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September 26, 2024

Patrick Wruck  
Commission Secretary and Manager  
Regulatory Services  
British Columbia Utilities Commission  
Suite 410, 900 Howe Street  
Vancouver, BC V6Z 2N3

Dear Patrick Wruck:

**RE: British Columbia Utilities Commission (BCUC or Commission)  
British Columbia Hydro and Power Authority (BC Hydro)  
2020 Street Light Rates Application (the Project)  
Compliance with BCUC Order No. G-312-21 Directive 5  
Final Replacement Program Report**

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BC Hydro writes in compliance with Commission Order No. G-312-21, Directive No. 5 to provide the Final Replacement Program Report for the Project.

For further information, please contact Shiau-Ching Chou at  
[bhydroregulatorygroup@bhydro.com](mailto:bhydroregulatorygroup@bhydro.com).

Yours sincerely,



Chris Sandve  
Chief Regulatory Officer

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Enclosure

# **BC Hydro 2020 Street Light Rates Application**

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## **Final Replacement Program Report**

**September 26, 2024**

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## 1 Background

BC Hydro submitted its 2020 Street Light Rates Application (**Application**) on November 12, 2020 which, among other things, sought approval of proposed amendments to Rate Schedule 1701 – Overhead Street Lighting (**RS 1701**) rate to allow for the provision of this service by way of light emitting diode (**LED**) street lights. Older technology street lights provided by BC Hydro under RS 1701 were to be replaced through the Street Light Replacement Program (**Program**) to meet a requirement to eliminate equipment that contains Poly-Chlorinated Biphenyls (**PCBs**) under the Federal PCB Regulation by December 31, 2025. The Application also sought approval to terminate Rate Schedule 1755 Private Outdoor Lighting (closed) (**RS 1755**) and remove all street lights provided by BC Hydro under this rate schedule. Where a street light was mounted on a BC Hydro owned pole that was part of BC Hydro's distribution system, and deemed to be suitable for migration, the Application sought approval to amend the RS 1701 availability criteria to allow the customer the option to take service under RS 1701 with the street light being replaced as part of the Program.

The Application was approved<sup>1</sup> with certain reporting requirement through the British Columbia Utilities Commission's (**BCUC** or **Commission**) Decision and Order No. G-312-21 on November 1, 2021. Directive 5 of the Order required BC Hydro to prepare this final report (**Final Replacement Program Report**) within three months of substantial completion of the Program. The Program was substantially complete as of June 30, 2024. Therefore, BC Hydro submits this Final Replacement Program Report pursuant to Directive 5 of the Order.

Appendix A of Decision and Order No. G-312-21 stated that the Final Replacement Program Report would include the following information:

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<sup>1</sup> The BCUC did not approve amendments to the electric tariff regarding the back-billing of unmetered service as proposed in the Application.

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- The final cost of the Program, including a breakdown of the final costs (summarized in section [2](#) below);
  - A comparison of these costs to the estimates provided in Table 1 in the Decision, including whether any change to the RS 1701 LED street light rates as approved in this Decision is warranted in light of the final program costs (summarized in section [2.1](#) below);
  - Material changes, if any, regarding the implementation of the Program, including (i) cost variances greater than 10 percent; (ii) any schedule delays greater than 3 months compared to BC Hydro's tentative street lighting installation plan as provided in Table 4 of the Application; and (iii) changes to the scope of work for the Program (summarized in section [3](#) below);
  - A breakdown of the total number of customer complaints regarding street lighting, if any, including an overview of the measures undertaken by BC Hydro to resolve the identified issues for each annual reporting period (summarized in section [4](#) below); and
  - A post-implementation review that includes (i) assessment of the Program and whether BC Hydro adequately met its objectives as proposed in the Application; (ii) identifying any potential support initiatives beyond the duration of the Program to maintain the benefits of LED street lighting; (iii) current customer segmentation of BC Hydro's street lighting rate schedules (i.e. RS 1701, RS 1702, RS 1703, and RS 1704); and (iv) general lessons learned with respect to the Program (summarized in section [5](#) below).

