

Optional Residential Time-of-Use Rate

NOVEMBER 2022

 **BC Hydro**
Power smart

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1. Background

1.1 Overview of BC Hydro's residential customers

The Residential Service rate class is BC Hydro's largest rate class accounting for about 89% of BC Hydro's customers, 36% of domestic energy sales and 43% of revenue.¹

There are approximately 1.88 million residential customers taking service under a few different residential rates. Table 1 below summarizes BC Hydro's residential customers by Rate Schedule (RS).

Table 1 BC Hydro's Residential Service Offerings

Rate Schedule	Applies to ²	Number of Customers	% of Customers	Revenue (\$M)
RS 1101, 1121 – Default Residential Inclining Block (RIB) Rate	Zone I	1,857,416	98.6%	2,091
RS 1105 E Plus Service (closed)	Zone I	5,646	0.3%	5
RS 1107, 1127 Residential Service – Zone II	Zone II	5,076	0.3%	7
RS 1148 Residential Service – Zone II (closed)³	Zone II	2	0.0%	0.00278
RS 1151, 1161 – Exempt Residential Service	Zone I, IB	15,067	0.8%	56
Total		1,883,207	100.00%	2,159

As shown in Table 1 above, the vast majority of BC Hydro's residential customers are taking service under RS 1101 and 1121 – the Residential Inclining Block (RIB) rate. RS 1101 is for Premises with separately metered Dwellings, and RS 1121 is for Premises with more than two Dwellings under one meter.

Currently, the RIB rate applies on a default basis to all residential customers in our integrated service area. There are limited options available to a small number of qualifying customers under other rate schedules:

- Qualifying residential farms may take service under RS 1151, which has a flat energy charge instead of inclining block energy charges like the RIB rate;
- Customers in Zone 1B (Bella Bella) also take service under RS 1151.
- Customers in Zone II take service under RS 1107 which has the same charges as RS 1151, except for a higher energy charge applied for any consumption over 1,500 kWh per month.
- Qualifying customers with back-up heating systems take interruptible service under RS 1105 Residential E-Plus Rate. RS 1105 is a closed rate and is being phased out by March 31, 2028;
- Common areas of residential multi-occupancy buildings have options to select the applicable General Service rate; and
- Qualifying residential customers taking service under the RIB rate may also participate in RS 1289 Net Metering Service.

1.2 Overview of the Residential Inclining Block rate

The RIB rate has a fixed daily basic charge and per kWh inclining block energy charges. The lower step 1 energy charge applies to consumption below a threshold of 1,350 kWh per two-month billing period (675 kWh per one-month billing period). The higher step 2 energy charge applies to consumption above that threshold. The 675 kWh threshold was intended to be near 90% of the median consumption of BC Hydro's residential customers. The fiscal 2022 charges for the RIB rate are provided in Table 2 and illustrated in Figure 2 below.

1 Based on fiscal 2020 actuals.

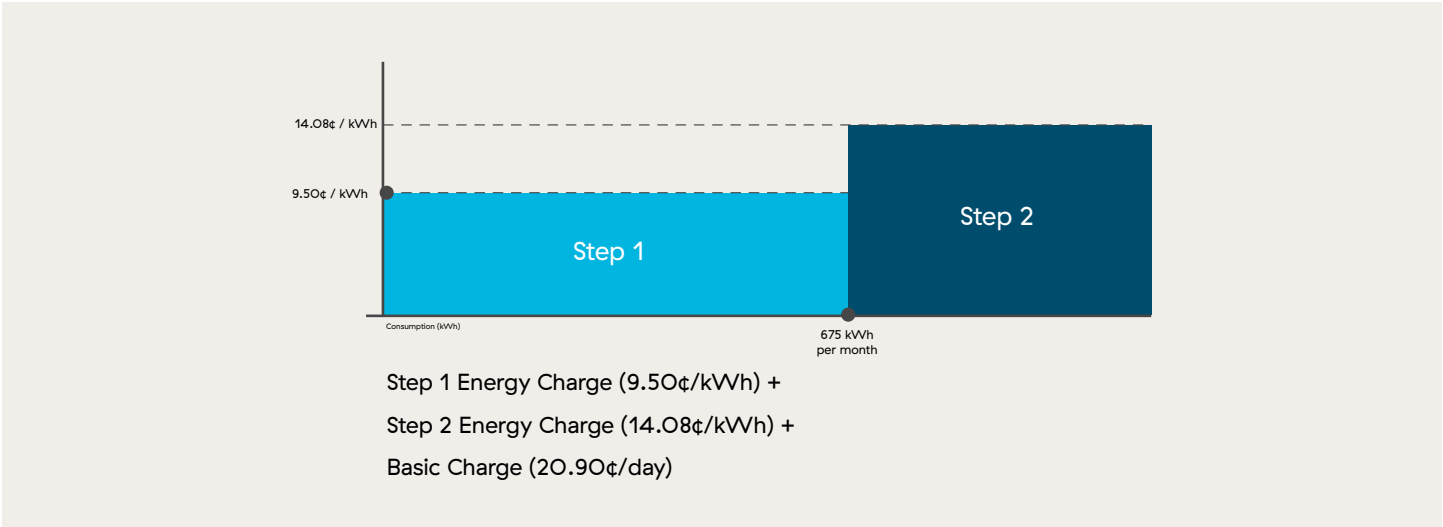
2 Zone I refers to BC Hydro's integrated system. Zone II are Non-Integrated Area communities that are served by stand-alone generation systems. Zone 1B is the community of Bella Bella.

