictions Reviewed**




| Utilities with Applicable Load Growth Programs |
|---|
| BC Hydro (Crown Corp) |
| SaskPower (Crown Corp) |
| Manitoba Hydro (Crown Corp) |
| Hydro-Québec (Crown Corp) |
| Nova Scotia Power, Inc. (Privately Owned by Emera) |
| Yukon Energy Corporation (Crown Corp) |

[13] The jurisdictional scans can be found in the Appendix.

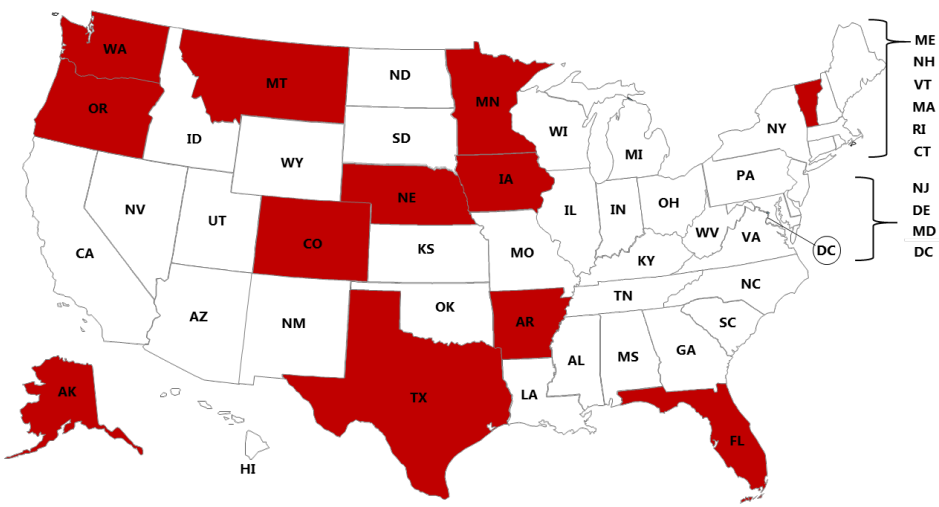
Electricity generation and distribution in these Canadian jurisdictions is mostly undertaken by crown corporations. Incentives for government-owned utilities may be different than private utilities in the United States and Canada – including broader environmental and socio-economic policies, for example.

Some of these utilities operate in some similar geographic settings as NWT, although they generally have milder climates, often include much denser urban environments, and are interconnected with neighbouring jurisdictions. The six jurisdictions selected had the most directly relevant initiatives and available information to inform potential load growth programs in NWT.

## 4.3 United States Jurisdictional Scan

The US jurisdictional scan focused on small, mostly public utilities along with select larger utilities that have leading electrification programs. A total of 15 utilities were selected for detailed survey. As noted at the bottom of Figure 13, another 6 jurisdictions were scanned solely for economic development programs.

**Figure 10: US Jurisdictions Reviewed**




**US Utilities with Applicable Programs Scanned**

- Alaska Electric Light and Power Company (AK)
- Chugach Electric Association Inc. (AK)
- Tacoma Power (WA)
- Orcas Power & Light Cooperative (WA)
- Columbia River People's Utility District (OR)
- Consumers Power (OR)
- Flathead Electric Cooperative (MT)
- Mountain Parks Electric (CO)
- Nebraska Public Power District (NE)
- Cedar Falls Utilities (IA)
- Midland Power Cooperative (IA)
- Jacksonville Electric Authority (FL)
- Burlington Electric Department (VT)
- CenterPoint Energy (*Various - program in TX)
- Entergy (*Various - program in AR)

Additional economic development programs are reviewed in Indiana, Michigan, Minnesota, New York and Pennsylvania (these are not illustrated or listed above).

The selected utilities have annual electricity demands from about 200 to 5,000 GWh. A wide geographic range of utilities were considered to capture the range of programs that could be adapted to NWT. To further align with NWT, many utilities surveyed serve predominantly rural customers. Despite these screening criteria, there are a limited number of US jurisdictions that are directly comparable to the NWT.

## 4.4 Load Growth Programs Identified

As discussed above in Section 3.1, the jurisdictional scans focused on beneficial electrification and other load growth programs that target increased electricity consumption. The most common programs in the North American jurisdictions reviewed can be categorized as one or more of the following: 1) rate discounts, 2) incentives, 3) financing, 4) infrastructure investment, and 5) utility-led education and technical support.

### 4.4.1 *Rate Discounts*

Rate discounts are straightforward – seeking to incent load growth with reduced electricity rates. Discounted rates can be tied to low marginal cost production, particularly from hydroelectric resources. BC Hydro, for example, offers a freshet rate providing a discount to customers during times of peak demand. New York Power Authority (NYPA) offers a similar block of low-cost hydroelectric power to large customers. Economic development rates can be offered to new or existing customers to increase load.

Rates can be set based on some threshold of investment or increased employment (net increase in new jobs, for example). These incentives can be offered as a reduced demand charge, lower energy rates or some combination of the two. A reduced demand charge is common in utilities across the United States. Some utilities may also offer lower rates based on the installation of an electric powered technology (i.e., heat pumps, EV chargers or electric hot water heaters).

Rate discounts may require Advanced Metering Infrastructure (AMI) investment or at least separate metering.

### 4.4.2 *Incentives*

Many utilities offer financial incentives in the form of rebates, tax credits or grants for customers to purchase load-increasing equipment such as electric water heaters, heat pumps, and EVs and chargers.[14] The incentives can be catered to different rate classes, end-uses and technologies. They may also be used to reduce associated costs such as behind-the-meter electrical work or metering and infrastructure upgrades.[15]

In most cases, the utility actively promotes and educates customers on the incentive programs to encourage participation. Utilities may also provide expertise on cost, economics, utilization, and installation. Incentives may also be combined with rate discounts.

### 4.4.3 *Financing*

Low-to-no cost financing can be provided to induce customers to invest in fuel-switching or load growth technologies. Financing is similar in concept to incentives but can help make the private costs more attainable for the average customer and reduce free-ridership. In other words, where an incentive may reduce the upfront cost it may not be enough to allow adoption – financing programs may be able to bridge that gap.

Some programs are administered and financed within the utility, while others are a partnership with local financial institutions. Like the other program types identified, financing is largely focused on EV chargers, electric hot water heaters and heat pumps. Programs may also target large users to invest in large, energy-intensive duty equipment (ex. forklifts, loaders, truck refrigeration units or cranes).

It is typical for financing to be applied as on-bill charge spread over a relatively long period of time. This is known as on-bill financing (OBF). Other forms of financing for electrification projects include commercial property-assessed clean energy (CPACE) programs, which allow borrowers to make repayments via an assessment on their property tax bill.

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[14] Utilities cannot directly offer tax credits, but can offer programs that rely or target tax incentives currently in place.

[15] An example of an installation incentive would be a separate rebate for EV charger wiring in NWT available in combination with the Arctic Energy Alliance administered $500 rebate for a Level 2 charger and $5,000 for new EVs.

### 4.4.4 *Infrastructure Investment*

As opposed to customers being encouraged through rate discounts, incentives or financing to invest in electric equipment, utilities themselves may invest in electricity infrastructure that enables increased customer consumption of electricity. The most common example of such utility investment is in public EV charging stations. In several jurisdictions, electric utilities own EV chargers.

Utilities can also own devices such as heat pumps and water heaters that could be installed at limited cost to customers or rented. Any such programs would likely be centered on grid flexibility versus a general goal of load growth to be justified.

### 4.4.5 *Utility-led Education and Technical Support*

In nearly every utility surveyed, marketing and technical assistance were key components of load growth programs. Marketing is required in most cases to ensure that customers are aware of the technologies available to them, as well as the programs in the jurisdiction. Marketing materials can provide information such as illustrations of the favourable economics of particular investments; highlighting advancements in technologies such as heat pumps and EVs; or broadly encourage the use of electricity. Education and engagement of customers is generally found to be critical for electric technology adoption and the efficacy of the other load growth programs identified.

Medium to large customers may be more focused on pursuing energy-related investments. Nonetheless, technical assistance from the utility can increase the likelihood that they undertake such investments. In some jurisdictions, particularly with large, vertically integrated utilities, the utility may offer more extensive technical consulting services to assist in electrification and/or economic development (i.e., locating in the service area).

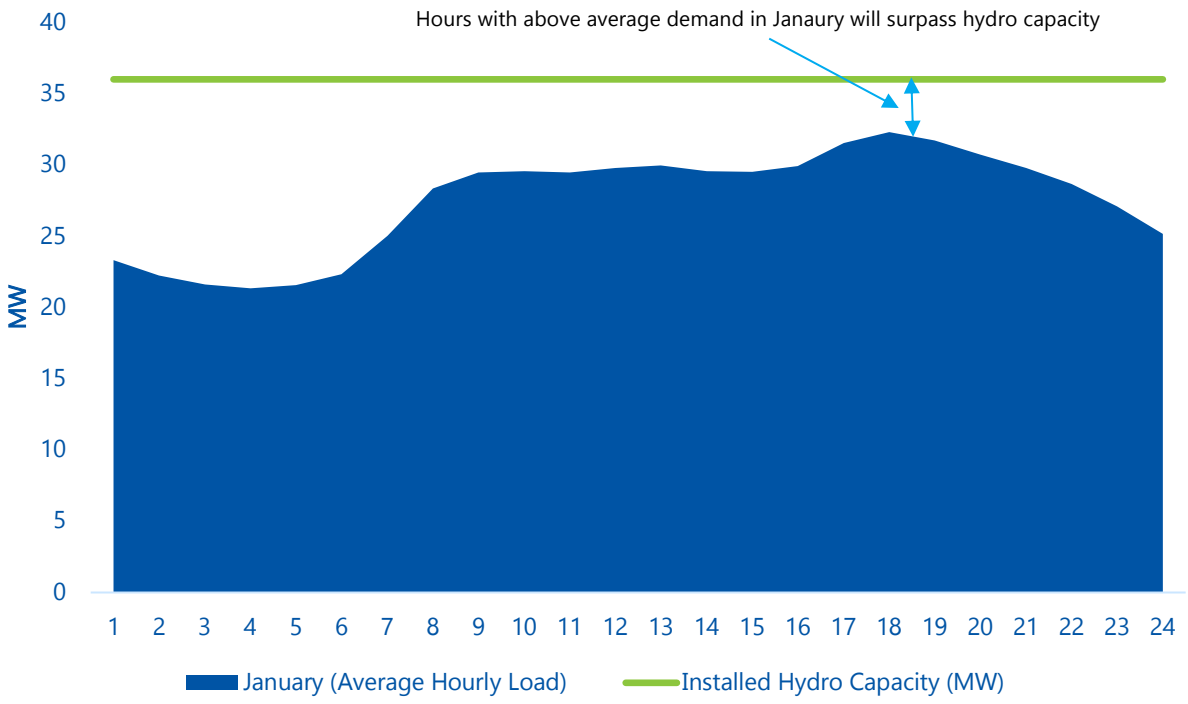
# 5. NWT INCREMENTAL UTILITY REVENUE RECOMMENDATIONS

Any rate design targeted to incremental load should be designed specifically for the Snare and Taltson grids separately.

As shown, the Snare grid has a modest amount of surplus capacity in most hours during the peak winter months. Nonetheless, in many hours, high marginal cost (and emitting) diesel-fired generators are dispatched to meet peak demand.

Average demand during the peak hours in January on the Snare grid, for example, is around 85-90% of the total capacity of hydroelectric system. Grid operators require a specific level of stand-by capacity in all hours to maintain the reliability of the grid in the event of an unexpected outage or spike in demand.[16] Hydroelectric facilities also typically operate below their stated installed capacity. Given the constraints of the Snare grid during the winter months, diesel generators are often dispatched to some extent – limiting the opportunity for incremental load to be economic in the short-to-medium term in the winter months. In previous years, there has been a near one-for-one inverse correlation between hydro and diesel generation – meaning a one-unit reduction in hydro output typically results in a one-unit increase in diesel output.[17]

**Figure 11 Peak Hydro Capacity and Average Hourly Demand in January on the Snare Grid**



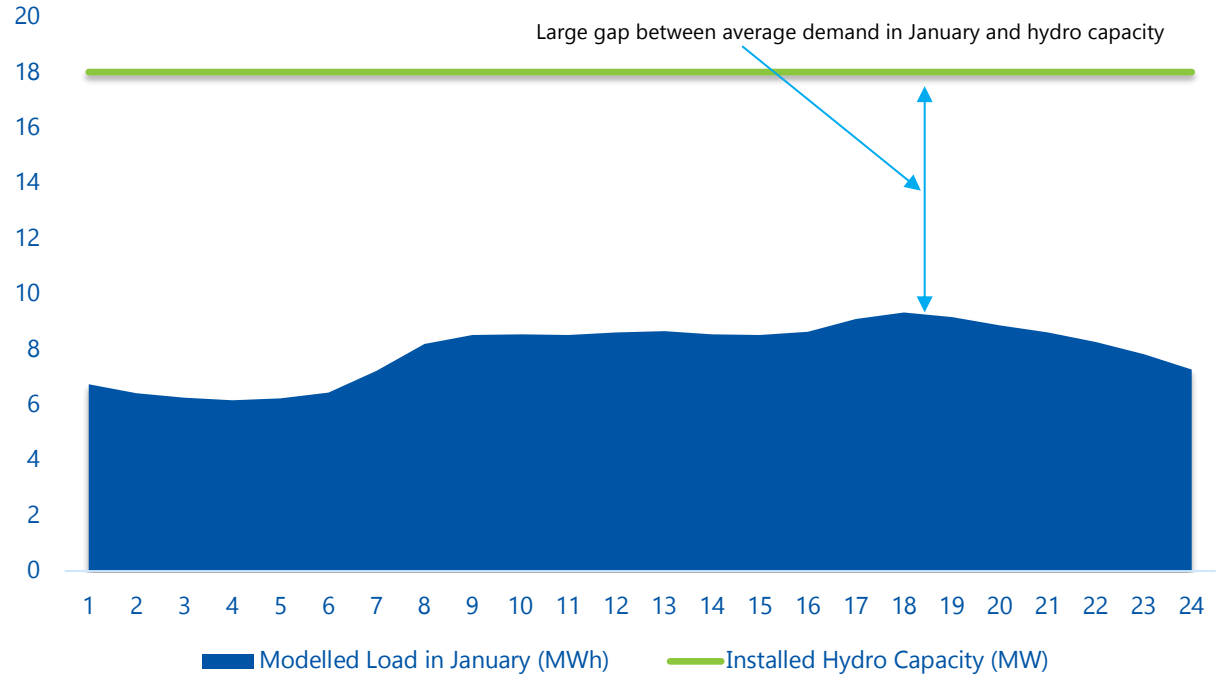

Conditions on the Taltson grid are fundamentally different – with the grid having ample levels of surplus capacity throughout the year. Using the same method as that described above, the average peak demand in the Taltson grid

[16] This is typically referred to as Operating Reserve. System Operators also account for surplus *capacity* when managing the grid to ensure there are enough resources to provide both energy and operating reserves throughout the year.

[17] See NTPC's last GRA, Schedule 2.1-1

is around 50% of its installed hydroelectric capacity. In non-winter months, the capacity surplus is even greater. With that amount of surplus capacity – and assuming there is no major industrial load expected to connect to the Taltson grid in the short-to-medium term – there is ample room for the utilities to economically promote incremental load without having to expand the generating capacity of the grid. This analysis focuses only on grid-level generation, recognizing that the distribution and transmission system may have limited ability to manage an increase in peak load.

**Figure 12 Taltson Grid Peak Hydro Capacity Versus Average Hourly Demand**




The material difference in surplus capacity between the two grids has shaped Power Advisory's recommendations regarding rate design. In the Snare grid, the recommendation for residential and other small-voulme consumers includes a true-up mechanism or blended rate that allocates diesel-related costs to incremental load customers on an annual basis (explained in more detail below). This provides an incentive to small-volume consumers to pursue incremental load investments, while also maintaining a very modest incentive to reduce consumption during peak demand hours – creating a rate design that balances administrative simplicity and economic efficiency. For larger consumers and government buildings, a more direct interruptible rate design (detailed below) is appropriate to mitigate the possibility of increasing system-wide costs beyond incremental revenues.

The Taltson grid faces no similar generation capacity constraints. As such, the rate design in the Taltson grid for incremental load can be more directly tied to the marginal cost of hydroelectric capacity with no consideration of the costs of diesel generators. With this rate design, there is no incentive to reduce consumption during peak demand hours, as there is little economic efficiency to be gained from doing so.

## 5.1 Designing an Attractive Fuel-Switching Rate

Any fuel-switching rate must start with a utility-led or coordinated education and outreach program, as many customers – particularly residential and small businesses – will have a limited understanding of the potential benefits and requirements of fuel-switching investments. Many other jurisdictions across North America have launched such campaigns, offering simple electrification slogans that encompass all of their load growth programs. More

importantly, the electrification campaigns highlight technological advancement in the energy sector – most notably as they relate to reduced costs and improved efficiency of cold-climate air source heat pumps recommended in this report – to help encourage adoption where appropriate.

One particular outcome that has not been modelled in this analysis, but should be considered, is the financial benefit from electrification as a result of carbon pricing. The federal government announced in December 2020 that it intends to increase the price of carbon to $170/tonne by 2030 from its current plan of $50/tonne. Given NWT's low carbon fleet of hydro generators, an increase in fuel-switching to better utilize non-emitting generating capacity would both reduce emissions and limit the financial and regulatory risk of aggressive carbon pricing regulations in the future.

### 5.1.1 *Marketing and Utility-Led Education of Targeted Incremental Load Rate Design*

A fuel-switching campaign increases the general awareness of utility program offerings and helps pre-sell the technologies that the utility expects will add incremental load to the system and, subsequently, increase the overall efficiency of the grid and mitigate future rate increases.

The education program could range from a low-cost campaign that educates customers on the benefits of electrification to a more extensive home audit program that provides a detailed cost/benefit analysis based on current rate designs and/or federal and territorial incentives. More comprehensive campaigns and any inclusion of new financial incentives or technical assistance would require steady funding – likely from various levels of government or PUB-approved utility spending. Any administrative costs related to the fuel-switching campaign must be more than fully offset by incremental electricity sales (i.e. the program must earn more than its administrative costs) and subject to PUB review.

Once the education and outreach program is established, it can be expanded to help customers access direct incentives or potentially provide them directly; educate customers on available rate discounts where appropriate; set-up on-bill financing and/or provide more formal technical assistance for medium to large customers making a more sizable investment. Given that there are other already energy-based programs in the NWT, a utility-led program should either be coordinated with these existing services or targeted to opportunities not currently available to customers. The decision to include direct incentives, either in the form of grants, tax rebates or low-cost loans, requires the approval of the GNWT – either through a directive to NTPC (with associated funding) or to the PUB to allow the NTPC and other utilities to backstop the programs.

Pre-selling, or selling in advance, is particularly important for electric space and water heating, which Power Advisory views as the largest and most readily implementable end-use opportunities for load growth in the NWT. These systems are typically not replaced until they reach the end of their useful lives. When space and water heaters no longer function, they are typically replaced quickly given their importance. Therefore, customers need to be informed of options in advance of the failure of their heating systems to make the decision to adopt a fuel-switching technology more likely to occur. This is particularly true for electric space heating where there have been significant technological advancements to the performance of heat pump systems in cold climates that are likely unknown to many customers.[18]

Power Advisory provides high-level estimates of the potential load impact on the hydroelectric grids of electric water heating and space heating adoption by residential, commercial and government customers throughout this chapter.

[18] Note that even with new models, the performance of heat pumps declines significantly in cold temperatures. Nonetheless, this report recommends dual heating systems (i.e. a heat pump and a furnace), so this is less of a concern. Secondly, the performance of heat pumps would decline in the same hours when demand is the highest, making this a feature of the rate design rather than a drawback.

A more limited fuel switching campaign and weaker rate incentives would be expected to be at the low end of these estimates. If the rate incentive is combined with new direct incentives and low-cost financing, the expected impacts would be towards the high estimates.

### 5.1.2 *Targeting Electric Space and Water Heating Investments*

Space heating and electric water heating are the two most common incremental load investments in jurisdictions surveyed – they were prevalent at nearly every utility surveyed. Just as important, these investments were often targeted at both small and large volume consumers – providing the NWT with an opportunity to target nearly all customer classes, while similarly being highly scalable, both in terms of the territory as a whole but also for individual customers. For instance, a residential customer may first opt for a space-heating program, which can be expanded to include water heating, or vice versa.

