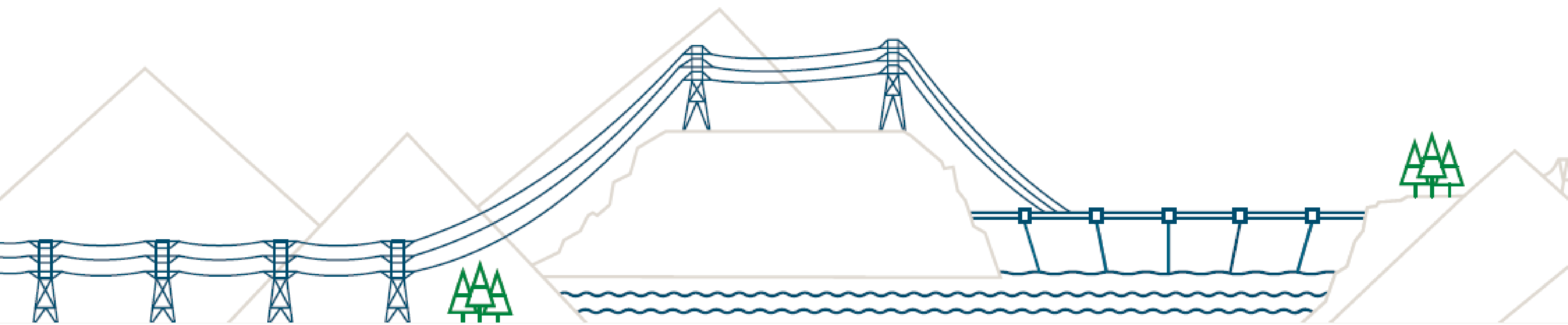
Transmission Service Rate Schedule 1823 Rate Redesign Workshop #3

October 22, 2021



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Workshop Agenda

Approximate Time	Item	Presenter
9:00 - 9:10	Virtual Workshop Procedures	Allwest
9:10 – 9:15	Opening remarks	Keith Anderson, Vice President, Customer Service
9:15 – 9:35	Recap and Summary of Feedback from Workshop #2	David Keir, Sr. Manager Transmission Rates and Large Customer Rate Operations
9.35 – 10:30	Transmission Service Rate Designs • Regulatory Principles • Rate Designs • Implementation • Segmentation	Anthea Jubb, Senior Regulatory Manager Tariffs and Rate Design
10:30 – 11:00	Revenue Impacts and Economic Justification • Load retention / growth and ratepayer benefit • Feedback needed from customers and other ratepayers	Chris Sandve, Chief Regulatory Officer
11:00 – 11:55	Bill Impacts and Mitigation Measures • Illustrative bill impacts by industry sector • Root causes of bill impacts • Mitigation measures Part 1: Energy • Mitigation measures Part 2: Demand TSR Portfolio Impacts • Impacted rate schedules • Pricing considerations	David Keir, Sr. Manager Transmission Rates and Large Customer Rate Operations
11:55 - noon	Closing remarks	Chris Sandve, Chief Regulatory Officer

Workshop #2 Recap and Summary of Feedback

David Keir

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TSR Workshop Recap

Workshop #1:
Feb 9, 2021

98 participants

↓

78 customers

↓

33 feedback forms

+

6 letters of comment

Review and consider feedback →

Workshop #2:
April 30, 2021

81 participants

↓

53 customers

↓

27 feedback forms

+

5 letters of comment

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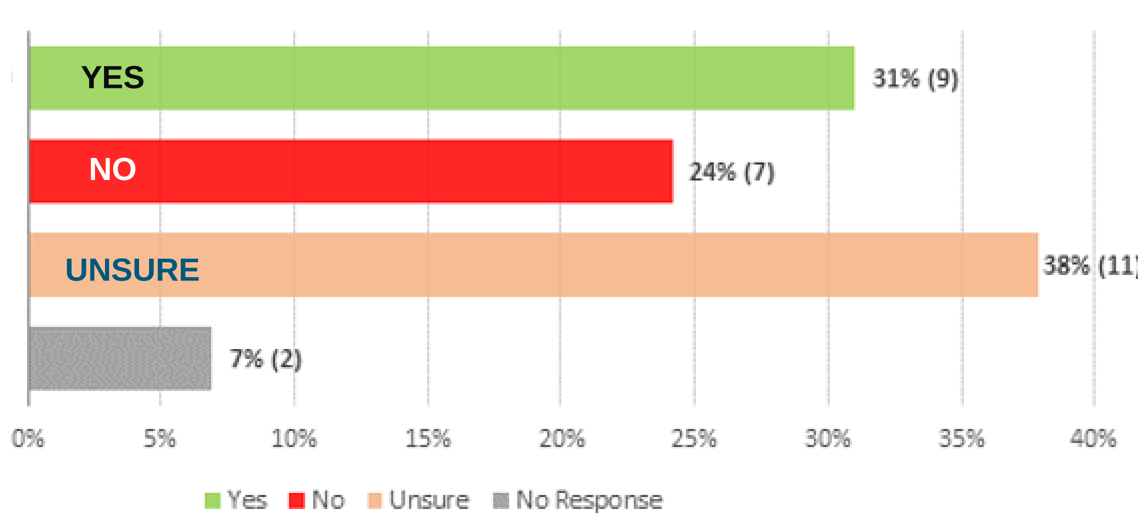
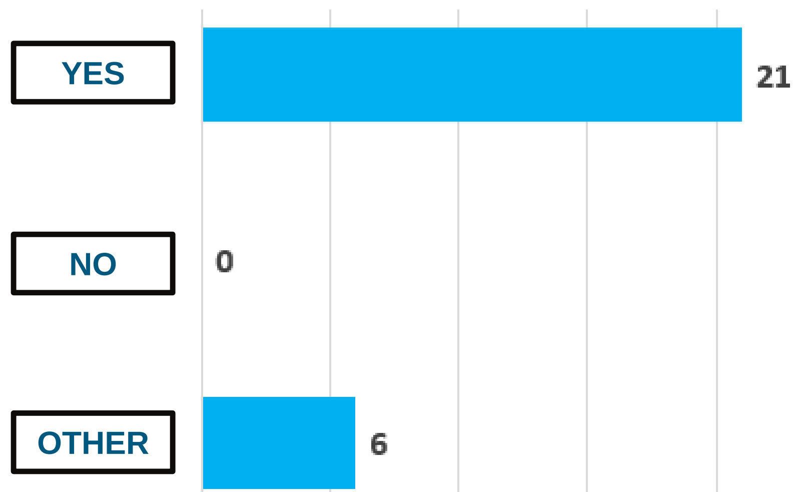
Do you support development of a new default rate to replace RS 1823?

WORKSHOP 1
33 feedback forms
(24 customers)



WORKSHOP 2
27 feedback forms
(21 customers)



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Workshop #2: Rate Designs and Pricing Scenarios

	Scenario	1	2	3	4	5	6
	STATUS QUO Interim F2022	FLAT RATE Fixed Demand RN energy	FLAT RATE Fixed Tier 1 RN demand	FLAT RATE Cost-based Demand RN energy	DECLINING BLOCK T2 = market forecast RN demand	STEPPED RATE 2.0 T2 = lower by $30 RN demand adder	STEPPED RATE 2.0 T2 = lower by $30 RN energy adder
Flat Energy *($/MWh)*	50.73	47.75	45.14	37.57	44.13	37.29	39.09
Tier 1 Energy *($/MWh)*	45.14	47.75	45.14	37.57	45.14	33.53	35.33
Tier 2 Energy *($/MWh)*	101.11	47.75	45.14	37.57	35.00	71.11	72.92
Demand *($/kVA)*	8.66	8.66	10.03	14.00	10.27	15.20	14.26