3 RS 1148 has the same charges as RS 1151.

Table 2 Rate Summary for Rate Schedule 1101

RS 1101	Rates Effective April 1, 2022
Basic Charge	20.90¢ per day
Step 1 Energy Charge	9.50¢ per kWh
Step 2 Energy Charge	14.08¢ per kWh
Step 1 / Step 2 Threshold	1,350 kWh per two-month billing period (675 kWh per one-month billing period)

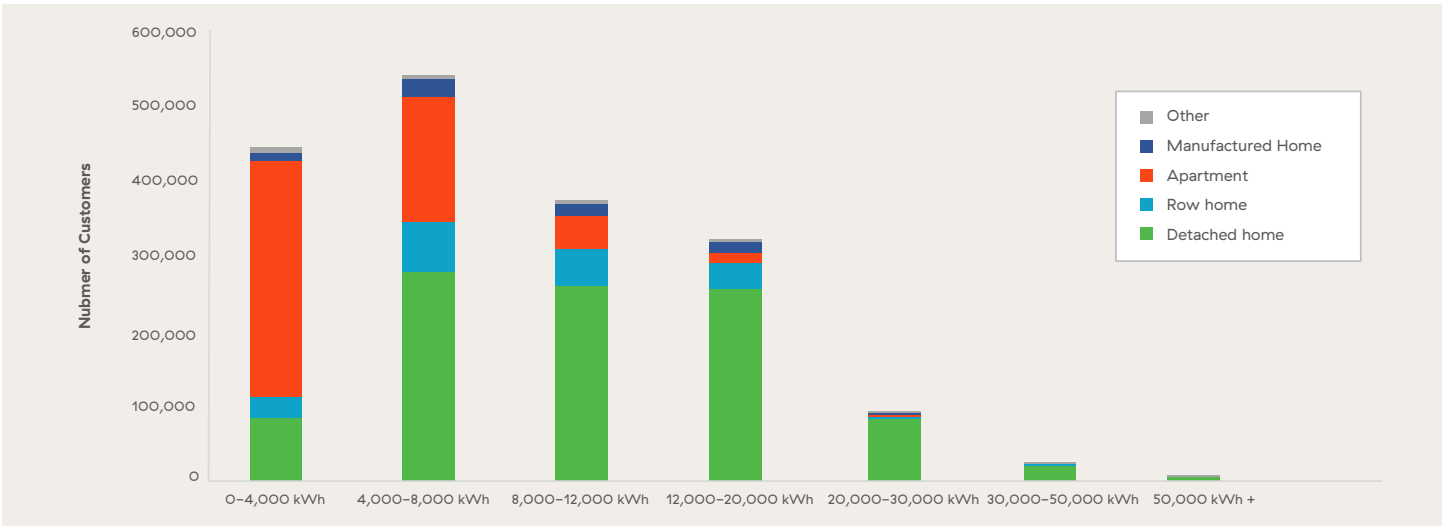
Figure 1 Residential Inclining Block Rate Charges



The average monthly consumption of all RIB customers in fiscal 2020 was 836 kWh, which is about 10,000 kWh a year, with an average monthly bill of approximately \$100.

Figure 2 below shows the consumption and housing type distribution of customers on the RIB rate.

Figure 2 Annual Electricity Consumption by Housing Type



As shown in Figure 2 above, most customers on the RIB rate consume less than 20,000 kWh a year and most live in single detached homes or duplexes (55%) or apartments (30%).⁴ In B.C., about 43% of RIB customers have primary electric fuel space heating and the rest are mostly primary natural gas fuel heated.

4 BC Hydro uses the term “apartments” to refer to separately metered, individual Dwellings in multi-occupancy buildings, and may include either owned or rented Dwellings.

1.3 Key drivers for developing an optional residential time-of-use rate

As discussed in section 1.1 above, the RIB rate applies on a default basis to all residential customers in our integrated service area with limited other options available to a small number of qualifying customers.

BC Hydro is exploring opportunities to provide customers with choices for the rate they pay for electricity service. A key area of focus has been optional time-varying rate structures which can provide bills savings by encouraging customers to shift their electricity use to periods when system capacity is more available.

The Government of B.C. released its CleanBC Plan on December 5, 2018, to increase the use of cleaner energy, especially renewable hydroelectricity, in key sectors of the economy, shifting away from reliance on fossil fuels. Among other things, the CleanBC Plan included a proposed timeline for new zero emission vehicle sales targets.

The CleanBC Roadmap to 2030, released October 25, 2021 is an elaboration and continuation of the CleanBC Plan.⁵ It sets out the following interim targets for zero-emission vehicle sales and leases in British Columbia:⁶

- 26% by 2026; and,
- 100% by 2035.

In addition, the federal government has also now set a target for light-duty zero emission vehicle sales of 100% by 2035.⁷

Electric Vehicles (EVs) are forecast to be a significant source of BC Hydro's peak demand, if not managed. BC Hydro's 2021 Integrated Resource Plan, filed with the Commission in December 2021, looks at a 20-year time frame and guides decisions on our integrated system to meet the future electricity needs of our customers. To meet future increased electricity demand due to increased EV charging load, BC Hydro's 2021 IRP includes introducing more customer-based electricity management options to support energy-efficiency and capacity savings during peak electricity demand periods. This includes new optional time-varying rate structures to encourage customers to shift their electricity use to periods when system capacity is more available.

