Residential Rate Design Engagement Session

November 18, 2021

BC Hydro
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Logistics

A few items before we begin …

- If you're having trouble connecting: https://stream.allwestbc.com/
- Presentation location: Other regulatory matters (bchydro.com)
- If you have questions, please use "Chat"
- If you have specific feedback and opinions, please provide them in the feedback form

Poll

Feedback Form

- Other questions, feedback or technical issues? BCHydroRegulatoryGroup@bchydro.com

Agenda

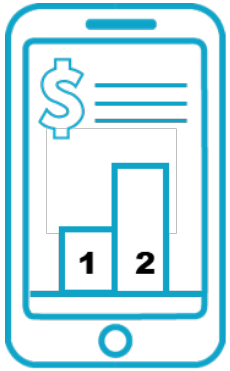
Time	Topic	Presenter
10:00 am – 10:15 am	Welcome and Overview	Keith Anderson Vice President, Customer Service
10:15 am – 10:45 am	Engagement Summary	Kari Baker, Customer Experience Manager
10:45 am – 11:30 pm	Default Residential Rate Design Options	Shiau-Ching Chou, Rates & Program Manager
11:30 am - noon	Default Rate Design Assessment, Implementation and F2023 Pricing Principles	Chris Sandve, Chief Regulatory Officer
12:00 pm – 12:30 pm	**Lunch Break**	
12:30 pm – 1:00 pm	Optional Residential Rates, our Integrated Resource Plan, and Engagement results	Anthea Jubb, Senior Regulatory Manager
1:00 pm – 1:30 pm	Optional Rates Context and Jurisdiction Review	Mike Wenzlaff, Senior Program Manager
1:30 pm – 2:20 pm	Optional Rate Designs	Rob Zeni, Senior Regulatory Specialist
2:20 pm –2:30 pm	Next Steps and Closing Remarks	Chris Sandve, Chief Regulatory Officer

An overview of rates

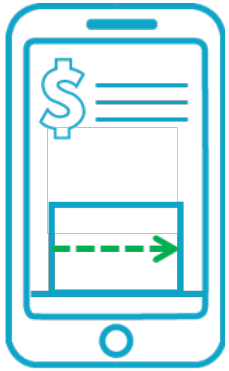
Here are the rates we'll be talking about today

1. Default rates

Option 1
Maintain Residential
Inclining Block Rate



Option 2
Transition to a
Flat Energy Charge Rate



2. Optional rates

Electric Vehicle
Peak Reduction Rate

Residential
Time of Use Rate

Welcome and Overview

Keith Anderson

Vice President, Customer Service

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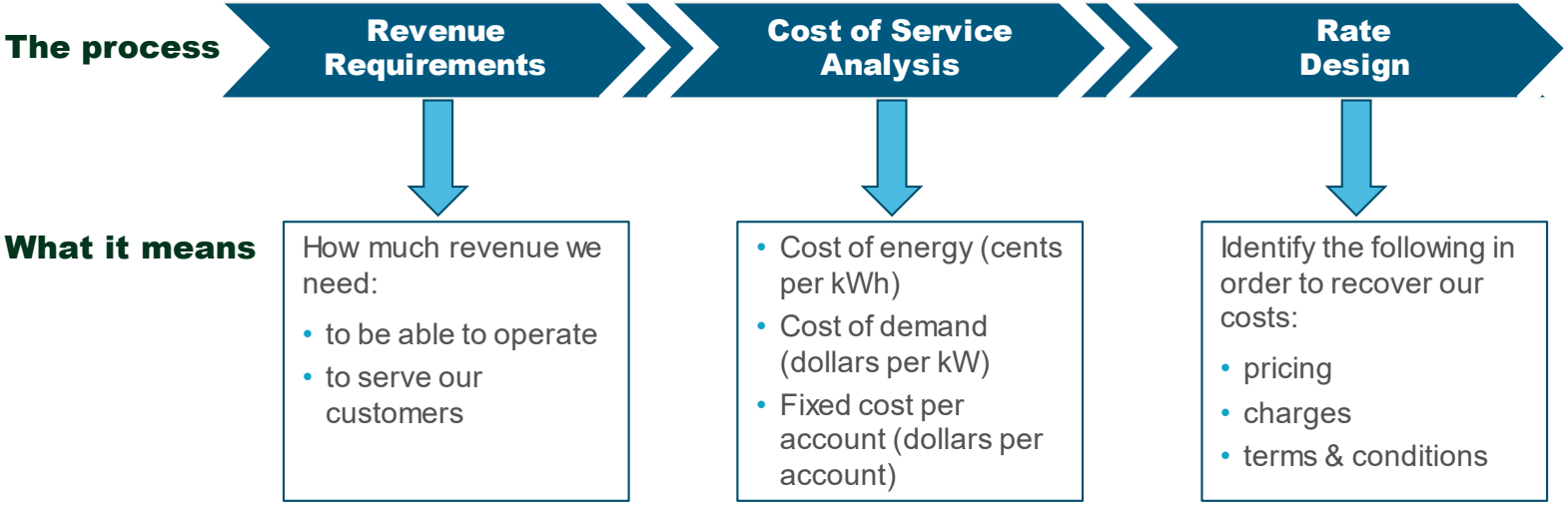
Today's objectives

- Provide a summary of engagement
- Provide an update on Residential Rate Design:
  - Default Residential Rate
  - Optional Residential Rates
- Collect feedback to help shape our future residential rate designs and inform future rate design applications to the BC Utilities Commission

What is rate design?

Rate design refers to pricing, charges, and terms & conditions of service



BC Hydro's rate design objectives

Affordability

Measured by bill impacts associated with a rate design

Economic efficiency

Measured by how closely the energy charge reflects our marginal cost

Decarbonization

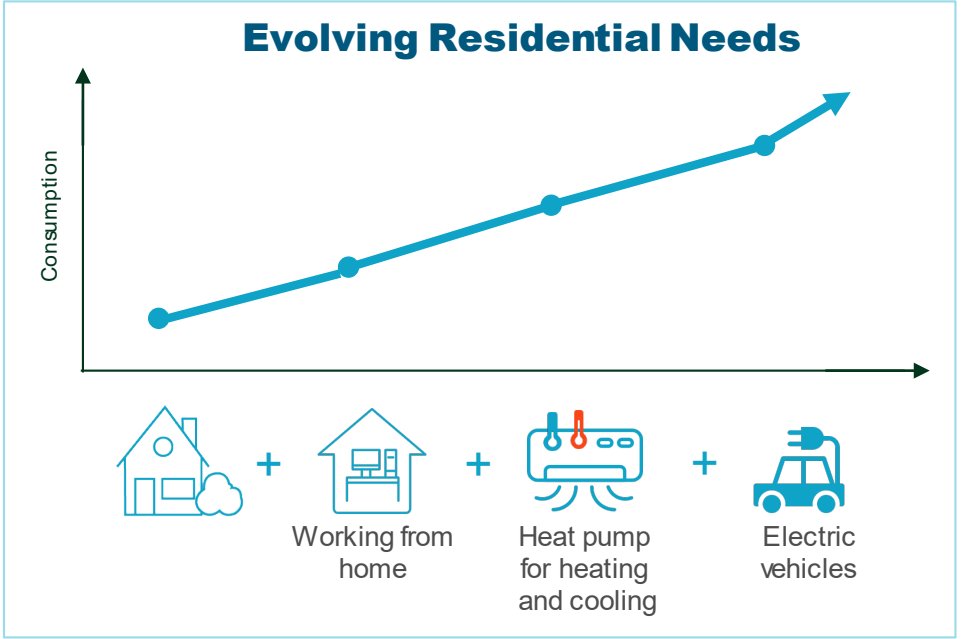
Measured by how much the rate design encourages switching from fossil fuels to clean electricity

Flexibility

Measured by the ability to respond to changes in the economic and policy environments and anticipate the need for greater product and service differentiation in rate design

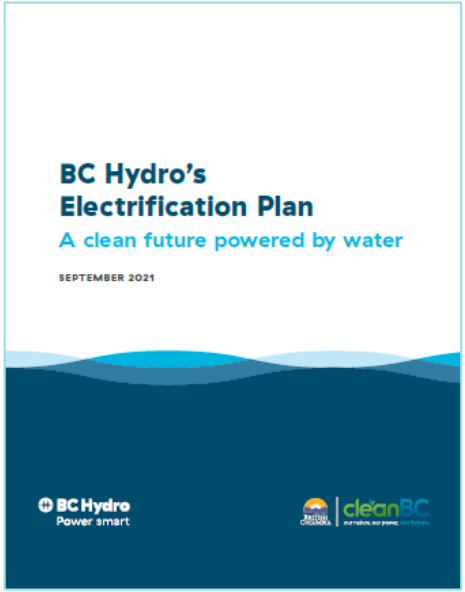
Why we are reviewing rate designs now

- Changes in customer energy needs and expectations
- Changes in climate policy
- Changes in BC Hydro's costs, such as a reduction in the cost of new energy supply, and the potential need to invest in transmission and distribution infrastructure



Electrification

- BC Hydro supports the Province's CleanBC climate plan and generates and delivers clean, renewable power to our customers.
- The Province announced BC Hydro's **Electrification Plan** in September 2021 to encourage and incentivize residents and businesses to switch from fossil fuels to clean electricity.
- Rate design is an important tool to encourage decarbonization.



Engagement Summary

Kari Baker

Customer Experience Manager, Customer Service

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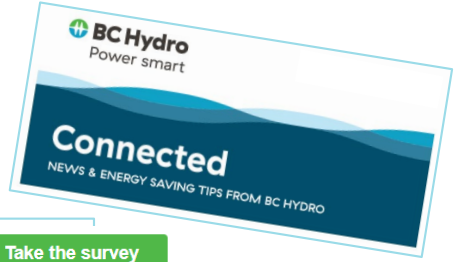
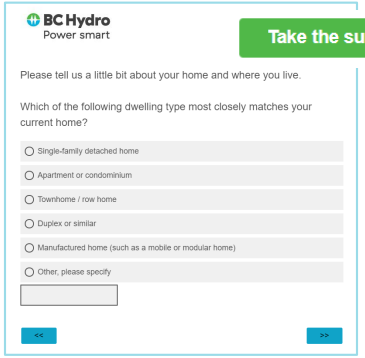
Engagement activities

We heard from more than 25,000 people

What we did	How many participated
Customer survey I	978
Customer panel	1,931
Customer survey II	792
Public poll	22,680
In-depth interviews	15
Telephone townhalls	395
Stakeholder workshops	109
Meetings	~
Digital dialogue	35





What we heard

- Affordability and keeping bills low are important to customers
- Those who often have higher bills due to the current residential inclining block rate (RIB) rate seek change, while those who do not, prefer the status quo
- Climate change is important to many customers
- Familiarity with and interest in rates varies significantly
- Of the potential rate options presented, optional Time-of-Use (TOU) rates drew the most interest

Customer feedback

There is tension between several views

Diverse customer sentiment

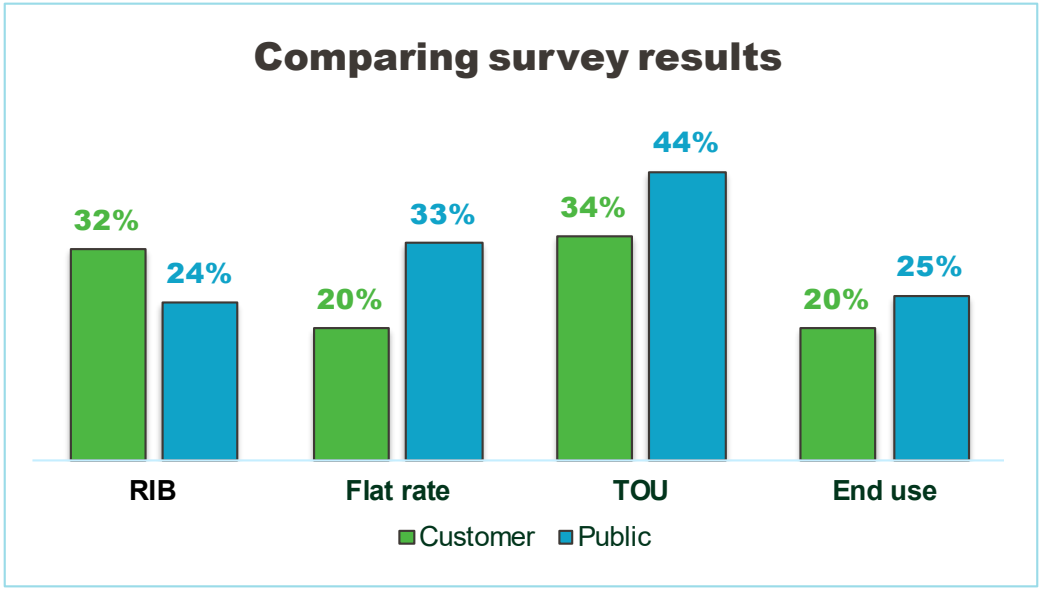
“Everyone should pay the exact same rate.”	vs	“People should pay different rates depending on their income, location, heating type, etc.”
“Thank you for keeping my bill and rates low.”	vs	“The bill from BC Hydro is the biggest one I have. ”
“Conservation is good for the environment.”	vs	“Electrification is good for the environment. ”
“People need to take personal responsibility for their usage.”	vs	“I'd be willing to help those that are struggling to pay their bill.”

There are differences between BC Hydro customers and the public

	Customer survey	Public survey
	n = 792	n = 22,680
Familiarity with the bill		
• Very familiar	22.2%	36.7%
• Familiar	47.3%	46.5%
• Somewhat familiar	25.4%	14.3%
• Not very familiar	5.2%	2.5%
Frequency in Step 2 (self reported)		
• Every bill	21.2%	32.6%
• Most of the bills	15.0%	17.0%
• Some of the bills	21.9%	20.9%
• Never	13.0%	14.0%
• Unsure	28.9%	15.5%

- The representative Customer survey collected feedback from a random sample drawn from the Residential account holder database.
- The Public survey acted as a broader public engagement activity, enabling the collection of larger volumes of comments across various customer profiles, including non-account holders.