Specifically, Power Advisory's recommendations for space heating are targeted at cold-climate air-source heat pumps ("Heat Pumps") and a combination of Heat Pump Water Heaters ("Heat Pump WH") or traditional Electric Resistance Water Heaters ("Electric WH). These incremental load investments were chosen based on being common to load growth programs across North America and are cost-effective in most jurisdictions surveyed. While a number of homes in the NWT already rely on electric hot water heaters, a majority of homes across the territory continue to rely on non-electric water heaters.[19]

The incremental load estimates contained in this report are based on the implementation of a rate design specifically targeting these applications for all non-industrial customers.[20] Although resistance heating has a much lower up-front capital cost, it should be avoided where feasible, particularly in the Snare Grid, given that it will increase the likelihood of output from diesel generators and is a highly inefficient use of electricity. If it is considered, it should only be implemented in the Taltson grid.[21]

While this analysis is limited to space and water heating, there are other targeted programs that can be considered, but have not been specifically modelled. A number of utilities offer rebates or other incentives for commercial customers to invest in electric forklifts, industrial equipment or truck refrigeration units, among other investments. Given the NWT's more limited number of commercial customers, these incentive programs can be targeted specifically on a case-by-case basis. As an example, one program reviewed specifically targeting non-heating, cooling or EV investments and resulted in a 0.3% increase in system sales in the first 18 months, with nearly 70% of that load occurring in off-peak hours.

### 5.1.3 *Designing A Specific Rate for Space and Water Heating By Rate Classes*

A space and water-heating rate design should initially target three rate classes in the NWT. The incentives offered to these customers should be designed based on the unique characteristics of these rate classes.

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[19] Less than 50% of homes in Yellowknife have an electric hot water heater, according to the most recent data from Statistics Canada. See: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110012701

[20] It is not clear whether there is any pending industrial demand in the NWT and, as such, there is no firm estimate provided.

[21] Even on the Taltson grid, if capacity were to be constrained in the future, resistance heating would likely need to be replaced with more efficient forms of space heating or move to an interruptible rate.

### *Residential Customers*

A rate design that targets residential customers – who are specifically excluded from the current electric heating rate incentive – should be considered. The most direct rate incentive for residential customers would be one that provides a discounted energy rate for all incremental energy related to space and water heating. For this rate class, administrative simplicity and implementability will be critical to supporting higher adoption levels. As such, this rate should be direct and non-interruptible. Any requirement for advanced metering and interruptible capabilities would increase the cost (for consumers and the utility) and administrative complexity of the program, reduce margins to the utility and, subsequently, limit its beneficial rate impacts. Nonetheless, it should be individually metered for all residential customers with up to five-year on-bill financing options available for all customers to recover metering costs (discussed in more detail later). The rate should also be designed separately for the Snare and Taltson grids (for reasons discussed in the next section).

- ***Taltson***: Given the year-round surplus hydroelectric capacity on the Taltson grid, the heating rate should be tied to the marginal cost of hydroelectric energy with an adder to ensure profitability for NTPC that can be used to offset rates for all customers. For most hydroelectric generators, the ***annual*** marginal cost of output is between $5-$15/MWh.[22] [23] At the minimum, NTPC should charge at least a $20/MWh adder (equivalent to two cents per kWh) for all incremental energy consumed for space and water heating purposes on top of the marginal cost. For example, if the marginal cost of energy is $10/MWh, the small-volume space and water heating rate should be, at a minimum, $30/MWh. While a higher adder could be considered, it would reduce the attractiveness of the program. A separate, fixed monthly charge could be added to recover administrative costs associated with the rate.

- ***Snare***: The Snare system faces hydroelectric capacity limitations in many hours during winter months. When demand surpasses hydroelectric output, NTPC must dispatch high marginal cost diesel generators to meet demand. With these limitations in mind, NTPC should consider offering one of two rate designs:

    I. A hydroelectric-based marginal cost energy rate similar to that on the Taltson grid, but with a true-up mechanism based on the costs associated with the incremental output of diesel generators in peak demand months (December-February). The true-up mechanism could be applied annually and added to the energy rate offered to customers participating in the space heating rate in the following year.

    II. A blended rate that combines the marginal cost of hydroelectric generation and diesel generation. If incremental heating load occurs in hours when diesel generators are dispatched, the high marginal cost is allocated to these customers based on their percentage of load served by diesel. For example, if diesel generators were providing 3 MW of output and incremental load was 1 MW, then 1/3 of diesel-related marginal costs would be allocated to incremental load customers. These costs would be in addition to

[22] In Ontario, for example, hydroelectric generators pay a Gross Revenue Charge and Water Rental Fee per MWh. This figure ranges from around $5 to $15. Marginal costs will change depending on the time of year. In the spring and early summer – when water levels are high – the marginal cost can be $0 (or negative) as there is a surplus of water that can be used to generate electricity. Power Advisory recommends a simplified approach of an annual marginal cost energy rate for small-volume consumers.

[23] Water rental fees are the main determinant in the marginal cost of hydro generation. Water rental fees vary by province. See: "Hydropower Royalties: A Comparative Analysis of Major Producing Countries (China, Brazil, Canada and the United States)", https://www.mdpi.com/2073-4441/9/4/287/htm

the marginal cost associated with the hydroelectric generators, creating a "blended" annual rate. The blended rate would be reset annually to recover diesel-related costs incurred in the previous year. While this design limits economic efficiency, as it does not allocate all real-time marginal costs to these customers, it is administratively simple.

It should be noted that in both the Taltson and Snare rate, ***small-volume customers are not provided an economic incentive to reduce demand during peak hours***. This is a drawback to the program design and could lead to higher system costs. This drawback must be weighed against the potential of incremental revenues for the utility. In the Taltson grid, an economic incentive to reduce demand is largely unwarranted given the prevailing surplus hydroelectric capacity.

**Table 1 Annual Incremental Revenues From Small-Volume Consumers[24]**

| | Taltson Water Heating | Taltson Space Heating | Snare Water Heating | Snare Space Heating | Total |
|---|---|---|---|---|---|
| Low | $2,176 | $4,492 | $13,766 | $12,574 | $33,007 |
| High | $21,763 | $44,915 | $137,661 | $112,439 | $316,778 |

### *General Service Customers*

A rate design for this customer class would include all businesses or consumers beyond the small-volume threshold, but below the industrial threshold (i.e., non-residential or multi-residential General Service customers). Rates for industrial customers are discussed in more detail in a following section and should be treated differently. Medium and large-volume electricity customers are typically more sophisticated in their consumption decisions – both in terms of investments and usage patterns. Given the small-scale of the Snare and Taltson grids, there are a limited number of customers that would fall into this rate class. While an administratively simple rate design – similar to that for small-volume customers – would be the easiest to implement, it will eliminate the economic incentive to reduce demand when high marginal cost diesel generators are needed to meet system-wide demand. Given the more sophisticated (and larger) energy profile of this rate class, removing this economic incentive is not appropriate, particularly on the Snare grid.

In both the Snare and Taltson grids, the option for on-bill financing with a term of no-more than five years should be considered to fully recover the cost of any metering or distribution-related investments required as part of the program (discussed in more detail later in this report).

- ***Taltson***: A more simplified rate design should be considered for the Taltson grid, given its year-round surplus in hydroelectric capacity. Incremental load tied to space or water heating should be charged a ***monthly*** energy rate tied to marginal cost of hydroelectric generation with an adder to ensure profitability for NTPC that can be used to reduce rates for other customers. In certain months – in the late spring and early summer, for example – the energy rate would be very low given high water levels and low demand. Similar to the small-volume rate, NTPC should charge a minimum $20/MWh adder (equivalent to two cents per kwh) for all incremental energy consumed for space and water heating purposes for medium and large-volume consumers. Additionally, the service should be interruptible to account for unexpected outages on the system and the dispatch of diesel generators. Conversely, if the service is not interruptible there should be a monthly (or annual for simplicity) true-up mechanism to fully recover costs related to diesel

[24] The methodology for these calculations is described later in this report.

generation, including full federal carbon prices. While the current carbon price regulations in NWT exempt power producers from the carbon price, including that cost in an interruptible service would increase the economic efficiency of the interruptible rate.

- ***Snare***: Any load growth rate design on the Snare System must be done on an interruptible basis, given the system-wide constraints. Similar to the Taltson grid, NTPC should consider offering a ***monthly*** hydroelectric-based marginal cost energy rate. Given the interruptible basis of the rate design, a true-up mechanism related to costs associated with the dispatching of diesel generators may not be required, except for instances when the consumer did not shut-down operations. If the rate were to be designed on a non-interruptible basis – for administrative simplicity – these customers should pay ***at least*** the full marginal cost rate (including carbon prices) in hours when diesel generators were dispatched. This leaves in place the economic incentive to respond to real-time energy prices, even if the customer is not on an interruptible rate design. This may require more advanced metering to monitor hourly consumption.

**Table 2 Annual Incremental Revenues From General Service Consumers**

| | Taltson EWH | Taltson Space Heating | Snare EWH | Snare Space Heating | Total |
|---|---|---|---|---|---|
| Low | $3,975 | $3,877 | $24,730 | $23,297 | $55,879 |
| High | $39,750 | $38,766 | $247,302 | $226,968 | $552,785 |

### *Non-residential government buildings*

NTPC should consider an energy rate design for space and water heating government buildings, notably offices, community centres and other public spaces. Programs for government housing are not included in this analysis as they may require a more detailed approach and cannot be done on an interruptible basis. The overall energy consumption of government class of customers is significant across the NWT, making it important that the economic incentive to reduce consumption during peak demand hours is maintained – thereby avoiding system-wide costs of adding new generation or delivery capacity. Again, this incentive is more vital in the Snare Grid. Overall, the rate should be similar to that proposed for medium-sized commercial customers, with one exception regarding the adder tied to the marginal cost energy rate.

- ***Taltson Grid:*** Given the significant subsidies from the GNWT to NTPC, a lower adder of $10/MWh, as opposed to $20/MWh may be considered, although that was not modelled as part of this analysis. While this will lower the overall profitability of the program – and subsequently reduce the incremental revenue used to lower rates for other customer classes – it will only be applied to ***incremental load*** tied to space and water heating. Similarly, the energy rate for government customers should either be interruptible or tied to a monthly true-up mechanism to fully recover costs related to diesel generation.

- ***Snare Grid:*** Similarly, an incremental energy rate for the Snare System must be done on an interruptible basis. Like the rate design for commercial customers, a true-up mechanism related to costs associated with the dispatching of diesel generators may not be required except for instances when the consumer did not shut-down operations. If the rate were to be designed on a non-interruptible basis – for administrative simplicity – these customers should pay ***at least*** the full marginal cost rate (including carbon prices) in hours when diesel generators were dispatched. NTPC should also consider charging them an additional monthly capacity charge tied to diesel generation. This design maintains the economic incentive to respond to real-time energy prices even, even though the customer is not on an interruptible or real-time rate design.

**Table 3 Annual Incremental Revenues From Government Space Heating**

| | Taltson Space Heating | Snare Space Heating | Total |
|---|---|---|---|
| Low | $5,269 | $4,862 | $10,130 |
| High | $52,686 | $48,617 | $101,303 |

## 5.2 On-Bill Financing for Metering and Grid Investments

To the extent that discounted energy rates are offered for space and water heating, separate metering is generally required in most jurisdictions reviewed. This is also the case for the existing Taltson grid space heating interruptible rate. The cost of a new meter and installation is fully borne by the customer. Having to bear the cost of separate metering and cost of installation – particularly for an interruptible service – acts as a deterrent to participation in the reduced rate program, according to interviews with local representatives.

In order to expand participation in the program, NWT utilities should consider offering on-bill financing for metering costs (at a minimum), but also for installation costs and any grid-related investments that may be required.

For small-volume customers, the financing would have a limit based on a standard cost of meter, installation and associated behind-the-meter electrical work in the NWT – $1,000, for example. The costs can be scaled to include higher volume customers. For example, a $20 per month charge could fully pay back – with interest – a $1,000 "loan" for the meter and some portion of installation costs over five years. Given that the recommended rate design of the program includes much lower hydroelectric-based rates, any amount above this threshold can be paid for the customers that will benefit from the program through significantly lower energy charges. Utilities and the GNWT should determine what amount of on-bill financing is appropriate. The interest attached to on-bill financing can be set at the long-term cost of borrowing for the utility or at a slight premium to account for defaults.

Metering and related costs are just one potential hurdle for customers. If the incremental load results in any form of grid-related upgrade (i.e., in "front of the meter"), that cost is expected to be recovered, up-front from those customers that are instigating the investment. Given that a number of recommendations in this report target small-volume customers (i.e., households and small business) and many medium-volume customers are likely facing economic difficulty due to the ongoing pandemic, requiring an up-front payment for a grid-related investment is either administratively difficult or will act as a significant economic barrier to the adoption of a rate designed specifically for space and water heating.

As such, for non-interruptible customers a small monthly charge can be applied to monthly bills to recover the cost of any grid-related investments that are required ***to specifically address incremental load as a result of the updated rate design***. Many of these assets will have a long service life – typically 20-40 years – allowing for a small monthly fee to fully recover the cost. As the incremental load program grows with higher adoption rates, the monthly fee can be reduced accordingly.

Interruptible customers typically – and currently in the NWT – do not pay a demand charge, which is appropriate as they require little to any capacity during peak demand hours. Nonetheless, they can be charged a monthly fee that is directly related to investments needed to meet incremental load specifically related to the new rate design. To mitigate the risk of default, the costs can be recovered over a shorter time frame and include a higher rate of interest.

## 5.3 Development Rate Design Targeted to Industrial and Commercial Customers

Electricity rate incentives for existing and new commercial and industrial customers are common in jurisdictions across North America – and are often used to support local industry (i.e. jobs) or promote economic diversification.

Incremental load growth from large commercial and industrial customers typically has two positive attributes. First, large customers often have a flat demand profile – meaning they consume, on average, the same amount of energy in all hours across an entire year. As a result, their contribution to system-wide load – as a percentage of the total – in peak demand hours is often lower than in off-peak hours. Second, they are typically more sophisticated energy consumers and often interested, and capable of participating in interruptible rates or Demand Response (DR) programs – both of which can help lower consumption during peak demand hours and reduce or mitigate growth in system-wide costs.

From a broader perspective, commercial and industrial load increases employment in the region, adding to overall economic activity and creating a positive feedback loop of greater demand for electricity. The increase in demand then typically results in lower rates – subsequently incenting more demand growth. A recent study from the United States found a one-year price elasticity of -0.14 and a three-year price elasticity of -0.29 – meaning a 10% decline in price results in a 1.4% and 2.9% increase in demand over a one and three-year period, respectively.[25]

How and where incremental large industrial and commercial load is added to the system will be vital with any rate incentive implemented in the NWT. Combining a rate incentive with an interruptible rate schedule for large industrial customers on the Snare grid will be required. A charge equal to at least the marginal cost of generation from a diesel generation should be applied for all loads that fail to interrupt. A penalty charge for consumption during hours when diesel generators are operating should also be considered.

Given the positive benefits for the economy and ratepayers as whole, the NWT utilities should consider targeted commercial and industrial rate incentives to attract incremental load to the system when it otherwise is not likely to trigger additional investment on the grid. These incentives are typically offered for a five-year term – allowing for the incentive to attract new businesses, but not unduly subsidize them perpetually compared to existing businesses. Based on the experience in other jurisdictions that have such programs in place, the following recommendations are considered reasonable both from an implementablility and utility best practices perspective. Commercial and industrial rate programs in NWT should focus on three types of rate incentives depending on rate class and grid:

1. A reduced demand charge for new or incremental load ***for medium-volume customers in both the Taltson and Snare grids***
2. A low-cost or reduced rate for allocated hydroelectric capacity for ***large industrial customers on the Taltson grid***
3. A reduced energy rate based on the marginal cost of output from existing or future hydroelectric facilities for ***large-volume customers on either the Taltson or Snare grid.*** This rate would only be available to customers that are not already offered option 2.

[25] The Long-Run Elasticity of Electricity Demand: Evidence from Municipal Electric Aggregation, Tatyana Deryugina, Alexander MacKay and Julian Reif, May 2, 2017, https://www.econ.pitt.edu/sites/default/files/Deryugina.Electricity%20Aggregation.pdf

### 5.3.1 *Reduced Demand Charges on the Taltson and Snare Grids*

One of the most common incentives to promote load growth is a reduced demand charge. Reduced demand charge incentives are particularly prevalent across the United States – typically in the form of a "rate rider" that provides billing credits per kW. The demand charge is only applied ***to customers on a non-interruptible rate***.

In many cases, the per kW credit is applied to incremental load added to the system, either from existing customers expanding operations or new customers relocating to that jurisdiction. In an effort to avoid providing short-term subsidies to customers, the demand charge reduction can be tied to employment or investment thresholds over a number of years. In the state of Indiana, for example, incremental load customers can apply for the Economic Development Rider, which offers a bill reduction of up to $11 per kW annually for new or existing customers that increase load by 500 kW.[26] Participants must highlight to the utility – which applies for the implementation of such programs to state's utilities regulator – that the investment would not have occurred without the rate rider.[27]

As noted, other jurisdictions may tie the incentive to investment or employment thresholds – with a customer having to invest more than $1 million (or some other pre-determined threshold) or provide for a certain number of new jobs. In either case, the local utility, along with approval from the regulator, can determine whether such thresholds are appropriate and set them accordingly based on local needs of the system. Reduced demand charges are more appropriate for customers adding incremental load where there is surplus transmission and distribution capacity, as the incremental load does not result in additional fixed costs, while the increase in total load provides additional revenue to the utility and lowers rates for existing customers.

### 5.3.2 *Low-cost Allocation of Hydroelectric Capacity on the Taltson Grid*

For large industrial customers on the Taltson grid, NTPC can offer an allocation of capacity at a fixed, low rate. For example, given the surplus capacity on the Taltson grid, it can offer a customer up to 1 MW (potentially more) of capacity from its hydroelectric facility to meet the customer's energy needs. The cost of this capacity would be greater than marginal cost, as it would have to include some portion of the utility's fixed O&M and capital costs, ROE and some percentage of lost "opportunity cost" to the utility to market that energy to other customers. A higher price would be associated with larger blocks of capacity allocated to one customer, given it incurs greater opportunity (and other) costs for NTPC. Some element of interruptibility should also be included to avoid having to dispatch diesel generators in the event of an outage.

Other predominantly hydroelectric-based grids provide allocations of generating capacity to local industry at a low, fixed rate. The state-owned New York Power Authority (NYPA) in New York, along with regional development agencies, is a notable example of a jurisdiction that ensures some portion of its hydroelectric generation is offered to local businesses at below market rates. NYPA owns and operates a number of large-scale hydroelectric facilities, foremost being the Robert Moses Niagara and St. Lawrence-Franklin D. Roosevelt power projects located on Lake Ontario and the St. Lawrence seaway, respectively. Collectively, NYPA allocates more than 1,000 MW of hydroelectric capacity to businesses across the state – with a portion of that amount offered to businesses located near the facilities – for economic development purposes at below market rates.[28]

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[26] See: http://indianamichiganed.aeped.com/wp-content/uploads/2017/08/New-IN-EDR-Aug2017-App.pdf

[27] Other utilities in the state offer a monthly discount up to 30% for incremental load customers. See: https://www.duke-energy.com/_/media/pdfs/for-your-home/rates/electric-in/de-in-rider-58.pdf?la=en

[28] See: https://www.nypa.gov/services/clean-power-programs/economic-development

In Canada, Hydro Quebec, which has more than 34,000 MW of installed hydroelectric capacity, provides a number of incentives to businesses providing incremental load in the province. These incentives range from discounts to struggling businesses, an interruptible rate and an economic development rate for existing businesses to expand operations – with discounts stretching over multiple years.[29] One consideration for any comparison to Quebec is that the province offers some of its largest consumers – aluminum smelters for example – low rates for all energy consumed, not just incremental load.[30]

### 5.3.3 *Reduced or Marginal Cost Energy Rate on the Taltson and Snare Grids*

Many jurisdictions, particularly in Canada, offer discounted energy rates to large volume consumers based on ***real-time marginal generation costs***. Providing customers with a marginal cost-based rate, particularly when the marginal resource is hydro and the marginal cost of generation is low, encourages large customers to shape their demand profile – or make the necessary investments to do so – to make use of surplus output. This rate would require advanced metering to monitor real-time output on the NWT grid.