Optional residential time-of-use rates are identified as a Near-term Action of the 2021 IRP. BC Hydro's optional residential time-of-use rate proposal below is the first large-scale optional time-varying rate we plan to introduce to deliver the capacity savings called for in the 2021 IRP.

1.4 Purpose of this information booklet

This information booklet is intended to:

- Provide background information on BC Hydro's recent residential rate design efforts;
- Recap various engagement activities conducted since December 2020 to learn what's important to customers when it comes to the cost of electricity, including feedback on potential rate options;
- Summarize feedback we received and explain how we have responded to this feedback.
- Explain key factors that have informed our thinking on the current rate design since our last public workshop on November 18, 2021; and
- Inform customers and stakeholders on our optional residential time-of-use rate proposal.

The next public workshop on our optional residential time-of-use rate proposal is scheduled for November 29, 2022. It will include a more detailed discussion on the rate design presented in this booklet. Feedback from customers and stakeholders received during this workshop will inform our optional residential rate design application, which is planned to be filed with the British Columbia Utilities Commission (BCUC) in early 2023. We hope you will join us at the next workshop, and we look forward to hearing your feedback.

⁵ CleanBC Roadmap to 2030.

⁶ Ibid.

⁷ In June 2021, the Government of Canada set a mandatory target for all new light-duty cars and passenger trucks sales to be zero-emission by 2035, accelerating Canada's previous goal of 100% sales by 2040.

1.5 Structure of this information booklet

The remainder of this information booklet is structured as follows:

- **Section 2** provides background on key stakeholder and customer engagement activities that informed our rate design proposal, including a recap of the engagement activities and a summary of stakeholder and customer feedback.
- **Section 3** describes our optional residential time-of-use rate proposal, including potential customer savings under the proposed time-of-use rate.
- **Section 4** summarizes the ratepayer economic, cost of service and Bonbright assessments of the optional time-of-use rate proposal.
- **Section 5** outlines the ways you can provide feedback.

2. Key engagement activities informing our rate design proposal

2.1 Summary of stakeholder and customer engagement activities

In 2020 and 2021, we undertook research and analyses to better understand our residential customers, their individual situations and their views on rates and energy consumption habits. This consultation process engaged over 35,000 customers and stakeholders to review the current RIB rate and customers' interests in optional rates.

Table 3 below summarizes the stakeholder engagement activities and Table 4 below summarizes the customer consultation activities.

Table 3 Summary of stakeholder engagement

Stakeholder Engagement Efforts	Timing	Number of Participants	Representation
BC Hydro Workshops	May 19, 2021 and November 18, 2021	109 (May 2021) 74 (November 2021)	<ul style="list-style-type: none"> <input type="radio"/> Residential customers <input type="radio"/> Aboriginal housing <input type="radio"/> Housing development <input type="radio"/> Electric vehicles <input type="radio"/> Environment & sustainability <input type="radio"/> Local government <input type="radio"/> Low income <input type="radio"/> Seniors <input type="radio"/> Union employees <input type="radio"/> Commercial customers
Four Meetings	May to December 2021	Three to 15 for each	<ul style="list-style-type: none"> <input type="radio"/> Builders <input type="radio"/> Indigenous Nations <input type="radio"/> Local Government <input type="radio"/> Low Income
	Total	200+	

Table 4 Summary of Customer Consultation:

Customer Engagement Efforts	Timing	Number of Participants ⁸	Purpose
Consultation Efforts with Quantitative Results			
Perception Survey by Sentis	December 2020	934	Understanding the needs of customers and perceptions about rates.
Your Power Poll by BC Hydro	April 2021	1,931	Testing survey questions for understanding with registrants of an ongoing panel.
Concepts Survey by Sentis	May 2021	821	Learning about rate preferences, energy use, values, and priorities as well as bill perceptions.
Public Survey No. 1 by BC Hydro	April to June 2021	22,680	Exploring rate concepts with customers and the public.
Time-of-use survey by Leger	October 2021	1,009	Exploring voluntary time-of-use rate concepts with EV and non-EV owners.
Public Survey No. 2 by BC Hydro	November 2021	6,031	Exploring rate options with customers and the public.
Options Survey by Sentis	November to December 2021	1,346	Learning more about electricity rate priorities, rate perceptions, and exploring whether customers intend to fuel switch to electricity.

⁸ The total includes individuals who may have participated in multiple consultation sessions.

Customer Engagement Efforts	Timing	Number of Participants ⁸	Purpose
Consultation Efforts with Qualitative Results			
Telephone Interviews by BC Hydro	April 2021	15	Individual calls to learn about customer perceptions and values related to rates, including those from Indigenous Nations.
Telephone Town Halls by Stratcom	May 2021	395	Two sessions to explore rate concepts.
Digital Dialogue by UPWORDS	August 2021	35	In-depth discussion about bill impacts.
Focus Groups by Leger	January 2022	32	Four sessions to explore time-of-use rate concepts with EV and non-EV owners
	Total	35,200+	

2.2 Summary of stakeholder and customer engagement feedback

Stakeholder feedback

Stakeholders’ feedback during the last two public engagement workshops on optional residential rates generally covered the following key topics:

- Environment, particularly decarbonization, heat pumps, and EVs;
- Affordability and fairness;
- Fuel switching; and
- Time-of-use rate designs.