## 2 Program Final Cost

The Program final cost is \$63.3 million which is within the Program Expected Cost of \$69.2 million. [Table 1](#) below contains a summary of the Program's budget, final

costs, cost variances and variance percentage. Comments on the cost variances greater than 10% are provided in section [2.1](#).

**Table 1 Street light Program Cost Summary Table**

	A	B	C	D	E = D - C	F = E / C	
	Table G-4 Budget <sup>1</sup> (Real \$M, inflation below)	Budget w/ RS1755 Termination <sup>1</sup> (Real \$M, inflation below)	Budget w/ RS1755 Termination <sup>2</sup> (Nominal \$M, inflation allocated to each line)	Final Costs <sup>3</sup> (Nominal \$M)	Variance (Nominal \$M)	Variance %	Ref for variances greater than 10%
<b>Program Costs</b>							
<b>Direct Deployment Costs (Materials + Installation):</b>							
Labour	20.1	15.6	16.4	20.3	3.9	24%	a
Materials	24.6	22.5	23.6	25.4	1.8	7%	
<b>Indirect Program Costs:</b>							
Program Management	1.3	1.3	1.3	1.9	0.6	42%	b
Deployment Management	3.2	3.2	3.4	2.5	-0.9	-26%	c
Supporting Technology	2.2	2.1	2.2	2.0	-0.1	-6%	
Customer Engagement	0.8	0.8	0.9	2.0	1.2	134%	d
Other (Change Management, Material Management, Procurement, Regulatory)	0.6	0.6	0.7	0.3	-0.4	-58%	e
Dismantling	2.4	6.2	6.7	3.7	-3.0	-45%	f
<b>Total Program Costs before Loadings and Contingency</b>	<b>55.4</b>	<b>52.6</b>	<b>55.1</b>	<b>58.1</b>	<b>3.0</b>	<b>5%</b>	
Contingency	7.5	7.1	7.5	0.0	-7.5	-100%	g
Inflation	2.9	2.9	0.0	0.0	0.0	N/A	
Capital Overhead	7.5	6.5	6.5	5.2	-1.3	-20%	h
<b>Program Expected Cost</b>	<b>73.4</b>	<b>69.2</b>	<b>69.2</b>	<b>63.3</b>	<b>-5.8</b>	<b>-8%</b>	
Program Reserve (Loaded)	9.9	9.4	9.4				
<b>Requested Total Authorized</b>	<b>83.3</b>	<b>78.6</b>	<b>78.6</b>				

Minor addition errors may occur due to rounding.

**Notes**

1. Table G-4 in the Street Light Rates Application assumed that all the RS 1755 lights were going to be converted to LEDs (Column A in [Table 1](#)). As explained in BC Hydro’s responses to BCOAPO IR 1.11.3 and BCUC IR 2.23.1 after the business case was approved, the decision was made to terminate the RS 1755 service. Column B in the [Table 1](#) above shows the revised Program budget.
2. In Column C, the revised budget was restated where inflation was allocated to each cost line item.
3. Final Costs (Column D in [Table 1](#)) are based on life-to-date actual as of August 31, 2024 and include an estimate to complete until Financial Close of the Program expected by March 31, 2025.

**2.1 Explanations for Cost Variances Greater than 10%**

The following costs have variances greater than 10%:

- (a) Installation Labour costs increased by \$3.9 million (24%) primarily due to higher costs for ammoniacal copper arsenate (ACA)<sup>2</sup> pole remediation;

<sup>2</sup> ACA is a preservative used on wooden poles. Remediation of ACA poles is required in order to complete any work on an ACA treated pole.