BC Hydro, a crown-owned utility, offers a Freshet Energy rate, providing large volume consumers with a market-based rate for incremental load during the fresh set period (May to end of July). The rate is set slightly above the marginal cost of production for BC hydro, with a slight surcharge and the lowest rate being $0.[31] Nearly 30% of transmission-connected customers signed up for the rate, generating an additional $11 million in annual revenue and "net positive gain" for ratepayers of $5.8 million over the four years since it was introduced.[32]

Manitoba Hydro offers a Surplus Energy Program (SEP), a rate for large-volume consumers to buy the utility's surplus energy at market-based rates.[33] The rate is largely based on the crown corporation's marginal cost of production at its hydroelectric generating stations. While the rate is intended to be revenue neutral for Manitoba Hydro, it provided $26K in net energy revenues for the utility in 2016.

Nova Scotia Power offers commercial and industrial customers a real-time pricing rate. The rate is based on Nova Scotia Power's hourly marginal costs. The rate includes an on-peak and off-peak adder. As part of the rate, the utility provides customers with day-ahead and weekly hourly price forecasts.

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[29] See: https://www.hydroquebec.com/business/customer-space/rates/economic-development-rate.html and https://www.hydroquebec.com/business/customer-space/rates/industrial-revitalization-medium-power-rate.html

and https://www.hydroquebec.com/business/customer-space/rates/interruptible-electricity-options-medium-power-customers.html

[30] The largest smelters receive a preferential rate based on the market price of aluminum. See: https://www.hydroquebec.com/data/documents-donnees/pdf/annual-report-2019-hydro-quebec.pdf and https://www.cbc.ca/news/canada/montreal/alcoa-aluminum-company-reaches-power-deal-with-quebec-1.2550681

[31] Wholesale energy price can go negative in certain months of the year when there is an extreme surplus of energy.

[32] See: https://www.bcuc.com/Documents/Other/2020/DOC_57975_2019-05-01-G-104-20-BCH-TSMRPR-Freshet-Rate-FinalOrder-Part1.pdf

[33] Manitoba's electricity system is not a competitive wholesale market, as is the case in Ontario and Alberta, but rather a vertically integrated utility model run by a crown corporation, Manitoba Hydro. Manitoba is interconnected with Ontario's wholesale market, as well as the Midcontinent Independent System Operator (MISO) in the United States. MISO is used at the basis to set the market-based energy charge. See https://www.hydro.mb.ca/docs/regulatory_affairs/pdf/gra_2012_2013/appendix_10_6.pdf

In Ontario, large and medium-sized consumers can qualify for the Industrial Conservation Initiative (ICI) program, which provides them with a reduced charge for fixed generation costs based on their percentage of consumption during the five highest peak demand hours. The Independent Electricity System Operator (IESO) estimates that the program can result in peak demand reductions of 1,600 MW – accounting for around 7-8% of total peak demand.[34] If large load consumes no energy during peak demand hours, it will be charged the marginal cost of generation – which is hydro in more than 40% of the hours in a given year – for the entire following year.

Nonetheless, the likelihood that electricity rates would the sole (or even predominant) factor in any economic development in NWT is unlikely and would likely need to be combined with broader incentives (i.e., tax or development incentives). As such, it may result in free-ridership or a push from existing customers for similar incentives.

## 5.4 How the Incremental Revenues Were Calculated

The incremental revenue analysis includes a number of assumptions As discussed throughout this report, NWT is a unique jurisdiction regarding its climate and the extreme cold it experiences for long periods of time. Engineering studies from other jurisdictions will have to be discounted to some extent to account for these differences.

The incremental load for residential consumers is based on adoption rates using the most recent residential customer counts from NTPC and NUL's GRA rate applications. For both the EWH and space heating estimates, the low and high scenarios assumed a 2% and 20% adoption rate, respectively. Because the current customer count figures are based on the most recent GRA applications for NTPC and NUL, they should be updated to account for any differences in actuals compared to the previous forecasts. Nonetheless, in both the North and South Slave grids, customer counts have remained relatively constant over the last 5 years.

For medium-sized customers, the adoption rate is based on General Service customer counts and escalated to account for higher average consumption values. Power Advisory estimated that the incremental load per General Service load customer would be three times that of a residential customer. On average, General Service customers annually consume more than four-times that of residential customers.[35] Given the incremental load in space and water heating is just one factor of overall consumption for General Service customers, discounting was applied (i.e., it was not escalated four times). A more detailed review of individual customer energy profiles, which are not publicly available, would improve the accuracy of the results. Similar to the residential analysis, the adoption rates were 2% and 20% in the low and high scenarios, respectively.

For government customers, the incremental load is calculated as a percentage of fuel oil for space heating that is converted to electricity. The analysis relied on fuel oil consumption data at government buildings in Yellowknife, Hay River and Fort Smith provided by the GNWT. These amounts were converted to MWh. Once the total energy from fuel oil was converted to MWh, the incremental load was calculated based on a fuel-switching amount of 2% and 20% in the low and high scenarios, respectively.

The incremental load volumes for each customer type are based on a jurisdictional scan of engineering studies from other jurisdictions and reference technology types.[36] For space heating, Power Advisory assumes that consumers

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[34] As stated previously, Power Advisory is not advocating for the ICI to be implemented verbatim in the NWT, as there are known concerns with the program as it is currently designed. See: http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/tech-conf/2020/TechnicalPlanningConference-Demand-Forecast-Key-Insights.pdf?la=en

[35] This estimate comes from NTPC's GRA. It does not provide a range of consumption values or customers types in the General Service rate class.

[36] For EWH, a number of engineering studies were used to create annual and monthly load shapes.

install a mini-split cold climate heat pump. While the efficiency of heat pumps declines in severely cold climate, recent models have been shown to function below -15 C. The analysis assumes that most heat pump installations (apart for small-volume consumers) would be tied to an interruptible rate, ensuring that they would be active for most months and hours of the year, but would be supplemented at the most extreme temperatures with dual-heating systems. The dual-heating systems – a heat pump supported by an oil, propane or biomass heating system – would mitigate the demand on the grid during peak demand hours, particularly on the Snare Grid.[37]

Revenue is calculated based on a $30/MWh rate. This rate includes a $20/MWh adder to the marginal cost of hydroelectricity, which is assumed to be $10/MWh. For residential consumers on the Snare grid, some adjustment would have to be made to account for a blended rate, if that is ultimately implemented.

## 5.5 Rate Design Recommendations

Based on Power Advisory's jurisdictional review and analysis, below are three rate design recommendations for the GNWT to consider in an effort to increase revenues for electric utilities in the NWT. As discussed, the focus of these recommendations is increasing electricity sales in the Snare and Taltson hydroelectric systems, primarily through rate design.[38] The recommendations, in order of descending importance, are:

- **Recommendation 1: Utility Led Fuel Switching Program Through Rate Design** - offer a wide-scale fuel switching program targeting end uses currently served by other energy sources with a ***focus on space and water heating***. The program could be provided to residential, commercial and government customers on the hydroelectric systems, building on existing programs. The program should rely on a rate design that specifically encourages incremental load, but could be expanded to include direct incentives, such as rebates or low-cost financing if that money were to become available.
- **Recommendation 2: On-Bill Financing for Metering and Grid Investments** - offer on-bill financing for metering investments or grid-related investments required as part of the fuel-switching program.
- **Recommendation 3: Development Rates for Industrial and Commercial Customers** – depending on customer size and location**,** provide reduced demand charges, low-cost blocks of surplus hydroelectric capacity or a reduced energy rate based on the marginal cost of hydroelectric generation to commercial and industrial customers. The various programs would be targeted to specific customer classes.

[37] For mini-split heating systems, hourly load shapes were created and then used to calculate monthly and annual incremental load. Power Advisory relied on audited data. See: Ductless Mini-Split Heat Pump Impact Evaluation, December 30, 2016 Prepared for: The Electric and Gas Program Administrators of Massachusetts and Rhode Island Part of the Residential Evaluation Program Area

[38] Increasing load in the thermal communities would be counter-productive both economically and environmentally.

# 6. INTERRUPTIBLE RATE ANALYSIS

NWT currently offers an interruptible rate tariff for space heating in the Taltson grid. The interruptible tariff has had a limited uptake, based on rate filings by NTPC and discussions with local organizations that oversee energy programs. Power Advisory was asked to review the Taltson interruptible rate and provide recommendations on how to increase participation. We were also asked to consider how an interruptible rate should be designed for the Snare grid, if appropriate.

## 6.1 What is An Interruptible Rate?

Interruptible rates or tariffs are typically an agreement between a customer and a utility that, in return for a lower energy rate or discounted demand charge, the customer will reduce energy consumption on a short notice or allow its service to be curtailed by the utility. Interruptible rates have been employed for decades and have, more recently, evolved in many cases into Demand Response (DR) programs. In competitive wholesale electricity markets, the Market Clearing Price (MCP) set by the marginal resource is typically used as the basis to curtail load for interruptible customers. In grids that lack a competitive wholesale market, the vertically integrated utility may design the program around its marginal resources – typically curtailing load prior to dispatching high-cost thermal units (i.e., diesel generators). In hydro grids, interruptible rates may be set on prevailing water conditions.

NTPC has been marketing an interruptible rate in the Taltson grid since the 1990s in the wake of the closure of the Pine Point mine and subsequent ongoing surplus capacity on the grid.[39]

Over time, NTPC has signed up some customers to an interruptible tariff in the Taltson grid, but the overall uptake has been limited. More recently, NTPC applied to the PUB for the right to offer an interruptible rate for space or process heating tied to an "avoided cost" rather than the traditional "cost-based" regulation used to set rates for firm-service customers, which is tied to the utility's total cost of providing the service. Since 2007, the GNWT has signed a Power Sales Agreement with the NTPC for an interruptible heating rate in Fort Smith. Apart from the GNWT, uptake for the interruptible heating rate has been negligible.[40] Revenues earned from the NTPC's interruptible rate – above those directly attributable costs of the program – are credited to the utility's rate-regulated customers, meaning incremental revenues from the program are used to lower rates for all customer classes.

## 6.2 The Design of the Interruptible Rate on the Taltson Grid

The interruptible heating rate on the Taltson grid is explicitly set on the basis of providing a discount to heating oil and is updated twice annually based on the cost of fuel oil in Yellowknife (i.e. "avoided cost").[41] The calculated rate is then reduced by nearly a third to account for the interruptible – lower quality of service – of the rate. The rate also carries a number of conditions:

- The interruptible energy must be separately metered.
- If a customer moves from interruptible to firm service, it will not be able to switch back.

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[39] See: NTPC's Application for Interruptible Wholesale Energy for Resale Rate for the Taltson Zone. Power Advisory has not reviewed effectiveness of the utility's marketing practices.

[40] Based on NTPC's GRA application, it forecasted $154K in interruptible sales. Using the current interruptible rate of 6.3 cents/kwh, that amounts to more than 2,000 MWh annually, or around 4% of total load.

[41] The process for setting the rate is: 1) Determine a heating oil price, 2) Convert heating oil price to a price per MJ, 3) Adjust the price per MJ for heating efficiency, 4) Convert heat price per MJ to kWh, and 5) Set at 70% ratio.

- There are no limits to NTPC on the frequency or duration of interruptions in the supply of energy for heating purposes.
- Interruptible customers are fully responsible for the cost of installing separate service, upgrades, metering devices and interruption equipment and any improvements or modifications to the distribution system.
- Participating customers must have an available alternative source of back-up power.

### 6.2.1 *Amortization of Grid Investments*

As discussed in the previous section, the cost of any distribution-level investments or interruption equipment should be amortized over a longer time period. ***This option would only be available to medium and large-volume consumers***. In certain instances where the incremental revenues are clearly greater than the required investment – if multiple government buildings, for example, agreed to adopt an interruptible rate – the utilities should be allowed to include the necessary investment in its overall rate base and recover this amount from all customers, given the system-wide benefits.

The grid-level connection or upgrade costs should be amortized over a period of at least five years. The costs would have to be tied to an agreement that the customer would pay back the investment if they leave the system prior to it being recovered. A longer amortization period provides two benefits. First, and most obviously, this policy lessens the burden for customers required to pay for any system-wide benefits, which can be material – improving the economics of investing in equipment as part of the interruptible rate. Second, spreading the costs over a long time period can remove the risk of a cross subsidy that may occur between a current customer(s) that paid for the system expansion and future customer(s) that may also benefit. If, for example, a new interruptible customer is added to the system in year three that also utilizes this investment, the rate associated with the initial investment for the original customer can be amortized by a prorated amount for the remainder of the term.

Other jurisdictions have implemented similar policies. In Ontario, for example, the Transmission System Code (TSC), allows a utility to charge a customer that requires a new connection to pay any capital contribution as part of an expansion over a "period of time not to exceed five years."[42] The amortized costs accrue interest at the borrowing cost of the utility. Amortizing connection costs related to interruptible customers may also allow the NTPC and other utilities to offer the rate to a wider range of medium-volume consumers, reducing the charge for each individual customer.

One concern with amortizing connection costs associated with the interruptible rate over a number of years is the risk that the costs could become stranded – ultimately flowing to all customers.[43] As such, the implementation of this policy must be done in a manner that protects existing customers from being charged for stranded costs.[44] One option would be to allow the residual investment to be charged – if possible – to the departing customer.

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[42] See: https://www.oeb.ca/sites/default/files/uploads/documents/regulatorycodes/2019-01/Transmission-System-Code-20181218.pdf

[43] While there is the possibility of a lien being applied to any property to recover stranded costs, Power Advisory has not reviewed the legal parameters around such a policy.

[44] One of the primary customers for the interruptible rate would be government buildings, which severely mitigates – or eliminate entire – this risk. Additionally, NTPC or other utilities could require a deposit to cover some portion of the investment that could be counted against the total cost or returned after a specified time period.

### 6.2.2 *Hydro-based Seasonal Interruptible Rate on Taltson Grid*

The rate for interruptible energy should be set on a "cost" basis, as opposed to the current method of setting it on an "avoided" cost basis. The Taltson grid has a material amount of surplus hydro energy throughout the entire year that can be sold to customers on an interruptible basis – with the only threat of interruption likely to occur in the small number of hours when there is an unexpected grid of hydro outage on the grid and diesel generators are dispatched.

The current design of the interruptible rate prices is based on competitive fuel types (i.e., heating oil). Instead, the interruptible rate should be set to the marginal cost of production from NTPC's hydroelectric facilities, as it is solely designed to utilize that generation resource – and not diesel generation. Incremental energy output at the Taltson hydro facility could be generated at a little additional cost to NTPC given the surplus capacity due to current low levels of demand. Utilizing that surplus energy – and including a fixed mark-up as discussed in the previous section – creates additional revenues for the utility that can be used to offset rates for all rate classes.

## 6.3 Interruptible Rate on the Snare Grid

### 6.3.1 *Amortization of Grid-Related Investments*

The option to amortize grid investments related to the interruptible rate on the Snare grid should be the same as that described for the Taltson grid.

### 6.3.2 *Tiered Interruptible Rates*

Given the greater need and likelihood of having service interrupted on the Snare grid – due to the tighter capacity conditions – the NWT should consider introducing a tiered interruptible rate based on certain hours of the day and month. As part of this rate design, the interruptible rate for the highest demand hours would pay the lowest energy rate, as they are most likely to be curtailed based on the capacity of the system. They are, in essence, paying the lowest energy rate for the lowest quality of service.

A tiered energy rate would encourage customers to shift consumption to the greatest extent possible to hours when demand is lower and the likelihood of being curtailed is reduced. Conversely, they could opt for the lowest rate (i.e. highest curtailment risk) and make behind-the-meter investments to offset the risk of disruption to regular consumption. The rate is specifically designed to maintain the economic efficiency of the grid by sending an accurate price signal during hours of high demand – namely that the marginal benefit of consumption in peak demand hours is below the marginal cost of output from diesel generators.

One option for the design of the program is the emergency response services offered in competitive wholesale markets like ERCOT.[45] While emergency response services pay participating loads a fixed amount per MW to be curtailed in the event of an emergency, an interruptible rate in the NWT could differ depending on what hours the

[45] In ERCOT loads participate in a competitive auction for a payment to make themselves available to be curtailed in the event of an emergency. The auctions are done quarterly and for various blocks of hours. The highest demand hours – i.e., those most likely to result in curtailment – clear at the highest price. The additional payment essentially acts a reduction in the total cost of electricity due to the higher likelihood of being curtailed. See: http://www.ercot.com/services/programs/load/eils

Other competitive markets rely on real-time pricing for Demand Response, which is not applicable to NWT.

customer is willing to have firm or non-firm service. As illustrated above, the NWT's peak demand hours in the winter are between 5:00 p.m. and 9:00 p.m. – within those hours a lower interruptible rate could be paid compared to the early morning hours when demand is lower and surplus energy is greater. With the lower rate, the risk of curtailment is higher.

The cost of this program would be directly related to the installation of advanced metering, which allows for more detailed data into hourly consumption. Additionally, it would include costs of necessary equipment to remotely interrupt a consumer.

The tiered rate would likely only be available to large customers than can be remotely shut off by the grid operator (or a group of customers that are aggregated and remotely interrupted).

## 6.4 Recommendations

Ultimately, NWT should consider two approaches for the interruptible tariff – one for the Taltson grid and one for the Snare grid. Regarding the Taltson grid, the NWT should consider the following:

**Recommendation 4:**

1. As discussed in the previous section, allow for the amortization of required grid investments related to incremental load tied to an interruptible service.
2. Tying the interruptible rate to the marginal cost of hydroelectric, as opposed to a discount to fuel oil.

For the Snare grid, an interruptible rate should include:

1. Similar amortization options as that described for the Taltson grid.
2. Introduce a tiered interruptible rate for the peak winter months that allows customers to pay a higher/lower rate for service that is less/more interruptible.

# 7. ELECTRIC VEHICLE ANALYSIS AND RATE DESIGN

Power Advisory was asked to determine whether a specific EV rate is appropriate for NWT in order to incent adoption and provide incremental load to the grid. As part of its analysis, a detailed jurisdictional scan was conducted to determine various EV rate options that have been implemented elsewhere and are considered utility best practice.

***Current State of EVs and EV Incentives in NWT***

The GNWT currently provides a number of subsidies to consumers interested in purchasing EVs and potential charging stations. As part of its *2030 Energy Strategy,* the GNWT initiated the Electric Vehicle Incentive Program (EVIP) to increase EV adoption. Eligible EVs for the purpose of the EVIP, as well as this analysis, primarily refers to Plug-in Electric Vehicles – that is, vehicles that can be connected and charged on grid-supplied energy. Specifically, these are Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEV).

Currently, out of the 23,600 Light-Duty Vehicles (LDVs) registered in the NWT, there are only 10 registered PEVs – 3 of which are BEVs and 7 are PHEVs.[46] That EV deployment in NWT is substantially less than 1% is unsurprising as the nascence of EVs, extreme cold climate in NWT and lack of public charging infrastructure is not conducive to their widespread adoption. That said, as the world is increasingly moving to decarbonizing transportation, markets and government policies are driving EV adoption across all geographies, albeit at different rates. Numerous governments have announced plans to increase EV penetration. Additionally, General Motors recently announced that all of its new light-duty vehicles will be fully electric by 2035.[47]

Consumers can apply for a $5,000 rebate related to the purchase of an EV and/or a $500 rebate for a Level 2 charger (220 or 240 volts) – with these rebates being incremental to current federal incentives.[48] There is currently no rate incentive targeted specifically for EV owners.

Power Advisory did not review expanding these programs, but did model the potential impact in terms of incremental load that EVs may have on the NWT grid, in both the Snare and Taltson grids. Our analysis considers the implementation of an EV charging rate that can be offered to small and large-volume customers.

In a recent study commissioned by the GNWT and published on June 30, 2020 Econoler forecast that EVs will comprise a 2.9% share of the total LDV population by 2030 in a no-incentive scenario. Conversely, in an aggressive policy scenario, Econoler forecast that EVs will comprise an 11.3% share by 2030. Power Advisory assumes a more conservative scenario of 1% (236 EVs) on the low end and 5% (1,180 EVs) on the high end by 2030, with overall system-wide demand remaining level over that time period. However, Power Advisory notes that total vehicle population growth in the NWT is expected to remain stagnant, meaning that EVs will simply replace existing non-electric vehicle stock. Despite the fact that the cold winter temperatures experienced in the NWT can decrease the energy capacity of EV batteries by as much as 50%, they are nonetheless sufficiently suited to meet most commuter needs, which average a single-way trip of 6.3km.[49]

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[46] Econoler, Electric Vehicle Infrastructure Needs Assessment and Forecast for Government of Northwest Territories, October 30, 2020.