In general, stakeholders support optional time-of-use rates that could help EV drivers reduce their EV charging costs and reduce demand-related costs for all ratepayers by incenting customers to shift usage out of BC Hydro’s system peak demand period to periods when system capacity is more available to make better use of existing electrical infrastructure.

Customer feedback

We learned that most customers think about their electricity bill first, and not the rate under which they are charged. As a result, a customer’s preferred rate structure tends to reflect their personal circumstances. Some customers, especially EV owners, expressed an interest in time-of-use rates. However, there was a strong view against default time-of-use rates on the basis that it would be difficult for many customers to change when they use electricity.

Key themes expressed include:

- Affordability, keeping bills low and decarbonization are important to customers;
- Familiarity with and interest in rates varies significantly; and
- Of the potential optional rates presented, optional time-of-use rates drew the most interest.

Of all the potential optional rates options we explored, optional time-of-use rates drew the most interest from participants. Many customers were familiar with the concept of time-of-use rates, either because they once lived in jurisdictions where time-of-use rates were an option, or through family and friends who have personal experience with these rates.

8 The total includes individuals who may have participated in multiple consultation sessions.

Most customers prefer optional time-of-use rates, and some customers are concerned that if time-of-use rates are introduced, they will become the default rate. EV owners are especially supportive of a rate that would allow them to charge their vehicles overnight at a lower rate.

In terms of specific design elements of time-of-use rates, key comments expressed include:

- Time-of-use energy charges should be offered year-round as opposed to during winter months only to offer customers more savings;
- Time-of-use energy charges should be offered daily as opposed to weekdays only to help build routine behaviours;
- The energy charge during the peak period should be under 25 cents per kWh so it is not prohibitive to customers who need to use electricity during peak hours; and
- Customers are not enthusiastic about investing in rewiring and installing a second meter to participate in a time-of-use rate that would only apply to EV charging load.

3. BC Hydro’s optional residential time-of-use rate proposal

3.1 Traditional time-of-use rate design

The most common time-of-use rate design among North American utilities is one that has fixed energy charges per kWh for specific time periods during a day. Most utilities also have time-of-use energy charges that apply only during their peak season (i.e., summer months only for utilities in warmer climates or winter months for utilities in colder climates). This is the residential time-of-use rate design we presented in our previous two workshops and it is illustrated in Figure 3 below.

The on-peak, off-peak and overnight energy charges in this design were modelled based on the average consumption and load shape of all RIB customers. This was done so that, on average, if customers who participated in an optional time-of-use rate did not change when they use electricity, the overall revenue collected by BC Hydro would remain the same.

Figure 3 Previous fixed energy charge residential time-of-use design



3.2 Challenges with the traditional time-of-use rates

As mentioned in section 1.1 above, most of BC Hydro’s residential customers take service under the RIB rate. With a time-of-use rate, the amount that a customer saves should depend on their load shape (i.e., how much they consume in each time period at different time-based energy charges). However, when customers’ default rate is an inclining block rate, like the RIB rate with its higher energy charge for consumption over a certain consumption threshold, the amount that a customer could save by opting into a time-of-use rate with fixed time-based energy charges depends on both their load shape and their overall consumption.

This creates two problems:

Low Participation: Customers with lower overall consumption currently pay most of their consumption at the lower step 1 energy charge of 9.50 cents per kWh. They can’t save because the time-based and non-winter charges under the above time-of-use rate are too high.

Structural Winners: Customers with high overall consumption currently pay for a significant portion of their consumption at the higher step 2 energy charge of 14.08 cents per kWh. They can save without reducing their peak demand because the time-based charges are too low.

As shown in Figure 3 above, under BC Hydro’s original proposal, during the non-winter months, customers would be charged a flat energy charge of 11.41 cents per kWh, which is the blended average of the step 1 (9.50 cents) and step 2 (14.08 cents) energy charges under the RIB rate. This increases the low participation and structural winners challenges described above because customers with low consumption would pay more during the non-winter months and customers with high consumption would pay less during the non-winter months.

BC Hydro explored a design modification where customers on an optional time-of use would be charged the RIB rate during the non-winter months. This partly addresses the two challenges described above but it doesn’t solve them. During the winter period, there are still a significant number of customers who can’t save and there are still a significant number of customers who can save without reducing their peak demand.