Rate preferences



Customer survey

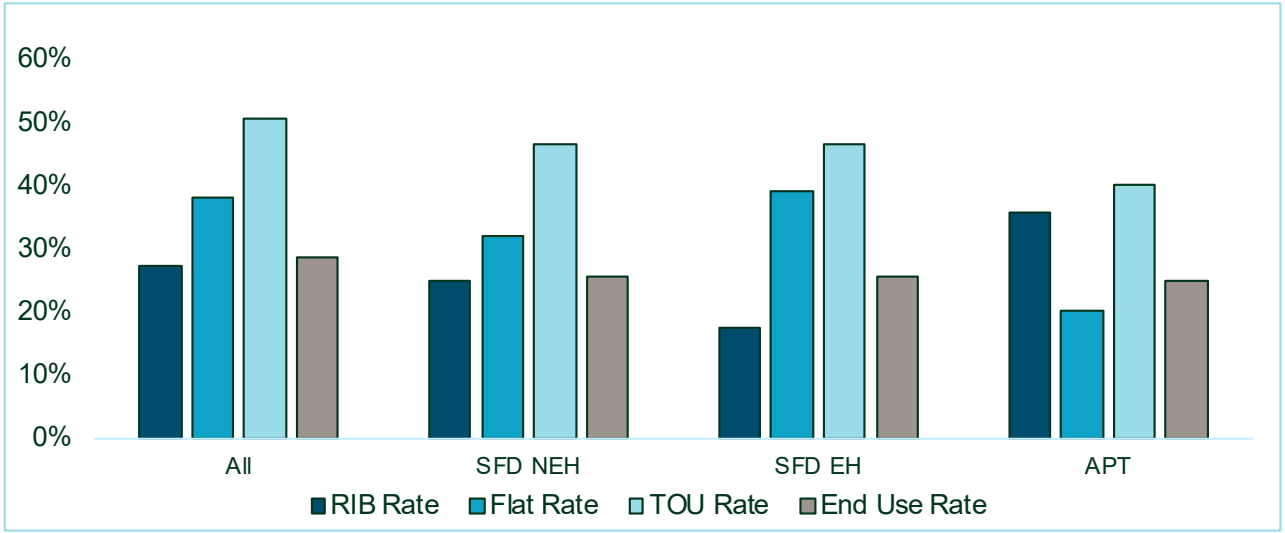
- Representative
- N= 749

Public survey

- Not weighted due to respondent self-selection and inability to confirm customer status
- N=16,552

Rate preference depends on several factors

Time Of Use (TOU) is most preferred overall
Electrically heated single-family dwellings preferring a Flat Rate
Apartments prefer Residential Inclining Block (RIB)

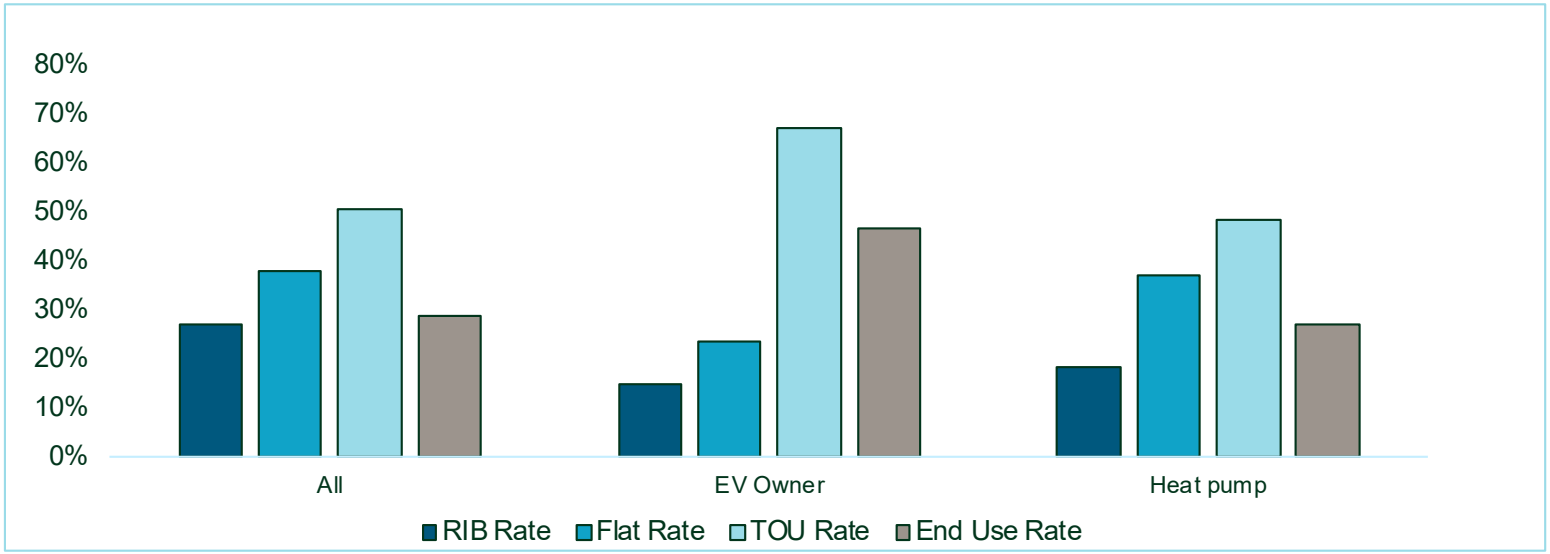


Legend

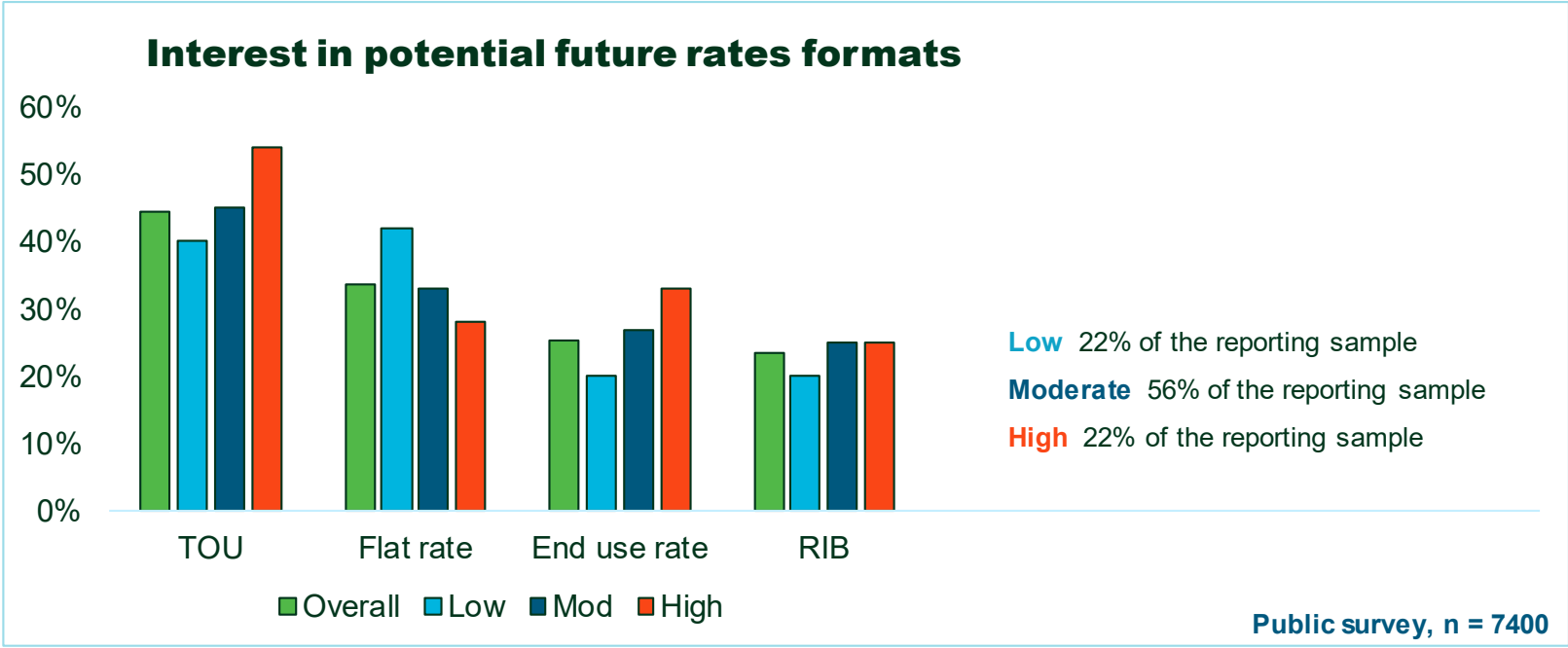
- SFD NEH: Single family dwelling with non-electric heat
- SFD EH: Single family dwelling with electric heat
- APT: Apartment

Rate options preference – special segments

Electric Vehicle owners prefer Time of Use and End Use
Heat pump owners prefer Time Of Use and Flat



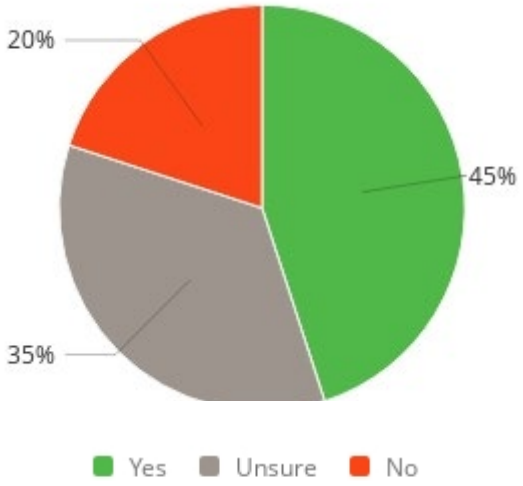
Preferences by income



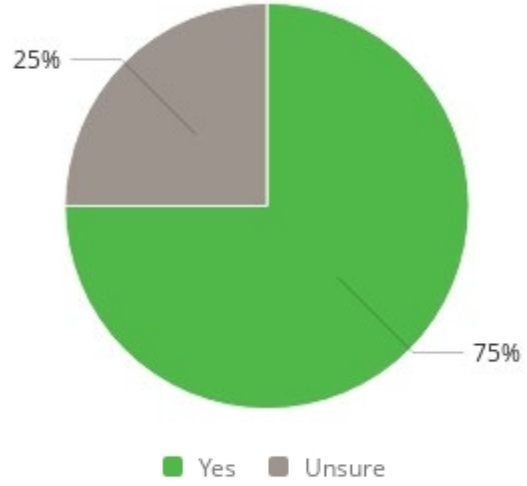
Stakeholder workshop feedback

Do you support BC Hydro advancing rate concepts that ...

Maintain RIB



Eliminate RIB



Telephone townhall

A new methodology to be more inclusive

- Support those who may not have internet access or prefer to interact in voice channels
- Provide information on the rate concepts being explored around residential rate design
- Mixed support to keep residential inclining bloc (RIB) or change the rate
- Lots of feedback and questions not related to rate design

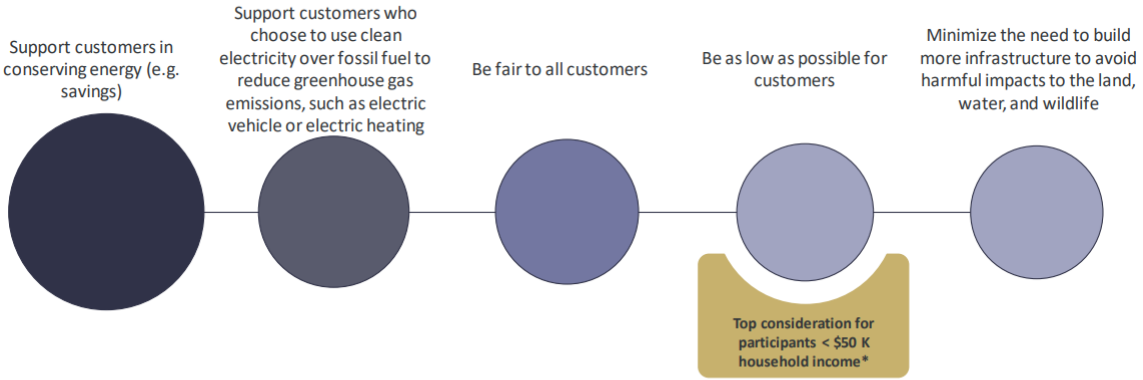
Digital dialogue

QUALITATIVE RESEARCH

Exploring attitudes more deeply

Supporting conservation, clean energy use and fairness were the top 'stated' considerations; lower income participants were mainly interested in having a low bill

Q: Which, if any of these factors, do you think BC Hydro should consider when developing its electricity rates?



After seeing hypothetical bill impacts, nearly all chose the option that provided them personally with the lowest bill and/or encouraged conservation.

Final thoughts

We're continuing to listen

- There is no "one size fits all" rate design
- The current engagement underway explores options and bill impacts

Default Residential Rate Design Options

Shiau-Ching Chou

Rates & Program Manager, Customer Service

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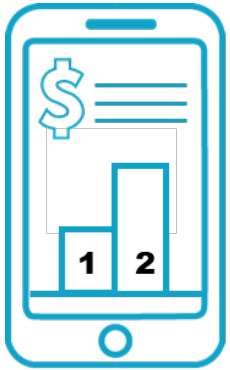
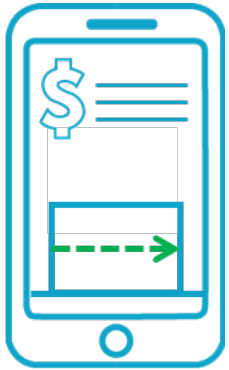
Default residential rate options

1. Default rates

Option 1
Maintain Residential Inclining Block Rate



Option 2
Transition to a Flat Energy Charge Rate



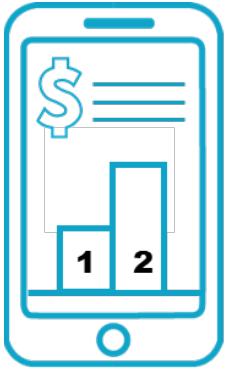
2. Optional rates

Electric Vehicle Peak Reduction Rate

Residential Time of Use Rate

Option 1

Maintain Residential Inclining Block (RIB) Rate



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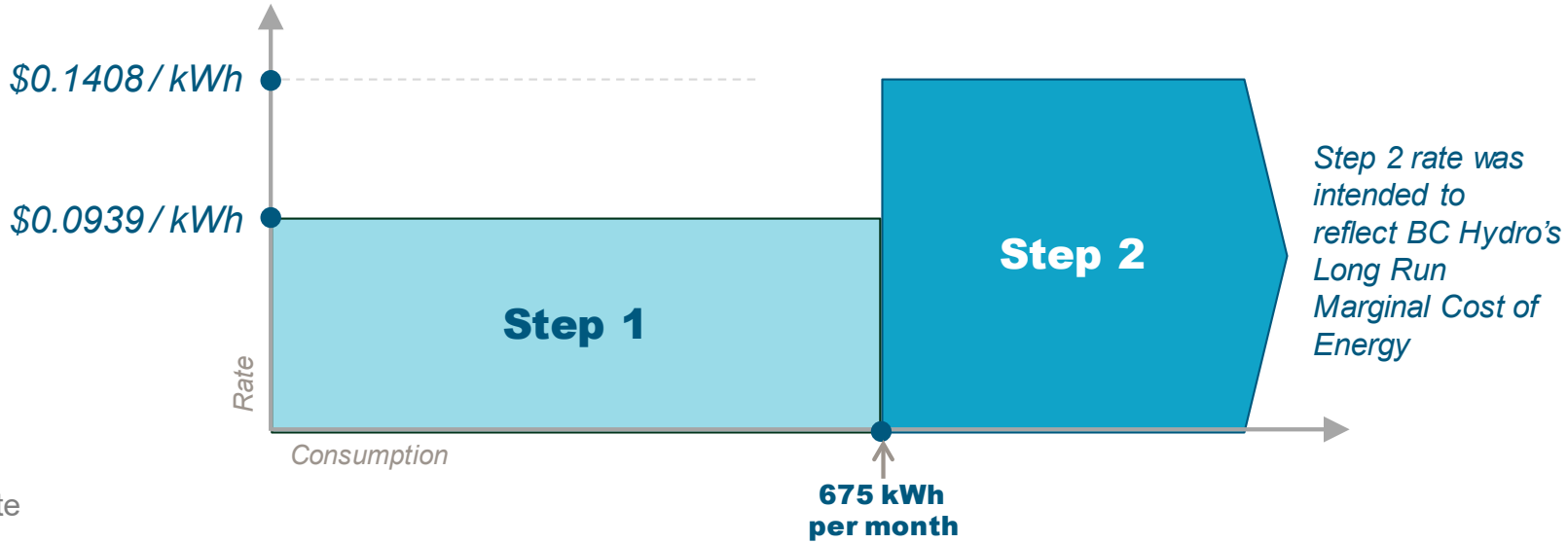
Residential Inclining Block Rate