[47] See: https://media.gm.com/media/us/en/gm/home.detail.html/content/Pages/news/us/en/2021/jan/0128-carbon.html

[48] See: https://aea.nt.ca/program/electric-vehicles/

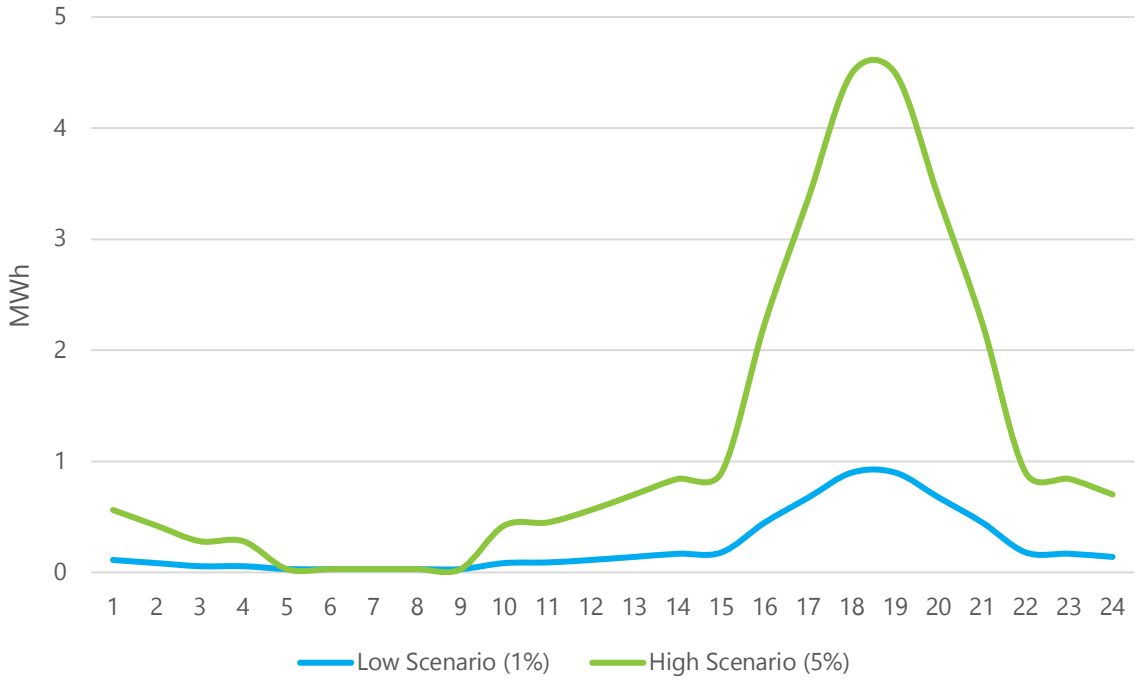
[49] Dillon Consulting, 2013 Electric Vehicle Update, prepared for Artic Energy Alliance, July 12, 2013: https://aea.nt.ca/document/3677/.

***Charging Patterns of EV Owners***

With respect to charging patterns, Power Advisory modelled the demand profile on a representative EV load pattern provided by the National Renewable Energy Laboratory (NREL) in an analysis completed for Colorado. NREL's study tracked EV charging patterns across residential homes, as well as commercial workplaces. A central observation is that charging occurs predominantly around the 6 p.m. and evening hours when residents return home from work. On the basis of this Power Advisory created the demand profile exhibited in the following figures.

The hourly load shape of EVs largely aligns with the peak load shape of the NWT – highlighting the need to induce customers to elect an interruptible service during the peak demand months.

**Figure 13: EV Charging Demand Profile (MWh)[50]**

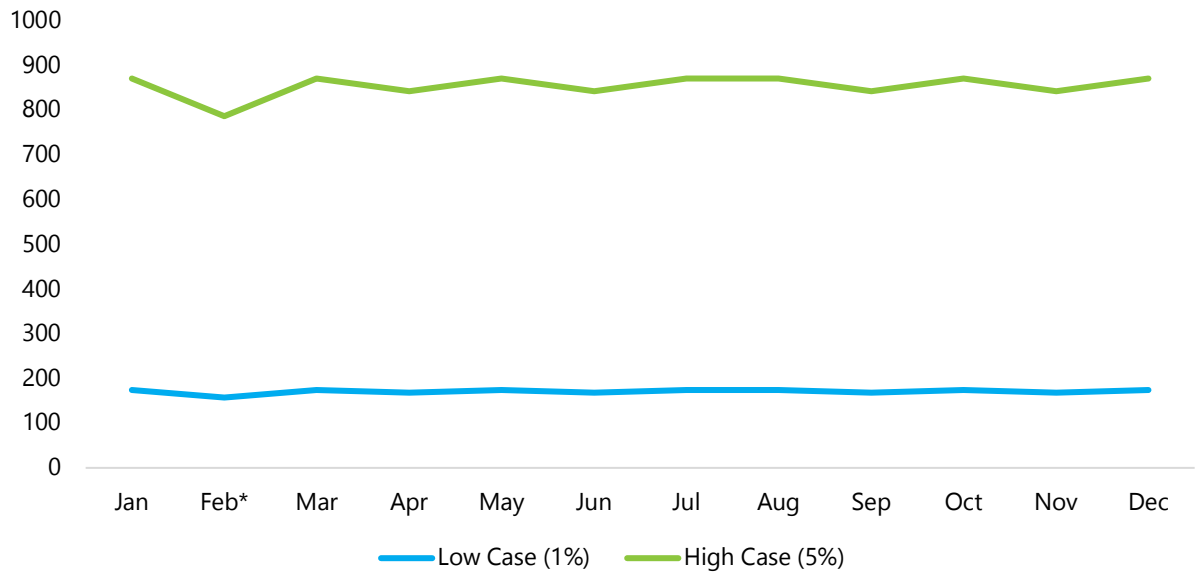



On a monthly basis, demand from EVs is predominantly the same throughout the year – meaning that an interruptible rate would likely only need to target the peak winter months when the potential for dispatching diesel generators is highest. The need for an interruptible rate is less important in the Taltson grid for the reasons outlined previously in this report.

Power Advisory's jurisdictional scan revealed a number of variations of EV incentive charging rates. Notably, a number of jurisdictions provide Time-of-Use (TOU) rates or a discounted rate in off-peak hours. The intention of these incentives is to reduce the impact on the grid during peak demand hours.

[50] This analysis assumes that the battery is completely drained, which is an extreme scenario. In many cases, the battery has some remaining capability, and the subsequent charging impact would be reduced.

**Figure 14: Monthly EV Charging Load (MWh)[51]**




***Taltson Grid EV Rate Incentive***

Given the surplus capacity on the Taltson grid, a TOU or off-peak rate is not required. Similar to previous recommendations in this report, a discounted energy rate for EVs should be based on the marginal cost of production from hydroelectric generators. Similarly, the EV rate should be separately metered for all customers, with the potential for on-bill financing to cover some or all of the costs related to metering.

As was discussed at length in the previous section, NTPC should charge at least a $20/MWh adder (equivalent to two cents per kWh) for all incremental energy consumed for EV charging on top of the marginal cost. If the average annual marginal cost from hydroelectric facilities is $10/MWh, a $30/MWh rate would act as a substantial incentive compared to other EV rates detailed in the jurisdictional scan.

For large customers that are considering a commercial fleet of EVs, a reduced demand charge – combined with interruptible service – should be considered. While the Taltson grid typically has surplus capacity, short-term outages may result in the dispatch of diesel generators. When this occurs, particularly for a large fleet of EVs, energy for EV charging should be curtailed or charged the full marginal cost of diesel output. For small-volume customers, a portion of diesel-related costs from the previous year should be included in the current year's rates. Considering the limited number of hours diesel generators are expected to run on the Taltson grid, these costs should be minimal and not materially reduce the economic incentive of the EV rate.

***Snare Grid EV Rate Incentive***

An EV charging rate on the Snare Grid must take into consideration the different characteristics of the grid – namely that it will dispatch diesel generators in many hours during the peak winter months (see the following figure). Given these constraints, an EV rate should be designed to include an economic incentive to ensure EV charging is reduced during peak demand hours. This incentive can be introduced in one of two ways: through an interruptible rate that

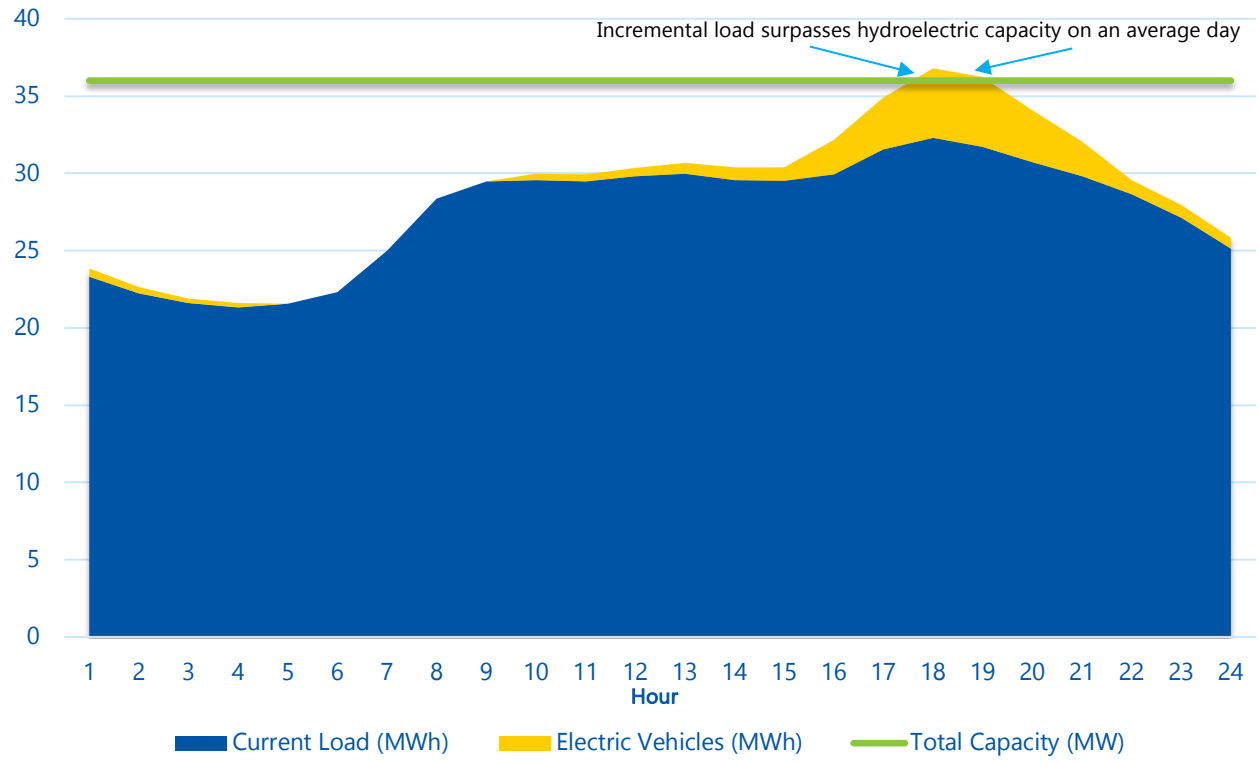
[51] Similar to the previous chart, the analysis assumes that the battery is fully drained and charged daily. In reality, the load impact would be expected to be less than that presented.

curtails EV load when diesel generators are dispatched or by charging EV customers the full marginal cost of diesel generation.

An administratively simple approach for small-volume consumers – i.e. households and small business that have an EV – would be to implement TOU rates during the winter months, with the peak rate set at the marginal cost of diesel generation. A TOU rate for EVs in off-peak months would likely be unnecessary and EV consumers can be charged a flat rate based on the marginal cost of hydroelectric generation, similar to that recommended EV rate for the Taltson grid.

Similar to the Taltson Grid, large customers considering a commercial fleet of EVs or a private EV charging station could be offered a reduced demand charge, combined with interruptible service as an incentive. Any charging that occurs during the peak hours during the winter months should be charged the full marginal cost of diesel generation – ensuring that large-volume customers are provided with the full economic incentive to reduce demand during peak hours and avoid an increase in system-wide costs or make the required investments (i.e. storage) to reduce charging during peak hours.

**Figure 15 Average Hourly Load Versus EV Charging on the Snare Grid**




***Revenue Impact of EV Adoption***

Power Advisory modelled the potential revenue impact of EV adoption. The analysis assumes EVs are adopted solely on the Snare Grid, due to it being home to the largest urban centre (Yellowknife) and EV adoption being highest in urban settings. The EV rate is modelled at $30/MWh – or three cents per kWh.

| | EV Incremental Load (MWh) | EV Incremental Revenue |
|---|---|---|
| **Low** | 2,050 | $61,502 |
| **High** | 10,251 | $307, 515 |

**Recommendation 5: Implement an Electric Vehicle Charging Rate** – Offer an EV rate tied to the marginal cost of hydroelectric generation on the Taltson Grid. On the Snare Grid, ensure that the EV rate is either interruptible or includes a peak rate tied to the marginal cost of diesel generation.

# APPENDIX A: LOAD GROWTH PROGRAM JURISDICTIONAL SCANS

# US Jurisdictional Scan

G=Generation; T=Transmission; D=Distribution

EV= Electric Vehicles; HP=Heat Pumps; EWH=Electric Water Heaters

| Utility / Jurisdiction | Utility Characteristics | Load Growth / Electrification Programs | Discussion |
|---|---|---|---|
| **Wrangell Municipal Light and Power (WMLP)**<br>Alaska, US | Type: Public (Municipal)<br>Scope: D<br>Customers: 2,073<br>Annual Load: 37.59 GWh<br>Capacity: 8.5 MW (Diesel-fired, 4 units)<br>Isolated? No. Mostly purchases power from Southeast Alaska Power Agency (hydroelectric).<br>Geography: Rural; Cold | Heat Rate Service[52]<br>"Electrical Rate Incentive"[53]<br>Industrial Interruptible Power Rate[54]<br>"Electrical Rate Incentive"[55]<br>Industrial Interruptible Power Rate[56] | *HP/EWH* - A heat and hot water rate is offered at a base rate of $4 per month (half the applicable monthly customer charge) and $0.0856 per kWh. Available to both residential and commercial customers in the Wrangell Borough. This rate is only applicable to separately metered electric furnaces/boilers and electric water heaters. There is no time of use or block component to the rate (i.e., rate for all kWh usage).<br>*Economic Development* - An electrical rate incentive can be offered to commercial and industrial users who expand their current business or build a new business. The rate can only apply to the separately metered new portion of the business, the incentive rate must be no less than $0.0856/kWh and can be for up to 5 years. Offered by the Assembly upon a finding of beneficial public interest and resolution to offer an electrical rate incentive to the customer.<br>*Interruptible Power Rate* - Heavy industrial power customers in Wrangell can purchase interruptible power directly from the wholesale power provider, Southeast Alaska Power Agency (SEAPA). Rate determined by the SEAPA. |

[52] WMLP, "Rate Sheet," Accessed September 2020 https://www.wrangell.com/electrical/rate-sheet

[53] WMLP, "Wrangell Municipal Code," Chapter 15.12 Electricity https://www.wrangell.com/sites/default/files/fileattachments/electrical/page/3235/wrangell_municipal_code.pdf

[54] WMLP, "Power Sales Agreement," Accessed September 2020 https://www.seapahydro.org/pdfs/companydocs/LongTermPowerSalesAgreement.pdf?

[55] WMLP, "Wrangell Municipal Code," Chapter 15.12 Electricity https://www.wrangell.com/sites/default/files/fileattachments/electrical/page/3235/wrangell_municipal_code.pdf

[56] WMLP, "Power Sales Agreement," Accessed September 2020 https://www.seapahydro.org/pdfs/companydocs/LongTermPowerSalesAgreement.pdf?

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|---|---|---|---|
| **Alaska Electric Light and Power Company (AEL&P)**<br>Alaska, US | Type: Public (Municipal)<br>Scope: G, T, D<br>Customers: 17,500<br>Annual Load: 345 GWh<br>Capacity: 84 MW (98% is clean energy, mostly hydroelectric)<br>Isolated? Yes<br>Geography: Small Urban; Cold (~8,500 HDD) | Electric Vehicle Rates and Charger Rentals[57]<br>Residential Heat Pump Service[58], Off-Peak/Heat Storage Rate from 10pm-6am<br>Large Interruptible Power Rate[59] | *EV* - Allows customers to charge their EV during off-peak hours at a reduced rate of $0.0561/kWh during the peak season and $0.0491 for the off-peak season for residential, and $0.0644/kWh during peak season and $0.0571/kWh during off-peak season for commercial EVs under two options. Option #1 customers are responsible for installing a 240V circuit but can rent a charging station from AEL&P for $10.13 per month, charged on the bill to avoid having to pay for the equipment up-front. Under Option #2 customers install their own charging station. Customers must qualify in order to get the EV rate by having an EV with at least 16kWh of battery storage and the main meter must be billed as residential or small commercial.<br>*HP* - Offers residential heat pump service rates at a $10.62 per month customer charge; demand charge per kW of $9.60/kWh during peak season and $5.86/kWh during off-peak season; and energy charge of $0.0496/kWh during peak season and $0.045/kWh during off-peak season. Off-Peak/Heat Storage Rate for space heating is offered to commercial and residential customers at an energy charge of $0.0737/kWh and customer charge depending on rate class of $7.58 to $25.30.<br>*Interruptible Rate* - AEL&P is reported to have interruptible Power Sales Agreements with at least two customers - Princess Cruise Lines and the Greens Creek Mine. Both own and maintain their own diesel generation for periods when AEL&P cannot serve them. |
| **Chugach Electric Association Inc.**<br>Alaska, US | Type: Co-Op<br>Scope: G, T, D<br>Customers: 84,327<br>Annual Load: 19,200 GWh<br>Capacity: 531.2 MW | EV Charging Research Program; EV Charging Rebates (Residential & Commercial); EV Lease / | *EV* - Offers $200 credit to residential members who provide information about the load profile of their charging (EV Charging Research Program). Residential members must provide proof of an EV and EV charging equipment ownership. Commercial customers can receive $500 credit to host a Level 2 EV charging facility that can be for the business' tenant or |

[57] AEL&P, "Electric Vehicles," Accessed September 2020 https://www.aelp.com/Energy-Conservation/Electric-Vehicles

[58] AEL&P, "Current Rates," Accessed September 2020 https://www.aelp.com/Customer-Service/Rates-Billing/Current-Rates

[59] McDowell Group, "Southeast Alaska Energy Update and Profile," June 2016 https://www.mcdowellgroup.net/wp-content/uploads/2016/09/Southeast-Energy-Update.pdf

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|---|---|---|---|
| | Isolated? Yes (Recently acquired Municipal Light and Power. The only other utility to which it was connected)<br>Geography: Small Urban; Cold | Rental Reimbursement Programs[60] | customer parking. Hotels and fleet operators are eligible for a larger EV charger incentive of $2,500 and $1,500, respectively.<br>Chugach has installed an EV charging station which is available for public use in the parking lot at its headquarters, in partnership with ChargePoint. Maintains a map of charging stations around Anchorage and EV consumer information.<br>Upcoming EV related plans for Chugach Electric include EV Lease and Rental Reimbursement programs. The rental reimbursement program is to enable an extended "ride and drive" opportunity for Chugach members by paying rental car companies up to $200 per participating member (initially up to 48 rentals and only 1 per member). As proposed, the lease program would pay rental companies up to $2,000 per month for one or more months for one or more drivers (to be determined by Chugach) to expose both drivers and passengers to EVs. To come into effect once rental car companies add electric vehicles to their fleets. Program budget would support six monthly lease periods per year. |
| **Tacoma Power / Tacoma Public Utilities (TPU)**<br>Washington, US | Type: Public (Municipal)<br>Scope: G, T, D<br>Customers: 182,234<br>Annual Load: 4,700 GWh<br>Capacity: 700 MW<br>Isolated? No. Relies on purchases from the federal Bonneville Power Administration<br>Geography: Urban; Temperate | Electric Vehicle Fast Charge Rate[61]<br>Residential Whole Home<br>Heat Pump and Ductless Heat<br>Pump Rebates and Loans; Commercial HVAC Rebate[62] | *EV* - Offers reduced demand charges to up to 25 EV fast charging stations in the service area through 2031 on a first come first serve basis. Partnered with providers for Level 2 charging stations. Ongoing 2-year study tracking 100 EV owners to inform potential residential EV programs.<br>*HP* - Residential rebate of $1,000 plus zero-interest loans. Commercial rebates from $150 to $500 per ton depending on the technology. Program goal of energy conservation but also supports electrification. Qualifying technology and approved contractor lists.<br>*EWH* - Rebate of $500 residential only. Instant at home improvement stores within the service area and otherwise available to qualified customers. |

[60] Chugach Electric, "Electric Vehicles," Accessed September 2020 https://www.chugachelectric.com/energy-solutions/electric-vehicles