3.3 New credit / charge time-of-use rate proposal

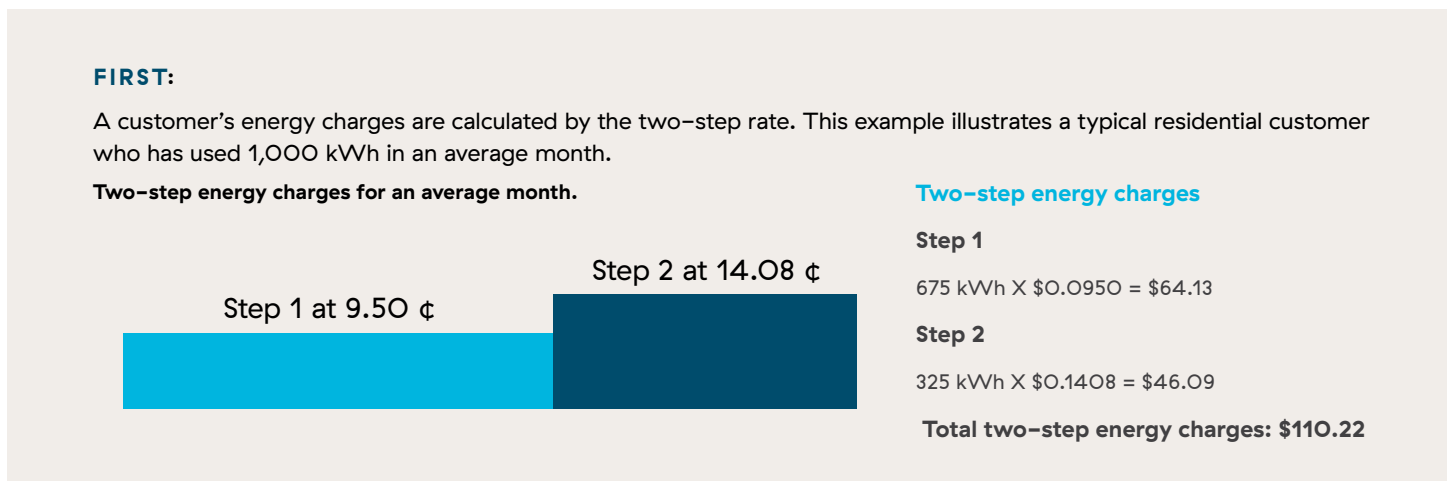
To overcome these challenges, BC Hydro developed a new time-of-use rate design that largely eliminates structural winners and provides all customers with an opportunity to save.

Under this new time-of-use rate design, customers would still have their total electricity usage during the billing period billed under the existing default RIB rate. Then customers would receive a 5-cent per kWh discount for all kWh consumed during the overnight period (11 p.m. to 7 a.m.) and a 5-cent per kWh additional charge for all kWh consumed during the peak period (4 p.m. to 9 p.m.). For kWh consumed during the off-peak period (9 p.m. to 11 p.m. and 7 a.m. to 4 p.m.), no discount or additional charge would be applied.

The 5-cent credit was selected because based on BC Hydro’s Fiscal 2021 Fully Allocated Cost of Service Study, the average embedded energy cost is approximately 4 cents per kWh. With a 5-cent credit, the minimum overnight energy charge is 4.5 cents per kWh (step 1 energy charge of 9.50 cents per kWh minus 5 cents). The 5-cent credit provides meaningful bill savings to customers while ensuring the minimum overnight energy charge still recovers the average embedded energy cost. To stay revenue neutral, a corresponding 5-cent charge is added to the peak period consumption.

The reason this concept works is that, on average, customer electricity usage during the peak period is almost identical to customer electricity usage during the overnight period at around 26% each. This means if customers participating in the optional time-of-use rate don’t shift any of their electricity use out of the peak period, they would pay the same as they would under the RIB rate. Figure 4 below illustrates the monthly energy charge for 1,000 kWh under this new design:

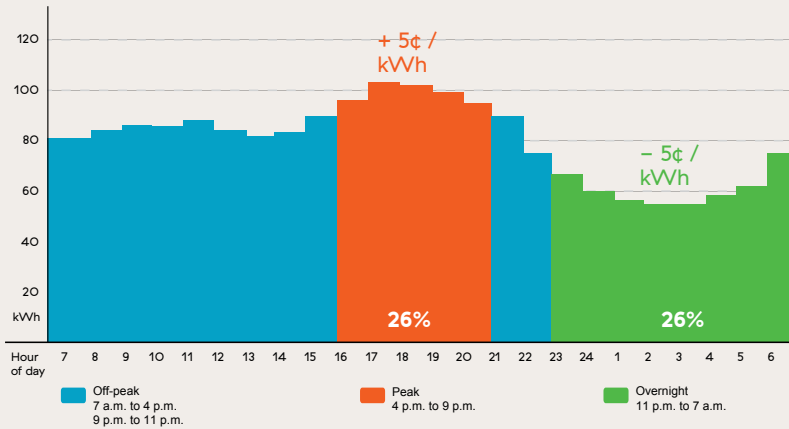
Figure 4 Illustrative monthly energy charge of the proposed time-of-use rate



SECOND:

This same customer's 1,000 kWh of usage is shown below in terms of energy use by time period. In this example, over a month period, they used as much energy (26%) between 4 p.m. and 9 p.m. as they did in the 11 p.m. to 7 a.m. period. Time-of-use energy charges are calculated by adding up electricity usage (kWh) during the Overnight (credit) and Peak (charges) periods.

Electricity for an average month, by each hour of the day. No shift in electricity use.



Time-of-use energy charges

Overnight Period Credit

$$260 \text{ kWh} \times (\$0.05) = (\$13.00)$$

Peak Period Charge

$$260 \text{ kWh} \times \$0.05 = \$13.00$$

Off-Peak: No credit or charge

480 kWh

Total time-of-use energy charges: \$0.00

THIRD:

The customer's monthly bill includes the RIB rate + time-of-use energy charges

$$\$110.22 + \$0.00 = \$110.22$$

While the information above shows this concept can work on average, every customer is different and whether the concept works overall, or for an individual customer, depends on the consumption patterns of the customers that decide to participate.

For this reason, BC Hydro also analyzed the consumption patterns of customers with different characteristics to understand how well this concept would work across a range of potential participation scenarios.

Table 5 below shows the peak period and overnight peak consumption ratios for customers with different housing and heating types. It also shows how much lower or higher bills would be for those customers, if they don't shift any of their electricity use out of the peak period.

