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April 26, 2017

Mr. Patrick Wruck Commission Secretary and Manager Regulatory Support British Columbia Utilities Commission Sixth Floor – 900 Howe Street Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

RE: British Columbia Utilities Commission (BCUC or Commission)

British Columbia Hydro and Power Authority (BC Hydro)

Application to Amend Rate Schedule (RS) 1289

for Net Metering Service (the Application)

Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

BC Hydro writes in compliance with Commission Order No. G-104-14 Directive 6 to provide its Net Metering Evaluation Report No. 4.

For further information, please contact Gordon Doyle at 604-623-3815 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,

Fred James

Chief Regulatory Officer

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Enclosure (1)



Rate Schedule (RS) 1289 for Net Metering Service Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

April 26, 2017



Table of Contents

1	Evoc	sutivo Su	ımmary	2
2				
3			nd Policy Background	
4	_	-	ecommended Actions from 2013 Report No. 3	
5	•		ion and Education	
6			ustomer Data	
•	6.1		ary of Inquiries	
	6.2		stering Project Summary	
	6.3		stering Energy Deliveries, Credits and Payments	
7			osting Data	
8			it and Energy Price Methodology	
•	8.1		of RS 1289: Avoided Cost and Load-Resource Balance (LRB) .	
	8.2		Credit	
	8.3	• • • • • • • • • • • • • • • • • • • •	Price	
9	Curr	0.	ds and Benchmarking Analysis	
	9.1		t Trends	
		9.1.1	Leasing Solar Equipment	
		9.1.2	Recovery of Fixed Infrastructure Costs	
		9.1.3	System Constraints	
		9.1.4	Non-Integrated Areas	28
		9.1.5	Virtual Net Metering	28
		9.1.6	Unauthorized Generator Connections	29
		9.1.7	Net Metering Price	29
		9.1.8	Anniversary Date	30
	9.2	Benchr	marking Analysis	31
10	Surv	ey Resu	Its Summary	31
	10.1	Survey	Feedback	31
11	Distr	ibuted G	eneration Update	34
12	Prog	ram Dev	velopments and Future Considerations	36
	12.1	Net Me	tering Program Developments	36
	12.2	Future	Considerations	37
13	Cond	clusion		38



List of Figures

Figure 1	Project Growth	15
Figure 2	Project Size Distribution (kW)	16
Figure 3	Barriers	32
Figure 4	Satisfaction with Experience	33
Figure 5	Satisfaction with Information	33
J		

List of Tables

Net Metering Projects by Region	12
Net Metering Activities for F2014 through F2016	13
Net Metering Costing Data	17
•	
	. , ,

Appendices

Appendix A	Net N	Meterina	Survey
	110011	victeiliu	Julyev

Appendix B BC Hydro Distributed Generation Interconnection Practices

Appendix C Net Metering In North America

Appendix D Benchmarking Analysis



1 Executive Summary

- 2 This is the fourth Net Metering Evaluation Report BC Hydro has provided the British
- 3 Columbia Utilities Commission (**Commission or BCUC**) since the Net Metering rate
- was established in 2004. It describes the developments in BC Hydro's Net Metering
- 5 program from April 1, 2013 to March 31, 2016 and identifies trends and
- 6 considerations for the future of the program.
- 7 Over the three years covered by this report, participation in the Net Metering
- 8 Program more than quadrupled from 154 customers at the end of Fiscal 2013 with
- 9 1.1 MW of aggregate capacity to 640 customers with 3.8 MW at the end of
- Fiscal 2016. BC Hydro expects participation in the program to continue to grow and
- plans to monitor this growth, as well as any impacts it may have on BC Hydro's
- costs and operations going forward and address them if necessary in the next Rate
- Design Application review expected in F2018.
- BC Hydro's Net Metering customers and stakeholders tell us they are satisfied with
- the program and it meets their needs. We are not currently considering modifications
- to the Net Metering program, however we may wish to make modest clarifications to
- 17 RS 1289 in the future.