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- (b) Program Management costs increased by \$0.6 million (42%) due to additional support required to manage the higher-than-expected complexity in the Program's Implementation Phase;
  - (c) Deployment Management costs decreased by \$0.9 million (-26%) as a result of lower-than-expected costs for installation quality assurance activities;
  - (d) Customer Engagement costs increased by \$1.2 million (134%) due to the need for BC Hydro to provide more support to its street lighting customers taking service under RS 1701 and RS 1755;
  - (e) Other (Change Management, Material Management, Procurement, Regulatory) costs decreased by \$0.4 million (-58%) due to lower-than-expected efforts required;
  - (f) Dismantling costs decreased by \$3.0 million (-45%) as a result of lower-than-expected RS 1755 removals;<sup>3</sup>
  - (g) Contingency was allocated to offset the net increase of \$3.0 million in direct deployment and indirect program costs. \$4.5 million unused contingency represents a saving to the Program; and
  - (h) Capital Overhead cost decreased by \$1.3 million (-20%) due to a change in the accounting treatment of some ancillary materials.<sup>4</sup>

A comparison of the Program's final costs to the estimates provided in Table 1 in the BCUC's Decision and Order No. G-312-21 is presented in [Table 2](#) below.<sup>5</sup>

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<sup>3</sup> A total of 1092 RS 1755 streetlights were migrated to RS 1701 and 2592 streetlights were removed as part of the Program.

<sup>4</sup> For example, change in capital overhead rate and change in exempt materials.

<sup>5</sup> BC Hydro notes that the costs summarized in [Table 2](#), as shown in Table 1 of Decision and Order No. G-312-21, do not include the costs associated with the RS 1755 Group 1 and Group 3 lights removals, which are not included in the calculation of RS 1701 rates. These costs are part of the Program scope; therefore these costs are included in [Table 1](#) above.

**Table 2 Comparison of the Estimated and Final Program Costs (excluding RS 1755 Group 1 and Group 3 Lights Removals)**

	A	B	C = B - A	D = C / A
	Cost Estimate (Table 1 in the Decision)	Final Costs	Variance (\$M)	Variance %
<b>Direct Deployment Costs (Materials + Installation):</b>				
Labour	15.65	20.29	4.64	29.6%
Materials	20.84	25.37	4.53	21.8%
<b>Indirect Program Costs:</b>				
Program Management	1.28	1.91	0.63	49.7%
Deployment Management	3.05	2.48	-0.57	-18.8%
Supporting Technology <sup>1</sup>	2.02	2.04	0.02	0.9%
Customer Engagement	0.78	2.04	1.26	162.8%
Other (Change Management, Material Management, Procurement, Regulatory)	0.62	0.28	-0.34	-54.7%
Dismantling	2.06	2.54	0.48	23.2%
<b>Total Program Costs before Loadings and Contingency</b>	<b>46.29</b>	<b>56.95</b>	<b>10.66</b>	<b>23.0%</b>
Contingency	6.50	0.00	-6.50	-100.0%
Inflation	2.52	0.00	-2.52	-100.0%
Capital Overhead	6.53	5.21	-1.32	-20.2%
<b>Program Expected Cost</b>	<b>61.85</b>	<b>62.16</b>	<b>0.32</b>	<b>0.5%</b>

Minor addition errors may occur due to rounding.

Note

- The cost estimate for Supporting Technology of \$2.02 million is as shown in BC Hydro’s response to BCUC IR 2.23.2.1. This amount was captured incorrectly as \$2.07 million in Table 1 in Decision and Order No. G-312-21 however this is a typographical error and the Total Program Costs and Program Expected Cost in Table 1 of the Decision and Order No. G-312-21 match those in [Table 2](#) above.

## 2.2 RS 1701 Rate Review is Not Required

In its Decision and Order G-312-21, the BCUC stated:

the Panel considers it important for the BCUC to review Replacement Program capital and installation costs on a regular basis and to evaluate whether any change to the approved LED rates is warranted upon completion of the Replacement Program.<sup>6</sup>

BC Hydro submits that considering the final cost variance for the portion of the Program that was used to determine the RS 1701 rate is only \$0.32 million or 0.5% higher when compared to the estimates provided in Column A of [Table 2](#), a review of the approved RS 1701 rates is not warranted.

<sup>6</sup> Decision and Order No. G-312-21, page 11.