Table 5 Load shape and energy charge comparisons by housing and heating type

Customer Group	Number of Customers	Average Annual Bill (\$)	Peak Period Load %	Overnight Period Load %	Bill Difference (\$)
Electrically heated					
Apartment	293,149	\$648	25.7%	25.8%	\$(0)
Single detached Home	249,207	\$2,085	24.4%	27.1%	\$(23)
Townhouse	88,214	\$1,352	25.6%	25.3%	\$2
Manufactured Home	13,139	\$1,548	24.0%	27.5%	\$(22)
Other	11,824	\$1,563	23.5%	28.6%	\$(32)
Non-electrically heated					
Apartment	141,259	\$385	27.4%	24.3%	\$5
Single detached Home	641,843	\$1,270	26.5%	25.4%	\$6
Townhouse	69,097	\$784	27.4%	24.0%	\$11
Manufactured Home	46,215	\$1,094	25.8%	25.5%	\$1
Other	8,935	\$891	23.3%	28.8%	\$(19)

As shown in the table above, customers from all different housing and heating types have very similar overall consumption ratios between the peak period and overnight period.

Table 6 below shows the same comparison for customers with different overall annual consumption levels. As with different housing and heating types, the data shows that overall consumption ratios between the peak period and overnight period are similar across different annual consumption segments.

Table 6 Time-of-use rate bill comparison by annual consumption

Customer Group	Number of Customers	Average Annual Bill (\$)	Peak Period Load %	Overnight Period Load %	Bill Difference (\$)
0 – 4,000 kWh	321,746	318	27.2%	24.4%	\$3
4,001 – 8,000 kWh	451,005	673	26.9%	24.5%	\$7
8,001 – 12,000 kWh	340,199	1,142	26.5%	25.0%	\$8
12,001 – 16,000 kWh	211,107	1,681	25.9%	25.7%	\$1
16,001 – 20,000 kWh	115,875	2,237	25.2%	26.5%	\$(11)
20,001 – 30,000 kWh	104,908	3,073	24.4%	27.5%	\$(37)
30,001 – 50,000 kWh	29,035	4,807	23.3%	29.3%	\$(107)

As shown, customers with very high annual consumption tend to have more consumption during the overnight period which means they can benefit from this time-of-use rate design without shifting any of their electricity use out of the peak period.

However, unlike BC Hydro’s previous proposal, these estimated bill savings reflect differences in consumption patterns rather than the structural savings from opting out of the RIB rate and avoiding its higher step 2 energy charge.

This analysis validated that the new time-of-use rate proposal largely mitigates the structural winner and low participation challenges with our previous proposal. Even though some customers may be charged more under the optional time-of-use rate than the RIB rate if their initial consumption patterns are unchanged, these estimated bill increases can be more than offset by shifting consumption out of the peak period, providing all customers with an opportunity to save.

3.4 Estimated customer bill savings

Under this new rate design, if a customer can shift some of their electricity usage such as EV charging, dishwashing, or clothes washing and drying out of the peak period, they can save 5 cents for each kWh shifted to the off-peak period and 10 cents for each kWh shifted to the overnight period. Table 7 below provides some illustrative saving estimates for a few consumption shifting scenarios:

Table 7 Illustrative consumption shifting scenarios

Example	Annual Saving
A customer typically plugs in their EV when they get home from work at 4:30 p.m. and keeps it plugged in until their commute to work the next morning. By plugging in or scheduling the charging to begin after 11 p.m., this customer could save	Up to \$240 per year
A customer typically runs their ENERGY STAR® dishwasher once a day around 6 p.m. after dinner. By starting the dishwasher around 8 a.m., after breakfast, this customer could save	Up to \$15 per year
A customer typically runs their ENERGY STAR® dishwasher once a day around 6 p.m. after dinner. By starting the dishwasher at 11 p.m., before they go to bed, this customer could save	Up to \$25 per year
A customer typically does two loads of laundry per week around 7 p.m. By starting those two loads between 9 p.m. and 11 p.m. this customer could save	Up to \$25 per year

Customers' bill savings will depend on their individual consumption behaviours. For rate design modelling purposes, BC Hydro used the following assumptions to estimate bill savings for different customer groups. These assumptions align with the assumptions used in BC Hydro's 2021 IRP and have been validated by The Brattle Group.

- Among customers with no EV, 15% of those who can save under the proposed time-of-use rate will participate.
- On average, participating customers with no EV will reduce their peak period consumption by 5%. Of the consumption shifted, 50% will be shifted to the overnight period and 50% will be shifted to the off-peak period.
- Among customers with an EV, 50% of those who can save under the proposed time-of-use rate will participate.
- On average, participating customers with an EV will reduce their peak period EV charging load by approximately 75%. Of the consumption shifted, 80% will be shifted to the overnight period and 20% will be shifted to the off-peak period.

The assumption of an average 5% reduction in non-EV peak period consumption is based on the price ratios of the proposed optional time-of-use rate design.

Table 8 below summarizes the price ratios of our optional time-of-use rate proposal after adding the 5-cent charge and 5-cent credit to the existing RIB rate step 1 and step 2 energy charges.

Table 8 Price ratios of proposed optional time-of-use rate design

Energy Charge	Peak Period	Off Peak Period	Overnight Period	Peak/ Overnight Ratio	Peak/ Off Peak Ratio
Step 1	14.50	9.50	4.50	3.2 : 1	1.5 : 1
Step 2	19.08	14.08	9.08	2.1 : 1	1.4 : 1

The Brattle Group maintains a database of time-varying pricing deployments and pilots from around the globe called Arcturus. Based on the results from opt-in, time-of-use rates in Arcturus, The Brattle Group estimated peak demand reduction impacts for each of these price ratios. These estimates are set out in Table 9 below.