F2019 FACOS

FIXED ENERGY	14,118 GWh
FIXED DEMAND	26,877 MVA
BASE REVENUE	$907 million

Scenarios priced to be "revenue neutral" using actual F2020 data

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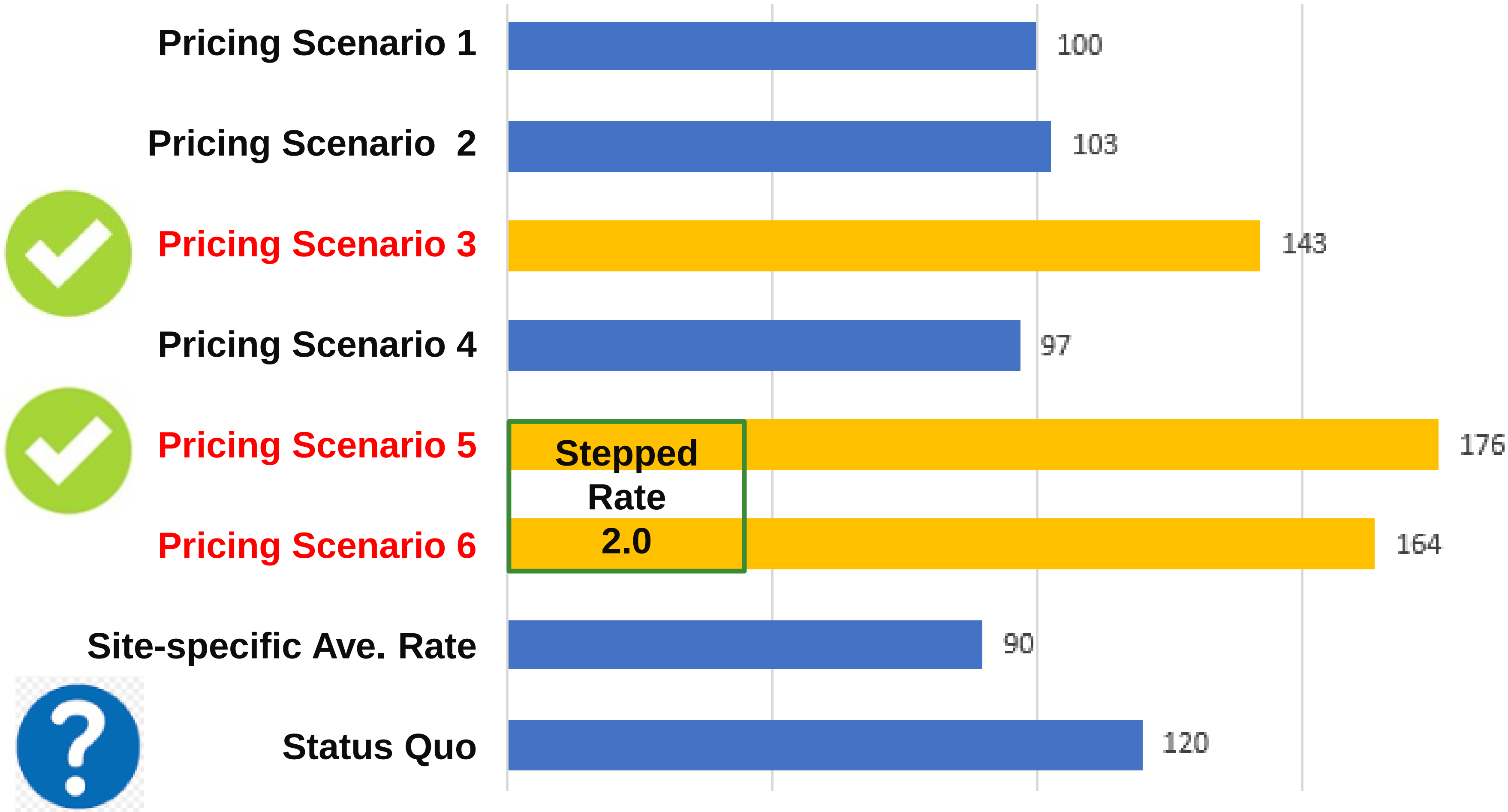
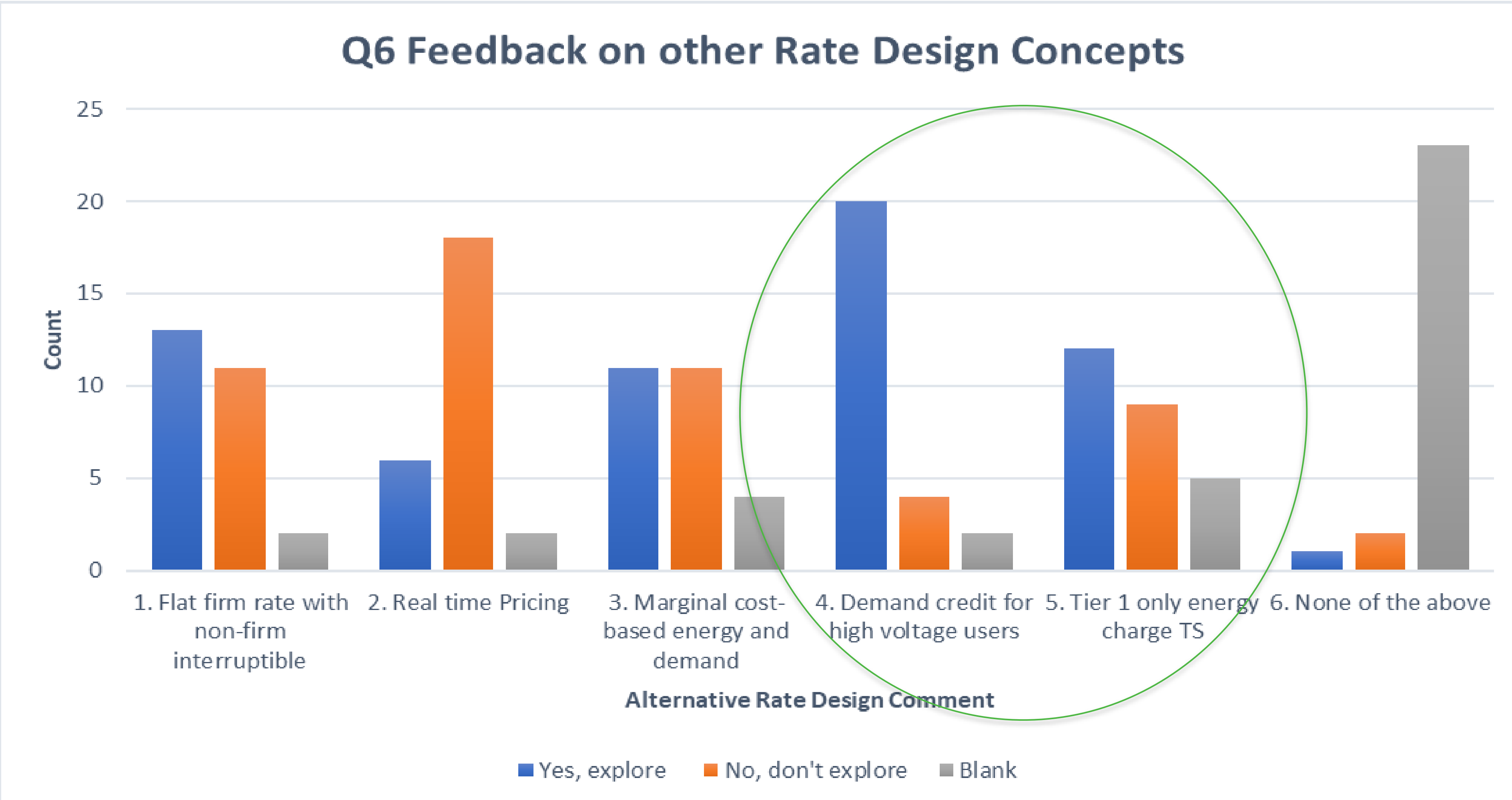
Workshop #2: Pricing Scenario Ranking



Workshop #2: Other Rate Concepts



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Workshop #2: Sample of Comments

"We have made DSM investments and enforced strategic energy management to improve energy efficiency in our operations. We will favor the options that consider these investments in the rate design…"

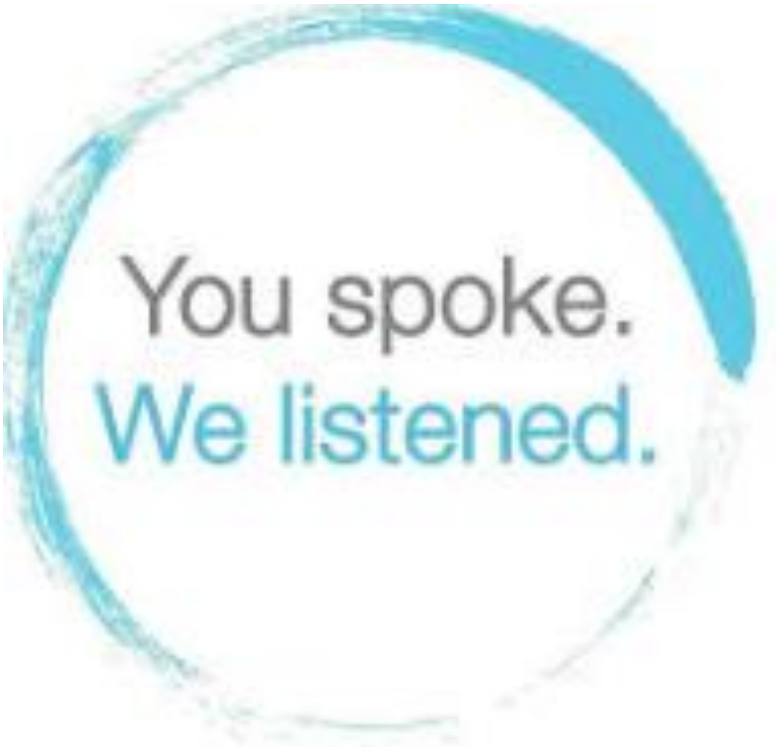
"Any RS 1823 re-pricing initiative must consider interactions with other rates … the options presented are more expensive than the status quo"