Residential Inclining Block Rate Schedule 1101 =

Basic Charge ($0.2077 / day)
+ Step 1 Energy Charge
+ Step 2 Energy Charge



Step 2 rate was intended to reflect BC Hydro's Long Run Marginal Cost of Energy

F2022 Rate

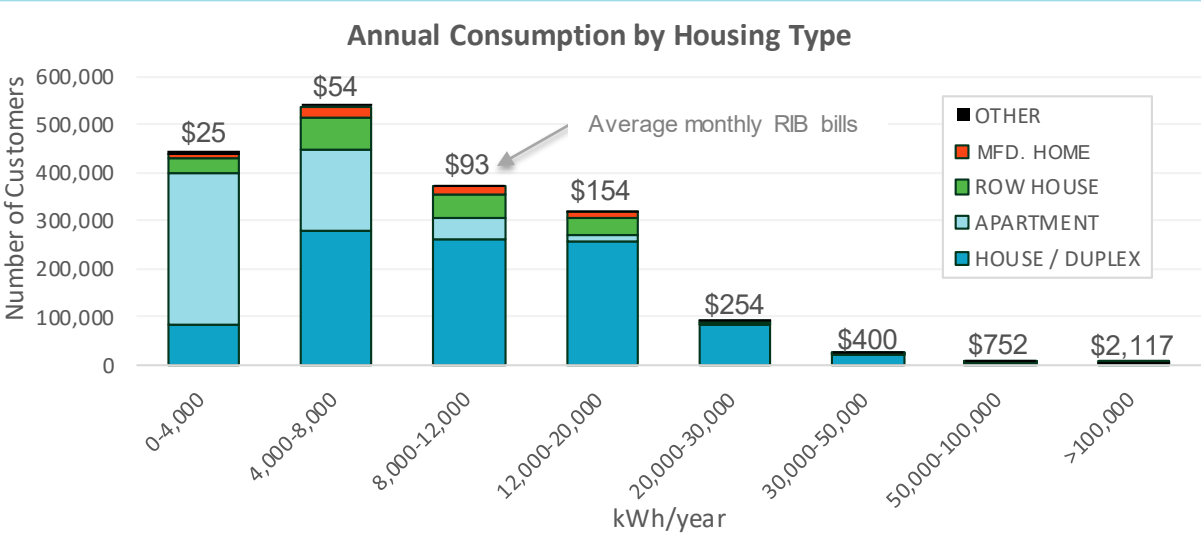
Residential Inclining Block (RIB) Rate background

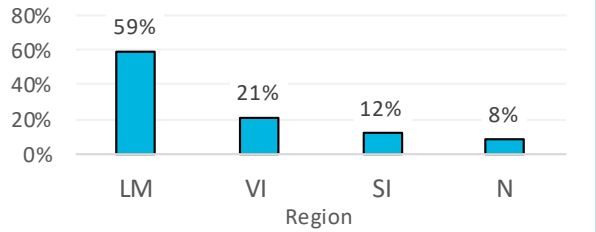
- About 1.9 million customers take service under RS 1101 Residential Inclining Block Rate ("RIB" rate). It accounts for 94% of residential sector revenue and 40% of BC Hydro's domestic revenue.
- The RIB Rate was implemented in 2008 to achieve energy conservation, by increasing bills for higher usage customers and decreasing bills for lower usage customers.
- The current RIB Rate pricing principles will expire in March 2022. BC Hydro has committed to file a residential rate application in February 2022.

RIB Rate customer characteristics

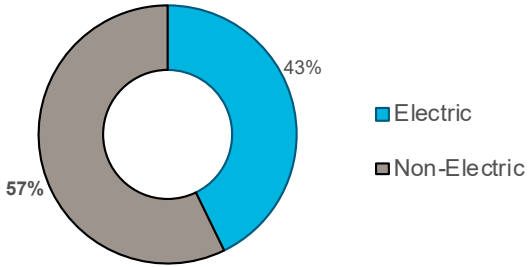
Fiscal 2020 Customer Data

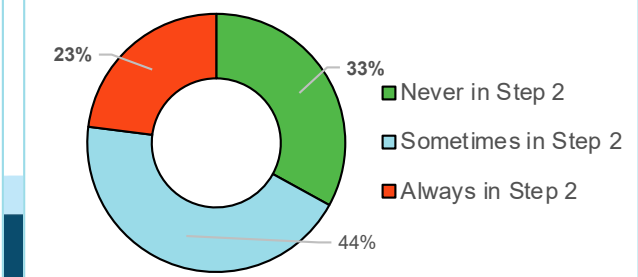
Customer Data	
Number of customers	~1.9M
Avg monthly consumption	836kWh
Avg monthly bill	$99
Total consumption	18,891GWh
Total revenue	$2.25B





LM: Lower Mainland **VI:** Vancouver Island **SI:** South Interior **N:** North





RIB achieved its objectives

- The RIB Rate met its objective of achieving energy conservation.
- Since its implementation in 2008, many customers have developed a good awareness and understanding of the RIB Rate, and how its stepped structure incents conservation.

RIB Evaluation Report F2009 to F2012*

Year	Energy Savings (GWh)	Peak Demand Savings (MW)
F2009	57 - 94	12 - 20
F2010	94 - 202	20 - 43
F2011	11 - 41	2 - 9
F2012	33 - 86	7 - 18

*Available in Appendix C-3B of BC Hydro's 2015 Rate Design Application: https://docs.bcuc.com/Documents/Proceedings/2015/DOC_44664_B-1-BCH-2015-Rate-Design-Appl.pdf

RIB is no longer achieving new conservation

- Customer response to the Step 2 price diminished over time.
- Some customer report they did all they could to respond to the higher step 2 price.
- By 2016, the RIB rate was no longer achieving new energy conservation.

RIB Evaluation Report F2013 to F2017*

Year	Energy Savings (GWh)	Peak Demand Savings (MW)
F2013	23	5
F2014	3	1
F2015	13	3
F2016	0 - 11	0 - 2
F2017	0 - 6	0 - 1

*Available in Appendix AA Attachment 2 of BC Hydro's F2020-F2021 Revenue Requirements Application: https://docs.bcuc.com/Documents/Proceedings/2019/DOC_53488_B-1-BCH-F20-F21-RR-Application.pdf

RIB no longer aligns with cost of service

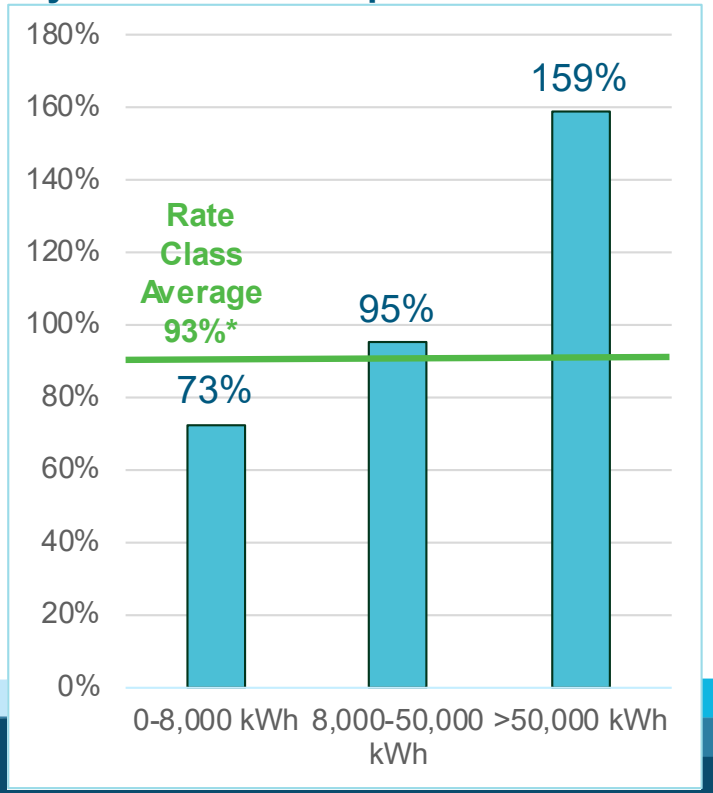
Marginal Cost of Energy

- RIB Step 2 energy charge was initially benchmarked to BC Hydro's long run marginal cost of energy.
- BC Hydro's updated long run marginal cost of energy will be released in December 2021 and is expected to be substantially lower than the current Step 2 rate of $0.1408/kWh.

Cost of Service

- Revenue to Cost Ratio (R/C Ratio) =
  Total revenue divided by full allocated cost of service
- Compared to the residential class, lower consumption customers are paying lower than their cost of service while high consumption customers are paying more.

Illustrative RIB Rate R/C Ratio by Annual Consumption



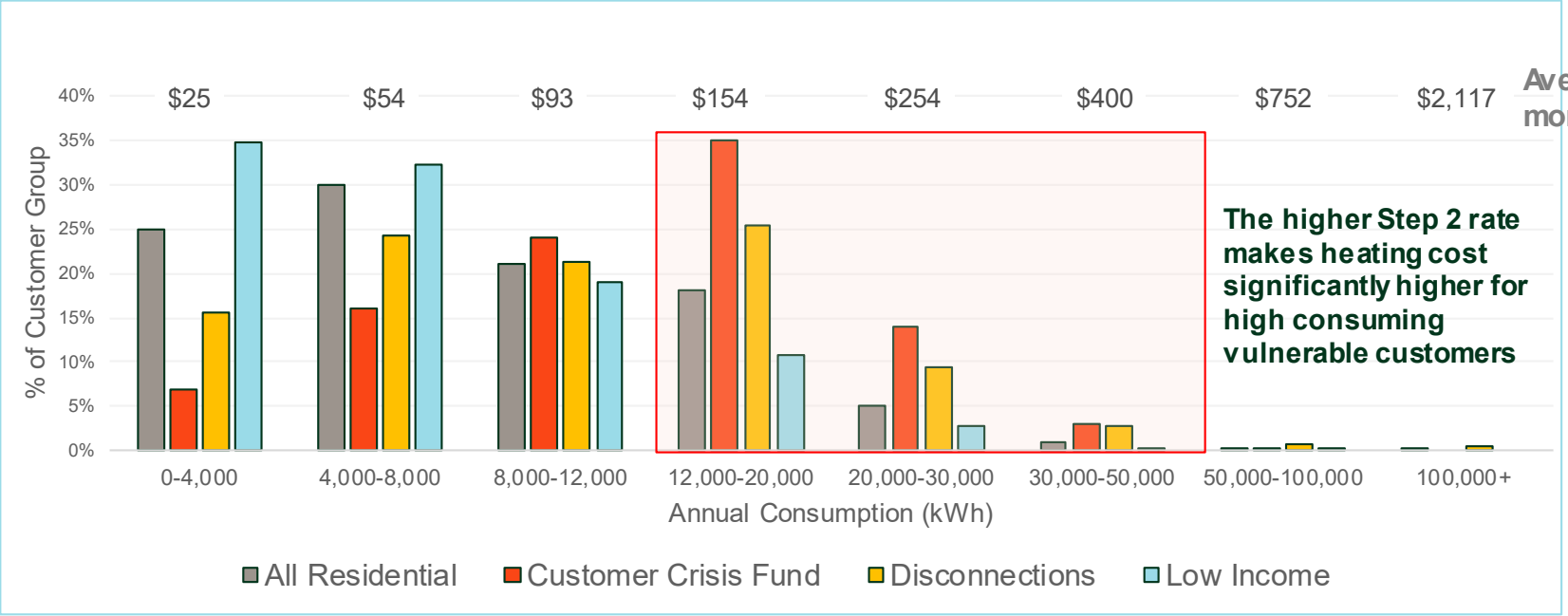
*F2020 Fully Allocated Cost of Service Study

Customer complaints and escalations

BC Hydro frequently receives complaints about the residential inclining block rate design from:

- Customers with no access to natural gas
- Customers with large families and large homes
- Customers who live in colder or rural areas
- Customers who purchased electric vehicles
- Customers who installed heat pumps

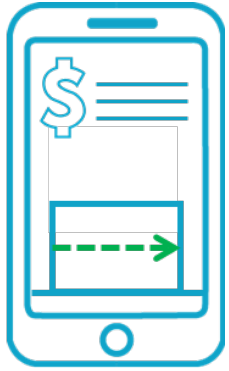
Higher consuming vulnerable customers have more challenges paying bills



F2019 Customer data (all residential)
2018-06 to 2021-05 Customer Crisis Fund Participants
F2020 Disconnection data
F2017 Residential End Use Survey (low income)

Option 2

Transition to a Flat Energy Charge Rate



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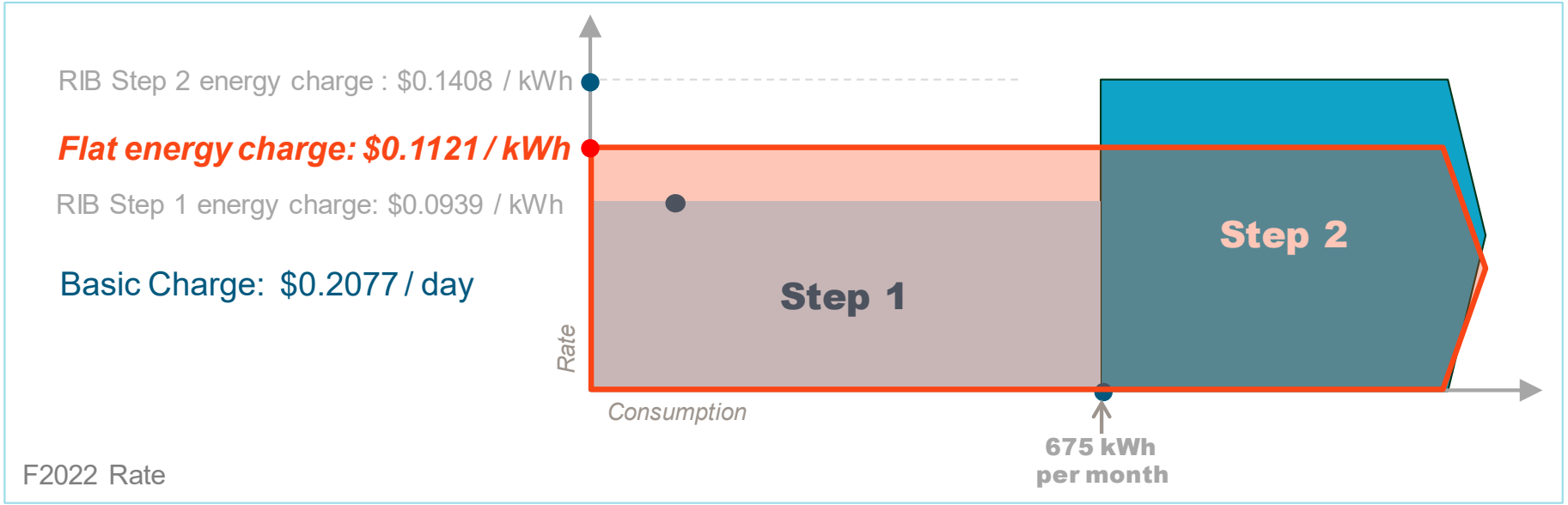
Preliminary Flat Rate (no change to basic charge)



	Step 1	Step 2
Energy Sales (% of kWh per year)	62%	38%
Revenue (% of $ per year)	52%	48%

Flat Rate better aligns with Cost of Service

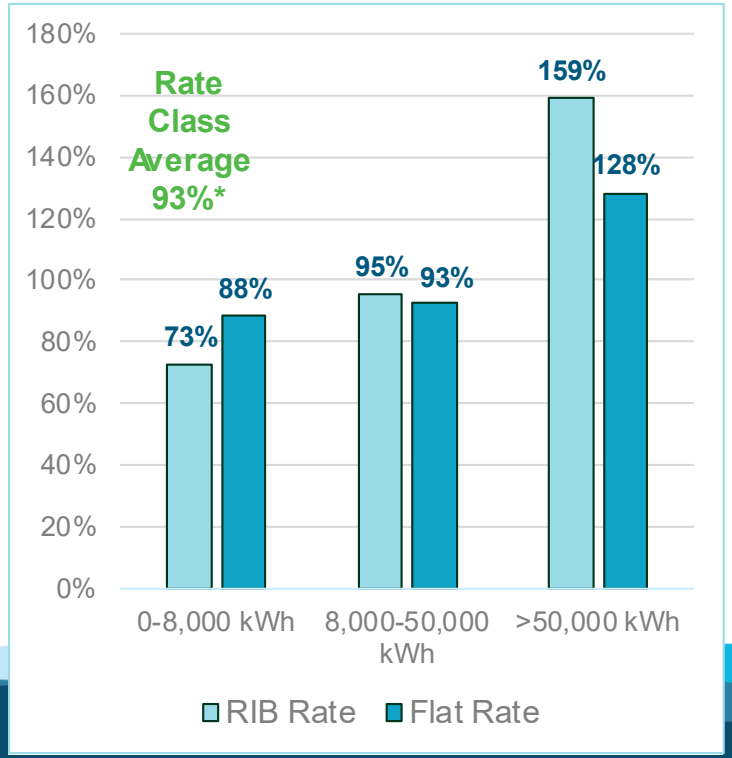
Marginal cost of energy

- Flat rate reduces the marginal cost of energy. Customers do not pay a higher price per kWh for consuming more electricity.