[61] Tacoma Power, "Schedule FC Electric Vehicle Fast Charge," Ordinance No. 28552, Effective April 1, 2019 https://www.mytpu.org/wp-content/uploads/FC_July_2020.pdf

[62] TPU, "Save with HVAC," Accessed August 2020 https://www.mytpu.org/ways-to-save/business-rebates/save-with-hvac/

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|---|---|---|---|
| | | Residential Heat Pump Water Heater Rebate[63] | |
| **Burlington Electric Department (BED)**<br>Vermont, US | Type: Public (Municipal)<br>Scope: G, D<br>Customers: 19,600<br>Annual Load: ~345 GWh<br>Capacity: 102.4 MW<br>Isolated? No. ISO-NE connected<br>Geography: Small Urban; Seasonal/Cold | Residential Electric Vehicle Rate; Public BED charging stations[64]; EV Rebates & Financing; Business Charging Station Incentives[65]<br><br>Heat Pump Rebates[66]<br><br>Water Heater Rebates; Power Miser Credit[67]<br><br>Other Rebates (Forklifts, E-Bikes, Lawnmowers, Cooktop/Ranges)[68] | *EV* - Rate schedule that is about 45% ($0.08/kWh) less for at home charging between 10 pm and 12 noon (i.e., overnight through morning). Requires connection of the charger to Wi-Fi. Special service rate for public use of BED owned and maintained EV charging, currently 11 stations. Up to $2,400 rebate for EVs (in addition to federal tax credits and $5,000 sate rebate) including for used vehicles. Additional $400 BED rebate for qualifying chargers. Low-cost financing from local credit unions.<br><br>*HP* - $2,250 to $3,350 toward the purchase of an eligible cold climate heat pump (CCHP). Others for different technologies.<br><br>*EWH* - Rebate $300-600 (+$200 for moderate income). Credit for participation in EWH load management/flexibility program in partnership with a private company, Packetized Energy.<br><br>*Off-Road Heavy-Duty EV* - Rebate of $6,500 for lithium-ion battery-powered forklift and $4,000 for lead-acid battery-powered forklift. Started in 2019 and ends December 31, 2020. |
| **Nebraska Public Power District (NPPD)**<br>Nebraska, US | Type: Public (State)<br>Scope: G, T, D | EV and ChargePoint Charging Station Incentive, ChargePoint Charging Station Installation Incentive, | *EV* - $4,000 incentive for the purchase of a new EV. Charging station must also be purchased and installed with WiFi connection. $500 incentive for the installation of a residential vehicle charging station. Another $200 for in home pre-wiring for installation of a charging station. Incentive programs in partnership, with the private EV |

[63] TPU, "Rebate Forms & Documents," Accessed August 2020 https://www.mytpu.org/ways-to-save/residential-rebates/energy-efficiency-rebate-forms/#pattern_4

[64] BED, "Rates & Fees," Accessed August 2020 https://www.burlingtonelectric.com/rates-fees#power-miser-credit

[65] BED, "Electric Vehicles." Accessed August 2020 https://www.burlingtonelectric.com/ev

[66] BED, "Air-Source Heat Pumps," Accessed August 2020 https://burlingtonelectric.com/cchp

[67] BED, "Water Heaters," Accessed August 2020 https://burlingtonelectric.com/waterheaters

[68] BED, "Special Rebates for Burlington," Accessed August 2020 https://burlingtonelectric.com/rebates

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| | Customers: 89,000 (cumulative through partner municipals, co-ops and rural power districts)<br>Annual Load: 20,600 GWh<br>Capacity: 3,295 MW<br>Isolated? No. Member of RTO, Southwest Power Pool (SPP)<br>Geography: Mostly Rural; Seasonal | Charger Pre-Wiring Incentive (Residential)[69]<br>High Efficiency Heat Pump Incentive or Low Interest Loan[70]<br>Heat Pump Water Heater Incentive[71]<br>Agriculture Rebates<br>Economic Development Services and Economic Development Incentive Electric Rate[72]<br>High Efficiency Heat Pump Incentive or Low Interest Loan[73]<br>Heat Pump Water Heater Incentive[74]<br>Agriculture Rebates<br>Economic Development Services and Economic | infrastructure company ChargePoint, Inc. NPPD's EV incentives were launched in June 2019.<br>*HP* - Rebate of $400 to $1,200 for residential customers depending on installed type. For dealers $50 per qualified installation. Alternatively, to the residential incentive, low interest loans are available from the state.<br>*EWH* - Rebate of $400 to $650 for residential and commercial customers depending on source (air, water, ground) and efficiency.<br>*Agriculture* - Rebates for various irrigation technologies ranging from $500/system to $12/horsepower and electric hot heat mats of $40-80 depending on type. These support electrification, depending on existing practices and energy source, but are more structured for efficiency.<br>*Economic Development* - Suite of consulting, support and assistance services offered by NPPD for communities and businesses with the goals of retention, expansion, and attraction. Economic development rate gives eligible customers discounted energy prices for up to five years. Eligibility includes being new or additional load ≥1 MW with a monthly factor ≥60%. |

[69] NPPD, "Electric Vehicle," Accessed August 2020 https://www.nppd.com/save-money/incentives-programs

[70] NPPD, "High Efficiency Heat Pump." Accessed August 2020 https://www.nppd.com/incentives/high-efficiency-heat-pump

[71] NPPD," Heat Pump Water Heater," Accessed August 2020 https://www.nppd.com/incentives/heat-pump-water-heater

[72] NPPD, "Economic Development Services," Accessed August 2020 https://sites.nppd.com/about-us/economic-development-services/

[73] NPPD, "High Efficiency Heat Pump." Accessed August 2020 https://www.nppd.com/incentives/high-efficiency-heat-pump

[74] NPPD," Heat Pump Water Heater," Accessed August 2020 https://www.nppd.com/incentives/heat-pump-water-heater

| | | Development Incentive Electric Rate[75] | |
|---|---|---|---|
| **Columbia River People's Utility District (PUD)**<br>Oregon, US | Type: Public (Special District)<br>Scope: T, D<br>Customers: 19,590<br>Annual Load: 463 GWh<br>Capacity: n/a<br>Isolated? No, Bonneville Power Administration purchases (generation supply) and others use PUD transmission assets<br>Geography: Rural; Temperate | Level 2 Charger Rebate[76]<br>Schedule 19 - Retail EV Charging[77]<br>Heat Pump Rebates[78]<br>Heat Pump Water Heater Rebate[79]<br>Heat Pump Rebates[80]<br>Heat Pump Water Heater Rebate[81] | *EV* - A $100 rebate for Level 2 Chargers installed within the PUD service territory started in 2019. Rate Schedule 19 for PUD Charging Stations only, not customer installed chargers. Level 2 Charger (8.57¢ per kWh) and Direct Current Fast Charger (9.35¢ per kWh). Current network of 2 stations with plans for more. Has hosted Ride & Drive Events with private partners.<br>*HP* - ASHP upgrade rebates from $700 to $2,100 with additional rebates for commission, controls, and duct work. Highest rebates for variable speed and high-efficiency HPs only available for electric furnace replacement as a result of BPA's legacy policy against incenting fuel switching. Ductless heat pump rebates of $1,000 to $1,300.<br>*EWH* - Rebate of $300 to $600 depending on heat pump water heater tier for system only and not to exceed 70% of cost. |

[75] NPPD, "Economic Development Services," Accessed August 2020 https://sites.nppd.com/about-us/economic-development-services/

[76] PUD, "EV Level 2 Charger Rebate," Accessed August 2020 https://www.crpud.net/clean-energy/ev-level-2-charger-rebate/

[77] PUD, "Schedule 19 – Retail Electric Vehicle (EV) Charging," Effective October 1, 2019 https://www.crpud.net/my-pud/rates-policies/current-rate-schedules/schedule-19-retail-electric-vehicle-ev-charging/

[78] PUD, "Heating Systems," Accessed August 2020 https://www.crpud.net/ways-to-save/at-home/heating-systems/

[79] PUD, "Heat Pump Water Heaters," Accessed August 2020 https://www.crpud.net/ways-to-save/at-home/water-heating/

[80] PUD, "Heating Systems," Accessed August 2020 https://www.crpud.net/ways-to-save/at-home/heating-systems/

[81] PUD, "Heat Pump Water Heaters," Accessed August 2020 https://www.crpud.net/ways-to-save/at-home/water-heating/

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| **Cedar Falls Utilities (CFU)**<br>Iowa, US | Type: Public (Municipal)<br>Scope: G, T, D<br>Customers: 18,000<br>Annual Load: 505 GWh<br>Capacity: 147 MW<br>Isolated? Yes<br>Geography: Small Urban/Rural; Seasonal | EV Community Program,[82] Business Level 2 EV Charger Rebate[83]<br><br>Heat Pump Rebates[84] [85]<br><br>Heat Pump Rebates[86] [87]<br><br>Water Heater Rebates | *EV* - Residential and business customers can voluntarily register their EVs for a $50 per vehicle incentive from CFU's EV Community Program. Partially used for utility data collection and future EV infrastructure and program planning. Messaging to charge overnight after 9:00 PM but no rate to support. Business Level 2 EV Charger rebate of $600 per new port (up to 4 new ports per customer per year). One public charger installed by CFU in downtown Cedar Falls in 2019. All EV charging enabled with ChargePoint technology and ChargePoint data transfer to CFU is a requirement for the customer rebates.<br><br>*HP* - Air source, ground source and mini-split rebates from $600 per system for ASHP to $100-300 per ton of heating/cooling for the other technologies (residential and commercial). CFU also offers rebates for natural gas HVAC equipment. Program designed not to fuel switch from natural gas given that CFU is also the natural gas utility for Cedar Falls.<br><br>*EWH* - $400 rebates for heat pump water heaters (≥ 2.0 and storage capacity ≤ 60 gallons) for both residential and commercial customers. However, CFU does not award rebates to locations that can receive natural gas service from it. |

[82] CFU, "2020 Application - EV Community Program," November 20, 2019 https://www.cfu.net/webres/File/save-energy/2020%20Forms/2020%20Application%20-EV%20Community.pdf

[83] CFU, "2020 Application – Business Level 2 EV Charger," November 20, 2019 https://www.cfu.net/webres/File/save-energy/2020%20Forms/2020%20Application%20-%20Business%20L2%20EV%20Charger.pdf

[84] CFU, "Commercial Rebate Programs," Accessed August 2020 https://www.cfu.net/save-energy/business-rebates/

[85] CFU, "Residential Services and Rebate Programs," Accessed August 2020 https://www.cfu.net/save-energy/residential-rebates/

[86] CFU, "Commercial Rebate Programs," Accessed August 2020 https://www.cfu.net/save-energy/business-rebates/

[87] CFU, "Residential Services and Rebate Programs," Accessed August 2020 https://www.cfu.net/save-energy/residential-rebates/

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| **Orcas Power & Light Cooperative (OPALCO)**<br>Washington, US | Type: Co-Op<br>Scope: T, D<br>Customers: 11,300 (across 20 islands in the Puget Sound)<br>Annual Load: 218 GWh<br>Capacity: n/a, supplied by the regional G&T co-operative PNGC Power<br>Isolated? No. Connected by 25 submarine cables<br>Geography: Rural; Temperate | "Switch it Up!" Financing[88]<br>Level 2 EV Charging Station Rebates[89]<br>Heat Pump and Fuel Switching to Electric Heating Rebates[90]<br>Heat Pump Water Heater Rebate[91]<br>Level 2 EV Charging Station Rebates[92]<br>Heat Pump and Fuel Switching to Electric Heating Rebates[93] | *On-bill Financing* - The "Switch it Up!" program was launched in April 2019 to encourage the use of electricity for heating and transportation. Assists residential customers in understanding options. Offers on-bill-financing of EV chargers, ductless HPs and EWH through a meter conservation charge tariff. EV charging stations have a project cap of $2,500 each, heat pump water heaters are capped at $3,500 and ductless heat pumps have a cap of $15,000. Not also eligible for rebates. "Switch it Up!" is part of a broader "Electric Life" campaign for electrification. OPALCO holds public events; has an Electric Life Blog with frequent posts on topics from customer electrification stories to electric lawn tools; and generally, markets the use of electricity in its service territory.<br>*EV* - $500 rebates for residential or commercial Level 2 EV Charger installation up to annually budgeted limits. Maintains a map of charging stations and information on state and federal tax incentives but OPALCO does not own EV infrastructure or offer additional vehicle incentives.<br>*HP* - Rebate program for high-efficiency electric ductless heat pumps to support residential fuel switching. Cap reached in July 2020, no longer accepting fuel switching rebates (at least this year). Remaining rebates for homes already heated with electric for installation of ductless and ducted HPs ranging from $500 to $1,600 depending on equipment. |

[88] OPALCO, "Switch it Up!," Accessed August 2020 https://energysavings.opalco.com/switch-it-up/

[89] OPALCO, "Level 2 EV Charging Station Rebates," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/ev-charging-station-rebate/

[90] OPALCO, "Residential Rebates," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/ and OPALCO, "Commercial Ductless Heat Pump," Accessed August 2020 https://energysavings.opalco.com/commercial-rebates/commercial-ductless-heat-pump/

[91] OPALCO, "Heat Pump Water Heater Rebate," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/heat-pump-water-heater/

[92] OPALCO, "Level 2 EV Charging Station Rebates," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/ev-charging-station-rebate/

[93] OPALCO, "Residential Rebates," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/ and OPALCO, "Commercial Ductless Heat Pump," Accessed August 2020 https://energysavings.opalco.com/commercial-rebates/commercial-ductless-heat-pump/

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|---|---|---|---|
| | | Heat Pump Water Heater Rebate[94] | Commercial rebate of $1,000.00 per ton of installed outdoor unit cooling capacity for ductless heat pumps. Businesses need to be individually metered, electricity as primary heating source and not for other heat pump technologies.<br><br>*EWH* - $300 to $600 residential rebate. Limited to single family homes: new and existing without gas water heaters. |
| **Mountain Parks Electric**<br>Colorado, US | Type: Co-Op<br>Scope: D<br>Customers: 22,044<br>Annual Load: ~300 GWh<br>Capacity: n/a, supplied from Tri-State Generation & Transmission Association<br>Isolated? No<br>Geography: Rural; Cold (High Altitude) | "Electrify Everything" Program / 202.12 Rider EE[95]<br><br>EV Charger Incentive[96]<br><br>ccASHP Dual Fuel Heating Pilot,[97] HVAC Rebates (Residential & Commercial) [98]<br><br>Electric Water Heater Rebates (including Fuel Switching)[99] | *On-bill Financing* - MPE's "Electrify Everything!" program allows qualifying consumer-members to spread upfront costs of installing heat pumps, commercial EV chargers, insulation upgrades and solar panels over multiple years – as an additional charge on monthly electric bills for up to 10 years (i.e., no more than 120 payments). Launched July 1, 2020. MPE received a $10 million Rural Energy Savings Program (RESP) loan from the U.S. Department of Agriculture to initiate the program.<br><br>*EV* - MPE studied the effects of Level 2 EV chargers on wholesale power costs. As a result, it developed an optional time-of-use (TOU) rate and EV charging and wiring incentives. Rebates of $500 for new Level 2, Wi-Fi capable EV charger and $500 for its wiring. Lower $250 rebates for existing installations. To receive the rebates customers must enroll in the time-of-use rate. MPE maintains a charger finder, EV information, directs |

[94] OPALCO, "Heat Pump Water Heater Rebate," Accessed August 2020 https://energysavings.opalco.com/residential-rebates/heat-pump-water-heater/

[95] MPE, "Electrify Everything!" Accessed August 2020 https://www.mpei.com/electrify-everything-program

[96] MPE, "Electric Vehicles," Accessed August 2020

[97] NRECA, "Space Heating in the Icebox of America: Piloting Dual Fuel Solutions At Mountain Parks Electric Cooperative," February 2020 https://www.cooperative.com/programs-services/bts/Documents/Reports/Report-Space-Heat-Pilot-Feb-2020.pdf

[98] MPE, "HVAC EQUIPMENT (RESIDENTIAL & COMMERCIAL)," Accessed August 2020 https://www.mpei.com/rebates

[99] MPE, "Electric Water Heaters," Accessed August 2020 https://www.mpei.com/rebates

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| | | Outdoor Power Equipment Rebates[100] | customers to the federal and state tax credits and offers test rides of its owned Tesla Model 3.<br><br>*HP* - Cold climate air source heat pump (ccASHP) 2019-2020 pilot study at 3 homes. Revealed a potential annual customer cost savings of ~30% vs. electric baseboard and propane heating. ccASHPs addressed ~45% of heating load over the heating season. MPE provides a $450/ton rebate for qualifying ccASHPs for both residential and commercial customers. If the ASHP is 15-17 SEER it can receive $300/ton; ASHP >17 SEER and 10 HSPF or higher, the lower of 50% of the heat pump cost or $1,000/ton; and Ground-Source Heat Pumps $500/ton.<br><br>*EWH* - Residential rebate for fuel switching from natural gas or propane water heater to electric of $250 ($230 for the electric water heater and $20 lifetime tank warranty). Also offers $50-75 for EWH replacement. Only tank-style 30 to 55-gallon heaters qualify.<br><br>*Other Rebates* - Mowers 25% of cost, up to $100. Trimmers, chainsaws, pruners and blowers 25% of cost, up to $50. Both rebates have limited funds. |
| **Consumers Power (CPI)**<br>Oregon, US | Type: Co-Op<br>Scope: T, D<br>Customers: 25,000<br>Annual Load: 402 GWh<br>Capacity: n/a | EV Charger Rebate[101]<br><br>Residential Heat Pump Rebates[102], Commercial Heat Pump Rebates[103] | *EV* - Offers a $50 bill credit to residential customers for the installation of EV chargers. Customers provide proof of charger purchase and installation.<br><br>*HP* - Variety of heating rebates offered with some targeting energy efficiency and others having the net effect of load growth. As examples for residential customers a $500 rebate can be earned for upgrading a heat pump to an air source heat pump, $1,500 to replace an electric |

[100] MPE, "Outdoor Power Equipment." Accessed August 2020 https://www.mpei.com/rebates

[101] CPI, "Electric Vehicle Offers and Information," Accessed September 2020 https://www.cpi.coop/home-energy-use/electric-vehicles/promos-events/

[102] CPI, "Heat Pump," Accessed September 2020 https://www.cpi.coop/rebate/heat-pump/

[103] CPI, "Commercial Air-Source Heat Pump Retrofit and Upgrades," Accessed September 2020 https://www.cpi.coop/rebate/commercial-rebates/commercial-air-source-heat-pump-retrofit-and-upgrades/

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| | Isolated? No. Supplied from Bonneville Power Administration<br>Geography: Small Urban; Temperate | Residential Heat Pump Water Heater Rebates[104] | furnace with an air source heat pump, and $300 to upgrade to a heat pump that does not meet CPI's minimum efficiency standards. For site-built or manufactured homes, a rebate of $900 is offered for the installation of a ductless heat pump. $500 is offered for new-construction site-built ductless heat pumps.<br>*EWH* - Residential rebates are offered for installing a new heat pump water heater or switching from an electric storage water heater to a heat pump water heater. The rebates start at $300 and go up to $600 depending on the type of water heater installed. |
| **Flathead Electric Cooperative (FEC)**<br>Montana, US | Type: Co-Op<br>Scope: T, D<br>Customers: 66,911<br>Annual Load: 1,452 GWh<br>Capacity: n/a<br>Isolated? No. Supplied from Bonneville Power Administration<br>Geography: Small Urban/ Rural; Temperate | Residential Energy Fix Loan Program[105]<br>Manufactured Home Incentive Program[106]; Heat Pump Rebates[107]<br>Peak Time Rebate Program[108]; Heat Pump Water Heater Rebates[109] | *Energy Fix Loan* - Residential customers can receive a low interest fixed rate loan directly from FEC for the installation of a heat pump, heat pump water heater, and certain other equipment with a maximum amount of $7,500. Loan payments are included on the electric bill. Customers can repay the loan in 1-5 years at 3%.<br>*HP* - FEC offers $1,200 to manufactured homes in their service regions that are electrically heated (Manufactured Home Incentive Program). Air source heat pumps, ductless heat pump, and ground source heat pump rebates are offered to residential customers from $500 up to $3,200 for the replacement of electric furnaces, non-electric furnaces, existing heat |

[104] CPI, "Heat Pump Water Heater," Accessed September 2020 https://www.cpi.coop/rebate/heat-pump-water-heater/

[105] FEC, "Residential Energy Fix Loan Program," Accessed September 2020 https://www.flatheadelectric.com/save-money-save-energy/residential-energy-fix-loan-program/