### 3 Material Schedule and Scope Changes

Material changes to the Program schedule and scope of work are provided as follows:

- (a) In Table 4 of the Application,<sup>7</sup> the LED Street Lighting Installation Plan presumed conversion of 90,850 street lights to LED and the overall scope of the Program was not materially different from this figure. As of June 30, 2024, the Program converted 88,790 LED street lights under RS 1701 and 1,092 under RS 1755 (Group 2). The total count of LED street lights installed was 89,882 or 98.9% of planned; and
- (b) The LED Street Lighting Installation Plan presumed installation would be completed by the end of the first quarter of fiscal 2024. The majority of the Program work related to RS 1701 street light replacements was completed as planned by that time. An additional 12 months to first quarter of fiscal 2025 was used to complete removals and replacements of 4,849 street lights under RS 1755, which included coordination with customers and receiving their selections.

There were no material changes to the scope of work for the Program.

BC Hydro considers the Program to be substantially complete as of June 30, 2024. The Program has been wound down as of this date and remaining replacements or removals will be undertaken by BC Hydro crews (i.e., not specifically tasked with implementation of the Program) and are expected to be fully completed by March 31, 2025.

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<sup>7</sup> Table 4 of the Application at p. 22

## 4 Breakdown of Customer Complaints

Complaints were received one of two ways: from the customer receiving the RS 1701 service or from nearby residents.

As of August 31, 2024, BC Hydro has recorded 627 complaints about the brightness of the street lights and/or about light trespass among all street lights replaced across the province which represents approximately 0.7% of the street lights replaced.

BC Hydro received no further complaints on this matter after October 2023. [Table 3](#) below summarises the number and type of complaints received.

**Table 3 Program Complaints Received**

Complaint Type	Number of Complaints
Too Bright	485
Light Trespass <sup>1</sup>	138
Too Dim	4
<b>Total</b>	<b>627</b>

Note:

- Light Trespass includes specific light trespass complaints as well as requests for shields, and adjustment of the angle of the street light.

In all cases, a complaint regarding a specific street light was raised by one resident or a RS 1701 customer. BC Hydro has not received multiple complaints regarding any specific street light.

In addition to these complaints, there may be cases where residents have raised complaints directly to their municipality (or the entity registered as the BC Hydro RS 1701 customer). However, if the RS 1701 customer determined that no action is required, the complaint may not have been forwarded to BC Hydro, and is therefore not included in [Table 3](#).

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#### 4.1 Summary of BC Hydro's Actions to Resolve Concerns

When a complaint was received, BC Hydro reviewed the correspondence and often asked for supplementary information – usually photographs that show how the newly installed light is performing in the field. The information was then sent to the RS 1701 customer asking how they would like to resolve the issue. The RS 1701 customer was generally provided the following options:

- Replace the street light with a lower wattage option (39 W being the lowest) and/or a warmer colour temperature option (i.e., 4000K down to 3000K);
- Adjust the angle of the street light on the pitch and roll axes;
- Rotate and/or change the length of the support arm on the pole, assuming there is no interference with other infrastructure (telecommunication wires, etc.); and
- Leave the street light as is, with no adjustments or modifications.

The first three options are not mutually exclusive, and a combination of them could be performed.

As of August 31, 2024, 611 of the 627 complaints received are considered resolved. Of the resolved complaints, 472 required an alteration order to be issued for the street light to be changed or adjusted. Of the orders that required an alteration, 457 are complete and 16 remain outstanding pending completion. The 16 in progress are expected to be complete by around the end of calendar year 2024. [Table 4](#) below provides a breakdown of the actions taken in the field to resolve the complaint.

**Table 4 Street light Alteration Requests**

Type of Alterations Requested	Total
Replaced the street light with a lower wattage option	261
Adjusted the Pitch/angle of the street light	95
Replaced the street light with a lower wattage and warmer (3000K) option	55
Replaced the street light with a lower wattage option and adjusted the pitch/angle of the street light.	45
Field work in progress and expected to be completed around the ended of the calendar year 2024	16
<b>Total</b>	<b>472</b>

155 complaints were resolved through discussions with the RS 1701 customer or resident without needing to change or adjust the street light. Fifty-four of these complaints were general complaints about the LED street lighting technology rather than complaints regarding a specific street light.