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2 Introduction

- BC Hydro's Net Metering program is designed for our customers to generate
- 20 electricity for their own use. When the customer generates more electricity than they
- need, once a year, on the customer's anniversary date, BC Hydro purchases the
- excess electricity at the rate of 9.99 cents per kWh. The Net Metering rate, known as
- 23 Rate Schedule 1289 Net Metering Service (**RS 1289**), was established in 2004 to
- 24 allow BC Hydro's residential and commercial customers to meet all or part of their
- electricity needs through small clean or renewable distributed generation (**DG**)
- facilities at their premises. Since then, over 640 customers have participated in



- BC Hydro's Net Metering program as at March 31, 2016, with over 95 per cent of
- those customers choosing to install solar photovoltaic systems.
- 3 On July 25, 2014, the Commission issued Order No. G-104-14, Directive 6, directing
- 4 BC Hydro to file a progress report on the RS 1289 Net Metering Rate and the
- 5 Micro-Standing Offer Program (Micro-SOP) by April 30, 2017 (Directive 6).
- 6 Directive 6 specified that the progress report include the issues listed as
- requirements for the 2013 Net Metering Evaluation Report (2013 Report No. 3) as
- well as the requirements included in the decision attached to Order No. G-104-14.
- 9 This report reflects a similar format as the 2013 Report No. 3 but also includes new
- sections and updated information. The report is filed in accordance with Directive 6
- and is the fourth net metering evaluation report filed with the Commission since
- 12 RS 1289 was established.

3 Regulatory and Policy Background

- In November 2003, BC Hydro applied for approval of a new rate schedule,
- RS 1289 Net Metering Service, and in 2004 the Commission approved the new
- tariff by Order No. G-26-04. Some key aspects of RS 1289 at the time included a
- 50 kW limit on generator nameplate capacity, the requirement that customer
- generation be "clean", and the payment of an Energy Price of 5.40 cents per kWh for
- surplus customer generation on an annual basis. The rate is based on a "netting" of
- 20 energy deliveries (deliveries by BC Hydro to the customer minus deliveries by the
- customer to BC Hydro).
- In its 2004 Order, the Commission directed BC Hydro to file a monitoring and
- evaluation report on the Net Metering program one year after the rate was approved
- 24 and BC Hydro filed that report on June 1, 2005.
- Subsequently, the B.C. Government released the 2007 BC Energy Plan. Policy
- Action No. 11 of the 2007 BC Energy Plan provided that the price paid for net annual
- surpluses of generation acquired by BC Hydro under RS 1289 should be generally



- consistent with prices paid under the Standing Offer Program (**SOP**). As a result, in
- 2 2008 BC Hydro applied to increase the Energy Price to 8.16 cents per kWh, based
- on the 2006 SOP prices and the Commission approved the increase by
- 4 Order No. G-4-09. In its 2009 Order, the Commission directed BC Hydro to submit a
- second Net Metering evaluation report after the completion of the next review of the
- 6 SOP.
- In January 2011, BC Hydro released its Report on the SOP 2-Year Review which
- included revised SOP pricing. In September 2011, BC Hydro filed an application with
- 9 the Commission to, among other things, increase the RS 1289 Energy Price to
- 9.99 cents per kWh, consistent with the revised SOP pricing. BC Hydro also filed its
- second Net Metering evaluation report.
- In 2012, the Commission issued Order No. G-57-12, directing BC Hydro to file a
- third Net Metering report. On April 30, 2013, BC Hydro submitted the
- 2013 Report No. 3 in accordance with Directive 4 of Commission Order No. G-57-12
- addressing the issues identified in that Order and providing a future direction for the
- Net Metering program, including a list of recommended actions (refer to section 4).
- Subsequently, on February 28, 2014 BC Hydro filed an application with the
- 18 Commission to amend RS 1289 to increase the Net Metering capacity limit for a
- generating facility from 50 kW to 100 kW for all eligible customers. BC Hydro also
- 20 proposed to amend RS 1289 to allow it to recover incremental
- interconnection-related costs from Net Metering customers incurred as a result of
- 22 allowing the larger more complex projects.
- 23 On July 25, 2014, the Commission issued Order No. G-104-14 approving the
- 24 proposed capacity limit increase to 100 kW for a generating facility and the ability to
- recover from Net Metering customers any incremental costs incurred by BC Hydro
- for interconnecting generating facilities with a nameplate greater than 50 kW. In
- 27 Directive 6 of the Order, the Commission also directed BC Hydro to provide a