Cost of Service

- The R/C ratios are more even under the Flat rate.
- The R/C ratio for lower consumption customers increased to be closer to the rate class average and high consumption customers reduced significantly.

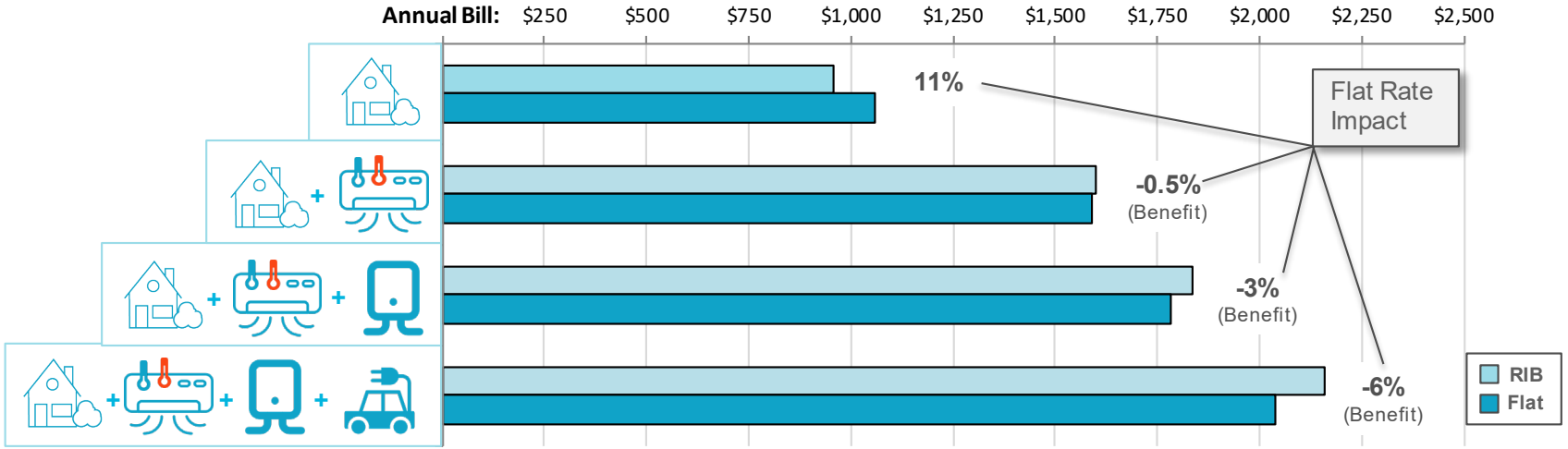
Illustrative R/C ratio by annual consumption



*F2020 Fully Allocated Cost of Service Study

Flat Rate Removes an Electrification Barrier

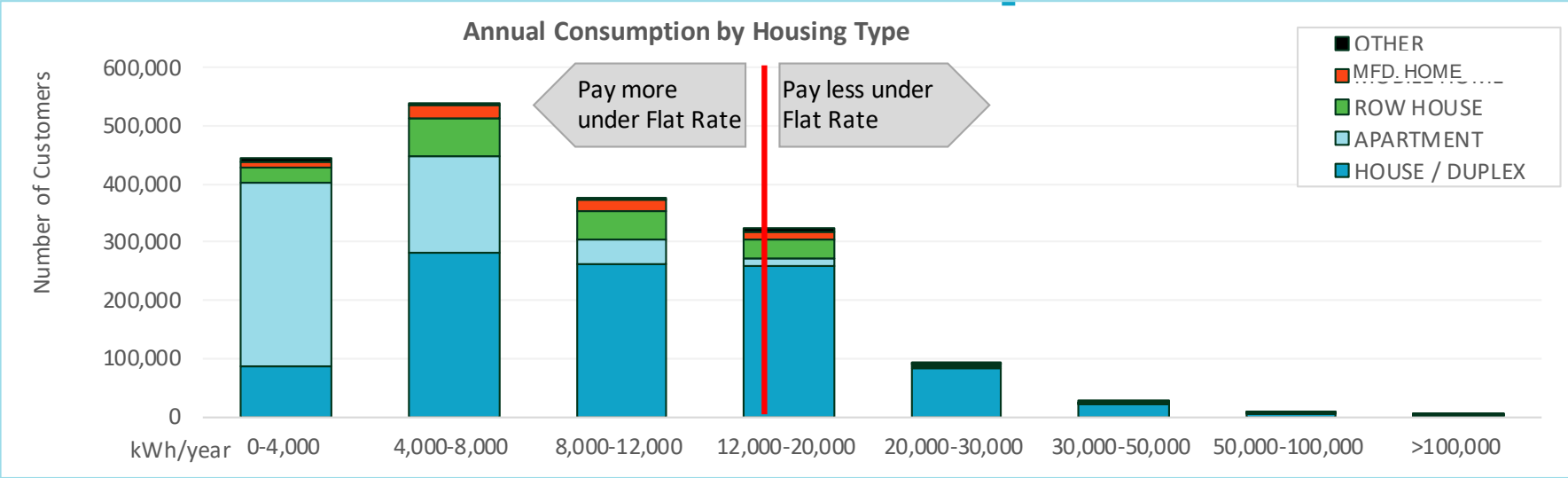
Single Family Home	Heat Pump	Water Heater	EV
~8,700 kWh/year Median non-electrically heated	~4,750 kWh/year (ASHP with COP 2.55)	~1,700 kWh/year (ASHP water heater COP 2.0)	~2,300 kWh/year



F2022 Rate: Flat rate based on $0.2077/day Basic Charge & $0.1121/kWh Energy Charge

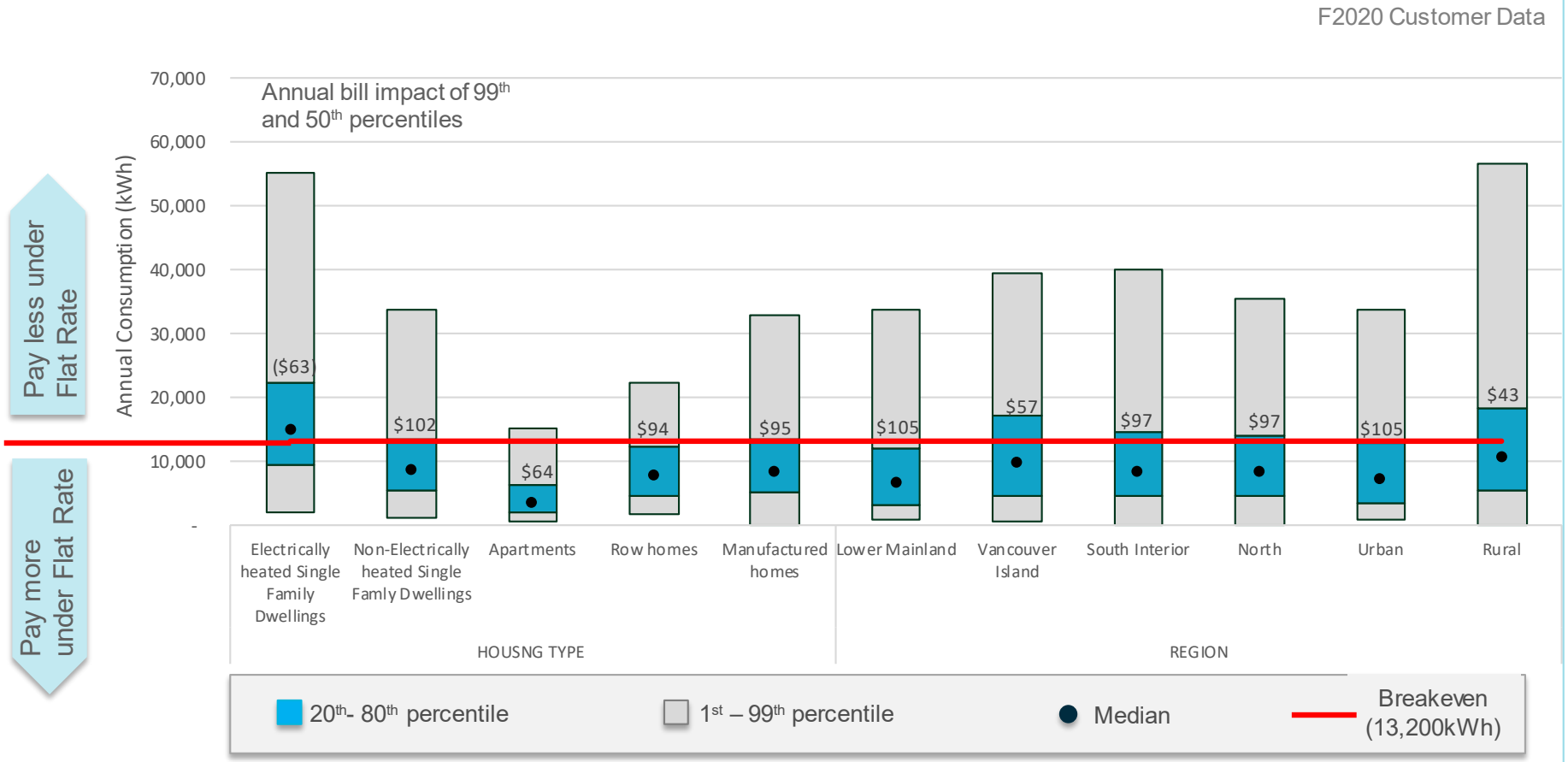
Flat Rate would have bill impacts

F2020 Customer data
F2022 Rate

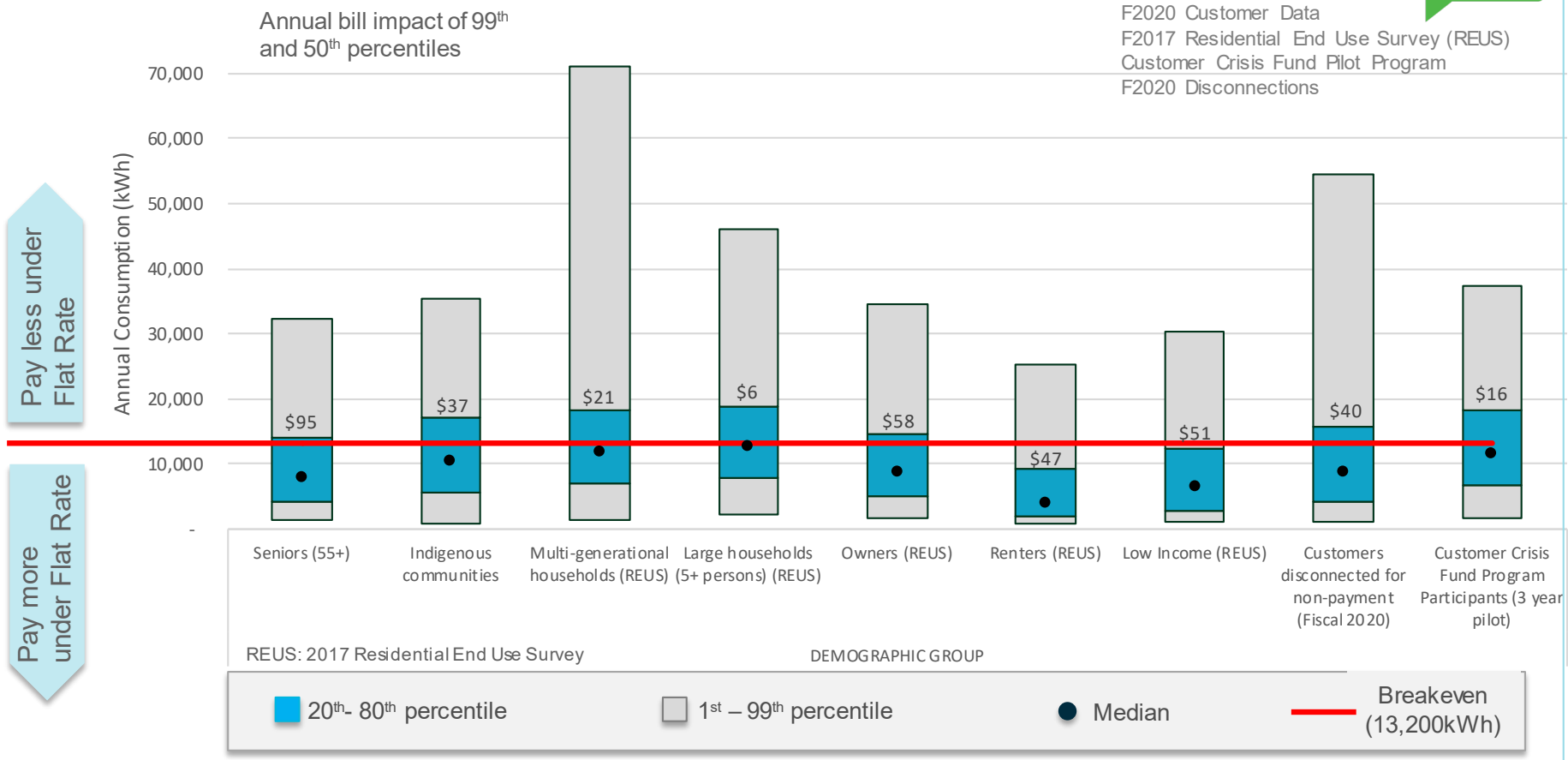


Annual consumption (kWh)	0-4,000	4,000-8,000	8,000-12,000	12,000-20,000	20,000-30,000	30,000-50,000	>50,000
% of all customers	25%	30%	21%	18%	5%	1%	0.5%
Avg. RIB Bill ($/year)	$306	$651	$1,106	$1,838	$3,026	$4,791	$13,995
Avg. Flat Bill ($/year)	$352	$750	$1,184	$1,785	$2,741	$4,155	$11,529
Med. Bill Impact $	$46	$99	$78	($52)	($284)	($635)	($2,466)
Med. Bill Impact %	15%	15%	7%	(3%)	(9%)	(13%)	(18%)

Illustrative annual Flat Rate bill impact



Illustrative annual Flat Rate bill impact



Default Rate Design Assessment

Chris Sandve, Chief Regulatory Officer

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A closer look at the Basic Charge

- The Residential basic charge was introduced in March 1977 and has since been increased by the amount of any general rate increase as approved by the Commission.
- The basic charge is intended to recover a portion of BC Hydro's customer-related costs, which do not vary with usage.
- The current RIB Basic Charge recovers ~60% of the fixed customer related costs, increasing it would reflect BC Hydro's fixed customer related costs.
- BC Hydro's basic charge is among the lowest of any Canadian Electric Utilities.