[106] FEC, "Manufactured Home Incentive Program," Accessed September 2020 https://www.flatheadelectric.com/save-money-save-energy/rebates/manufactured-home-incentive/

[107] FEC, "Heat Pumps," Accessed September 2020 https://www.flatheadelectric.com/save-money-save-energy/rebates/heat-pumps/

[108] FEC, "Peak Time Rebate Program," Accessed September 2020 https://www.flatheadelectric.com/residential/peak/

[109] FEC, "Heat Pump Water Heater Rebate," Accessed September 2020 https://www.flatheadelectric.com/save-money-save-energy/rebates/heat-pump-water-heater-rebate/

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| | | | pumps, and electric resistance heat. Rebates of $500-$3,000 are offered for the new construction.<br><br>*EWH* - Rebates are offered to residential customers for the installation of HPWHs. Customers can earn $600 for the installation of a HPWH and $800 for the installation of a Sanden Split System HPWH. Customers must provide proof of purchase and installation of the water heater to qualify for the rebate. Residential customers are offered up to $48 per year, with a $4 per month bill credit for installing a device on their electric water heaters that reduces demand during peak periods. FEC installs the device for free. |
| **Minnesota Valley Electric Co-Op (MVEC)**<br>Minnesota, US | Type: Co-Op<br>Scope: D<br>Customers: 42,523<br>Annual Load: 888 GWh<br>Capacity: n/a<br>Isolated? No. Purchases energy from Basin Electric Power, Green River Energy, and Interstate Power and Light Company<br>Geography: Small Urban / Rural; Seasonal | Energy Wise Electric Vehicle Program[110]; Commercial EV Charging[111]<br><br>Energy Wise Heating/Cooling Programs[112]; Commercial Rebates[113]<br><br>Energy Wise Electric Water Heating[114] | *EV* - The residential energy wise electric vehicle program includes Time-of-Day rates and charger rebates. In the Summer (June- Sept) rates from 11pm-7am is 6.9c/kWh, from 9pm-11pm and 7am-3pm is 12.5c/kWh, and from 3-9pm is 39.7c/kWh. In the Winter (Oct-May) rates from 11pm-7am is 5.2c/kWh, from 9pm-11pm and 7am-3pm is 11.7c/kWh, and from 3-9pm is 39.7c/kWh. Residential customers receive a $150 rebate for EV charger installation. Commercial EV rebates up to $250 per charger are offered for the installation of public, workplace and multifamily, and fleet Level 2 EV chargers.<br><br>*HP* - A rebate of $500 is offered for the installation of an air source heat pump and $200/ton for a ground source heat pump to residential customers. For all electric heating products, members pay lower rates |

[110] MVEC, "Electric Vehicle Program," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/electric-vehicle-program/

[111] MVEC, "Commercial EV Charging," Accessed September 2020 https://www.mvec.net/wp-content/uploads/2020/01/2020-Fillable-EV-Charging-MVEC.pdf

[112] MVEC, "Electric Heating Programs," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-heating-programs/

[113] MVEC, "Business Efficiency Rebates," Accessed September 2020 https://www.mvec.net/business/efficiency-rebates/

[114] MVEC, "Electric Water Heating," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-electric-water-heating-programs/

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| | | Electric Forklifts and High Frequency Battery Charging[115]<br><br>Energy Wise Heating/Cooling Programs[116]; Commercial Rebates[117]<br><br>Energy Wise Electric Water Heating[118]<br><br>Electric Forklifts and High Frequency Battery Charging[119] | during off-peak hours. Commercial rebates of $200/ton are offered for air source heat pumps and $400/ton for new ground source heat pumps.<br><br>*EWH* - Residential members with an electric water heater pay half price electric rates using a separate meter or can receive up to $84 per year for unmetered water heating. Customers must cover the cost of installation for an energy management switch for metered heating, but MVEC will cover the cost of the switch for unmetered heating.<br><br>*Other* - Rebates starting at $500 up to $2,000 are offered to commercial customers who convert their forklift fleet to electric. Rebates of $500 are offered for the commercial use of high frequency battery chargers. High frequency batter chargers allow electric forklifts to charge at a faster rate and improve efficiency for the forklifts. |
| **Midland Power Cooperative (MPC)**<br>Iowa, US | Type: Co-Op<br>Scope: D<br>Customers: 12,020<br>Annual Load: 494.774 GWh<br>Capacity: n/a | Electric Vehicle Charger Rebate[120] | *EV* - Residential rebates up to $500 per home are offered for the installation of Level 2 EV chargers.<br><br>*HP*- Air source heat pump rebates are offered at $300/ton for EnergyStar pumps and $200/ton for standard air source heat pumps to residential customers. A discounted electric heat rate is also offered for the heat |

[115] MVEC, "Electric Forklifts and High Frequency Battery Charging," Accessed September 2020 https://www.mvec.net/wp-content/uploads/2020/01/2020-Fillable-Electric-forklifts-MVEC.pdf

[116] MVEC, "Electric Heating Programs," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-heating-programs/

[117] MVEC, "Business Efficiency Rebates," Accessed September 2020 https://www.mvec.net/business/efficiency-rebates/

[118] MVEC, "Electric Water Heating," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-electric-water-heating-programs/

[119] MVEC, "Electric Forklifts and High Frequency Battery Charging," Accessed September 2020 https://www.mvec.net/wp-content/uploads/2020/01/2020-Fillable-Electric-forklifts-MVEC.pdf

[120] MPC, "Electric Vehicle Chargers," Accessed September 2020 https://www.midlandpower.coop/EVChargers

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| | Isolated? No. Power is supplied from Corn Belt Power Cooperative and Central Iowa Power Cooperative<br>Geography: Small Urban/ Rural; Seasonal | Residential Heat Pump Rebates and Discounted Rate[121]<br><br>Water Heater Rebates[122]<br><br>"All Electric Home" Rebates[123] | pumps. Commercial customers must email a member representative to get information about the rebates available.<br><br>*EWH* - Rebates are offered to residential customers for the installation of new electric water heating equipment and drain water heat recovery pipes. $500 for EnergyStar EWHs and $200 for 80+ gallon resistance storage units, $100 for a 45-79 gallon, and $300 for a drain water heat recovery pipe.<br><br>*Other (All Electric Home)* - Additional rebates of $500 and $200 are offered if the residential customer has efficient heating and cooling and water heater systems. Only for new single family all-electric homes. |
| **San Isabel Electric Association (SIEA)**<br>Colorado, US | Type: Co-Op<br>Scope: D<br>Customers: 24,296<br>Annual Load: 464 GWh<br>Capacity: n/a<br>Isolated? No<br>Geography: Rural; Seasonal | Empower Financing[124]<br><br>Empower EV Program (Rebates and Rates)[125]<br><br>Heat Pump Rebates and Conversion Program[126]<br><br>Outdoor Power Equipment Rebates[127] | *"Empower Financing"* - SIEA offers on-bill financing up to 100%, low interest loans, and fixed payment loans starting at $500 for up to 6 months to 2-year terms for their members for a variety of equipment, including water heaters, electric thermal storage, electric forced air heater, and air source heat pumps.<br><br>*EVs* - Members receive a $500 rebate for purchasing an EV, up to $500 for the purchase of a Level 2 charging station, and also receive up to a $500 rebate for the installation of the charger. EV charging rates for the |

[121] MPC, "Heat Pumps," Accessed September 2020 https://www.midlandpower.coop/heatpumps

[122] MPC, "Water Heaters," Accessed September 2020 https://www.midlandpower.coop/waterheaters

[123] MPC, "All Electric Home," Accessed September 2020 https://www.midlandpower.coop/content/all-electric-home

[124] SIEA, "Empower Financing," Accessed September 2020 https://siea.com/empowerfinancing/

[125] SIEA, "Empower EV Education," Accessed September 2020 https://siea.com/empowereveducation/

[126] SIEA, "SIEA Member Rebates," Accessed September 2020 https://siea.com/empower/

[127] SIEA, "Rebate List," Accessed September 2020 https://siea.com/wp-content/uploads/2020/01/Rebates2020Update.pdf

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| | | | first 1,000 kWh off-peak is $0.076/kWh, over 1,000 kWh off-peak is $0.062/kWh and during on-peak is $0.149/kWh.<br><br>*HP* - Residential rebates are offered starting at $85 up to $500 per ton for the installation or replacement of electric heat pumps.<br><br>*HPWHs* - Residential rebates are offered starting at $25 up to $350 for the purchase of electric water heaters. SIEA also offer members electric water heaters for free to convert from gas to electric if they enter into a load control agreement. The water heater must be a Rheem Marathon water heater or a state water heater that is 95% efficient to qualify for the agreement.<br><br>*Other rebates* - Residential rebates are offered at 25% of the cost, up to $125, for the purchase of qualifying electric mowers, snow blowers or trimmers. |
| **Jacksonville Electric Authority (JEA)**<br>Florida, US | Type: Public (Municipal)<br>Scope: G, T, D<br>Customers: 478,000<br>Annual Load: 12,732.23 GWh<br>Capacity: 3,300 MW<br>Isolated? No<br>Geography: Urban; Warm | Non-Road Electrotechnology (NRE) Program[128]<br><br>Plug-In Electric Vehicle Rebate[129]<br><br>Heating and Cooling System Rebates[130] | *NRE Program* - Promotes and assists the purchase or lease of or conversion to electric equipment as an alternative to diesel or propane powered equipment. Select technologies eligible for Non-Road Electrotechnology Rebates include:<br>○ Forklifts: $300<br>○ Aircraft Tractors/Pushbacks: $400<br>○ Baggage/Tow Tractors: $250<br>○ Belt Loaders: $100<br>○ GPUs: $600<br>○ e-TRUs: $200 |

[128] JEA, "Non-Road Electrotechnology Rebates," Accessed August 2020 https://www.jea.com/Business_Resources/Rebates_for_Businesses/Non-Road_Electrotechnology_Rebates

Study on technologies and potential - JEA, "Non-road Electrotechnology Study," December 19, 2014 https://www.jea.com/Pdf/Download/12884923308

[129] JEA, "Electric Vehicle Incentives," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Electric_Vehicle_Incentives/

[130] JEA, "Heating and Cooling Rebates," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Heating_and_Cooling_Rebates/

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| | | Electric Lawn Equipment Rebates[131]<br><br>Economic Development Incentive Program[132]<br><br>Plug-In Electric Vehicle Rebate[133]<br><br>Heating and Cooling System Rebates[134]<br><br>Electric Lawn Equipment Rebates[135]<br><br>Economic Development Incentive Program[136] | ○ H-D TSE: $200<br>○ Cranes: $15,000 to $75,000<br>○ Golf Carts: $50<br><br>Designed around common commercial and industrial equipment within the Jacksonville area. There are also custom incentives available and for other technology uses not listed above such as cruise ship shore power. Program was launched in 2018 to specifically promote electrification. Said to have increased annual sales by 38.7 GWh (~0.3% system sales) in the first 18 months and ~70% of those incremental sales were off-peak.<br><br>*EV* - Vehicle rebates of $500 to $1,000 depending on battery size. Are for plug-in electric passenger type vehicles (all electric and hybrid). JEA offers EV-focused outreach events and maintains EV information.<br><br>*HP* - $150 residential rebate for 16.0 + SEER split system heat pump. Only this technology. Heating load requirements are low in Florida. Additional rebates for small businesses as well as custom C&I ones but these are more so for energy efficiency.<br><br>*Other Rebates* - Instant rebates of $25 for select electric lawn equipment at retailers within the JEA service territory.<br><br>*Economic Development* - New and existing customers whose new demand or incremental demand is a minimum of 300 kW at a single site of delivery and add at least 15 full-time employees in the JEA service |

[131] JEA, "Electric Lawn Equipment Rebates," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Electric_Lawn_Equipment_Rebates/

[132] JEA, "Economic Development Incentive Program," Accessed August 2020 https://www.jea.com/business_resources/economic_development_incentive_program/

[133] JEA, "Electric Vehicle Incentives," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Electric_Vehicle_Incentives/

[134] JEA, "Heating and Cooling Rebates," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Heating_and_Cooling_Rebates/

[135] JEA, "Electric Lawn Equipment Rebates," Accessed August 2020 https://www.jea.com/Residential_Customers/Residential_Rebates/Electric_Lawn_Equipment_Rebates/

[136] JEA, "Economic Development Incentive Program," Accessed August 2020 https://www.jea.com/business_resources/economic_development_incentive_program/

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| | | | territory are eligible. Discount applied to demand, energy, and environmental charges of 30% in Year 1 decreasing by 5% each year to 0% in Year 7. Designed to provide a financial incentive for new commercial or industrial customers or existing customers who expand their business and add new jobs. |
| **CenterPoint Energy (CPE)**<br>Various (Program in Texas, US) | Type: Investor Owned<br>Scope: T, D<br>Customers: 2 million<br>Annual Load: 88,636 GWh<br>Capacity: n/a<br>Isolated? No. Part of ERCOT wholesale market<br>Geography: Urban; Warm | Clean Air Technologies (CAT)[137]<br><br>Plug-in Electric Vehicles[138] | *CAT Program* - This program provides commercial customer assistance and incentives of up to $1,000 for the use of technologies such as electric TRUs (Truck Refrigeration Units) and electric forklifts. Direction to alternative funding opportunities such as grants from the TX Commission of Environmental Quality.<br><br>*EVs* - CPE does not offer incentives, rates, or rebates for EVs. It only maintains consumer information on the costs and benefits of EVs. |
| **Entergy**<br>Various, (Program in Arkansas, US) | Type: Investor Owned<br>Scope: G, T, D<br>Customers: 715,000 (AR)<br>Annual Load: 22,525 GWh (AR only)<br>Capacity: 30,000 MW<br>Isolated? No<br>Geography: Urban and Rural; Warm | Agricultural Energy Solutions Program[139]<br><br>Smart Direct Load Control Program[140] | *Energy Solutions Program* - Supports the installation of certain agricultural equipment. Agricultural customers must apply to the program in order to get project assistance. Primarily supports conversion of diesel irrigation pumps to electricity. Focused on technical support, marketing, electric line extension, facilitation, and contractor coordination with no direct customer incentives. Customer cost savings are said to cover the majority of equipment costs.<br><br>*HVAC* - Load Control Program offered to residential and small commercial customers. Enrollment in this program earns residential customers $100 per year and non-residential customers up to $40 per year to reduce energy demand during peak events. Customers also earn |

[137] CPE, "CenterPoint Energy Clean Air Technologies Program," Accessed September 2020 https://cnpelectrification.com/

[138] CPE, "Plug-in Electric Vehicles," Accessed September 2020 https://www.centerpointenergy.com/en-us/residential/services/electric-

[139] Entergy, "Agricultural Energy Solutions," Accessed September 2020 https://www.entergy-arkansas.com/your_business/save_money/ee/agricultural/

[140] Entergy, "Smart Direct Load Control Program," Accessed September 2020 https://www.entergy-arkansas.com/your_home/save_money/ee/thermostat/

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| | | | incentives up to $225 for the installation of a qualifying thermostat, which over the costs of most devices. Customers retain the option to opt out of load events but receive a reduced payment. |

**Additional Utility Economic Development Programs**

| Jurisdiction | Description |
|---|---|
| **New York** | New York offers a number of direct and indirect subsidies to large customers:<br>○ The Industrial Economic Development Program, Preservation Power, ReCharge NY, St. Lawrence County Economic Development Power (SLCEDP) and the Expansion Power (EP) and Replacement Power (RP) all allocate blocks of energy to regional and statewide businesses for economic development purposes. The allocations are overseen by the NYPA and, in some cases, regional development agencies. Collectively, these programs provide over 1,000 MW of cheap energy to businesses and other electricity customers.[141]<br>○ The Niagara Economic Development Fund provides direct loans for the expansion or maintenance of plants or facilities if the project will increase load and the low-cost energy results in an economic benefit to the region.[142]<br>○ The Electric Capital Investment Incentive Program provides funds for facilities to expand or launch a new project.[143]<br>○ The Three-Phase Power Incentive Program provides funds to expand three-phase service to predominantly rural customers.[144]<br>○ The North Country Economic Development Fund is jointly overseen by the NYPA and a regional development agency and provides loans and funds to businesses expanding operations or creating new jobs.[145]<br>○ The Northern New York Power Proceeds Allocation Board in conjunction with a development agency provides funds for capital investment projects in northern regions of the state.[146]<br>○ St. Lawrence River Valley Redevelopment Agency (RVRDA) oversees funds from the NYPA to support economic development projects.[147]<br>○ The Western New York Power Proceeds Allocation Board (WNYPPAB) also oversees funds from the NYPA to support economic development projects in western regions of the state.[148] |

| Jurisdiction | Description |
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| **Michigan/Indiana** | In Michigan, the Indiana-Michigan Power Economic Development Rider 2019 offers a bill reduction of up to $12 per kilowatt to new and expanding businesses. The new customer must have a billing demand of 300 kW or more, or existing customers must increase their demand by that amount. The customer must also apply and receive government assistance and prove that the project would not be operational without the rider.[149]<br><br>In Indiana, the Indiana-Michigan Power Economic Development Rider 2019 offers a bill reduction of up to $11 per kilowatt to new and expanding businesses. The customer must have a billing demand of 500 kw/kVA or, if they are an existing customer, increase their billing demand by that amount. The investment must add ten or more full-time employees or $1 million capital |

[141] New York Power Authority, "Economic Development," Accessed September 2020 https://www.nypa.gov/services/clean-power-programs/economic-development

[142] City of Niagara, "City Business Loan and Grant Programs," Accessed September 2020 http://niagarafallsusa.org/download/EconomicDevelopment/CNFloangrantinfo10_09.pdf

[143] National Grid, "Electric Capital Investment Incentive Program," Accessed September 2020 http://www.shovelready.com/ProgramDocuments/ElectricCapitalInvestmentIncentive.pdf

[144] National Grid, "3-Phase Power Incentive Program," Accessed September 2020 https://www.shovelready.com/ProgramDocuments/3phasePowerIncentive.pdf

[145] Development Authority of the North Country, "North Country Economic Development Fund," Accessed September 2020 https://evogov.s3.amazonaws.com/media/83/media/123493.pdf

[146] NY Power Authority, "Northern NY Power Proceeds Allocation Board," Accessed September 2020 https://www.nypa.gov/services/clean-power-programs/economic-development/nnyppab

[147] St. Lawrence County IDA, "St. Lawrence River Valley Redevelopment Agency," Accessed September 2020 https://slcida.com/rvrda/

[148] The New York State Senate, "Section 189-B The western New York power proceeds allocation board," Accessed September 2020 https://www.nysenate.gov/legislation/laws/COM/189-B

[149] Indiana Michigan Power, "Michigan Economic Development Rider 2019," Accessed September 2020 https://indianamichiganed.aeped.com/wp-content/uploads/2019/03/MI-EDR-2019-App.pdf

| Jurisdiction | Description |
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| | improvements. The project must also be competitive – meaning it could have been made in other jurisdictions – and supported by local, state or other development agencies.[150] |
| **Illinois** | Illinois has introduced dozens of programs that provide price reductions for facilities or customers that increase load. The credits range from lower monthly demand charges to lower block rates for energy. The reductions are available to both new and existing customers. |
| **Ohio** | Ohio provides the Development Incentive Rider, which consists of three separate programs to encouragement new and existing developments: the Economic Development Program, the Urban Redevelopment Program and the Brownfield Incentive Program. The programs provide up to a 50% reduction on monthly distribution charges.[151]<br>○ For new or expanding businesses, the Economic Development Program must produce an additional 25 full-time employees and the increase in load must result in at least $1 million in capital investment at one of the company's facilities. The new employee requirement is waived if the company invests $10 million. Existing customers must agree to maintain employment levels for at least one year.<br>○ The Urban Redevelopment Program is targeted for facilities or investments that produce an additional 500 kW of new load.<br>The Brownfield Development Program is applicable to developments in recognized "brownfield" areas. |

[150] Indiana Michigan Power, "Indiana Economic Development Rider 2019," Accessed September 2020 https://indianamichiganed.aeped.com/wp-content/uploads/2019/03/IN-EDR-2019-App.pdf

[151] Duke Energy, "Duke Energy Incentive Riders," Accessed September 2020 https://datacache.duke-energy.com/Content/electricity101/build/rates-and-incentives-3a.html

| Jurisdiction | Description |
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| **Pennsylvania** | The PECO Development Rider provides a rate rider to loads of at least 350 kw to support businesses and "encourage environmentally sustainable growth." The credit can reduce monthly variable demand charges by up to 15%.<br><br>The PECO Economic Development Rider-Competitive Alternative provides a rate rider to both manufacturing and non-manufacturing businesses that can demonstrate a viable alternative to service from PECO, demonstrate an increase in load of at least 1 MW and increased in employment of at least 10 jobs per MW of load.[152] |
| **Minnesota** | The Xcel Energy Business Incentive and Sustainability Rider reduces the monthly demand charge by up to 40% for new or existing customers with an increase in load of 350 kW or greater.[153] |

[152] PECO, "Electric Service Tariff," https://www.peco.com/SiteCollectionDocuments/RateCaseCompl.pdf

[153] Xcel Energy, "Business Incentive and Sustainability Rider," https://www.economicdevelopment.xcelenergy.com/incentives/Minnesota/Business-Incentive-and-Sustainability-Rider

# Canada Jurisdictional Scan

| Utility/Jurisdiction | Utility Characteristics | Load Growth / Electrification Programs | Discussion |
|---|---|---|---|
| **BC Hydro and Power Authority** | Type: Crown Corporation<br>Customers: 4 million<br>Annual Load: 52,000 GWh<br>Capacity: 12,100 MW | Transmission Service Freshet Energy Rate Schedule 1892[154]<br>General Service E-Plus (*discontinued)[155]<br>Fleet Electrification Rates (Demand Transition Rate & Overnight Rate) [156]<br>Irrigation Rate[157]<br>CEC Proposal for Interruptible Rate[158] | *Freshet Energy* - provides participating customers market pricing for incremental consumption during the freshet period (May 1 to July 31 inclusive). Rate is set above marginal cost of production for BC Hydro. As set out in BC Hydro's Final Evaluation Report, over the three years of the pilot (2015-2018), the freshet rate drove participation from approximately 30% of the transmission customer class, increased domestic energy sales by 458 gigawatt hours and revenue by $11.8 million (M), and had an estimated positive ratepayer impact of $3.7M.<br>*E-Plus* - Provided discounted rate for separately metered energy used for electrical heating (space, water, and industrial process) on an interruptible basis when there is a lack of surplus hydro energy and cannot be provided economically from other resources. To access rate, special condition was imposed on customer to maintain a permanent back-up system with adequate fuel. Offered in 1987-1990 and closed for new accounts thereafter. Original customers continued service under automatic monthly renewal. There were approx. 200 remaining customers in 2019. BC Hydro to discontinue for existing customers starting 2023. |

[154] BC Hydro, "Freshet Rate Extension Application," April 8, 2019 https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-filings/rates/2019-04-08-fst-extension.pdf.