- progress report (fourth evaluation report) on RS 1289 and the Micro-SOP by
- ² April 30, 2017.
- 3 On June 26, 2015, to help expand Net Metering participation and in consideration of
- 4 Commission Order No. G-7-15 (Order No. G-7-15 provided regulatory exemptions
- for leasing entities involved in providing electricity from small-scale solar and wind
- 6 generation eligible for the Net Metering program), BC Hydro applied for approval to
- amend RS 1289 to allow customers to either own or lease a generating facility for
- the purpose of generating electricity to serve all or part of their electricity
- 9 requirements under the Net Metering program. The Commission issued
- Order No. G-116-15 on July 9, 2015 approving BC Hydro's proposed amendments
- to RS 1289 (refer to section <u>9.1.1</u> for further discussion on leasing).

4 Update on Recommended Actions from 2013 Report No. 3

- The table below summarizes the outcomes of the recommended actions included in
- the 2013 Report No. 3.

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Action	Description	Outcome	Date completed
A1.	Increase the Net Metering cap from 50 kW to 100 kW for General Service rate customers.	BC Hydro's application approved by Commission. Order No. G-104-14	July 2014
A2.	Automate and improve billing practices to increase accuracy, enhance online accessibility and ensure consistency with other customer programs	Automated Net Metering billing for residential and small commercial class of customers (over 90 per cent of all customers)	August 2013
A3.	Continue to promote Net Metering through BC Hydro's website, and by implementing the actions identified in BC Hydro's Marketing and Communications plan for the Net Metering program	Regular website updates and marketing through presentations/webinars.	Ongoing



Action	Description	Outcome	Date completed
A4.	Work with local government, contractors, installers and customers on educational materials to enhance understanding of the impacts of solar PV on the urban environment.	Number of in-person presentations and webinars	Ongoing
B1.	Design a streamlined acquisition process that supports small-scale DG projects (50 kW to 1 MW).	Micro-SOP for Communities and First Nations launched	March 2016
B2.	Identify opportunities to work collaboratively with industry associations to standardize interconnection equipment for small-scale DG projects.	Participated in IEEE 1547A (Standard for Interconnecting Distributed Resources with Electric Power Systems) Working Group.	December 2013
B3.	Explore the replacement of revenue meters with Smart Meters to reduce costs for both customers and BC Hydro.	Micro-SOP projects will utilize smart meters wherever possible	March 2016
B4.	Explore the implementation of a flat fee for interconnection studies for small DG projects (less than 1 MW).	Implemented a flat fee for screening studies	March 2016
B5.	Explore the possibility of deferring the cost of upgrades until projects have reached commercial operation.	BC Hydro is not currently pursuing this as no customers have requested this option	N/A
B6.	Create optional contract lengths (five, ten, 15 and up to 40 years) for small-scale projects.	Micro-SOP developers have the flexibility of choosing a contract term from 5 to 40 years	March 2016
B7.	Explore how BC Hydro applies energy price escalation rates for small-scale projects and determine if an alternative approach may be appropriate.	BC Hydro is currently reviewing the SOP pricing and program terms which could impact this action item.	Ongoing



5 Communication and Education

- 2 BC Hydro's consultation and communication objective is to increase the awareness
- 3 of the Net Metering program, through engagement and communication, and to
- 4 obtain feedback about our customers experience with Net Metering. The following is
- a list of some engagement and communication activities we have been involved
- 6 with:

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- From April 2013 to end of March 2016, BC Hydro delivered nearly
 20 presentations on the Net Metering program.
- BC Hydro hosted and participated in a series of webinars on the Net Metering
 program to a variety of customer and non-customer stakeholders.
- In February 2014, we also gave a presentation on BC Hydro's Net Metering program at a workshop hosted by Canadian Standards Association (**CSA**) and National Resource Canada (**NRCan**). The workshop included a separate discussion with Provincial representatives to provide updates on Canadian trends related to DG.
- BC Hydro regularly participates in events held by the Canadian Solar Industry
 Association (CanSIA), including their national conference where BC Hydro
 delivered a presentation in December 2014. Our involvement with CanSIA
 allows us to keep abreast of developments at the national level, and learn about
 emerging trends/issues in other jurisdictions.
 - One key area of focus for the Net Metering team has been on enhancing and building relationships with the solar installer community in B.C. as we see this group as a critical and direct conduit to our customers. We have observed that when the solar industry understands our process, timelines and the impact a solar installation can have on customers' bills, the knowledge is transferred to our Net Metering customers. Installers are in a position to educate our customers on how a solar installation might look; how it may impact their lifestyles; what to expect for a rate of