Street light deployment under the Program is progressing as planned and the complaints received are being resolved in a timely manner, as are the outstanding complaints received that remain unresolved. BC Hydro remains committed to working with our customers and residents to address light trespass and other street light related issues.

## 5 Post-Implementation Review

As the Program reached substantial completion, BC Hydro conducted a post-implementation review focusing on several key factors outlined in the sections below:

- Achievement of Program objectives;
- Customer engagement;
- BC Hydro street lighting customers; and

- General lessons learned.

## 5.1 Achievement of Program Objectives

BC Hydro identified six main drivers for the Program<sup>8</sup>, which are listed below along with their completion assessment.

1. **Compliance with Federal Environmental poly-chlorinated biphenyl (PCB) Regulations.** This objective was completed by removing and recycling old high pressure sodium (**HPS**) and mercury vapour (**MV**) street lights and their electrical ballasts that could potentially have PCB components. BC Hydro will complete this objective ahead of the Federal government deadline of December 31, 2025.
2. **Energy conservation.** This objective was completed by installing more efficient LED street lights which have lower power consumption for the same or higher level of brightness compared to HPS units.
3. **Better quality lighting with fewer failures, resulting in improved public safety.** This objective was completed by installing LED street lights which have a lower failure rate and, as result, less outage time, which improved public safety.
4. **Meet customers' expectations for converting street lights to LEDs.** RS 1701 customers were strongly in favour of replacement of street lights with LED technology. This objective was completed by working individually with each RS 1701 customer, receiving their street light wattage and colour selection for each street light location, then installing LED street lights in accordance with these selections.
5. **More efficient than replacing fixtures as HPS lights failed.** This objective was completed by replacing the old HPS street lights with new, more efficient

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<sup>8</sup> Page 12, Appendix E of the Application.

LED technology all at once through the Program instead of replacing with outdated HPS technology or with LED street lights as the lights failed.

6. **Improved coordination with customers.** This objective was completed by establishing a customer service team specifically dedicated for street light customer coordination, receiving their wattage and colour selection as well as addressing and resolving complaints.

## 5.2 Customer Engagement

BC Hydro engaged all RS 1701 and RS 1755 customers who were eligible and opted to migrate their service to RS 1701 during preparation and deployment phases. Customers provided their detailed LED wattage and colour selections; however various changes were submitted prior to, during, or even after street light installation. These requests were mainly the result of residents' complaints about brightness. As result, BC Hydro coordinated additional replacements of LED to LED street lights and customer support to achieve appropriate brightness for residents.

## 5.3 BC Hydro Street Lighting Customers

[Table 5](#) below summarizes BC Hydro's current street lighting customers by rate schedule.

**Table 5 Street Lighting Customer Segmentation**

	BC Hydro- Owned Street Lighting	Customer-Owned Street Lighting		
	RS 1701 Overhead Street Lighting	RS 1702 Public Area Ornamental Street Lighting	RS 1703 Street Lighting Service	RS 1704 Traffic Control Equipment
Number of Customers	439	186	10	97
Number of Accounts	1,399	318	11	5,066
Number of Lights	89,341	255,693 <sup>9</sup>	23,192	n/a

#### 5.4 General Lessons Learned

BC Hydro considers the Program to be successful for many reasons including meeting all objectives, staying within planned budget and high customer satisfaction. Like any other program, this Program has some lessons learned during preparation and execution phases, including:

- (a) Apply more consideration to seasonal specific aspects in deployment planning to minimize potential impact on the schedule;
- (b) On completion, undertake detailed LED testing by all customers to minimize risk of potential street lights re-installation;
- (c) Propose more options for street light shielding for residents, where necessary, to minimize brightness complaints; and
- (d) Provide more details and expectations on the scope of work for installation crews to minimize delays and re-installation.

<sup>9</sup> Excluding a small number of metered RS 1702 street lights.