"Segmentation for the TSR class may help to minimize impacts … explore splitting the class by load factors or voltage levels"

"BC Hydro's goal for rate design should be to minimize or eliminate negative impacts on existing industrial customers, especially for customers who have invested in previous government strategic priorities, including conservation …"

Workshop #2: Key Feedback Themes

1. DSM investment recognition
2. Bill impact mitigation
3. Revenue neutrality
4. Rate alternatives
5. TSR class segmentation



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Transmission Service Rate Designs

Anthea Jubb

Regulatory Principles

- Rate regulated utilities typically must justify rate designs on either a cost of service or economic basis.
- Intended to protect the economic interests of ratepayers who will *not* take service under the rate schedule being redesigned.
- Standard approach is to set pricing to collect the utility's revenue requirements, using forecast revenue neutrality, or fully allocated cost recovery.
- Individual charges within a rate schedule are adjusted to collect the revenue requirement while also providing price signals to meet Bonbright criteria.
- Another approach sometimes used for optional and economic development rates is to set pricing to recover marginal costs. In some cases, this approach may under collect the utility's revenue requirements while still providing economic benefits to ratepayers.

Revenue Neutrality

For redesigning an existing Service

- Rate is designed to collect the target revenue, which is forecast load multiplied by the previous year’s rates and any general rate increase or decrease.
- Ensures that allocated class revenue requirement is collected on a forecast basis, and other ratepayers are not harmed.
- In BC Hydro’s case, we can refer to our Revenue Requirements Applications for the target revenue
- Common practice for the redesign of existing default rate schedules, e.g.:
    - Redesign of the BC Hydro’s Medium and Large General Service Rate Schedules, Commission Order No. G-5-17

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Fully Allocated Cost Recovery

For designing a new Service

- Our Revenue Requirements Applications may not provide a suitable revenue forecast in the case of a new Service
- In such cases, a new revenue forecast can be developed based on the expected load characteristics and established principles for cost allocation
- Common practice new rate designs e.g.:
    - E.g., BC Hydro’s Fleet Electrification Overnight Rate, Commission Order No. G-67-20

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Marginal Cost Recovery

For encouraging load attraction or retention

- The rate is designed to recover marginal costs and make some contribution to fixed costs
- Marginal costs reflect the cost of an additional unit of electrical energy or demand as applicable
- May collect less revenue than revenue neutral or fully allocated cost recovery approaches
- Has been used to justify rates designed to attract new load, e.g.
    - Freshet Energy Rate, Commission Order No. G-104-20;
    - Fleet Electrification Demand Transition Rate, Commission Order No. G-67-20

Transmission Service Rate Designs

- All rate designs presented in workshop #1 (Feb 9, 2021), and Workshop #2 (April 30, 2021) were based on revenue neutrality
- For workshop #3, we are seeking your feedback on two new design options that are not revenue neutral

Rate Designs

Option	Energy Charge (Relative to Status Quo)	Demand Charge Relative to Status Quo	Collects the revenue requirement
1:RS 1823 Tier 1 Energy Charge and Existing Demand Charge	Single energy charge, same as current Tier 1	No change	No
2:Lower Energy Charge and Moderately Higher Demand Charge	Single energy charge, lower than current Tier 1	Moderately Higher	No
3: Cost of service Demand Charge, Revenue Neutral Energy Charge*	Single energy charge, lower than current Tier 1	Higher	Yes, revenue neutral
4: Stepped Rate 2.0*	Two-tiered energy charges, lower than current Tier 1 and Tier 2	Higher	Yes, revenue neutral

*Option 3 was discussed in both workshop #1 and #2, Option 4 was discussed in workshop #2

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Preliminary Pricing

Option	Status Quo	1	2	3	4
Flat Energy Charge ($/MWh)	50.65	45.07	41.60	36.89	37.23
Tier 1 Energy Charge ($/MWh)	45.07	-	-	-	33.48
Tier 2 Energy Charge ($/MWh)	100.95	-	-	-	70.95
Demand Charge ($/kVA)	8.64	8.64	11.00	14.23	15.15

Notes:
Pricing is illustrative and preliminary, subject to refinement based on the BC Hydro's F2023 to F2025 Revenue Requirements Applications. Pricing for options previously presented have been updated to reflect more recent general rate increases and fully allocated cost of service studies

Implementation Options

1. **Immediate Implementation.** Implement the new rate design shortly after Commission approval. e.g., BC Hydro's Large and Medium General Service Rate Design, Commission Order No. G-5-17
2. **Delayed Implementation** Provide a period (e.g., 3 years) under the existing rate before implementing the new rate design. Allows customers time to get ready for service under new rate. e.g., BC Hydro Met Metering, Commission Order No. G-168-20; General Service E Plus, Commission Order No. G-76-20
3. **Gradual Implementation.** Adjust prices over a transition period (e.g., 3 or 5 years) until they reach the new rate design. This spreads the bill impact over a longer period. e.g., Fortis BC Residential Conservation Rate, Commission Order No. G-40-19 ; BC Hydro E Plus Rate Commission Order No. G-194-17

Option 3 Flat Rate: Illustrative 3 Year Gradual Implementation

Pricing Option 3	Prior to Transition	Transition	Transition	End of Transition
Year	Year 0	Year 1	Year 2	Year 3
Energy Charge $/MWh	50.65	46.07	41.48	36.89
Tier 1 Energy Charge $/MWh	45.07	42.34	39.61	-
Tier 2 Energy Charge $/MWh	100.95	79.60	58.24	-
Demand Charge $/kVA	8.64	10.51	12.37	14.23

Illustrative Customers	Year 1 Bill Impacts	Year 2 Bill Impacts	Year 3 Bill Impacts	Cumulative Impacts over Transition
Shows bill impacts for illustrative customer purchasing tier 1 energy only under rate schedule 1823B				
80% Load Factor	1.1%	1.0%	1.0%	3.13%
50% Load Factor	3.8%	3.6%	3.5%	11.35%
Shows bill impacts for illustrative customer purchasing 90% tier 1 and 10 % tier 2 energy under rate schedule 1823B, or a customer purchasing energy under RS 1823A				
80% Load Factor	-1.8%	-1.9%	-1.9%	-5.57%
50% Load Factor	1.1%	1.0%	1.0%	3.11%

Note: Illustrative bill impacts calculated assuming 95% power factor
Bill impacts are before general rate increases or decreases

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Option 3 Flat Rate: Illustrative 5 Year Gradual Implementation

Pricing Option 3	Prior to Transition	Transition	Transition	Transition	Transition	End of Transition
Year	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Energy Charge $/MWh	50.65	47.90	45.15	42.40	39.64	36.89
Tier 1 Energy Charge $/MWh	45.07	43.43	41.80	40.16	38.52	-
Tier 2 Energy Charge $/MWh	100.95	88.14	75.33	62.51	49.70	-
Demand Charge $/kVA	8.64	9.76	10.88	12.0	13.11	14.23

Illustrative Customers	Year 1 Bill Impacts	Year 2 Bill Impacts	Year 3 Bill Impacts	Year 4 Bill Impacts	Year 5 Bill Impacts	Cumulative Impacts over Transition
Shows bill impacts for illustrative customer purchasing tier 1 energy only under rate schedule 1823B						
80% Load Factor	0.62%	0.64%	0.62%	0.58%	0.63%	3.13%
50% Load Factor	2.26%	2.24%	2.17%	2.09%	2.10%	11.35%
Shows bill impacts for illustrative customer purchasing 90% tier 1 and 10 % tier 2 energy under rate schedule 1823B, or a customer purchasing energy under RS 1823A						
80% Load Factor	-1.12%	-1.11%	-1.14%	-1.18%	-1.15%	-5.57%
50% Load Factor	0.62%	0.63%	0.62%	0.58%	0.62%	3.11%

Note: Illustrative bill impacts calculated assuming 95% power factor
Bill impacts are before general rate increases or decreases

Option 4 Stepped Rate: Illustrative 3 Year Gradual Implementation

Pricing Option 4	Prior to Transition	Transition	Transition	End of Transition
Year	Year 0	Year 1	Year 2	Year 3
Energy Charge $/MWh	50.65	46.18	41.70	37.23
Tier 1 Energy Charge $/MWh	45.07	41.20	37.34	33.48
Tier 2 Energy Charge $/MWh	100.95	90.95	80.95	70.95
Demand Charge $/kVA	8.64	10.81	12.98	15.15