Table 9 Peak demand reduction by price ratio

Price Ratio	Peak Demand Reduction
1.4	2.9%
1.5	3.5%
2.1	6.4%
3.1	10.0%

The average split between step 1 and step 2 consumption for all RIB customers is approximately 61% / 39%.

Using this split and the 50% to off-peak and 50% to overnight shifting assumption mentioned above, the average reduction in non-EV peak period consumption can be calculated as follows:

$$(3.5 \times 50\% + 10.0 \times 50\%) \times 61\% + (2.9 \times 50\% + 6.4 \times 50\%) \times 39\% = 5.9\%$$

The overall blended average price ratio for the non-EV consumption can be calculated as follows:

$$(1.5 \times 50\% + 3.1 \times 50\%) \times 61\% + (1.4 \times 50\% + 2.1 \times 50\%) \times 39\% = 2.1$$

Using the 20% to off-peak and 80% to overnight shifting assumption mentioned above, the EV Charging load blended average price ratio can be calculated as follows:

$$(1.5 \times 20\% + 3.1 \times 80\%) \times 61\% + (1.4 \times 20\% + 2.1 \times 80\%) \times 39\% = 2.5$$

The assumed reduction in EV peak load is 75%. An evaluation prepared for San Diego Gas & Electric found that EV owners shifted 73% to 84% of their charging to the overnight period in response to price ratios in the range of 2:1 to 4:1.⁹

9 Refer to: <https://www.sdge.com/sites/default/files/SDGE%20EV%20%20Pricing%20%26%20Tech%20Study.pdf>.

Table 10 below shows the estimated household load and EV load shifting savings by housing and heating type using the above assumptions. Table 11 below shows the same bill saving estimates by annual consumption segments.

Table 10 Estimated bill savings by housing and heating type

Customer Group	Number of Customers	Average Annual Consumption (kWh)	Average Annual Bill (\$)	Estimated Annual Household Load Saving (\$)	Estimated Annual 2,433 kWh EV Load Saving (\$)
Electrically heated					
Apartment	293,149	5,457	\$648	\$(5)	\$(57)
Single detached Home	249,207	16,488	\$2,085	\$(38)	\$(57)
Townhouse	88,214	11,165	\$1,352	\$(9)	\$(57)
Manufactured Home	13,139	12,531	\$1,548	\$(33)	\$(57)
Other	11,824	12,528	\$1,563	\$(43)	\$(57)
Non-electrically heated					
Apartment	141,259	3,112	\$385	\$2	\$(57)
Single detached Home	641,843	10,566	\$1,270	\$(5)	\$(57)
Townhouse	69,097	6,780	\$784	\$4	\$(57)
Manufactured Home	46,215	9,165	\$1,094	\$(8)	\$(57)
Other	8,935	7,051	\$891	\$(26)	\$(57)

Table 11 Estimated bill savings by annual consumption

Customer Group	Number of Customers	Average Annual Consumption (kWh)	Average Annual Bill (\$)	Estimated Annual Household Load Saving (\$)	Estimated Annual 2,433 kWh EV Load Saving (\$)
0 – 4,000 kWh	321,746	2,442	\$318	\$1	\$(57)
4,001 – 8,000 kWh	451,005	5,962	\$673	\$1	\$(57)
8,001 – 12,000 kWh	340,199	9,869	\$1,142	\$(2)	\$(57)
12,001 – 16,000 kWh	211,107	13,814	\$1,681	\$(12)	\$(57)
16,001 – 20,000 kWh	115,875	17,791	\$2,237	\$(28)	\$(57)
20,001 – 30,000 kWh	104,908	23,749	\$3,073	\$(58)	\$(57)
30,001 – 50,000 kWh	29,035	6,039	\$4,807	\$(138)	\$(57)

As shown, savings for customers living in apartments and townhouses or with low annual consumption are minimal. However, the 5% peak period consumption reduction assumption is an average and individual customers can save more than shown above if they can reduce their peak period consumption by more than 5%. In addition, all customers can achieve meaningful savings if they own an EV and shift the EV charging load out of the peak period.

3.5 Our time-of-use rate proposal incorporated customer feedback

BC Hydro’s new optional residential time-of-use rate proposal incorporates the following design elements that reflect customers’ feedback:

The proposed time-of-use rate is optional.

Customers who cannot or do not want to shift their electricity usage behaviours can stay on the current RIB rate.

The proposed time-of-use rate is year-round.

This provides more opportunities for customers to save and allows customers to “set it and forget it” when it comes to behavioural or technology changes they may make to achieve savings.

The proposed time-of-use rate applies everyday during a week.

This helps customers easily build their daily electricity consumption routines.

Energy charge during peak hours does not exceed 25 cents per kWh.

Even if a customer has a lot of consumption at the step 2 energy charge, the peak period energy charge including the additional 5 cent additional charge will be 14.08 cents + 5 cents = 19.08 cents per kWh, which is significantly lower than 25 cents per kWh.

Customers with an EV do not need to install a second meter to achieve savings from EV charging.