[155] BC Hydro, "General Service E-Plus Amendment Application," November 14, 2019 https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-filings/rates/00-2019-11-14-bc-hydro-rs-1205-1206-1207amendment.pdf.

[156] BC Hydro, "Fleet Electrification Rates," Accessed September 2020 https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/fleet-electrification-rates.html.

[157] BC Hydro, "Irrigation Rate," Accessed September 2020 https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/irrigation-rate.html.

[158] BC Hydro, "CEC Interruptible Rate Proposal," November 8, 2016 https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-matters/cec-interruptible-rate-proposal-presentation-20161108.pdf.

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| | | | *Fleet Electrification Rates (FER)* - provides incentives for customers looking to adopt electric vehicle fleets. Specifically, the DTR is aimed at providing rate relief to customers with fleets that cannot charge at night by removing the demand charge component and phasing it in over a 6 year period (must be metered separately). Specifically, the Overnight Rate provides a flat energy rate regardless of time with one demand charge during the daytime hours (with maximum set demand) and no demand charge at nighttime hours.<br><br>*Irrigation Rate (IR)* - The IR provides a flat energy rate (does not appear to contain demand charge) for loads using a specific motor for irrigation purposes. The rate is divided into two season (i.e., the irrigation season and non-irrigation season). |
| **Manitoba Hydro** | Type: Crown Corporation<br>Customers: 587,000<br>Annual Load: 26,000 GWh<br>Capacity: 5,700 MW | General Service - Short Duration Intermittent Rate[159]<br><br>Alternative Rate Options[160] (Surplus Energy Program, Curtailable Rate Program)<br><br>Manitoba Energy Jobs Fund[161] | *Intermittent Rate (IR)* - The Short Duration IR is intended for customers with load profiles of short periods of high demand combined with very low overall energy consumption, with the service being interruptible anytime. Measured demand is reduced by 50% (demand charge). Energy charge based on 1% load factor. Penalty for exceeding monthly energy entitlement. Peak may be shifted by MB Hydro.<br><br>*Surplus Energy Program (SEP)* - The SEP is Effectively an interruptible rate for C&I customers billed on a basic service charge, a market-based energy charge, and a distribution charge. Alternate back up system is required.<br><br>*Curtailable Rate Program* - Expected to drop 5000 kW within specified time frame when called to do so (e.g., very similar to concept of demand response except without a market). |

[159] Manitoba Hydro, "Proposed Rate Schedules," Accessed September 2020 https://www.hydro.mb.ca/docs/regulatory_affairs/pdf/electric/electric_rate_application_2019/11_appendix_11_-_proposed_rate_schedules_for_rates_effective_april_1_2019.pdf.

[160] Manitoba Hydro, "Commercial Rates," Accessed September 2020 https://www.hydro.mb.ca/accounts_and_services/rates/commercial_rates/#e-alternative.

[161] Manitoba, "Energy Opportunities Office," Accessed September 2020 https://www.gov.mb.ca/sd/environment_and_biodiversity/energy/opportunities.html

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| | | | *Energy Jobs Fund* - The Manitoba government created a $30 million fund to provide "flexible" loans to businesses that expand to establish new operations in the province. The program is not a load growth incentive to help manage the province's ongoing capacity surplus. |
| **Hydro-Québec** | Type: Crown Corporation<br>Customers: 4 million<br>Annual Load: 208.3 TWh (net electricity sales)<br>Capacity: 34,500 MW | Incentive rates[162]<br>Québec Economic Plan 2016[163]<br>Electricity Discount Program[164] | Incentive rates for large consumers:<br>○ *Load Retention Rate* – Customer must demonstrate financial hardship and rate gets reduced according to calculated coefficient.<br>○ *Interruptible Rate* – Provides fixed and variable bill reduction credits based on interruptible power. There are several variations of the program with advance notification of interruption to service.<br>○ *Economic Development Rate* – Customer to build 1 MW or add 500 kW to existing facility demand. Provides 20% discount decreasing by 5% annually for 3 years.<br>○ *Industrial Revitalization Rate* – Provides discounted rate to incentivize returning of load back to QC that was moved to another place.<br>○ Curtailable and peak shifting options available as well for targeted customers and activities (i.e., greenhouses – load for photosynthetic lighting).<br>*Some of the rate options above are mutually exclusive while others can be "stacked"<br>*Québec Economic Plan 2016* offers cash reimbursement on electricity bills to businesses and natural resource processing sectors making investments in: new |

[162] Hydro-Québec "2019 Electricity Rates," Accessed September 2020 https://www.hydroquebec.com/data/documents-donnees/pdf/electricity-rates.pdf?v=20190401.

[163] Gouvernement du Québec, "Electricity Discount Program Applicable to Consumers Billed at Rate L," Accessed September 2020 http://www.finances.gouv.qc.ca/en/Department677.asp.

[164] Gouvernement du Québec, "Electricity Discount Program Applicable to Large Power Consumers Served by Off-Grid Systems," Accessed September 2020 http://www.finances.gouv.qc.ca/en/Department679.asp

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| | | | production start-up, increased output to adapt supply to market demand, conversion/enhancement or productivity, new technology etc. There is upper limit cap.<br><br>*Electricity Discount Program* - This program allows customers on the industrial rate to recover up to 50% of an investment through lower electricity rates. The maximum annual reduction in electricity rates is capped at 20%. Investments eligible for the discount include new facilities, increased output, a conversion in production processes or energy efficiency and modernization upgrades. |
| **SaskPower** | Type: Crown Corporation<br>Customers: 540,000<br>Annual Load: 23,500 GWh<br>Capacity: 4,900 MW (IPPs inclusive) | Irrigation Interruptible Rate[165] | *Irrigation Interruptible Rate* - "This rate is for farm irrigation main pumping stations requiring in excess of 1,000 kilovolt amperes (kVA) served on an interruptible basis through customer-owned transformation, and for related booster pumps and pivot systems less than 1,000 kVA that will be inoperable as a consequence of an interruption to the main pumping station. The annual irrigation pumping season is from April 1 to Oct. 31." |
| **Nova Scotia Power** | Type: Privately owned by Emera<br>Customers: 500,000<br>Annual Load: 11,300 GWh | Interruptible Rider to the Large Industrial Tariff [166] | *Interruptible Rate* -<br>Large industrial customers who qualify for interruptible service will receive a $3.43 per month per kilovolt ampere reduction in demand charge for billed interruptible demand. |

[165] SaskPower, "Farm Rates," Accessed September 2020 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwizgIOElcjrAhUpoXIEHX5dBpwQFjAAegQIBRAB&url=https%3A%2F%2Fwww.saskpower.com%2F-%2Fmedia%2FSaskPower%2FAccounts-and-Services%2FRates%2FService-Rates%2FPower-Supply-Rates%2FServiceRates-Farm.ashx&usg=AOvVaw1RYgi8KWNqKqdZbgicEUE0.

[166] Nova Scotia Power, "Interruptible Rider (Large Industrial Tariff)," Accessed September 2020 https://www.nspower.ca/about-us/electricity/rates-tariffs/interruptible-rider.

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| | Capacity: 3,100 MW (IPPs inclusive) | One Part Real Time Pricing [167] | *Real Time Pricing* - Real Time Pricing tariffs are electricity prices that vary hourly according to Nova Scotia Power's varying cost of generation. This provides customers an opportunity to reduce electricity costs by managing their consumption to take advantage of lower priced electricity during off-peak periods (overnight, weekends and holidays). No demand charge |
| **Yukon Energy Corporation** | Type: Crown Corporation<br>Customers: 2,200<br>Annual Load: 450 GWh (produced and partly supplied to ATCO who retails to its own customers in Yukon)<br>Capacity: 116-129 MW | Secondary Energy 32[168] | *Secondary Energy* - This program gives eligible Yukon businesses the option of using hydro power to heat their facilities instead of diesel fuel or propane. There are some stipulations: the business' existing heating system must be maintained and fully operational so that it can be re-activated on 24 hours notice. A second electrically fired heating system must be added in order to use the secondary sales electricity as a heating source. The business must also be located in an area that is served by hydro-generated power. The Secondary Sales Program helps customers save 10 percent or more on heating bills. It also helps Yukon Energy to earn more revenue than it otherwise would and it displaces the use of diesel fuel for heating. |

[167] Nova Scotia Power, "One Part Real Time Pricing (RTP)," Accessed September 2020 https://www.nspower.ca/about-us/electricity/rates-tariffs/rtp.

[168] Yukon Energy, "Secondary Sales Program," Accessed September 2020https://yukonenergy.ca/customer-service/programs/secondary-sales-program.

# APPENDIX B: INTERRUPTIBLE RATE DETAILED JURISDICTIONAL SCANS

# US Interruptible & Heating Rate Scan

| Utility | Rate Type | Discussion |
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| **Wrangell Municipal Light and Power (AK)** | Heat Rate[169] | Available to both residential and commercial customers in the Wrangell Borough. This rate is only applicable to separately metered electric furnaces/boilers and electric water heaters. There is no time of use or block component to the rate (i.e. rate for all kWh usage).<br>• The heat and hot water rate is offered at a base rate of $4 per month and $0.0856/kWh.<br>• **Discount is half the applicable monthly customer charge and energy charge discount is the same charge as the charge for the over 1200 kWh energy use for residential customers.**<br>  ○ The standard energy base rate for residential customers is $8 per month, and from 0-300 KWH is $0.1348/kWh, from 300-1200 kWh is $0.1091/kWh, and 1200 kWh and over is $0.0856/kWh.<br>  ○ The standard energy base rate for small commercial customers is $9 per month, and all kWh usage is $0.1241/kWh.<br>  ○ The standard energy base rate for large commercial customers is $13.50 per month, from 0-70,000 KWH is $0.1145/kWh, and 70,000 kWh and over is $0.1102/kWh. |
| | Interruptible Rate[170] | Heavy industrial power customers in Wrangell can purchase interruptible power directly from the wholesale power provider, Southeast Alaska Power Agency (SEAPA). Rate determined by the SEAPA. |
| **Alaska Electric Light and Power Company (AK)** | Heat Rate[171] | Offers residential heat pump service rates at a $10.62 per month customer charge; demand charge of $9.60/kW during peak season (Nov-May) and $5.86/kW during off-peak season (Jun-Oct); and energy charge of $0.0496/kWh during peak season and $0.045/kWh during off-peak season.<br>• **Heat pump discount for residential customers of $0.0501/kWh during off-peak and $0.0661/kWh during peak season.**<br>• Off-Peak/Heat Storage Rate for space heating is offered to commercial and residential customers at an energy charge of $0.0737/kWh and customer charge depending on rate class of $7.58 to $25.30.<br>• **Residential discount of $1.02 per month customer charge and $0.0214/kWh during the off-peak season and $0.042/kWh during the peak season.** |

[169] WMLP, "Rate Sheet," Accessed September 2020 https://www.wrangell.com/electrical/rate-sheet

[170] WMLP, "Power Sales Agreement," Accessed September 2020 https://www.seapahydro.org/pdfs/companydocs/LongTermPowerSalesAgreement.pdf?

[171] AEL&P, "Current Rates," Accessed September 2020 https://www.aelp.com/Customer-Service/Rates-Billing/Current-Rates

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| | | • **Small commercial discount of $12.14 per month customer charge and $0.0155/kWh during the off-peak season and $0.0384/kWh during the peak season.**<br>• **Large commercial discount of $70.83 per month customer charge.**<br>  ○ The standard base rate for residential customers is $8.60 per month, the off-peak energy charge is $0.0951/kWh, and the peak energy charge is $0.1157/kWh.<br>  ○ The standard base rate for small commercial customers is $18.22 per month, the off-peak energy charge is $0.0892/kWh and the peak energy charge is $0.1121/kWh<br>  ○ The standard base rate for large commercial customers is $96.13 per month, the off-peak energy charge is $0.0555/kWh and the peak energy charge is $0.0592/kWh. |
| | Interruptible Rate[172] | AEL&P is reported to have interruptible Power Sales Agreements with at least two customers - Princess Cruise Lines and the Greens Creek Mine. Both own and maintain their own diesel generation for periods when AEL&P cannot serve them. |
| **Midland Power Cooperative (IA)** | Heat Rate[173] | Air source heat pump rebates are offered at $300/ton for EnergyStar pumps and $200/ton for standard air source heat pumps to residential customers. A discounted electric heat rate is also offered for the heat pumps. Commercial customers must email a member representative to get information about the rebates available. |
| **Minnesota Valley Electric Co-Op (MN)** | Heat Rate[174][175] | Residential members with an electric water heater and electric heating and cooling pay half price electric rates using a separate meter or can receive up to $84 per year for unmetered water heating. Customers must cover the cost of installation for an energy management switch for metered heating, but MVEC will cover the cost of the switch for unmetered heating.<br><br>• **Discount of up to 50% of the standard base rate for residential customers.** |

[172] McDowell Group, "Southeast Alaska Energy Update and Profile," June 2016 https://www.mcdowellgroup.net/wp-content/uploads/2016/09/Southeast-Energy-Update.pdf

[173] MPC, "Heat Pumps," Accessed September 2020 https://www.midlandpower.coop/heatpumps

[174] MVEC, "Electric Heating Programs," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-heating-programs/

[175] MVEC, "Electric Water Heating," Accessed September 2020 https://www.mvec.net/residential/energy-wise-programs/energy-wise-electric-water-heating-programs/

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| | | • The standard base rate for residential customers is $10/month, from June-Sept for the first 2,000 kWh is $0.125/kWh, and from Oct-May for the first 2,000 kWh is $0.117/kWh. |
| **Imperial Irrigation District (CA)** | Interruptible Rate[176] | Commercial customers with a monthly maximum demand of 1,000 kW or higher during peak periods over 12 months can qualify for the interruptible rate program. The customer must commit to reducing 50% or more of their maximum demand within a 15-minute period. Customers are paid a monthly interruptible bill credit.<br><br>• The rate for bill credits during May-Sept is $2.50/kW and during Oct-Apr is $0.75/kW.<br>  ○ The standard base rate for general customers is $12 per month, for the first $1,000 kWh is $0.1231/kWh, for the next 6,000 kWh is $0.1205/kWh, and for all over 7,000 kWh is $0.1169/kWh.<br>  ○ The standard base rate for large general customers (100 kW or more) is $140 per month, the demand charge is $6.75 per kW of billing demand, and the energy charge is $0.0930/kWh. |
| **Marshall Municipal Utilities (MO)** | Heat Rate[177] | Residential, commercial, small general, and large general customers who have installed electric heat and heat pump equipment have access to a reduced heat rate.<br><br>• For residential customers, the rate is $0.075/kWh (**discount of $0.01/kWh)** in the winter and $0.12/kWh in the summer for all remaining heat over 1,200 kWh.<br>  ○ The standard base rate for all remaining non-electric heat over 1,200 kWh is $0.085/kWh in the winter and $0.12/kWh in the summer.<br>• The rate is $0.05/kWh for "all kWh in excess of the 80% maximum kWh used during the maximum month usage of the summer season of the prior year" for commercial, small, and large general customers.<br>• For small and large general customers, "all demand kW in the winter season in excess of the maximum kW billing demand used during the maximum month usage of summer season of the prior calendar year shall be billed at 50% of the posted winter season demand rate."<br>  ○ The standard base rate for commercial customers is $20 for single phase and $30 for three phase, the energy charge for the first 2,000 kWh is $0.1040/kWh, and for the remaining kWh in the winter is |

[176] IID, "Interruptible Rate Schedule," Accessed September 2020 https://www.iid.com/home/showdocument?id=3312

[177] Marshall Municipal Utilities "C-Commercial," Accessed September 2020 http://www.mmumo.net/crates.php

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| | | $0.1050/kWh and $0.1150/kWh in the summer. **(Discount of $0.055/kWh in the winter and $0.065/kWh in the summer)**<br>○ The standard base rate for small general customers is $14 for single phase and $20 for three phase, the energy charge is $0.060/kWh in the winter and $0.065/kWh in the summer. The demand charge is $12.50/kW in the winter and $15/kW in the summer. **(Discount of $0.06/kWh in the summer, 50% discount in the winter)**<br>○ The standard energy charge for large general customers is $0.065/kWh for the first 430kWh/kW, and $0.0545/kWh for all additional kWh for all seasons. The demand charge is $12.50/kW in the winter and $15/kW in the summer. **(Discount of $0.0045/kWh for additional kWh over 430kWh/kW)** |
| | Interruptible Rate[178] | For single metered industrial customers with loads of 200 kW or more, an interruptible rate is offered. The customer charge per month is $250, the demand charge per kW is $5/month, and the energy charge per kWh is $0.065/month.<br>• The standard energy charge for industrial customers is $0.0575 for the first 430kWh/kW and $0.0475 for all additional kWh for all seasons. The demand charge is $14/kW in the winter and $18/kW in the summer. **(Discount of $9/kW in the winter and $13/kW in the summer)** |
| **Rochester Public Utilities (MN)** | Heat Rate[179] | Residential, general service, and medium general service customers that use an air source or ground source heat pump, an electric water heater, or receive approval from RPU are eligible for a heat rate.<br>• The residential customer charge is $18.30, with the winter first 600 kWh energy charge of 10.726 cents, winter over 600 kWh energy charge of 8.988 cents, and summer kWh charge of 12.812 cents.<br>• **Discount of 1.738 cents/kWh for energy over 600 kWh in the winter for residential customers.**<br>○ The standard base rate for residential customers is $18.30/month, the energy charge in the winter is 10.726 cents/kWh, and the summer energy charge is 12.812 cents/kWh.<br>• The general service customer charge for loads less than 75 kW is $41/month, with the winter energy charge of 8.628 cents/kWh, and the summer energy charge of 13.312 cents/kWh. |

[178] Marshall Municipal Utilities "INT - Interruptible," Accessed September 2020 http://www.mmumo.net/intrates.php

[179] RPU, "2020 Rate Schedules," Accessed September 2020 https://cms.cws.net/content/rpu.org/files/2020%20Rates.pdf