Illustrative Customers	Year 1 Bill Impacts	Year 2 Bill Impacts	Year 3 Bill Impacts	Cumulative Impacts over Transition
Shows bill impacts for illustrative customer purchasing tier 1 energy only under rate schedule 1823B				
80% Load Factor	0.1%	0.1%	0.1%	0.24%
50% Load Factor	3.4%	3.3%	3.2%	10.27%
Shows bill impacts for illustrative customer purchasing 90% tier 1 and 10 % tier 2 energy under rate schedule 1823B, or a customer purchasing energy under RS 1823A				
80% Load Factor	-0.9%	-0.9%	-0.9%	-2.56%
50% Load Factor	2.3%	2.3%	2.3%	7.07%

Note: Illustrative bill impacts calculated assuming 95% power factor
Bill impacts are before general rate increases or decreases

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Segmentation

- Pricing presented to date assumes all default, firm Transmission Service Rate Schedules with pricing linked to RS 1823 are included in the rate redesign. These are:
    - RS 1823 (customers are primarily large industrial facilities)
    - RS 1828 (customers are large industrial facilities)
    - RS 1827 (customers are large institutions and one large municipality)
    - RS 3808 (customer is an electric utility)
- If the rate redesign included only RS 1823 and RS 1828, pricing and bill impacts for revenue neutral rate design options would be lowered, and pricing for RS 1827 and 3808 would be unchanged
- Segmentation should be based on cost of service

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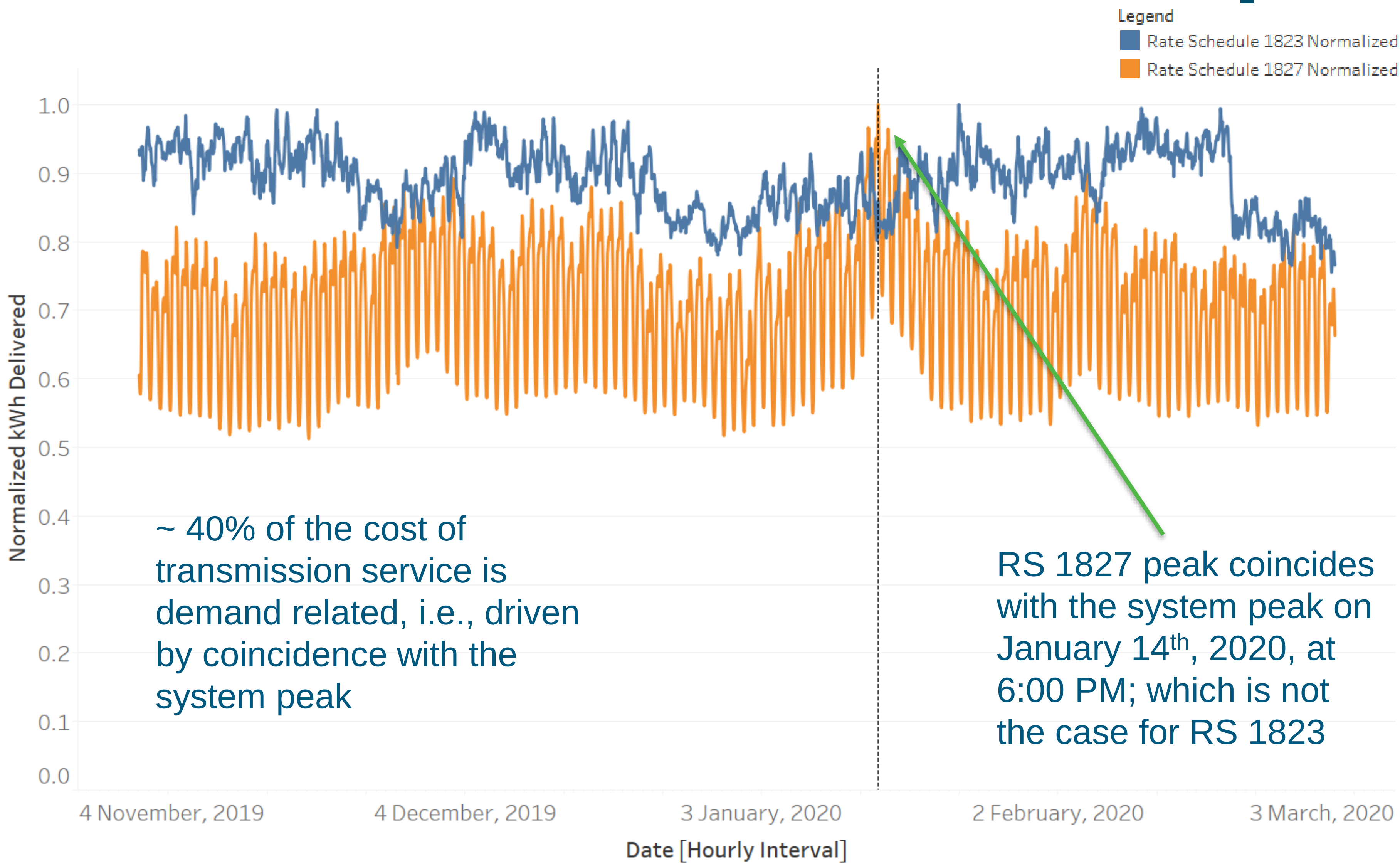
Transmission Service Rates Load Shape



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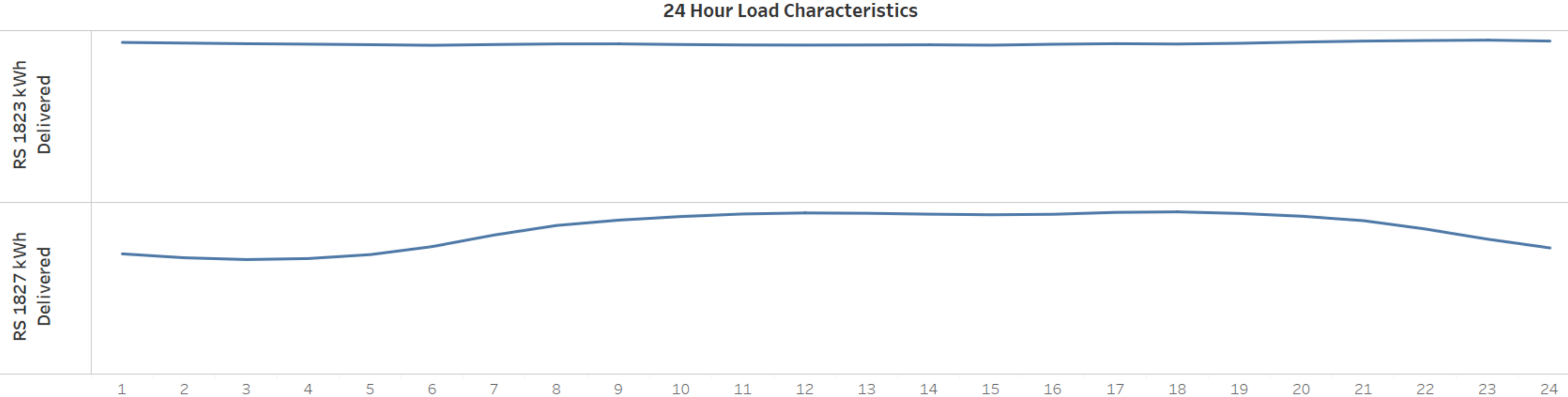
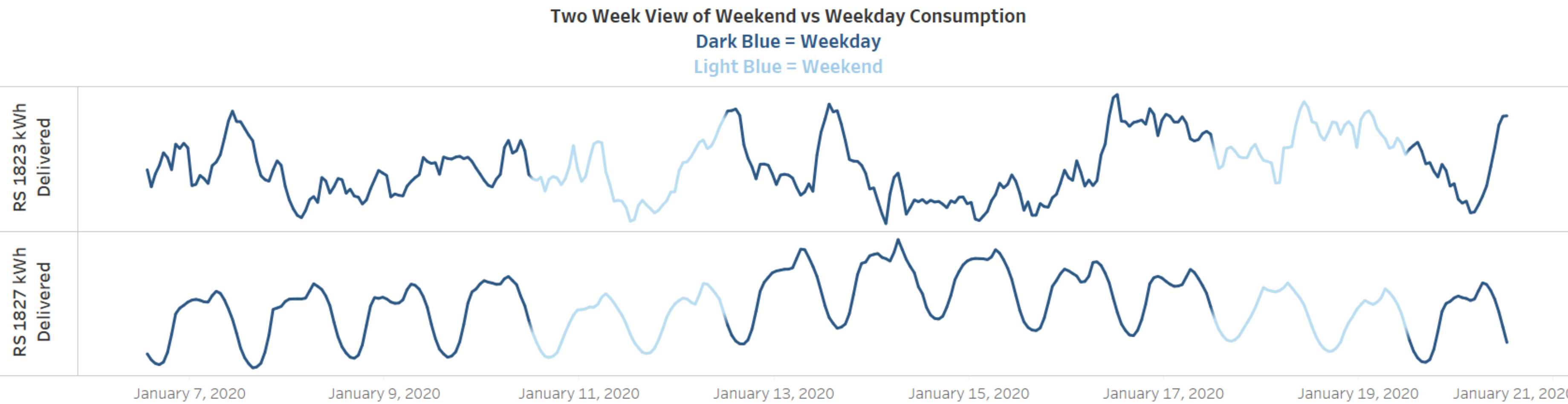
Transmission Service Rates Load Shape – Comparison

RS 1827 aggregate 24-hour load shape shows higher consumption during the day. This coincides with the system peak.
RS 1823 aggregate 24-hour load shape is flat across all hours.