The proposed time-of-use rate is largely bill neutral to most customers if they do not reduce their peak period consumption. This means that customers with EVs can achieve bill savings if they charge their EV during the overnight period even if their other electricity consumption habits remain unchanged.

Customers who already have a separate meter for EV charging or plan to install one at a marginal incremental cost while undertaking service upgrades to install new Level 2 charging at their home, can choose to have both their home and EV consumption billed under the optional time-of-use rate or to have the time-of-use credits and charges apply to their EV charging load only. In the future, if advancements in measurement standards and technology allow, the option to have the time-of-use credits and charges apply to EV charging load only could be offered to more customers, without the need for a separate meter.

4. Assessment of the optional residential time-of-use rate proposal

4.1 Ratepayer economic assessment

BC Hydro assessed the forecast economic impacts on ratepayers from the new time-of-use rate. BC Hydro calculated the benefit-cost ratio of the rate using the following formula:

$$\frac{\text{Forecast Capacity Savings}}{(\text{Estimated Implementation Cost} + \text{Forecast Revenue Loss})}$$

A benefit-cost ratio greater than one indicates that forecast benefits from the proposed rate exceed the forecast revenue loss when compared with forecast RIB rate revenue and the estimated implementation costs, resulting in benefits to all BC Hydro customers over time. A benefit-cost ratio of one indicates no impact on ratepayers. A benefit-cost ratio less than one indicates a negative impact on non participating ratepayers.

Table 12 below shows that the proposed optional time-of-use rate has a benefit-cost ratio over 1 greater than a 10-year period and a 15-year period, indicating the rate is forecast to achieve benefits for all ratepayers over the long term. While costs exceed benefits over the shorter-term, this is common for optional rate structures given lower initial participation and higher up-front implementation costs.

Table 12 Benefit-cost ratio of the optional time-of-use rate proposal

Year after rate launch	Year 5	Year 10	Year 15
Benefit-cost ratio	0.5	1.10	1.75

4.2 Cost of service assessment

BC Hydro also assessed the forecast cost recovery of the proposed optional time-of-use rate. A revenue-cost (R/C) ratio of 1 indicates the cost to provide service to a group of customers is recovered from the revenue received from these customers. Based on BC Hydro's Fiscal 2021 Fully Allocated Cost of Service Study (FACOS), the R/C ratio for the residential rate class was 93%. Therefore, BC Hydro considers a R/C ratio that is close to 93% to be an appropriate level of cost recovery for the optional residential time-of-use.

Table 13 below shows that the proposed optional time-of-use rate has a R/C ratio above 90% by year 8 and above 93% by year 12, indicating that the rate is forecast to appropriately recover its costs over the long term. As with the benefit-cost ratio, a lower R/C ratio is to be expected in the shorter term due to lower initial participation and higher up-front implementation costs.

Table 13 Revenue-cost ratio of the optional time-of-use rate proposal

Year after rate launch	Year 5	Year 8	Year 10	Year 12	Year 15
Benefit-cost ratio	88.0%	90.6%	92.0%	93.2%	94.7%

4.3 Bonbright assessment

The British Columbia Utilities Commission has previously determined that the eight rate design criteria, set out by Dr. James Bonbright in Principles of Public Utility Rates, are consistent with the Utilities Commission Act test of fair, just, and not unduly discriminatory and form an appropriate foundation for rate structures. BC Hydro assessed the proposed optional time-of-use rate against the eight Bonbright criteria. Table 14 below provides a summary of BC Hydro’s Bonbright assessment.

Table 14 Bonbright assessment of the optional time-of-use rate proposal

Bonbright Criteria	Remarks
Economic Efficiency	
1. Price signals that encourage efficient use and discourage inefficient use	The rate provides a clear price signal to encourage customers to reduce consumption during BC Hydro’s system peak period and incents customers to use more during the overnight period when more system capacity is available.
Fairness	
2. Fair appointment of costs among customers	The rate has an additional charge for each kWh during BC Hydro’s system peak period when the cost to provide service is higher and a discount for each kWh during the overnight period when the cost to provide service is lower.
3. Avoid Undue Discrimination	All customers are provided the same charge/credit if they choose to take service under the rate.
Practicality	
4. Customer understanding and acceptance; practical and cost-effective to implement	The optional rate reflects customers’ feedback, as summarized in section 3.5 above. The simple “-5 / +5 per kWh” concept means it is easy for customers to understand and estimate bill savings. It’s also easier to implement, administer and communicate to customers. The rate is flexible and can be layered on top of any rate structure.
5. Freedom from controversies as to proper interpretation	Since the rate is voluntary and provides mutual benefits, freedom from controversy is not an issue.
Stability	
6. Recovery of the Revenue Requirements	The rate is designed to be revenue neutral on a class average basis to recover forecast revenue requirements.
7. Revenue stability	The rate largely eliminates structural revenue loss. This means that revenue loss will generally only occur from customers’ shifting their consumption out of the peak period, which will have corresponding cost reductions for all ratepayers.
8. Rate stability	The rate is stable as the charge/credit is fixed.

5. Ways to provide feedback

BC Hydro is hosting a workshop on November 29, 2022 with interveners and stakeholders to review and discuss this new optional residential time-of-use rate proposal. At this meeting, we will be providing a feedback form to seek your feedback on this proposal. You can also contact us at bhydroregulatorygroup@bhydro.com with any additional comments or questions. For information on BC Hydro's residential rate designs, please visit [bhydro.com/yourrates](https://www.bhydro.com/yourrates).