Illustrative bill impacts of increasing Basic Charge

- BC Hydro consulted extensively on the concept of increasing the basic charge as part of our 2015 Rate Design Application
- At that time, some parties opposed increases to the basic charge because the current level is accepted by customers and increasing it would increase bills for low consuming customers, including apartments and some low-income customers

Annual Consumption (kWh)	No Change to Basic Charge	Increase Basic Charge to 1.5X
Basic charge (per day)	$0.2077	$0.3116
Energy charge (per kWh)	$0.1121	$0.1082
0-4000	15%	24%
4001-8000	15%	17%
8001-12000	7%	6%
12001-20000	-3%	-5%
20001-30000	-9%	-12%
30001-50000	-13%	-16%
>50000	-18%	-21%

Default Rate Design Bonbright Assessment

Bonbright Principle	Maintain RIB Rate Design	Flat Energy Charge no change to Basic Charge	Lower Flat Energy Charge Increased Basic Charge
Economic Efficiency Price signals to encourage efficient use and discourage inefficient use	**Poor** Step 2 energy charge does not reflect marginal cost	**Good** Energy charge better reflects marginal cost	**Good** Energy charge better reflects marginal cost
Fairness Fair Appointment of costs among customers; avoid undue discrimination	**Poor** High consuming customers pay more than their cost of service while low consuming customers pay less	**Good** High and low consuming customers pay closer to their cost of service	**Very Good** Closest design to cost of service
Practicality Customer understanding and acceptance, practical and cost effective to implement; freedom from controversies as to proper interpretation	**Moderate** Customer complaints and engagement indicate mixed support for status quo	**Moderate** Bill impacts arise but can be moderated with a gradual transition	**Poor** Bill increases to low consuming customers may be unacceptably high
Stability Recovery of the revenue requirement; revenue and rate stability	**Moderate** High step 2 price may discourage customers from using electricity. Stepped rate design leads to bill volatility.	**Good** Elimination of stepped rate design stabilizes bills and rates. Lower energy charge reduces barrier to using electricity.	**Very Good** Higher fixed charges stabilize revenue, lower energy charge and encourage customers to use electricity.

Other rate design options considered

Concepts	Rate Designs	Considerations
Modifying the inclining block rate	• Lowering Step 2 rate • Increase Step 1 threshold • Add an additional tier	✓ Reflects feedback from customers X Bill impacts to low consumption customers X Does not address RIB rate challenges
Eliminating the inclining block rate	• Declining block rate • Seasonal rate	✓ Lower customers' marginal cost to replace fossil fuels with clean electricity X Worse bill impacts to low consumption customers than Flat rate X Seasonal rates add complexity without reducing annual electricity costs
Segmenting residential customers	• Segment by consumption • Segment by dwelling type • Varying energy charge • Varying basic charge	✓ Minimize bill impact for certain customer groups X Benefits to certain customers limited unless very targeted X Shifts bill impacts to other customer groups X No cost of service basis X Challenging to implement and administer

Implementation Options

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Rate change implementation options

Implementation option	Description	Example
1. Immediate	Implement the new rate design shortly after Commission approval.	BC Hydro's Large General Service and Medium General Service rate change in 2017.
2. Delayed	Provide a period (e.g., 3 years) under existing rate before implementing the new rate design. Allows customers time to prepare for the new rate.	BC Hydro's General Service E-Plus rate phase out.
3. Gradual	Adjust prices over a transition period (e.g., 5 to 10 years) until they reach the new rate design. This spreads the annual bill impact from the transition to a new rate over a longer period.	FortisBC's Residential Conservation Rate transition to a flat rate over 5 years. BC Hydro's Residential E-Plus Rate phase out over 10 years.

BC Hydro believes gradual implementation is the best option to transition the default residential rate to a Flat Rate.

Illustrative bill impact mitigation – transition

Transitioning from RIB rate to flat rate over several years can mitigate some bill impacts

Annual Consumption (kWh)	Avg Annual RIB Bill	Flat Rate Total Bill Impact $	Flat Rate Total Bill Impact %	3-Year Transition Annual Impact	5-Year Transition Annual Impact	7-Year Transition Annual Impact	10-Year Transition Annual Impact
0-4000	$306	$46	15%	5.0%	3.0%	2.2%	1.5%
4001-8000	$651	$100	15%	5.1%	3.1%	2.2%	1.5%
8001-12000	$1,106	$78	7%	2.4%	1.4%	1.0%	0.7%
12001-20000	$1,838	($52)	(3%)	(0.9%)	(0.6%)	(0.4%)	(0.3%)
20001-30000	$3,026	($284)	(9%)	(3.1%)	(1.9%)	(1.3%)	(0.9%)
30001-50000	$4,791	($635)	(13%)	(4.4%)	(2.7%)	(1.9%)	(1.3%)
>50000	$13,995	($2,466)	(18%)	(5.9%)	(3.5%)	(2.5%)	(1.8%)

Combined bill impact – 5 year transition

Illustrative annual bill impact of transitioning from RIB rate to flat rate over 5 years with no change to basic charge inclusive of general bill increases or decreases

Annual Consumption (kWh)	Y0 F2023	Y1 F2024	Y2 F2025	Annual Consumption (kWh)	Y0 F2023	Y1 F2024	Y2 F2025
General Rate Increase	(1.4%)	2.0%	2.7%	General Rate Increase	(1.4%)	2.0%	2.7%
0-4000	(1.4%)	4.9%	5.6%	0-4000	($4)	$15	$18
4001-8000	(1.4%)	5.0%	5.6%	4001-8000	($9)	$32	$38
8001-12000	(1.4%)	3.3%	4.0%	8001-12000	($15)	$36	$45
12001-20000	(1.4%)	1.3%	2.0%	12001-20000	($26)	$24	$36
20001-30000	(1.4%)	0%	0.6%	20001-30000	($42)	($1)	$18
30001-50000	(1.4%)	(0.8%)	(0.2%)	30001-50000	($67)	($38)	($10)
>50000	(1.4%)	(1.7%)	(1.2%)	>50000	($195)	($234)	($158)

Combined bill impact – 10 year transition

Illustrative annual bill impact of transitioning from RIB rate to flat rate over 10 years with no change to basic charge inclusive of general bill increases or decreases

Annual Consumption (kWh)	Y0 F2023	Y1 F2024	Y2 F2025	Annual Consumption (kWh)	Y0 F2023	Y1 F2024	Y2 F2025
General Rate Increase	(1.4%)	2.0%	2.7%	General Rate Increase	(1.4%)	2.0%	2.7%
0-4000	(1.4%)	3.5%	4.2%	0-4000	($4)	$10	$13
4001-8000	(1.4%)	3.5%	4.2%	4001-8000	($9)	$22	$28
8001-12000	(1.4%)	2.7%	3.4%	8001-12000	($15)	$29	$38
12001-20000	(1.4%)	1.7%	2.3%	12001-20000	($26)	$30	$43
20001-30000	(1.4%)	1.0%	1.7%	20001-30000	($42)	$29	$50
30001-50000	(1.4%)	0.6%	1.3%	30001-50000	($67)	$28	$60
>50000	(1.4%)	0.2%	0.8%	>50000	($195)	$21	$111

F2023 Pricing Principles

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RIB pricing principles

RIB Pricing Principles

How the annual general rate increase / decrease is applied to the three elements of the RIB rate:

- Basic Charge
- Step 1 Energy Charge
- Step 2 Energy Charge

The current pricing principles will expire in March 2022

Fiscal Year	BCUC Order No.	
F2009 – F2010	G-124-08	Approval of RIB Rate.
F2011	G-180-10	Apply RRA % equally
F2012 – F2014	G-45-11	Increase Step 2 to the higher of RRA % or up to 10% bill impact
F2015 – F2016	G-13-14	Apply RRA % equally
F2017 – F2019	G-5-17	Apply RRA % equally
F2020	G-214-18	Apply RRA % equally
F2021 – F2022	G-62-20	Apply RRA % equally

Preliminary F2023 RIB pricing principles

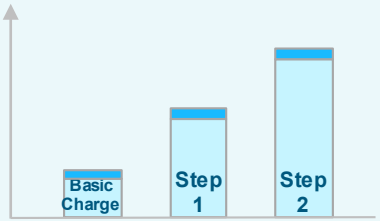
(interim and refundable)

F2023 RRA – net impact of 1.4% decrease

- +0.62% increase
- -2% Deferral Account Rate Rider (DARR)

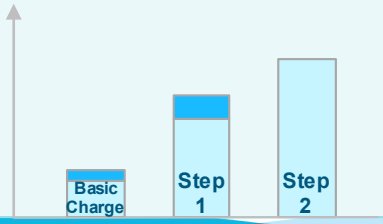
Option 1

Basic charge: increase by 0.62%
Step 1: increase by 0.62%
Step 2: increase by 0.62%
(-2% DARR applies to the total bill)
All customers see a ~1.4% bill decrease



Option 2

Basic charge: increase by 0.62%
Step 1: increase by 1.17%
Step 2: no change
(-2% DARR applies to the total bill)
Customers see various bill decreases



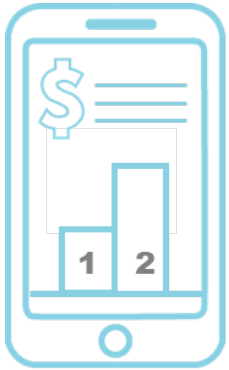
Illustrative option 2 bill impact

Annual Energy Usage (kWh)	Average Bill Impact ($)	Average Bill Impact (%)
0-4000	($3)	(1.0%)
4001-8000	($6)	(1.0%)
8001-12000	($14)	(1.2%)
12001-20000	($28)	(1.5%)
20001-30000	($51)	(1.7%)
30001-50000	($87)	(1.8%)
>50000	($271)	(1.9%)

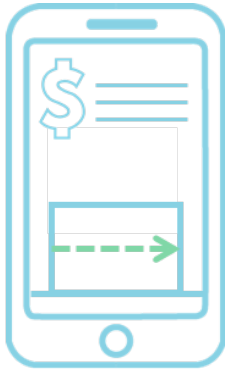
Optional residential rates

1. Default rates

Option 1
Maintain Residential
Inclining Block Rate



Option 2
Transition to a
Flat Energy Charge Rate



2. Optional rates

Electric Vehicle
Peak Reduction Rate

Residential
Time of Use Rate

Agenda

Time	Topic	Presenter
12:30 pm – 12:50 pm	Time-of-use Rates and our Integrated Resource Plan	Anthea Jubb, Snr. Regulatory Manager
12:50 pm – 1:10 pm	Customer and stakeholder feedback	Anthea Jubb
1:10 pm – 1:20 pm	Electric vehicles in BC	Mike Wenzlaff, Snr. Program Manager
1:20 pm – 1:30 pm	Jurisdictional review	Mike Wenzlaff
1:30 pm – 2:20 pm	Optional time-of-use rate designs	Rob Zeni, Snr. Regulatory Specialist
02:20 pm – 02:30 pm	Next steps and closing Remarks	Chris Sandve, Chief Regulatory Officer

Time-of-use rates and our Integrated Resource Plan

Anthea Jubb

Senior Manager Tariffs and Rate Design

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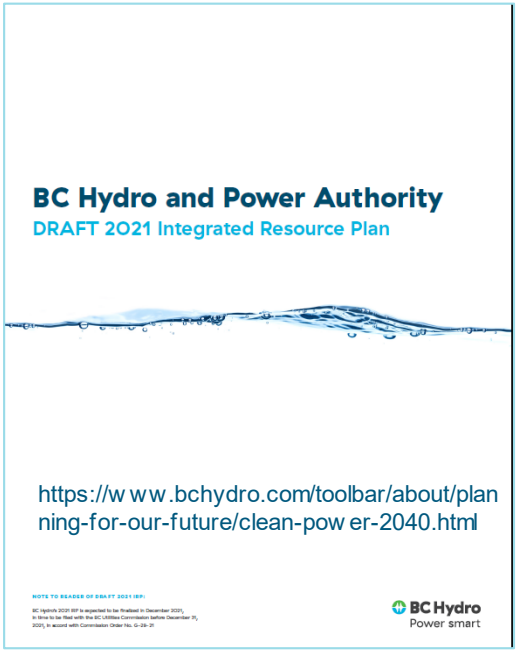
BC Hydro's Integrated Resource Plan

- An integrated resource plan is a guidebook for what, when, and how to meet customers' evolving electricity needs
- BC Hydro's 2021 Integrated Resource Plan looks at a 20-year time frame and will guide decisions on how to meet future customer needs for electricity
- We released our draft Integrated Resource Plan in July 2021 and will file our final plan with the BC Utilities Commission December 2021



The need for capacity

- Capacity is needed as early as Fiscal 2027 in the Lower Mainland and Vancouver Island regions