RS 1827 peaks in the weekday, which coincides with the system peak as well.
RS 1823 can be at a peak in both weekends and weekdays.

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Cost Basis for Segmentation

- Preliminary analysis indicates that RS1827 load is more expensive for BC Hydro to serve then RS 1823 load
    - Preliminary revenue to cost ratio of 101% vs 94%
- There may be a cost-of-service justification to segment RS1823 and 1828 from the rest of the transmission service rate class
- If segmentation is pursued, BC Hydro would propose that pricing for RS 1827 and 3808 not be determined as part of the rate schedule 1823 restructuring effort currently underway

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Illustrative Pricing Summary with Segmentation

Option	Status Quo	3	4
Flat Energy Charge ($/MWh)	50.65	36.89 Segmented: 36.59	37.23
Tier 1 Energy Charge ($/MWh)	45.07	-	33.48
Tier 2 Energy Charge ($/MWh)	100.95	-	70.95
Demand Charge ($/kVA)	8.64	14.23	15.15 Segmented: 15.13

Segmentation does not impact the pricing of options 1 or 2

Reference Slides: dataset used for illustrative pricing Options 3 and 4

F2020 ACTUAL SALES	Energy (MWh)	Final F22 Rates	Baseline Revenue ($M)
RRA increase		**1.00%**	
RS 1823 Tier 1 energy	10,635,456	45.07	$ 479.3
RS 1823 Tier 2 energy	305,887	100.95	$ 30.9
RS 1823A energy	1,677,818	50.65	$ 85.0
RS 1827 + RS 3808 energy	1,499,330	50.65	$ 75.9
TOTAL ENERGY	**14,118,491**		**$ 671.1**
RS 1823 demand	23,868,273	8.642	$ 206.3
RS 1827 + RS 3808 demand	3,008,924	8.642	$ 26.0
TOTAL DEMAND (kVA)	**26,877,197**		**$ 232.3**
TOTAL REVENUE ($)			**$ 903.4**

- Pricing is based on F2020 data with minor adjustments to reflect a select number of unique customer circumstances in that year
- Yellow highlighted rows depict rate schedules removed for segmentation analysis
- Pricing will be updated to be revenue neutral on a forecast basis (e.g. F2023 Revenue Requirements) prior to any rate design application to the BCUC

Revenue Impacts and Economic Justification

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		OPTION 1	OPTION 2	OPTION 3	OPTION 4
		No RS 1823 customer pays more	Find the middle ground	Higher demand charge	Higher demand charge
	Status Quo	**Current Tier 1 and Demand**	**Lower energy and Higher demand**	**Cost-based demand, Revenue Neutral energy**	**Stepped Rate 2.0**
Flat Energy Charge ($MWh)	50.65	45.07	41.60	36.89 Segmented: 36.59	37.23
Tier 1 Energy Charge ($/MWh)	45.07	-	-	-	33.48
Tier 2 Energy Charge ($/MWh)	100.95	-	-	-	70.95
Demand Charge ($/kVA)	8.64	8.64	11.00	14.23	15.15 Seg:15.13

	Option 1	Option 2	Option 3	Option 4
No Segmentation (TSR class)	($34.8)M	($20.4)M	$0M	$0M
With Segmentation (RS1827/3808 removed)	($26.5)M	($13.9)M		

Maintain revenue neutrality

May require bill mitigation

Potential Economic Justification for Revenue Shortfall or Funded Bill Mitigation

- Options 1 and 2 do not collect forecast revenue requirement if new rate design is applied to forecast load.
- Options 3 and 4 do collect the forecast revenue requirement but may require bill mitigation, which would need to be funded
- <u>Net benefits to ratepayers could still arise if all the following holds true:</u>
  - The rate designs <u>results in</u> additional revenue through load growth or retention
  - The additional revenues exceed marginal costs (i.e., produce a net benefit)
  - The net benefit equals or exceeds the revenue shortfall / bill mitigation cost.
- The standard approach to estimate additional revenues is price elasticity, which estimates the class average change in load due to a change in price
- Marginal cost to serve load growth is estimated using BC Hydro's marginal cost of energy and capacity

Forecast Revenue from Rate Design

Forecast Load X Rate = Target Revenue

Fixed *Variable* *Fixed*

What happens if a rate design <u>results in</u> a change in forecast load?

Forecast Load X Rate = Target Revenue

Variable *Variable* *Fixed*

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Estimated Load and Revenue Growth

- Pricing Options 1, 2 and 3 produce similar load and revenue growth
- There is a wide range of uncertainty

	Energy Impact (GWh)				Revenue Impact ($M)			
	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4
Lower	42	15	-26.3	-1	2.6	1	-1.7	0.2
Upper	768	752	728	244	48	46	43	24
Mid	362	369	377	123	23	23	23	12

Notes: Assumed price elasticity of -0.15
Lower bound based on Tier Specific Approach
Upper bound based on Marginal Price Approach
Mid is the average of the Upper and Lower bound
Energy and Demand costs are blended to provide effective price.

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Estimated Ratepayer Benefit

Ratepayer benefits may arise over the longer term

Ratepayer benefit impact per year ($M), Mid-case				
	Option 1	Option 2	Option 3	Option 4
Over 5 Years	6.2	6.6	7.3	6.0
Over 10 Years	3.7	4.0	4.6	4.8

Note: Ratepayer benefit measures what happens to customer bills or rates due to changes in utility revenues and incremental costs

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Factoring in a Price Elasticity Benefit

	OPTION 1	OPTION 2	OPTION 3	OPTION 4
No Segmentation (TSR class)	($34.8)M	($20.4)M	$0M	$0M
With Segmentation (RS1827/3808 removed)	($26.5)M	($13.9)M	$0M	$0M
Incremental Load (Net Benefit, 5-years, Mid)	($20.3)M	($7.3)M	$7.3M	$6.0M

Not immediate

Potential Additional Sources of Load Growth or Retention

Reduced Closure / Load Migration Risk

"DNV GL supports the continuation of BC Hydro's approach to load forecasting which involves building up sector specific forecasts, including site-specific large commercial and industrial forecasts, and applying a single price elasticity to account for price changes in the forecast. **Given that BC Hydro employs a site by site assessment for industrial facilities which captures price effect for a selection of energy intensive facilities, such as pulp mills**; and precedent elsewhere, of applying the same price elasticity across all three sectors, we recommend that BC Hydro continue to use the same price elasticity estimate for all sectors."

Source: DNV GL Price Elasticity Study, BC Hydro Fiscal 2020 to Fiscal 2021 Revenue Requirements Application

Fiscal 2017 to Fiscal 2020

11 Sites Closed

1850 GWh

1000 GWh Restarted

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Potential Additional Sources of Load Growth or Retention

Electrification and Load Attraction

Source: Electrification Plan, Chapter 10, BC Hydro Fiscal 2023 to Fiscal 2025 Revenue Requirements Application

"BC Hydro will continue to advance work to understand the needs of our customers and **make our rates more attractive to potential commercial and industrial customers**. BC Hydro recently introduced the CleanBC Industrial Electrification rates (Rate Schedule 1894/1895) to support the attraction of new, clean technology and innovation to B.C. Many of the customers under the Load Attraction programs would be eligible for these rates. In addition, **BC Hydro is currently consulting with stakeholders and customers on transmission service rate design options…**"

Potential Additional Sources of Load Growth or Retention

	OPTION 1	OPTION 2	OPTION 3	OPTION 4
Incremental Load (Net Benefit, 5-years, Mid) **Not immediate**	($20.3)M	($7.3)M	$7.3M	$6.0M

Reduced Closure / Load Migration Risk

Electrification and Load Attraction

Net benefits to ratepayers could arise if all the following holds true:

- The rate design results in additional revenue through load growth or retention
- The additional revenues exceed marginal costs (i.e., produce a net benefit)
- The net benefit equals or exceeds the revenue shortfall or bill mitigation cost

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Regulatory Accounting

- Rates are set based on the forecast revenue requirement
- Revenue Variance: deferred to Load Forecast Variance Account and recovered from all ratepayers through the Deferral Account Rate Rider
- Cost of Energy Variance: deferred to either Heritage Deferral Account or Non-Heritage Deferral Account and recovered from all ratepayers through Deferral Account Rate Rider
- May be possible to create a mechanism that allows any variances to be addressed on a “transmission class only” basis.