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| | | • **Discount of 1.715 cents/kWh in the winter for general service customers.**<br>  ○ The standard base rate for general service customers is $41/month, with the winter energy charge of 10.343 cents/kWh and the summer energy charge of 13.312 cents/kWh.<br>• For medium general service customers for loads between 75 kW and 1,000 kW, the winter demand charge is $16.50/kW and the summer demand charge is $20.64/kW. The winter energy charge is 4.724 cents/kWh and the summer energy charge 5.881 cents/kWh.<br>• **Demand charge discount of $1.34/kW in the winter and $3.42/kW in the summer. Energy charge discount of 0.926 cents/kWh in the winter for medium general service customers.**<br>  ○ The standard energy charge for medium general service customers is 5.650 cents/kWh for both seasons. The standard demand charge is $17.840/kW in the winter and $24.06/kW in the summer. |
| | Interruptible Rate[180] | Offered to commercial, industrial, and governmental customers with at least 100 kW of interruptible demand, customers either nominate an interruptible demand amount or a firm demand amount to be eligible for the rate.<br><br>• The demand charge for medium general service customers is $12.95/kW, for large general service customers is $11.64/kW, and for large industrial service customers is $11.72/kW.<br>• **Discount of $4.89/kW in the winter and $11.11/kW in the summer for medium general service customers**<br>• **Discount of $8.36/kW for large general service customers.**<br>• **Discount of $8.78/kW for large industrial service customers.**<br>  ○ The standard demand charge for large general service customers is $20/kW and the energy charge is 5.867 cents/kWh.<br>  ○ The standard demand charge for large industrial service customers $20.50/kW and the energy charge is 5.240 cents/kWh.<br>• Customers approved for metering at 13.8 kV are eligible for a discount of 1.25% on base rate charges for measured demand and energy.<br>• Medium general service and large general service customers also qualify for a discount of $0.35/kW of measured demand each month if they own the transformer. |
| **Park Electric Cooperative (MT)** | Heat Rate[181] | A heat rate is available to residential customers who use an electrical heating system with a maximum load that does not exceed 40 kW. Hard wired electric heaters, radiant panels, electric boilers, electric forced air furnaces, air source, and |

[180] RPU, "Interruptible Rate," Accessed September 2020 https://www.rpu.org/my-account/rates-fees/interruptible-rate.php

[181] Park Electric, "Heat Rate Program," Accessed September 2020 http://www.parkelectric.coop/content/heat-rate-program

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| | | ground source heat pumps qualify for the electric heating rate. The rate is available from October to April and is currently 5.4 cents per kWh.<br><br>• **Residential discount of $0.032/kWh for the first 1500 kWh and $0.005/kWh for all kWh over 1500 kWh.**<br>• The standard base rate for small residential customers is $23/month and for large residential customers is $28/month. The energy charge for the first 1500 kWh is $0.086/kWh and over 1500 kWh is $0.059/kWh. |
| **Northern States Power Company - Subsidiary of Excel Energy (MN)** | Heat Rate[182] | A discounted electric space heating rate is offered to residential customers. The June-Sept rate is $0.10815/kWh and for other months is $0.06287/kWh, with a customer charge of $10 or $12 per month for overhead or underground, respectively.<br><br>• **Discount of $0.02954/kWh from Oct-May for residential customers.** |
| | Interruptible Rate[183] | Offered to residential, commercial, and industrial customers with loads up to 50 kW for dual fuel space heating, water heating, and other loads subject to company approval.<br><br>• The interruptible rate customer charge is $4.95, and the energy charge is $0.04711/kWh.<br>• For residential customers, the optional June-Sept rate is $0.10815/kWh.<br>  ○ The standard rate for residential customers from June-Sept is $0.10815/kWh and for other months is $0.09241/kWh, with a customer charge of $8 or $10 per month for overhead or underground, respectively.<br>  ○ **Discount of $0.0453/kWh from Oct-May**<br>• For commercial and industrial customers, the optional June-Sept rate is $0.09728/kWh.<br>○ The standard rate for small general (non-residential) customers from June-Sept is $0.09728/kWh and for other months is $0.08156/kWh, with a customer charge of $8 or $10 per month for unmetered and metered heating, respectively.<br>○ **Discount of $0.03445/kWh from Oct-May** |

[182] Northern States Power Company, "Rate Schedules," Accessed September 2020
https://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/rates/MN/Me_Section_5.pdf

[183] Northern States Power Company, "Rate Schedules," Accessed September 2020
https://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/rates/MN/Me_Section_5.pdf

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| | | ○ The standard energy rate for general customers is $0.03577/kWh for all months with a customer charge of $25.64/month.<br>○ **Customer charge discount of $20.69/month** |
| **Northwestern Rural Electric Co-operative (PA)** | Heat Rate[184] | A discounted rate is offered to residential customers where electricity is the primary source for heating and cooling and an electric water heater is used.<br>• The rate for the discount panel is $0.06504/kWh, with a cost of service rate of $41 per month.<br>• **Discount of $0.036/kWh.**<br>○ The rate for a standard panel is $0.10104/kWh, with a cost of service rate of $30 per month. |
| | Interruptible Rate[185] | A discounted rate and discounted cost of service rate is offered to residential customers utilizing electricity for space heating and agreeing to interrupt their electric energy during peak loading periods.<br>• The discounted rate is $0.06504/kWh, with a discounted cost of service rate of $11 per month.<br>• **Cost of service discount of $30 per month.** |
| **Dakota Electric Association (MN)** | Heat Rate[186] | A discounted rate for commercial customers using a geothermal heat pump system is offered.<br>• The discounted energy charge is $0.0940/kWh.<br>• **Discount of $0.0329/kWh during the summer and $0.0189/kWh during the winter for small general customers.** |

[184] Northwestern Rural, "Electric Rates," Accessed September 2020 https://www.northwesternrec.com/sites/northwestern/files/Northwestern%20REC/Rates/2019%20Rates%20Revised%2007-10-19.pdf

[185] Northwestern Rural, "Electric Rates," Accessed September 2020 https://www.northwesternrec.com/sites/northwestern/files/Northwestern%20REC/Rates/2019%20Rates%20Revised%2007-10-19.pdf

[186] Dakota Electric, "Commercial and Industrial Electric Rates," Accessed September 2020 https://www.dakotaelectric.com/wp-content/uploads/2016/07/CommercialRates2020.pdf

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| | Interruptible Rate[187] | A discounted rate is offered to residential, commercial, industrial, and farm members with qualifying loads that are remotely controlled by the association.<br><br>• The discounted energy charge is $0.055/kWh.<br>  ○ The standard residential and farm member energy charge in the summer (June-Aug) is $0.1308/kWh and in the winter is $0.1168/kWh.<br>  ○ **Discount of $0.0758/kWh in the summer and $0.0618/kWh in the winter.**<br>• The standard energy charge for small general customers (15 kW or less) is $0.1269/kWh in the summer and $0.1129/kWh in the winter.<br>  ○ **Discount of $0.0719/kWh in the summer and $0.0579/kWh in the winter.**<br>• The standard energy charge for general customers for the first 200kWh/kW is $0.0776/kWh, for the next 200kwh/kW is $0.0676/kWh, and for over 400kWh/kW is $0.0576/kWh.<br>  ○ **Discount of $0.0226/kWh for the first 200kWh/kW, $0.0126/kWh for the next 200kWh/kW, and $0.0026/kWh for over 400kWh/kW.** |
| **Entergy New Orleans (LA)** | Interruptible Rate[188] | For industrial customers with loads up to 50,000 kVA, a discounted rate is offered if at least half the load can be interrupted.<br><br>• The demand charge is $51,686.87 for the first 4,000 kVA or less of Firm Demand, $12.98 per kVA for all additional kVA of Firm Demand, and $5.27 per kVA for all Interruptible Demand. The discounted energy charge is $0.01306 per kWh for all kWh<br>• The standard demand charge for large electric customers is $678.31 for the first 50 kW, or less, of Billing Demand; $11.45 per kW for the next 50 kW of Billing Demand; $10.71 per kW for the next 100 kW of Billing Demand; $10.27 per kW for all additional kW of Billing Demand. The standard energy charge is $0.06781 per kWh for the first 5,000 kWh; $0.03661 per kWh for the next 10,000 kWh; $0.03537 per kWh for the next 15,000 kWh; $0.03502 per kWh for all additional kWh.<br>  ○ **The energy charge discount starts at $0.02196/kWh and can be up to $0.05475/kWh depending on usage.** |

[187] Dakota Electric, "Residential Electric Rates," Accessed September 2020 https://www.dakotaelectric.com/wp-content/uploads/2016/07/ResidentialRates_2020.pdf

[188] Entergy New Orleans, "Large Interruptible Service," Accessed September 2020 https://cdn.entergy-neworleans.com/userfiles/content/price/tariffs/eno/enol_elec_lis.pdf?_ga=2.218996889.1642353435.1601068493-1374178599.1601068493

# Canada Interruptible Rate Scan

| Utility | Rate Type | Design | Discussion |
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| **BC Hydro** | Freshet Rate 1892[189] | Availability | For Customers that increase their Electricity usage during the Freshet Period |
| | | Rate | Energy Charge: The charge applied to energy during each HLH (on-peak) and LLH (off-peak) of the current Freshet Period is equal to:<br><br>1. The greater of:<br>(a) The Intercontinental Exchange(ICE) Mid-Columbia (Mid-C) Peak or Mid-C Off-Peak weighted average index price, as published by the ICE in the ICE Day Ahead Power Price Report, applicable to the hour, and<br>(b) $0/kWh, plus<br><br>2. A $3/MWh wheeling rate. |
| | | Reference Demand | The highest kVA Demand during the High Load Hours in the Billing Period will be equal to the lesser of:<br><br>1.The Reference Demand; and<br><br>2.The actual highest kVA Demand during the High Load Hours in the Billing Period. |
| | | Rate schedule energy determination | 1. If HLH Net Freshet Energy is greater than zero, for each HLH hour of the current Freshet Period the energy taken by the Customer during the hour in excess of the HLH Baseline will be multiplied by the HLH Net to Gross Ratio, and the product will be the amount of energy supplied during that HLH hour under this RateSchedule1892.<br><br>2. If LLH Net Freshet Energy is greater than zero, for each LLH hour of the current Freshet Period, the energy taken by the Customer during the hour in excess of the LLH Baseline will be multiplied by the LLH Net to Gross Ratio, and the product will be the amount of energy supplied during that LLH hour under this RateSchedule1892. |

[189] https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-filings/rates/2019-04-08-fst-extension.pdf

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| | | | 3. All other energy supplied to the Customer during the current Freshet Period will be deemed to have been supplied under RateSchedule1823. |
| | CEC Proposed Interruptible Rate | *Note: Proposed but not adopted* | https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/regulatory-planning-documents/regulatory-matters/cec-interruptible-rate-proposal-presentation-20161108.pdf |
| **Manitoba Hydro** | Short-Duration Intermittent Rate[190] | Availability | Short-duration, intermittent power and energy to customers whose operation requires short periods of high demand combined with overall, very low energy consumption.<br><br>MBH may regulate timing of the customer's demand requirements so that they do not coincide with other system peak demands.<br><br>MBH may interrupt the supply at any time, for any length of time and for any reason. |
| | | Rate | Qualifying customers will be billed at, and subject to the conditions of, the appropriate General Service Large or Medium rate with the following provisions:<br>a) Measured demand will be reduced by 50% for billing purposes.<br>b) Customers will be assessed a monthly energy entitlement based on a 1% load factor (monthly demand x 0.01 x 730) to be billed at the applicable General Service rate.<br><br>c) Energy consumption in excess of the monthly energy entitlement will be billed at a rate equal to 10 times the usual applicable General Service rate. |
| | Surplus Energy Program - Option 1: Industrial Load | Availability | Total demand must be 1000 kVA or greater. Defined as Reference Level of Demand PLUS SEP demand. SEP demand does not exceed 50 MVA except where the load factor of such load is guaranteed by customer in writing to exceed 25% on a weekly basis. MBH may require customer to maintain a minimum power factor of 90% as a condition. |
| | | Energy Charges | SEP energy is energy associated with the demand taken by a customer in excess of the monthly reference level of demand in kW. Measurement of SEP energy based on each 15-minute interval reading of kW during a billing month. |

[190] https://www.hydro.mb.ca/accounts_and_services/rates/commercial_rates/#e-alternative

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| | | | The rates which will be charged are set out in Schedule SEP-1 and are subject to weekly approval by PUB.<br><br>a) (i) a basic charge of $100 per month to cover admin and metering costs;<br>(ii) energy charge per kWh which will be set for three TOU periods on a weekly basis (table defines hours for off-peak, shoulder, and on-peak.<br>(iii) a distribution charge per kWh intended to collect approximately one-third of the embedded cost of distribution, subtransmission, and regional transmission.<br><br>b) All non-SEP energy billed at the appropriate standard general service large or medium rate. |
| | | Demand Charge | a) Demand up to maximum monthly reference level of demand in kVA will be billed at the appropriate standard general service large or medium rate, subject to Monthly Billing Demand criteria. In case of different reference level of demand for the TOU periods, the highest designated monthly TOU reference level of demand will be used.<br><br>b) The monthly billing demand in kVA for a customer participating in SEP is the greatest of the following:<br><br>i) Measured demand up to a maximum of the monthly reference level of demand in kVA; or<br><br>ii) 25% of the highest annual reference level of demand in kVA<br><br>Limited exception if customer demand exceeds total demand the standard charge will apply to all kVA in excess of total demand. |
| | Surplus Energy Program - Option 2: Heating Load | Availability | Demand must be 200 kW or greater; and the electricity is to be used for space and/or water heating only; and the load must be metered separately from the customer's firm load; and the customer has an alternate energy source as a back-up facility for the entire SEP load; and demand associated with SEP does not exceed 50 MVA except where the load factor of such load is guaranteed by customer in writing to exceed 25% on a weekly basis; and the load is not being served under the curtailable load program. |
| | | Energy Charges | Rates to SEP customers will be as follows. The rates which will be charged are set out in table below (sets out TOU hours) and subject to weekly approval of PUB.<br><br>(i) the basic charge to cover admin and metering @ $100/month for loads greater than 1000 kVA and $50/month for load equal to or less than 1000 kVA |

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| | | | (ii) an energy charge per kWh which is set out for three TOU periods on a weekly basis (on- and off-peak, and shoulder)<br>(iii) distribution charge per KWh intended to collect approximately one-third of the embedded cost of distribution, subtransmission, and regional transmission |
| | | Demand Charge | Fixed rate based on customer class as indicated in schedule |
| **Hydro Québec** | Interruptible Electricity Options for Medium-Power Customers[191] | Availability | Customers who can commit to curtail power during the winter period, where the maximum power demand has been at least 1,000 kilowatts during a consumption period included in the 12 consecutive monthly periods preceding the date of the sign-up request.<br><br>The customer commits to a base power, which must not exceed 80% of the average billing demand for the preceding winter period. The contractual commitment remains in effect for the entire winter period. |
| | | Rate | Option I<br><br>Fixed credit: $13.00 per kilowatt for the difference between the average hourly power during useable hours and the base power.<br><br>Variable credit:<br><br>20.00¢ per kWh of effective hourly interruptible power for each of the first 20 interruption hours;<br>25.00¢ per kWh of effective hourly interruptible power for each hour between the 21st and the 40th interruption hours inclusive; and<br>30.00¢ per kWh of effective hourly interruptible power for each of the 60 subsequent interruption hours.<br><br>Option II<br><br>Fixed credit: $9.10 per kilowatt for the difference between the average hourly power during useable hours and the base power.<br><br>Variable credit: 20.00¢ per kilowatt-hour of effective hourly interruptible power for each interruption hour. |

[191] https://www.hydroquebec.com/data/documents-donnees/pdf/electricity-rates.pdf?v=20190401

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| | | Effective Credit | a) Effective fixed credit: The effective fixed credit to which the customer is entitled for a given consumption period equals the product of the fixed credit for the winter period and the difference between the average hourly power during useable hours and the base power for the consumption period in question, prorated to the number of days in the consumption period in relation to the number of days in the winter period.<br><br>b) Effective variable credit: The effective variable credit to which the customer is entitled for a given consumption period equals the product of the variable credit and the number of kWh of effective hourly interruptible power for each interruption hour. |
| | Interruptible Electricity Options for Large (Rate L) Customers | Availability | Rate L contract of a customer who is able to curtail power during the winter period.<br><br>The interruptible power per contract must not be less than the greater of 3,000 kilowatts or 20% of the maximum contract power over the last 12 consumption periods ending at the end of the consumption period that precedes October 1, but in no event may it exceed that maximum contract power. The contractual commitment remains in effect for the entire winter period. |
| | | Rate | Option I<br><br>Fixed credit: $13.00 per kW of effective interruptible power.<br><br>Variable credit:<br>20.00¢ per kWh of effective hourly interruptible power for each of the first 20 interruption hours;<br>25.00¢ per kWh of effective hourly interruptible power for each hour between the 21st and the 40th interruption hours inclusive; and<br>30.00¢ per kWh of effective hourly interruptible power for each of the 60 subsequent interruption hours.<br><br>Option II<br><br>Fixed credit: $6.50 per kilowatt of effective interruptible power.<br><br>Variable credit: 20.00¢ per kWh of effective hourly interruptible power for each interruption hour. |
| | | Effective Credit | a) Effective fixed credit: The effective fixed credit to which the customer is entitled for a given consumption period equals the product of the fixed credit for the winter period and the |

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| | | | effective interruptible power for the consumption period in question, prorated to the number of hours in the consumption period in relation to the number of hours in the winter period.<br>b) Effective variable credit: The effective variable credit to which the customer is entitled for a given consumption period equals 118the product of the variable credit and the number of kWh of effective hourly interruptible power for each interruption hour. |
| Nova Scotia Power | Interruptible Rider to the Large Industrial Tariff[192] | Availability | To a minimum regular billing demand of 2 000 kV.A at 90% Power Factor, under the following terms and conditions:<br>1. The customer has provided written notice of his desire to take service under this option, identifying that portion of the load that is to be firm and that portion that is to be interruptible (minimum 2,000 kV.A).<br>2. The customers will reduce their available interruptible system load by the amount requested by NSP within ten (10) minutes of such request by the Company.<br>3. Following interruption, service may only be restored by the customer with approval of the Company.<br>4. Failure to comply in whole or in part with a request to interrupt load will result in penalty charges. The penalty charge shall be twice the cost of the appropriate firm billing effective at that time for the consumption used in that billing period.<br>5. Interruption is limited to 16 hours per day and 5 days per week to a maximum of 30% of the hours per month and 15% of the hours in a year. |
| | | Rate | Customers who qualify for interruptible service will receive a $3.43 per month per kilovolt ampere reduction in demand charge for billed interruptible demand. The billed interruptible demand is defined as the difference between any contracted firm demand requirements and the total billing demand. Where the billing demand is less than the contracted firm demand, no interruptible credit shall apply. The billed interruptible demand will be the maximum interruptible demand of the current month or the maximum actual interruptible demand of the previous December, January or February occurring in the previous eleven (11) months. |

[192] https://www.nspower.ca/about-us/electricity/rates-tariffs/interruptible-rider

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| **Yukon Energy** | Secondary Energy 32 (Interruptible)[193] | Availability | "From time-to-time" for general service or industrial customers connected to the hydro grid to take advantage of surplus. Only for new secondary loads where sufficient surplus distribution capacity at time of connection or pay for upgrades.<br><br>Must satisfy all conditions:<br>o Secondary energy is fully interruptible separate service<br>o Utility is satisfied that secondary energy usage is in excess of normal consumptions – that its incremental, displacing an alternative fuel source by an appliance – primarily space or process heating<br>o Viable alternative fuel source is available in event of service interruption of unlimited duration<br>o Not allowed to shift to firm service without 12 month notice or waiver and if switched then cannot go back to secondary rate |
| | | Rate | Adjusted every three months as follows:<br>a) First, Determine price per MJ for heat energy from oil: use the oil price index (cents/litre net of GST) for rate period divided by 38.2 MJ/litre to yield a price in cents per MJ.<br>b) Second, determine price per MJ of delivered heat from oil: divide the result from step A by an efficiency rate of 90%.<br>c) Third, convert price of delivered heat energy from oil to an equivalent price for heat energy from electricity: multiply the result from step B by 3.6 MJ/kWh to yield a price in cents per kWh.<br>d) Fourth, set at 66.7% ratio: multiply the result from step C by 66.7% to yield the quarterly secondary energy charge for the rate period in cents/kWh. |
| | | Interruption protocol | a) Can either install SCADA controlled service to initiate interruptions on 15 minute notice as required for actual real time diesel generation.<br>b) Or standard meter with 24 hours notice of interruption when forecast to run diesel for more than 10% of the hours in the subsequent seven day period or diesel runs for more than 48 hours. |

[193] https://yukonenergy.ca/media/site_documents/30_secondary_32.pdf