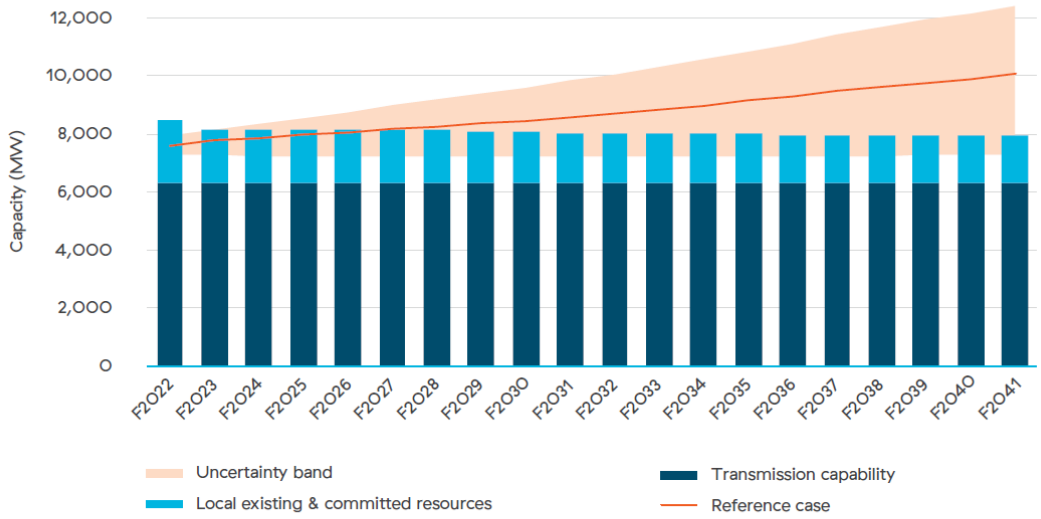
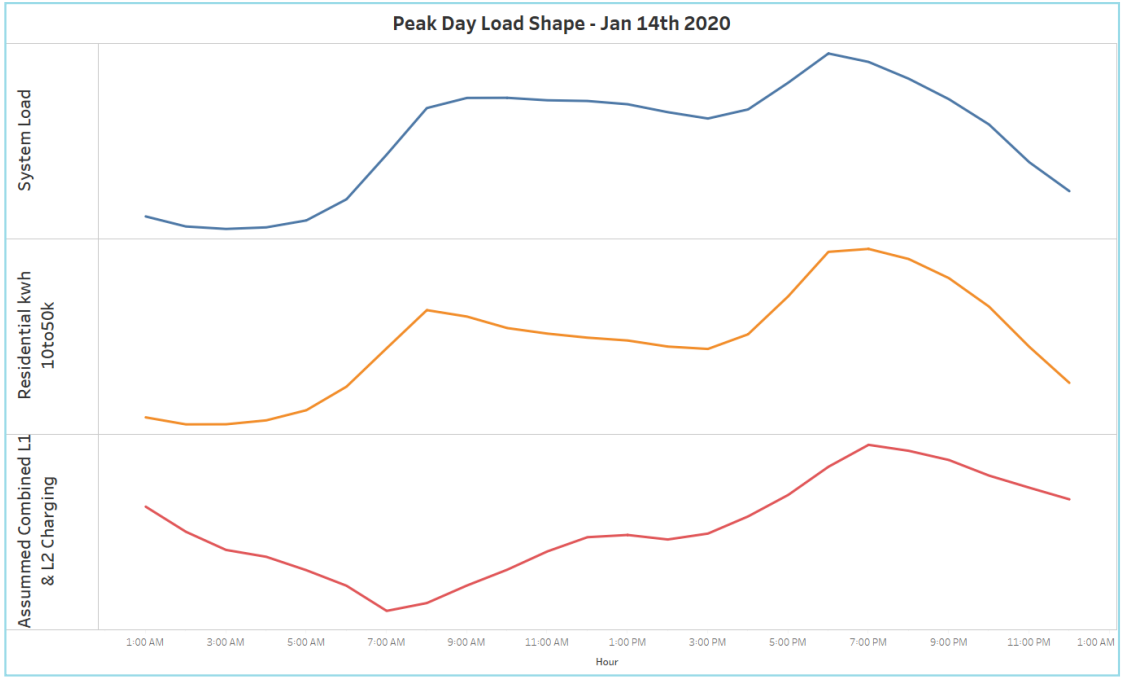


Figure 3. South Coast capacity Load Resource Balance: December 2020 Load Forecast vs. existing & committed resources (w/ transmission) – before planned resources

Time-varying rates can be a capacity resource

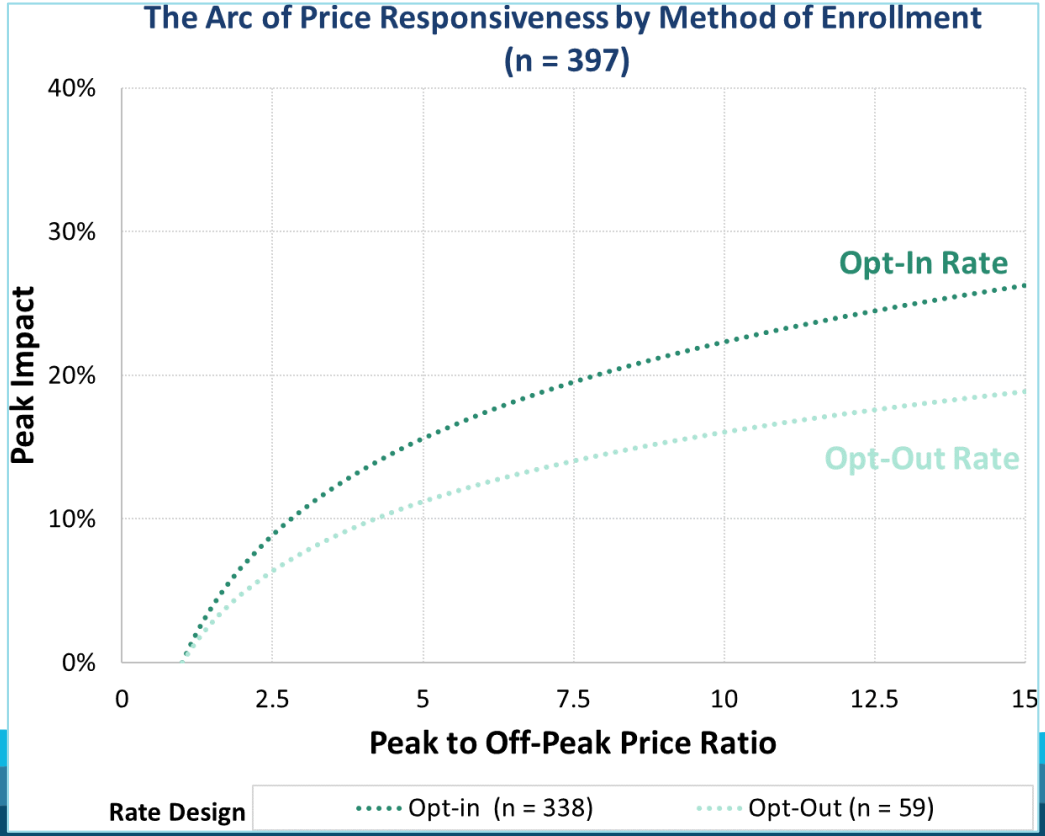
- BC Hydro's demand related costs arise because of the need to serve load during our peak demand times
- If customers can move when they use electricity to time outside our peak demand periods, this can provide a resource alternative to investing in distribution, transmission and generation capacity



Support for opt-in time-varying rates

- Consultation completed for the integrated resource plan showed an overall openness and support for time-varying rates
- Concern for customers who cannot take advantage of time-varying rates to lower their bills
- Opt-in design emphasizes customer choice and mitigates the potential for negative bill impacts for customers who could be defaulted into a rate that is not well suited for them

Opt-in time varying rates reliably reduce peak demand



Source: The Brattle Group

Time-varying rates in the Integrated Resource Plan

BC Hydro's draft integrated resource plan includes the following elements:

- Pursue voluntary time-varying rates supported by demand response programs to achieve 220 MW of capacity savings at the system level by fiscal 2030
- Pursue a combination of education and marketing efforts as well as incentives for smart-charging technology for customers to support a new or existing (as applicable) voluntary residential time of-use rate to shift home charging by 50 per cent of residential electric vehicle drivers to off-peak demand periods to achieve 100 MW of capacity savings at the system level by fiscal 2030.

Optional residential time-of-use rate

We are advancing two of the time varying rates in the Integrated Resource Plan now:

- Opt-in residential time of use rate that applies to the entire residential account
- Opt-in electric vehicle peak reduction time of use rate that applies to home charging of electric vehicles only

Help manage the impact of home charging of electric vehicles on BC Hydro's system, and provide capacity in the South Coast where it is needed earliest

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Engagement Results

Anthea Jubb

Senior Regulatory Manager Tariffs and Rate Design

BC Hydro
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2020 Rates Perception Survey

Approach

A random sample of residential customers with an email address on file who have given consent to be contacted

15-minute email-to-online survey

Survey Responses

Year	Date	Invitations	Completed Surveys	Participation Rate
2020	December 11 - 30	8,427	978	12%

Total results accurate to **±3%**
(19 times out of 20)

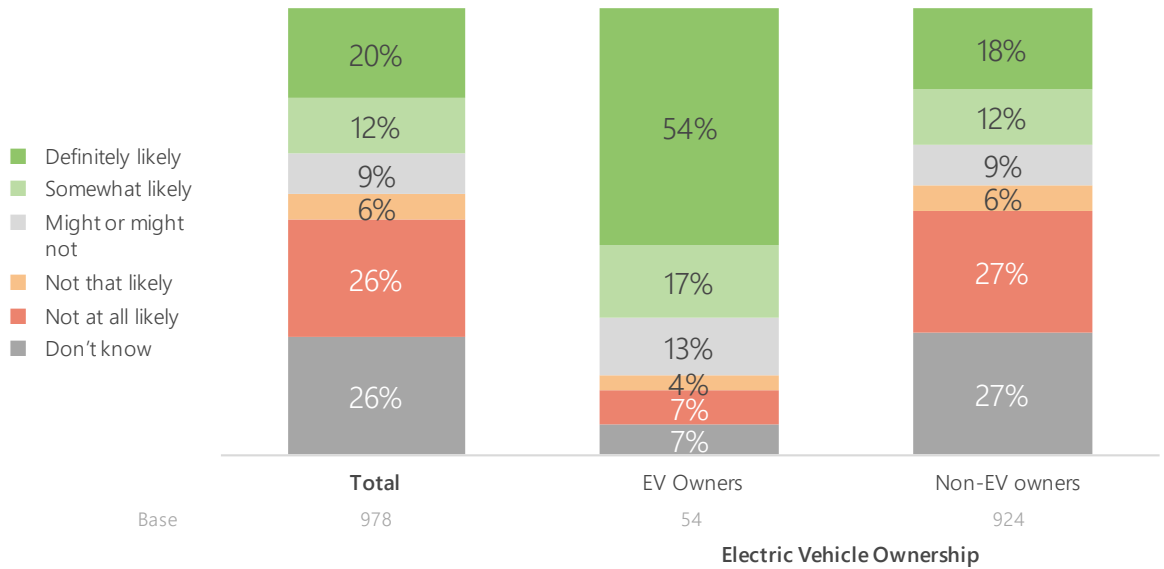
The survey results have not been weighted

ELECTRIC VEHICLE RATE LIKELIHOOD TO OPT-IN

Overall, just under one-third of customers indicate that they are likely to opt in to receive a lower electricity rate in exchange for charging an EV during off-peak times.

Current EV owners are very likely to opt in – over half (54%) indicate that they are 'definitely likely' to opt in.

Impact of Off-Peak Charging Rates on Likelihood to Opt-In



Base: Total

E2. For many customers with electric vehicles, "plugging in" while parked at home is the most convenient way to charge the battery. An off-peak electric vehicle home charging rate would allow customers to charge their vehicles at home at a lower cost. If an off-peak rate for electric vehicle charging became available, what is the likelihood that you will sign up (opt in)?

ABILITY TO CHANGE TIMING OF ELECTRICITY USE

Overall, just under half of customers indicate that they could adjust the timing of the use of their washer, dryer or dishwasher to take advantage of lower off-peak electricity rates. Those living in condos/apts are less likely to indicate that they can adjust the timing of their use of these appliances.

Much smaller percentages of customers indicate that they would be able to adjust a space heating or cooling appliance to take advantage of lower-off peak electricity rates.

Proportion That Could Adjust Their Timing of Use

	Total	Condo / Apt	Small, detached home	Larger family home
Base	(978)	(294)	(499)	(185)
Washer	47%	39%	51%	52%
Dryer	47%	39%	51%	50%
Dishwasher	48%	41%	50%	54%
Space (room) heating	17%	17%	17%	18%
Space (room) cooling	12%	10%	13%	14%

■ / ■ % yes

■ Lower than other household profiles

Base: Total (978)

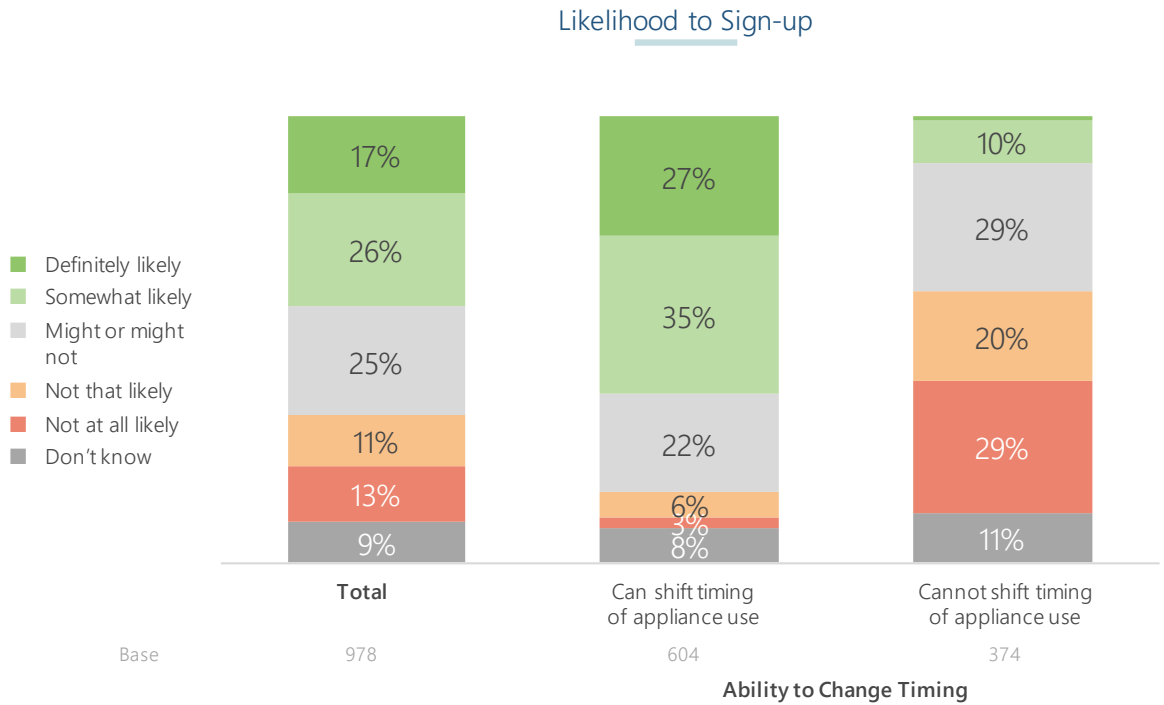
D1. BC Hydro is also exploring other optional rates. Customers would be able to choose to stay on the standard rate or they could sign up for an option that meets their needs. A time of use rate is one option. This rate helps shift electricity use away from peak demand times (i.e. 4 p.m. to 8 p.m.) by offering a lower rate for using power during off-peak times (i.e. 11 p.m. to 7 a.m. or weekends) and a higher rate for electricity used during peak times. If time of use rates became available, could you change the timing of the use of any of the following electrical appliances to take advantage of a lower off-peak charge?

LIKELIHOOD OF SIGNING UP FOR TME OF USE OPTION

Overall, 43% of customers indicate that they are likely to sign up for a time of use option, while just under one-quarter (24%) are not likely.

However, 62% of customers who indicated that they could operate at least one of their appliances during off-peak times indicate that they are likely to sign up for a time of use option.

Consistent with their lower stated ability shift appliance use to off-peak times, those living in condos/apts are less likely to sign up for a time of use option (35%), compared to those living in small detached homes (45%) or larger family homes (48%).