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Preliminary Rate Design Assessment

Option	Pros	Cons
Status Quo	• Avoids bill impacts • Encourages conservation	• Does not reflect BC Hydro's long run marginal cost for new supply • Maintains stepped rate design which can discourage load growth
1	• No customers pay more and some customers (e.g., any customer currently consuming RS1823A energy or any volume of RS 1823B Tier 2 energy) would pay less • Provides simple low, flat energy rate to encourage electrification	• Creates revenue shortfall by providing discount to some customers; however, segmentation and net revenue from load retention and/or load growth could help to mitigate
2	• "Middle ground" between current design and fully cost-reflective rates with more manageable bill impacts • Provides bill reductions to customers with Tier 2 energy, that are on the RS 1823A flat rate, or that have expiring DSM • Lower energy charge encourages electrification	• Diminished benefits for customers who have made previous DSM investments • Creates revenue shortfall; however, segmentation and net revenue from load retention and/or load growth could help to mitigate

Preliminary Rate Design Assessment

Option	Pros	Cons
3	• Cost reflective and revenue neutral • Lower bills for customers with higher load factors (e.g., steady-state, 24x7 operations) and that purchase energy under RS1823A today • Lower energy charge encourages electrification	• Higher bills - in some cases significantly higher - for some customers (typically those who have invested in DSM and are operating at Tier 1 today) • Diminished benefits for customers who have made previous DSM investments
4	• Revenue neutral • Lower bills for customers with high load factors and existing DSM investment • Lower tier 1 and flat energy charge encourages electrification	• Higher bills for customers with variable and shift-based operations (lower load factor) • Maintains stepped rate design structure which can discourage load growth

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Illustrative Bill Impacts and Root Causes

David Keir

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4 rate designs (TSR class pricing, no segmentation)

		OPTION 1	OPTION 2	OPTION 3	OPTION 4
	Status Quo	Current Tier 1 and Demand	Lower Energy and higher Demand	Cost-based Demand, revenue neutral Energy	Stepped Rate 2.0, revenue neutral Demand
Flat Energy Charge ($MWh)	50.65	45.07	41.60	36.89	37.23
Tier 1 Energy Charge ($/MWh)	45.07	45.07	41.60	36.89	33.48
Tier 2 Energy Charge ($/MWh)	100.95	45.07	41.60	36.89	70.95
Demand Charge ($/kVA)	8.64	8.64	11.00	14.23	15.15

Options 1–2: Forecast revenue SHORTFALL

Options 3–4: Forecast revenue NEUTRAL

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Illustrative Bill Impacts (no segmentation)

Revenue calculated using F2022 prices for each rate option

No customer pays more	Find the middle ground	No DSM and high demand charge	High demand charge
Option 1	Option 2	Option 3	Option 4

INDUSTRY SECTOR	# of sites	Total Energy F20 GWh	% of class	Baseline Revenue $M	Option 1 $M	Option 1 %	Option 2 $M	Option 2 %	Option 3 $M	Option 3 %	Option 4 $M	Option 4 %
MINING	24	3,794	27%	238.2	226.9	-4.7%	229.0	-3.9%	232.0	-2.6%	232.6	-2.3%
PULP & PAPER	14	3,359	24%	211.8	208.4	-1.6%	212.3	0.3%	217.8	2.9%	214.7	1.4%
NATURAL GAS PROCESSING	16	1,850	13%	113.3	109.4	-3.4%	110.1	-2.8%	111.1	-1.9%	110.5	-2.5%
EXEMPT/UTILITY	5	1,499	11%	101.9	93.6	-8.2%	95.5	-6.4%	98.1	-3.7%	101.4	-0.5%
CHEMICALS	5	1,318	9%	77.1	77.0	-0.2%	77.2	0.1%	77.5	0.6%	75.0	-2.7%
WOOD MANUFACTURING	34	1,037	7%	70.1	68.4	-2.4%	70.8	0.9%	74.0	5.5%	73.9	5.4%
OIL PIPELINES/PROCESSING	23	497	4%	34.9	33.1	-5.2%	34.3	-1.8%	36.0	3.0%	36.6	4.9%
OTHER / MANUFACTURING	23	536	4%	38.5	35.5	-7.7%	36.8	-4.4%	38.5	0.1%	39.9	3.6%
PORTS / TERMINALS	13	228	2%	17.6	16.3	-7.6%	17.1	-2.8%	18.2	3.8%	19.0	8.0%
Totals	**157**	**14,118**	**100%**	**903**	**869**		**883**		**903**		**903**	

Bill impacts reflect pricing for each option applied to actual F2020 customer electricity use

FIXED ENERGY	14,118 GWh
FIXED DEMAND	26,877 MVA
BASE REVENUE	$903 million

Root causes of bill impacts

ENERGY CHARGE (kWh x price)

- Flat vs stepped

DEMAND CHARGE (kVA x price)

- Power factor *(kVA vs kW)*
- Load factor *(average / peak)*
- Billing demand definition
  - Peak demand *(30min HLH)*
  - Minimum demand
  - Ratchet demand

UNIT COST OF ELECTRICITY (Bill $ / MWh)

Example: RS 1823 Billing Demand

BILLING DEMAND IS THE HIGHER OF:

a) Peak 30min kVA demand during High Load Hours (HLH) ---> *Customer peak*

b) 50% of Electricity Supply Agreement (ESA) Contract Demand ---> *Minimum*

c) 75% of prior winter peak Billed Demand (months of Nov – Feb) ----> *Ratchet*

NON-COINCIDENT PEAK:

- Peak demand during HLH (06:00 – 22:00) ……………… 50,000 kVA ----> *Billed Demand*
- Peak demand during LLH (22:00 – 06:00) ……………… 55,000 kVA

MINIMUM DEMAND:

- Contract Demand …………... 80,000 kVA
- 50% x Contract Demand ………………………………… 40,000 kVA

RATCHET DEMAND:

- Highest Billed Demand from prior winter ………...…….. 60,000 kVA
- 75% x Prior Winter Peak …………………………….…. 45,000 kVA

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Root causes of bill impacts

Load (kW)	Power Factor	Peak demand (kVA)	kVA Demand Charges $/kVA	$/kVA	$/kVA	$/kVA	$/kVA
10,000	100%	10,000	**8.64**	**11.00**	**14.23**	**15.15**	**15.15**

Load Factor	Status Quo: Tier 1 only ($/MWh)	Status Quo: RS1823A ($/MWh)	Option 1 ($/MWh)	Option 2 ($/MWh)	Option 3 ($/MWh)	Option 4: *Tier 1 only* ($/MWh)	Option 4: *RS1823A* ($/MWh)
90%	**58.22**	**63.80**	$ 58.22	$ 58.34	$ 58.55	**$ 56.54**	60.29
80%	**59.87**	**65.45**	$ 59.87	$ 60.44	$ 61.26	**$ 59.42**	63.17
70%	**61.98**	**67.56**	**$ 61.98**	$ 63.13	$ 64.74	$ 63.13	66.88
60%	**64.80**	**70.38**	**$ 64.80**	$ 66.71	$ 69.39	$ 68.07	71.82
50%	**68.75**	**74.33**	**$ 68.75**	$ 71.74	$ 75.88	$ 74.99	78.74
40%	**74.67**	**80.25**	**$ 74.67**	$ 79.27	$ 85.63	$ 85.36	89.11
30%	**84.53**	**90.11**	**$ 84.53**	$ 91.83	$ 101.88	$ 102.66	106.41

If demand charge is higher:

- Higher load factor customers will see unit cost decrease
- Lower load factor customers will see unit cost increase

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Root causes of bill impacts

Load (kW)	Power Factor	Peak demand (kVA)	$/kVA	$/kVA	$/kVA	$/kVA	$/kVA
10,000	95%	10,526	**8.64**	**11.00**	**14.23**	**15.15**	**15.15**

Load Factor	Status Quo: Tier 1 only ($/MWh)	Status Quo: RS1823A ($/MWh)	Option 1 ($/MWh)	Option 2 ($/MWh)	Option 3 ($/MWh)	Option 4: *Tier 1 only* ($/MWh)	Option 4: *RS1823A* ($/MWh)
90%	**58.92**	**64.50**	$ 58.92	$ 59.22	$ 59.69	**$ 57.75**	61.50
80%	**60.65**	**66.23**	$ 60.65	$ 61.43	$ 62.54	**$ 60.79**	64.54
70%	**62.87**	**68.45**	**$ 62.87**	$ 64.26	$ 66.21	$ 64.69	68.44
60%	**65.84**	**71.42**	**$ 65.84**	$ 68.04	$ 71.10	$ 69.89	73.64
50%	**69.99**	**75.57**	**$ 69.99**	$ 73.32	$ 77.94	$ 77.17	80.92
40%	**76.22**	**81.80**	**$ 76.22**	$ 81.25	$ 88.20	$ 88.09	91.84
30%	**86.61**	**92.19**	**$ 86.61**	$ 94.47	$ 105.30	$ 106.30	110.05

Power factor exacerbates the unit cost impact of a higher kVA demand charge

kW / power factor = kVA

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Load factor breakpoint for bill neutrality

Load (kW)	Power Factor	Peak demand (kVA)	$/kVA	$/kVA
10,000	100%	10,000	15.15	15.15

Load Factor	Status Quo: Tier 1 only ($/MWh)	Status Quo: RS1823A ($/MWh)	Option 4: *Tier 1 only* ($/MWh)	Option 4: *RS1823A* ($/MWh)
90%	58.22	63.80	$ 56.54	60.29
80%	59.87	65.45	$ 59.42	63.17
77%	60.44	66.02	$ 60.43	64.18
70%	61.98	67.56	$ 63.13	66.88
67%	62.87	68.45	$ 64.69	68.44
60%	64.80	70.38	$ 68.07	71.82
50%	68.75	74.33	$ 74.99	78.74
40%	74.67	80.25	$ 85.36	89.11
30%	84.53	90.11	$ 102.66	106.41

Load (kW)	Power Factor	Peak demand (kVA)	$/kVA	$/kVA
10,000	95%	10,526	15.15	15.15

Load Factor	Status Quo: Tier 1 only ($/MWh)	Status Quo: RS1823A ($/MWh)	Option 4: *Tier 1 only* ($/MWh)	Option 4: *RS1823A* ($/MWh)
90%	58.92	64.50	$ 57.75	61.50
81%	60.45	66.03	$ 60.45	64.20
80%	60.65	66.23	$ 60.79	64.54
70%	62.87	68.45	$ 64.69	68.44
60%	65.84	71.42	$ 69.89	73.64
50%	69.99	75.57	$ 77.17	80.92
40%	76.22	81.80	$ 88.09	91.84
30%	86.61	92.19	$ 106.30	110.05

Key takeaway:

- **The load factor breakpoint for bill neutrality is ~ 10% higher for an RS 1823 Tier 1 customer versus an RS 1823A customer**

Bill Impact Mitigation Measures

David Keir

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Bill impact mitigation: Energy

Issue:

- Customers have made substantial investments in DSM
- RS 1823 provides rate savings via Tier 1 energy pricing
- Elimination of RS 1823 stepped rate would eliminate DSM benefit

DSM CREDIT

Concept:

- Apply to existing customer-funded DSM projects
- Verify DSM energy savings annually
- Savings expire as duration ends under TS 74
- Credit = Annual DSM energy / Annual RS 1823 energy
- Max credit = 10% of annual RS 1823 energy
- Credit applied 1x per year (annual settlement)

Example 1: *illustrative*

Verified DSM energy savings	50 GWh
Annual RS 1823 energy	300 GWh
DSM as % of annual energy use	17%
Max DSM Credit	**10%**
Eligible DSM Energy Credit	**30 GWh**

Example 2: *illustrative*

Verified DSM energy savings	5 GWh
Annual RS 1823 energy	100 GWh
DSM as % of annual energy use	5%
~~**Max DSM Credit**~~	~~**10%**~~
Eligible DSM Energy Credit	**5 GWh**

Bill impact mitigation: Energy

- How should DSM credit be valued?
- For how long should the credit apply?
- Existing DSM vs New DSM?
- Who should pay for the credit?

Exploratory pricing concept:

- BC Hydro capital incentive base price = $45/MWh
- NPV base incentive for 10yrs = $30.20/MWh
- Max incentive = 75% of project cost
- Sample calculation: $30.20/MWh x 0.75 = $22.65/MWh

Illustrative Cost

DSM Credit Period	DSM Credit Term (yrs)	Illustrative DSM Energy Credit (GWh)	Illustrative Credit Pricing ($/MWh)	Illustrative Cost ($M)
F2024 - F2026	3	777	**22.65**	**17.6**
F2024 - F2028	5	1,145	**22.65**	**25.9**
F2024 - F2030	7	1,367	**22.65**	**31.0**

Bill impact mitigation: Demand*

INDUSTRY SECTOR	# of sites	F20 Billed Energy MWh	F20 Billed Demand kVA	Average Load Factor %	Proportion of TSR class demand %
MINING	24	3,793,748	6,470,636	82%	24%
PULP & PAPER	14	3,359,313	6,598,381	71%	25%
GAS PROCESSING	16	1,849,622	3,011,743	86%	11%
EXEMPT/UTILITY	5	1,499,330	3,008,924	70%	11%
CHEMICALS	5	1,317,837	2,032,185	91%	8%
WOOD MANUFACTURING	34	1,037,231	2,510,850	58%	9%
MANUFACTURING / OTHER	23	536,372	1,315,823	57%	5%
OIL PIPELINES / PROCESSING	23	496,825	1,238,216	56%	5%
PORTS / TERMINALS	13	228,212	690,439	46%	3%
Totals	**157**	**14,118,491**	**26,877,197**	**71%**	**100%**
			Power factor	98%	

Individual customer impacts will vary

Issue:

- **Load factor = Average use / peak use**
- **Higher demand charges impact customers with variable operations (i.e., with lower load factor)**

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Bill impact mitigation: Demand

3 concepts for exploration based on customer and industry feedback:

1. Demand charge transition
2. Fixed demand credit
3. High voltage credit

Note: Bill mitigation concepts are discussed for RS 1823 customers only

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Concept 1: Demand charge transition

Concept (shown for Stepped Rate 2.0)

- Transition to new higher demand charge: Transition period = 3yrs or 5yrs
- Graduated instalments of Stepped Rate 2.0 demand charge adder of **$0.92/kVA**.

TSR Class Demand = 26,877,197 kVA

$ 14.23	$ 15.15	8.64	*current demand charge*
$ 0.92	*RN demand charge adder*	6.51	*total demand charge increase*

OPTION 1	3YR TRANSITION	YEAR 1	YEAR 2	YEAR 3		
Transition demand adder	Modified Demand Adder ($/kVA)	0.30	0.61	0.92		
	Modified Demand Charge ($kVA)	14.54	14.84			
	Demand Charge Difference ($/kVA)	(0.62)	(0.31)	-		
(25.0)	**Revenue variance ($M)**	**(16.6)**	**(8.4)**	-		
	5YR TRANSITION	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**
	Modified Demand Adder ($/kVA)	0.18	0.37	0.55	0.74	0.92
	Modified Demand Charge ($kVA)	14.42	14.60	14.79	14.97	
	Demand Charge Difference ($/kVA)	(0.74)	(0.55)	(0.37)	(0.18)	-
(49.5)	**Revenue variance ($M)**	**(19.8)**	**(14.9)**	**(9.9)**	**(5.0)**	-

- **Transition approach is not "revenue neutral"**
- **How should the revenue variance be recovered?**

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Concept 2(a): General demand credit

Concept (shown for Stepped Rate 2.0)

- Apply a fixed demand credit of $1/kVA to all customers
- Reduce credit uniformly over set transition period (e.g., 3yrs or 5yrs)

TSR Class Demand = 26,877,197 kVA

OPTION 2(a)	3YR TRANSITION	YEAR 1	YEAR 2	YEAR 3		
General demand credit	Demand Credit ($/kVA)	(1.00)	(0.50)	-		
	Modified Demand Charge ($kVA)	14.15	14.65	15.15		
(40.3)	**Revenue variance ($M)**	**(26.9)**	**(13.4)**	**-**		
	5YR TRANSITION	**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**
	Demand Credit ($/kVA)	(1.00)	(0.75)	(0.50)	(0.25)	-
	Modified Demand Charge ($kVA)	14.15	14.40	14.65	14.90	15.15
(67.2)	**Revenue variance ($M)**	**(26.9)**	**(20.2)**	**(13.4)**	**(6.7)**	**-**

- **Transition approach is not “revenue neutral”**
- **How should the revenue variance be recovered?**