Base: Total (978)
D2. Based on this time of use rate concept, what is the likelihood that you will sign up if it became available to you?

REASONS FOR LIKELIHOOD OF SIGNING UP

The most common reason that customers are likely to sign up for a time of use option is the prospect of lower electricity bills.

Most of those who indicate that they might sign up want more information or say it depends on the cost savings that could be achieved.

The most common reasons that customers are not likely to sign up for a time of use option are that they simply don't want to change their usage to off-peak times or unable to do so.

	Total	Condo	Smaller Detached Home	Larger Family Home
Likely to sign-up	368	87	196	85
Reduces cost / more economical / cheaper	28%	28%	27%	31%
I can change my time of use / can take advantage of program	16%	14%	16%	18%
Need more information / details	14%	9%	13%	19%
More off-peak use better for the system environment / already do this	10%	11%	12%	6%
Depends on the cost difference / cost savings	8%	3%	9%	12%
Like being able to control my use to access lower rates	8%	9%	8%	6%
Good idea / It is used elsewhere	8%	10%	7%	7%
Might or might not sign-up	219	65	116	38
Need more information / details	30%	23%	36%	24%
Depends on the cost difference/ cost savings	23%	15%	26%	29%
Don't want to change my time of use / not interested / hassle	8%	6%	9%	5%
Don't know if I'll be able to change my time of use	8%	12%	5%	8%
Depends on what time periods would qualify	7%	6%	7%	11%
Not likely to sign-up	223	79	103	41
Don't want to change my time of use / not interested / hassle	36%	33%	38%	37%
Can't change time of use on some or all things / can't take advantage of program	25%	28%	21%	29%
Current bill already low/ not relevant for my situation	13%	20%	12%	5%

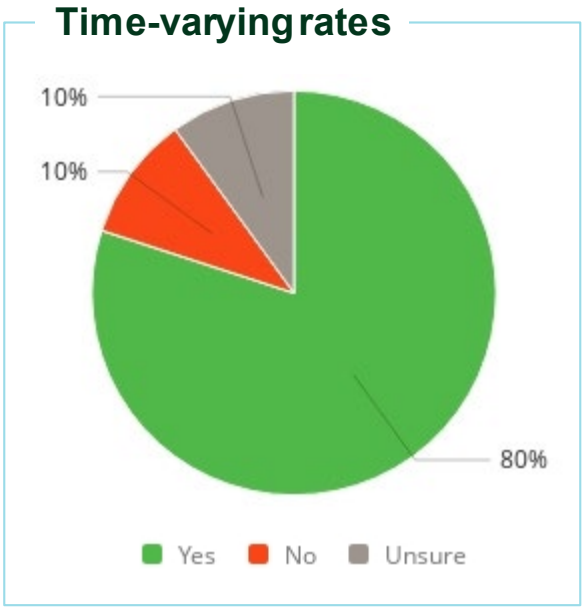
D3. Why are you [definitely / somewhat likely / unlikely to sign up?] / Why do you say you might or might not sign up? Only main mentions are shown.

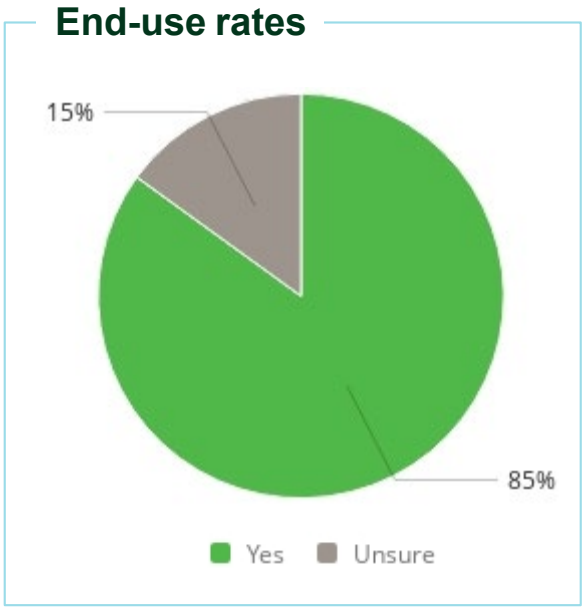
2021 customer and public survey

	Customer survey	Public survey
Fielding method	Online & phone May 10 to 31, 2021	Online via BCH website starting April 28, 2021
Respondents	Randomized representative sample drawn from the account holder database	Open to anyone
Sample size	821 (includes 72 phone interviews)	21,000+
Final preferences on future rate design: Top 3 choices	**Time-of-use** Keep RIB	**Time-of-use** Flat rate Plan with options

2021 public workshop

- Public rate design workshop on May 19, 2021
- 109 participants made up of organizations that represent BC Hydro residential customers
- Participants were asked if they support BC Hydro advancing the development of time-varying rates and end-use rates





Electric vehicle market and policy context

Mike Wenzlaff – Senior Program Manager, Electric Vehicles

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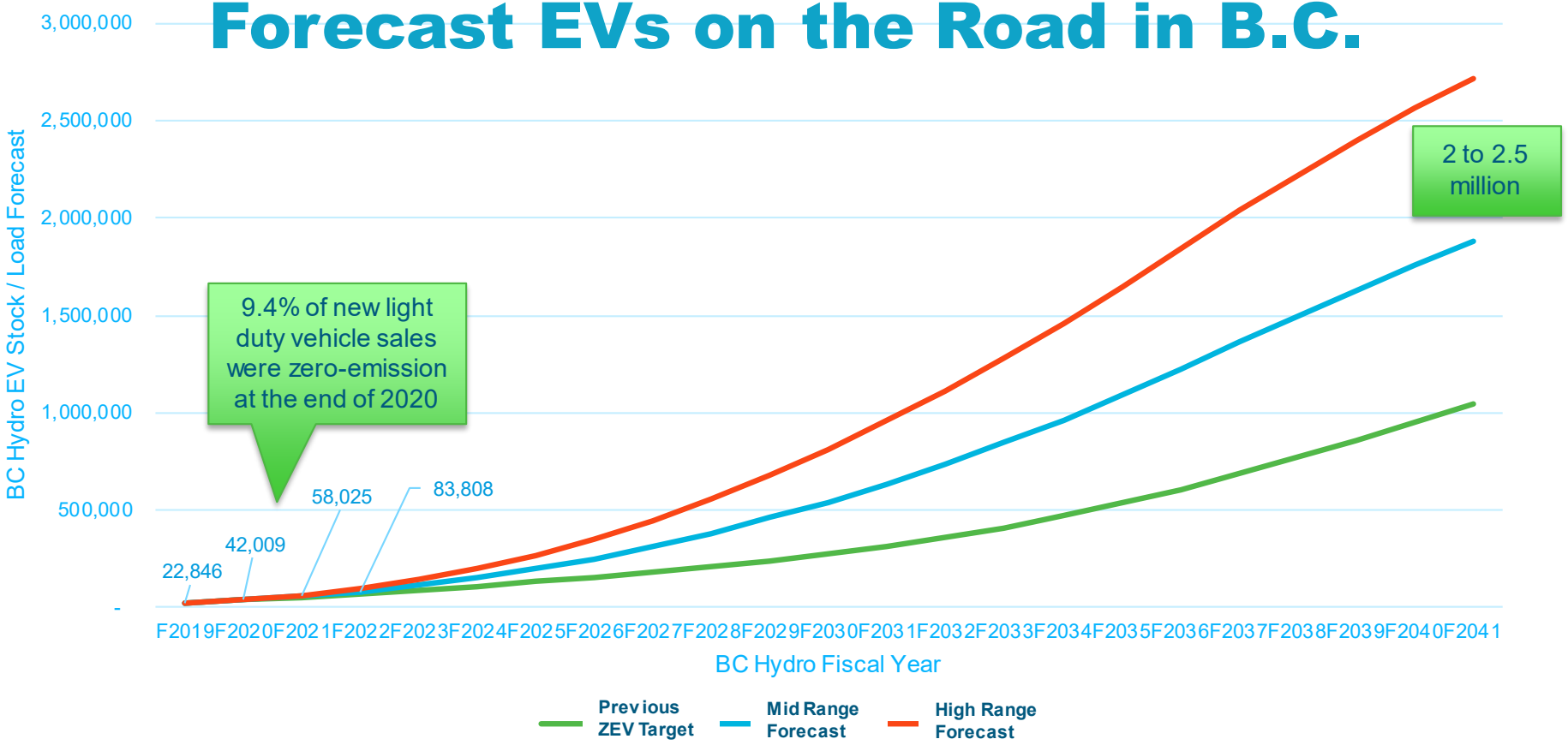
CleanBC Policy Context

- B.C. Government's CleanBC Roadmap to 2030 launched in October 2021
- More ambitious goals than the 2018 version to respond to the climate crisis
- Key focus is accelerating electrification of transportation and buildings
- Five years ahead of original zero-emission vehicle sales target (10% by 2025) as 9.4% of new car sales reached at end of 2020

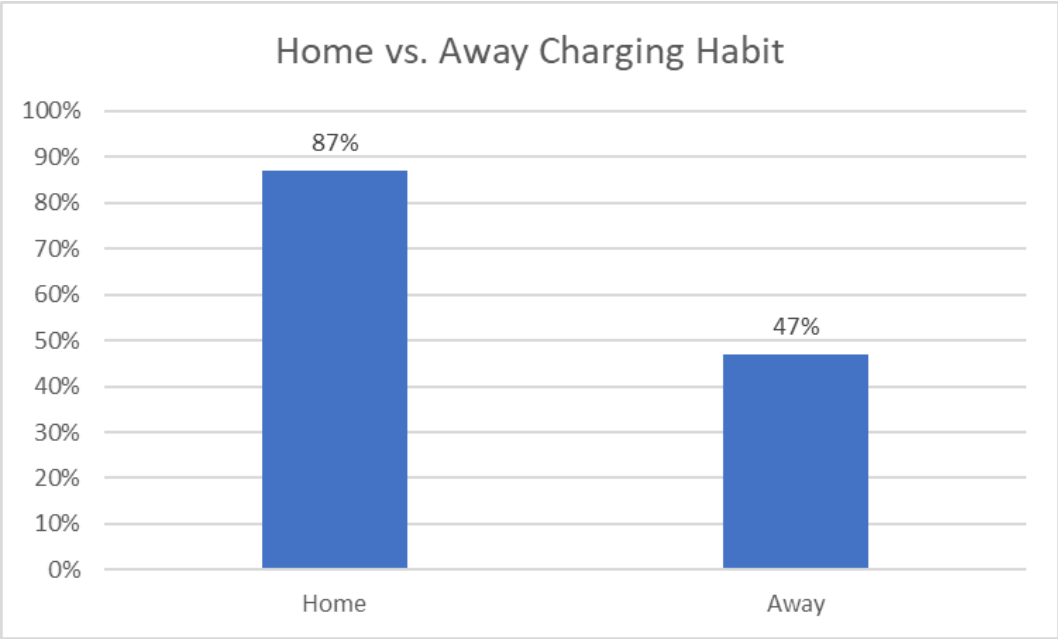
Updated B.C. Zero Emission Vehicles Sales Targets	
2026	26%
2030	90%
2035	100%

cleanBC
our nature. our power. **our future.**

Forecast EVs on the Road in B.C.



EV Charging – Home and/or Away



Source: BC Hydro Residential End-Use Survey 2020

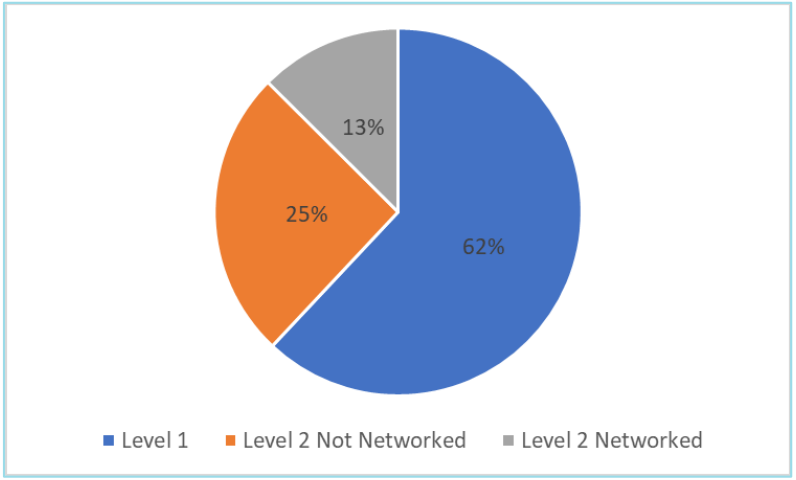
EV charging – at home

Home Charging Levels

Level 1
Regular wall socket (120 volt)

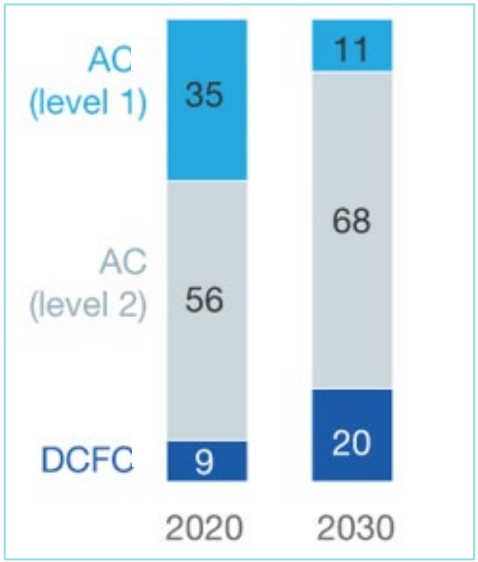
Level 2
Networked or non-networked EV charger (240 volt)

Today: More than half of home charging is Level 1



Source: BC Hydro Residential End-Use Survey 2020

Future: Level 2 charging will be the majority



DCFC: Direct Current Fast Charge

Source: United States Market Forecast; McKinsey & Company

Charging EV's at home – metering

EV charging can either be metered as part of whole-home consumption or separately metered

	Standard Metering	Separate Metering	
Metering Configuration	**Current** 	**Initial Option: Second BC Hydro meter** 	**Potential Future Option: Metering via networked EV charger** 
Rates Supported	• **Current**: Standard default rate (Residential Inclining Block) • **Proposed**: Optional Whole-Home Time-Of-Use rate	• **Proposed**: EV Peak Reduction end-use rate	
Charging Speed	• Level 1 or Level 2	• Level 1 or Level 2	• Level 2 only
Considerations	✓ Simpler to administer and easier for customer to sign up for optional rate as no additional metering required × EV consumption cannot be separated for billing purposes from rest of the home usage	✓ Full recognition of EV load shift to off-peak periods ✓ Supports some newer apartments that have separate meters for EV × Customer will need to install separate metering at their cost	✓ Full recognition of EV load shift to off-peak periods ✓ Customer can take advantage of supported networked EV charger with no further electrical work required × Not currently approved by Measurement Canada

Jurisdictional review

Mike Wenzlaff – Senior Program Manager, EV's

BC Hydro
Power smart

Time-of-use rates jurisdictional review

- Residential time-of-use rates have been around for many years in some jurisdictions
- Some time of use rate are available only to those with electric vehicles
- More recently, utilities are offering specific electric vehicle time-of-use rates requiring a second utility meter
    - Two utilities are using the Level 2 networked charger and/or vehicle telemetry to bill EV charging separately

Examples of time-varying rates

Utility	Default	Whole Home	Electric Vehicle (end-use)
Pacific Gas & Electric	Time-of-use (peak and off-peak periods) *Customers can opt-out for another plan including tiered rate structure	Three plans offered • 4-9 pm everyday (baseline allowance) • 5-8 pm weekdays • EV ownership required	Time-of-use plan • Peak, off-peak and super off-peak rates • Requires second meter
Salt River Project	Basic plan – flat with seasonal 2 tier (summer and summer peak months)	Four plans offered • 3-6 pm or 4-7 pm weekdays • Shift 6-8 hours of use on weekdays • EV overnight	N/A
Consumers Energy	2-tier step rate	Three plans offered • Default with summer peak Seasonal and off-peak pricing • Low overnight	N/A
Sacramento Municipal Utilities District (SMUD)	Time-of-use *Customers can opt-out for a seasonal flat rate structure	Two plans offered • Seasonal, peak and off-peak • EV option to receive a lower overnight rate – must register the EV	N/A

Examples of time-varying rates

Utility	Default	Whole Home	Electric Vehicle (end-use)
Georgia Power	Starting 2021 – Smart Usage Time-of-Use	Three plans offered • On and off-peak • Plug in EV rate (super off-peak) • Smart usage	N/A
Green Mountain Power	Variety of rate options including: • Single flat rate • Critical Peak Pricing • Seasonal Time-of-Use • EV Off-Peak and Time-of-u	One plan offered • Seasonal, May – Oct and Nov - April	Two plans offered • Off-peak period, customer managed • Utility managed charging
San Diego Gas & Electric	Time-of-Use	Three plans offered • 2 pricing periods • 3 pricing periods • 3 pricing periods + demand response • EV specific – 2 plans, seasonal	One plan offered • Seasonal • Requires installation of second meter

Nova Scotia Power time-of-use rate

Rate	Time of Use	Standard
Monthly Charge	$10.83	$10.83
Winter Season & On-Peak Pricing (per kWh)	NOV 1 – MAR 31 (151 DAYS) 7 AM - 11 AM: $0.32 11 AM - 4 PM: $0.16 5 PM - 9 PM: $0.32 9 PM - 7 AM: $0.16	$0.16
Non-Winter Season & Off-Peak Pricing (per kWh)	APR 1 – OCT 31 (214 DAYS) $0.10 ANYTIME IN NON-WINTER ~34.7% savings of standard rate	
Holidays & Weekends	ALL HOLIDAYS & WEEKENDS IN WINTER ARE OFF PEAK $0.16	
Estimated Savings	~20%	

Implemented 2021 as a capacity resource in support of Nova Scotia Power's 2020 Integrated Resource Plan

Optional Residential Rate Designs

Robert Zeni

Senior Regulatory Specialist, Regulatory

BC Hydro
Power smart

Rate design framework

- Pricing is revenue neutral to the otherwise applicable rate, assuming no load shifting
- Rates are opt-in
- Designs are assessed for potential economic and cost of service justification
- Designs are assessed for attractiveness to participants, and for potential free ridership

Preliminary rate design assessment: impacts on ratepayers

Ratepayer economic Assessment:

- Analyzes revenue loss and load shifting relative to the marginal value of capacity, allowing for uncertainty. The value of capacity which can be assessed from our capacity reference prices (to be included in our 2021 integrated resource plan) as well as our distribution extension costs

Evaluation:

- Benefit cost ratio of 1 or more is good
- Between 0.80 and 1 is moderate
- Less than 0.80 is poor

Cost of Service Assessment:

- Compares the revenue to cost ratio of participants after load shifting to the revenue to cost ratio of other residential customers, allowing for the standard uncertainty range of +/- 5%, based on our fully allocated cost of service study
- Average residential revenue to cost ratio is 93%

Evaluation:

- Greater than 93% good
- Between 88% is 93% is moderate
- Less than 88% is poor

Preliminary rate design assessment: enrollment & load shifting

Bill Savings with Load Shifting:

- Potential bill savings for the target customer after load shifting should be high enough to attract participation
- Preliminary assessment:
  - Greater than 100 $/yr is good
  - Between 50 and 100 $/yr moderate
  - Less than 50 $/yr is poor

Bill Savings without Load Shifting:

- Potential bill savings for customers without load shifting provides an indicator of the risk of attracting free riders.
- While some free ridership is expected, ideally most customers will have limited bill savings if they do not shift load.
- Preliminary assessment
  - Less than 50 $/yr is good
  - Between 50 and 100 $/yr is moderate
  - Greater than 100 $/yr is poor

Electric Vehicle Peak Reduction Rate Designs

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Electric vehicle peak reduction rates

Option 1: Three Price Periods, Year-Round Pricing, Energy Charges Only, Electric Vehicle Load Only

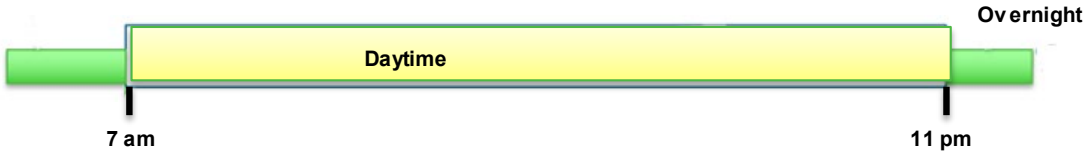
Preliminary Rates		
Energy Charge	7:00 AM – 4:00 PM	11.25 ¢/kWh
Energy Charge	4:00 PM – 11:00PM	18.39 ¢/kWh
Energy Charge	11:00 PM – 7:00 AM	4.54 ¢/kwh
Basic Charge	0 ¢/day	

Preliminary Assessment

- Capacity benefit cost ratio: 1
- Revenue to cost ratio: 75% to 130%
- Illustrative customer bill savings with load shifting: $120 / yr
- Illustrative customer bill savings without load shifting: $0 / yr

Electric vehicle peak reduction rates

Option 2: Two Price Periods, Year-Round Pricing, Energy Charge and Basic Charge, Electric Vehicle Load Only



Preliminary Rates		
Energy Charge	7:00 AM – 11:00 PM	10.78 ¢/kWh
Energy Charge	11:00 PM – 7:00AM	4.54 ¢/kWh
Basic Charge	20.8 ¢/day	

Preliminary Assessment

- Capacity benefit cost ratio: 1.4
- Revenue to Cost Ratio: 104% to 183%
- Illustrative customer bill savings with load shifting: $87 / yr
- Illustrative customer bill savings without load shifting: $35 / yr

Electric vehicle peak reduction
Bonbright assessment

Bonbright Principle	Option 1 Three price periods, year-round pricing, energy charges only	Option 2 Two price periods, year-round pricing, energy charge and basic charge
Economic Efficiency: Price signals to encourage efficient use and discourage inefficient use	**Very Good** Three price periods reflects marginal costs	**Good** Two price periods somewhat reflects marginal costs
Fairness: Fair Appointment of costs among customers; avoid undue discrimination	**Good** Capacity benefit cost ratio is good Revenue to cost ratio is good	**Very Good** Capacity benefit cost ratio is very good Revenue to cost ratio is good
Practicality: Customer understanding and acceptance, practical and cost effective to implement; freedom from controversies as to proper interpretation	**Very Good** Bill savings with load shifting are high enough to attract participation Bill savings without load shifting are low enough to discourage free ridership	**Moderate** Bill savings with load may be too low to attract participation Bill savings without load shifting may attract some free riders
Stability: Recovery of the revenue requirement; revenue and rate stability	**Good** The rates are predictable and revenue neutral	**Good** The rates are predictable and revenue neutral

Residential Time-of-Use Rate Designs

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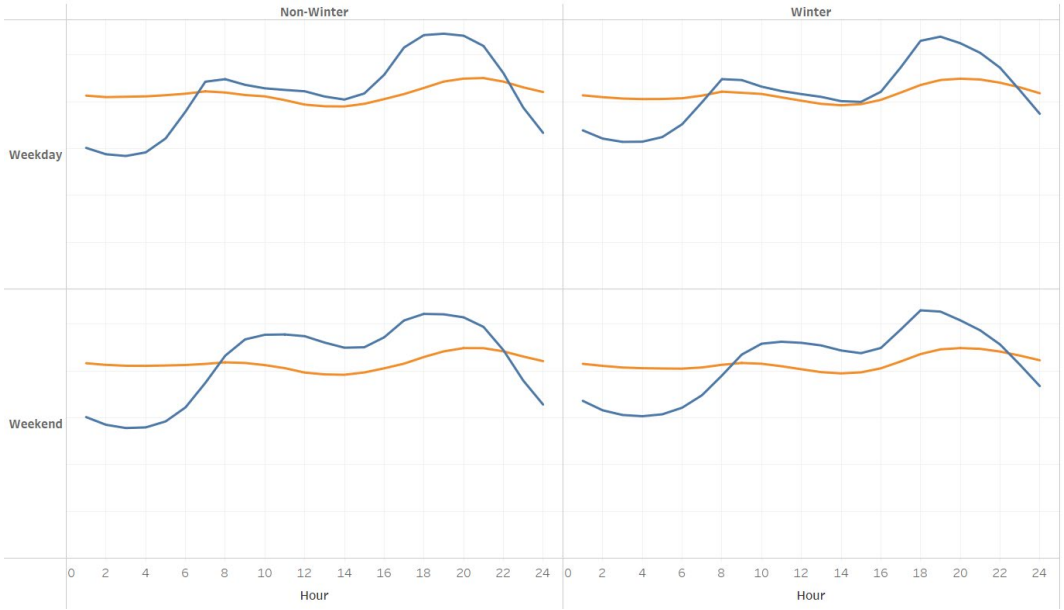
Available for accounts with annual consumption up to 50,000 kW/year



- Residential service accounts with consumption > 50,000 kWh/yr are primarily business operations
- Their high load factor and majority exposure to Step 2 means they would get substantial bill savings under a residential time of use rate, **without load shifting**
- As they use electricity differently than households, we have little confidence that they would shift load in response to a residential time of use rate

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Annual Consumption (kWh)	Number of Customers	Average Energy Usage (kWh)	Average Annual Bill Under RIB	Average Annual Bill Under TOU w/o Load Shifting	Average Annual Bill Savings
50k – 100k	3,425	65,500	$8,900	$7,350	$1,550 / 17%
> 100k	1,641	172,000	$24,000	$19,100	$4,900 / 20%

Time-of-use pricing in winter only

- The economics of offering year-round time of use pricing that applies to an entire residential account are not supportable
- The value to BC Hydro of time of use rates comes from the capacity savings that occur in our winter peak demand period
- Discounted overnight pricing outside of winter reduces customer bills and erodes BC Hydro revenue without a corresponding benefit to BC Hydro
- The approach aligns with industry standards: a survey of > 150 residential time of use rates found that 78% offer time of use pricing in the utility's peak demand season only[1]

Note 1: The Electricity Journal 30 (2017) 64–72; A. Faruqui et al; Arcturus 2.0: A meta-analysis of time-varying rates for electricity.

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Optional residential time-of-use rates

Option 1: Three Price Periods, Winter Weekday, <50,000kWh/yr Accounts only

Preliminary Rates			
Energy Charge	7:00 AM – 4:00 PM 9:00 PM – 11:00 PM	10.33 ¢/kWh	Weekdays November 1 to February 28 Daily
Energy Charge	4:00 PM – 9:00PM	26.37 ¢/kWh	
Energy Charge	11:00 PM – 7:00 AM	4.54 ¢/kwh	
Energy Charge	All hours	11.44 ¢/kWh	All day not listed above
Basic Charge	20.8 ¢/day		Daily

Preliminary Assessment			Illustrative Customer	
	Benefit / Cost Ratio	Revenue / Cost Ratio	Bill Savings with Load Shifting	Bill Savings without Load Shifting
Household load only	0.3*	94%	$67	$44
Household with EV	0.8	97%	$146	$101

* Can improve by marketing Time Of Use to “high load shifting potential” households

Optional residential time-of-use rates

Option 2: Three Price Periods, Winter Daily, <50,000kWh/yr Accounts only

Preliminary Rates			
Energy Charge	7:00 AM – 4:00 PM 9:00 PM – 11:00 PM	10.33 ¢/kWh	Weekdays November 1 to February 28 Daily
Energy Charge	4:00 PM – 9:00PM	26.37 ¢/kWh	
Energy Charge	11:00 PM – 7:00 AM	4.54 ¢/kwh	
Energy Charge	All hours	11.44 ¢/kWh	All day not listed above
Basic Charge	20.8 ¢/day		Daily

Preliminary Assessment			Illustrative Customer	
	Benefit / Cost Ratio	Revenue / Cost Ratio	Bill Savings with Load Shifting	Bill Savings without Load Shifting
Household load only	0.3*	94%	$83	$62
Household with EV	0.7	95%	$145	$93

* Can improve by marketing Time Of Use to “high load shifting potential” households

Residential time-of-use Bonbright assessment

Bonbright Principle	Option 1 Three price periods, winter weekday	Option 2 Three price periods, winter daily
Economic Efficiency: Price signals to encourage efficient use and discourage inefficient use	**Very Good** Pricing reflects marginal costs	**Good** Pricing reflects marginal costs
Fairness: Fair Appointment of costs among customers; avoid undue discrimination	**Moderate** Capacity benefit cost ratio is poor but can be improved if high load shift potential customers are targeted Revenue to cost ratio is good	**Moderate** Capacity benefit cost ratio is poor but can be improved if high load shift potential customers are targeted Revenue to cost ratio is good
Practicality: Customer understanding and acceptance, practical and cost effective to implement; freedom from controversies as to proper interpretation	**Good** Bill savings with load shifting are high enough to attract participation Weekday only pricing may attract participants Bill savings without load shifting are low enough to discourage free ridership	**Good** Bill savings with load shifting are high enough to attract participation Bill savings without load shifting are low enough to discourage free ridership
Stability: Recovery of the revenue requirement; revenue and rate stability	**Good** The rates are predictable and revenue neutral	**Good** The rates are predictable and revenue neutral

Special conditions

Electric vehicle peak reduction

- Enrollment is on an opt-in basis
- Available for service primarily for home charging of electric vehicle(s)
- Electric vehicle load must have a separate meter and be associated with a primary residence
- If a customer chooses to opt-out, the electric vehicle meter consumption will be aggregated to the primary residence meter consumption and be billed under the selected whole home rate.
- Must be billed monthly on paperless billing
- Equal Payment Plan, Net Metering and Meter Choices Program customers are not eligible
- Minimum enrollment is one billing period, if a customer opts out of the time-of-use rate they cannot re-enroll in the rate for one year

Residential time-of-use

- Enrollment is on an opt-in basis
- Must have a BC Hydro smart meter
- Must be billed monthly
- Must be paperless billing
- Equal Payment Plan, Net Metering and Meter Choices Program customers are not eligible
- Minimum enrollment is one billing period, if a customer opts out of the time-of-use rate they cannot re-enroll in the time-of-use rate for one year

Monitoring and evaluation

- Annual Monitoring
  - Participation
  - Customer satisfaction / complaints
- Three Year Evaluation
  - Analyze the economic impact on all rate payers
  - Analyze the fully allocated cost of service
  - Assess the extent of any free-ridership
  - Customer and stakeholder feedback
- Three-year evaluation report to be filed with the British Columbia Utilities Commission and potentially inform re-pricing

Closing Remarks

Chris Sandve

Chief Regulatory Officer

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Thank you

Please complete the online Feedback Form by Friday Nov 26

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