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Concept 2(b): Targeted demand credit

Concept (shown for Stepped Rate 2.0)

- Target fixed demand credit of $1/kVA to customers with adverse bill impacts only
- Apply credit for transition period (3yrs or 5yrs)
- Use a monthly load factor breakpoint* to determine the credit
- **RS1823A and RS1823B customers have different load factor breakpoints*

Load factor breakpoint	# of customer sites	Total billed demand (kVA)	% of TSR class demand	Credit $/kVA	Annual Cost ($M)	3yr transition ($M)	5yr transition ($M)
<70%	118	10,886,714	41%	$1.00	$10.9	$32.7	$54.5
<65%	102	8,157,285	30%	$1.00	$8.2	$24.6	$41.0
<60%	91	5,384,919	20%	$1.00	$5.4	$16.2	$27.0

Considerations

- Customer site must be operating (no credit for shutdown plant)
- Credit doesn't apply if customer on minimum/ratchet/average billing demand
- Credit applied on monthly bill based on actual load factor and power factor
- *Use a single load factor breakpoint or multiple breakpoints?*

- **Transition approach is not "revenue neutral"**
- **How should the revenue variance be recovered?**

Concept 3: High voltage credit

Concept

- BC Hydro provides transmission service at 69kV, 138kV, 230kV, 287kV
- Provide a fixed demand credit of $1/kVA for service voltages at 138kV and higher
- Rationale is that there are avoided costs related to voltage transformation

Illustrative revenue impact

High voltage credit eligibility	# of customer sites	Total billed demand (kVA)	% of TSR class demand	Credit ($/kVA)	3yr Transition F2024 - F2026 ($M)	5yr Transition F2024 - F2028 ($M)
Service ≥ 138kV	65	14,431,978	54%	1.00	**43.3**	**72.2**

Considerations

- High voltage credits offered by other Canadian utilities such as Hydro Quebec
- BCH does not have a formalized cost-basis for this approach
- Credit would be arbitrary as it's based on customer service voltage, not bill impact

- **Transition approach is not "revenue neutral"**
- **How should the revenue variance be recovered?**

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Demand Charge Pricing* (large power) Comparison for Canadian Utilities

Canadian Utility	Rate	Units	Demand Charge ($2021)
BC Hydro	Schedule 1823A (>60kV)	$/kVA	8.64
Hydro Quebec	Rate L	$/kW	13.00
Sask Power	Rate GE-23 (72kV)	$/kVA	8.41
Sask Power	Rate GE-24 (> 100kV)	$/kVA	8.28
Manitoba Hydro	Rate GS-L (30kV - 100kV)	$/kVA	7.96
Manitoba Hydro	Rate GS-L (>100kV)	$/kVA	7.09
Nova Scotia Power	Rate Code 23 - Firm	$/kVA	11.68
New Brunswick Power	N-4 Large Industrial	$/kW	14.80

**Data Sources:*
Published rate sheets for each utility as of April 1, 2021. For large power/industrial customers served at transmission voltage, with customer-owned transformation. Excludes various pricing options, special discounts, curtailment credits, taxes, etc.

HQ Voltage Adjustment	Credit	Adjusted Demand Charge
Rate L	$/kW	$/kW
50kV - 80kV	2.21	10.79
80kV - 170kV	2.70	10.30
> 170kV	3.57	9.43

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Transmission Service Rate Portfolio Impacts

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Rates with pricing linked to RS 1823 Tier 2

TIER 1

RS 1823B Stepped Rate

TIER 2

$100.95/MWh

RATES WITH PRICES LINKED TO RS 1823 TIER 2 ENERGY PRICE

- **RS 1825: Time of Use**
- **RS 1828: Biomass Energy**
- **RS 1880: Maintenance and Standby**
- **RS 1891: Shore Power**

RATES THAT REFERENCE TS 74

- **RS 1892 Freshet Rate**
- **RS 1893 Incremental Energy Rate**

TARIFF SUPPLEMENT 74 (CBL Determination Guidelines)

If RS 1823 replaced with any rate other than Stepped Rate 2.0:

- **Re-price associated services such as RS 1880 and RS 1891**
- **Re-establish RS 1892 and RS 1893 baselines**

RS 1880 / RS 1891 Re-pricing Concepts

1. Update existing reference price

Current price
$100.95
/MWh

Update price to reflect new Energy LRMC

2. Short-run marginal cost (Mid-C)

RS 1853
(Mid-C, no adder)

RS 1893
(Mid-C, with adder)

3. Revert to pre-2006 pricing
   - 10% premium on first 250 kWh per kVA of energy
   - Pro-rated demand charge based on hours of use
   - Minimum demand charge for Period of Use < 72hrs

???
Pricing TBD

- **TSR customers have over 800 MW of installed self-generation**
- **Customers will require RS 1880 pricing certainty to manage service requirements during periods of generator outage**

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Impacts to RS 1892 (Freshet) and RS 1893 (IER Pilot)

ISSUE:

- No visibility to CBL-related adjustments under TS 74
- Ability to discern "normal use" will be impacted
- Customers may operate differently under new rates
- New operating history required for baseline re-determination

Customer Load

Non-firm service

(RS 1892 and RS 1893)

Energy charge
No Demand charge

ELECTRICITY BASELINES

Firm service

(RS 1823 or replacement)

Energy charge
Demand charge

Service provided in accordance with Tariff Supplement 5 - Electricity Supply Agreement (ESA)

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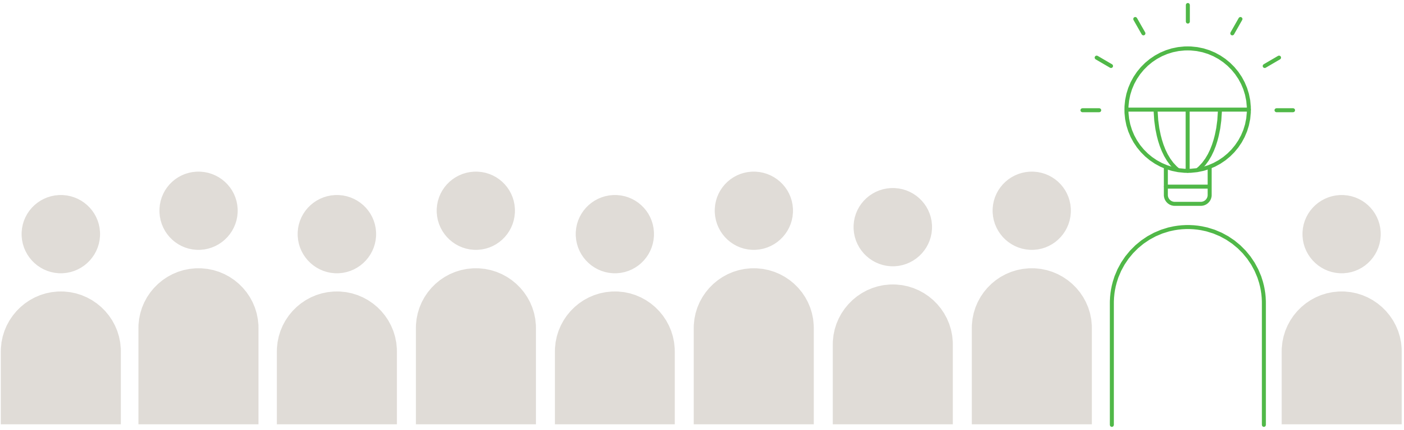
Closing Remarks

Chris Sandve



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Next Steps

	Milestone	Target Date
1	**FOURTH customer and stakeholder engagement** • Consideration of feedback from third workshop • Refine options based on feedback and updated information (e.g., F23 RRA forecast, IRP)	Early 2022
2	**FIFTH customer and stakeholder engagement** • Consideration of feedback from fourth workshop • BC Hydro's final proposal for new default rate • Pricing + terms (including transition, bill impact mitigation) • Proposal for related rate schedules (RS 1880, etc.) **Objective: confirm customer and stakeholder support for final rate design concept that BC Hydro proposes to file with BCUC**	TBD
3	File application	Q2 2022
4	Regulatory Process	Q3 2022 - Q1 2023
5	Effective date of new rates (if approved on interim basis)	April 1, 2023

DRAFT

Closing Remarks: Key Contacts and Process

- BC Hydro values your participation and feedback on our rate designs
- Please contact BC Hydro Regulatory Group with any questions about the regulatory or engagement process: BCHydroRegulatoryGroup@bchydro.com
- Remember to Submit your feedback form by November 5, 2021
- The link to the online feedback form is:

https://www.bchydro.com/toolbar/about/planning_regulatory/regulatory.html?utm_source=promo&utm_medium=email&utm_content=materials

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Questions

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