- return on investment, and so on. The upfront time we spent with the installers has
- 2 proven to pay off over the long term. With this in mind, we made four presentations
- to solar installers and electricians; and have made appearances and given
- 4 presentations at two green energy workshops.
- In addition, we delivered the following presentations to First Nations, and local
- 6 governments on the Net Metering program and other DG opportunities at BC Hydro:
- University of Victoria's First Nation Energy Forum on DG opportunities within
 BC Hydro;
- Kamloops' Community workshop on solar and Net Metering program, and
- Vancouver Island Mayors roundtable on DG opportunities for Municipalities at
 BC Hydro.
- As a part of our education and awareness campaign, BC Hydro has featured "How
- to" videos and stories on our website, as well as posting stories featuring Net
- 14 Metering customers who have demonstrated leadership and implemented
- sustainable energy solutions for themselves and their communities. These stories
- can be found on our website and include:
- December 2014 Dawson Creek Net Metering customer
- https://www.bchydro.com/news/unplug_this_blog/2014/dawson-creek-solar-offic
- 19 <u>e.html</u>;
- February 2015 Video on how net metering works
- https://www.youtube.com/watch?v=CJwJI-PdVRw;
- March 2015 Salt Spring solar on high school
- https://www.bchydro.com/news/conservation/2015/gulf-islands-secondary-solar.
- 24 html;



- November 2015 Kamloops customer
- 2 <u>https://www.bchydro.com/news/conservation/2015/kamloops-woman-generates</u>
- 3 <u>-own-electricity.html</u>; and
- October 2015 Story on solar
- 5 https://www.bchydro.com/news/conservation/2015/selling-electricity.html.
- 6 Our customers' stories reflect the diversity of projects people are developing and
- what motivated them to install solar PV on their residences, workplaces or local
- schools. Whatever the reasons, they tell us they found the process to be relatively
- simple and straightforward and are seeing the benefits of offsetting their electricity
- load. By sharing these stories more broadly, we hope to educate and inspire others
- to learn more about the Net Metering program and perhaps even install a generator
- at their home or business.

- While we continue our efforts to highlight and promote the Net Metering program, we
- understand there is still more that could be done. Based on feedback from our
- survey, BC Hydro is considering three further actions:
- Host or participate in more workshops, webinars, and community events;
 - Periodically include advertisement of the Net Metering program on BC Hydro bill for all eligible customers; and
- Continue to work with municipalities and local governments to provide support and education on the benefits of net metering.



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6 RS 1289 - Customer Data

2 BC Hydro provides the following information concerning Net Metering customers.

6.1 Summary of Inquiries

- 4 From April 2013 to March 2016, BC Hydro responded to 616 phone calls and
- 5 401 emails. The following is a summary of the most frequent types of inquiries
- 6 related to Net Metering.

	F2014 April 2013 to March 2014		F2015 April 2014 to March 2015		F2016 April 2015 to March 2016	
	Phone	Email	Phone	Email	Phone	Email
How net metering works	85	87	107	81	212	96
Available incentives	7	5	11	6	15	9
Installer/equipment references	8	12	18	13	19	13
Eligibility requirements	65	31	90	29	77	49
(e.g., energy source, technical requirements, service type, load size)						
Change of anniversary date*	0	0	1	1	1	0
Community solar/virtual net metering	5	0	5	1	5	9
Leasing	0	0	0	2	3	0
Options for projects over 100 kW	14	2	6	1	16	4
Total inquiries**	184	137	238	134	348	180
No. of calls or emails	155	122	203	119	258	160

^{*} Additional eight emails were received on this topic in F2017.

6.2 Net Metering Project Summary

- As of March 31, 2016, BC Hydro's Net Metering program had a total of 640 projects
- installed with approximately 3.8 MW of aggregate capacity. The generation type
- breakdown is as follows: 96 per cent solar PV, 2 per cent micro-hydro, 1 per cent
- wind, and 1 per cent wind/PV, biogas, wave and hydro/PV combined, as reflected in
- 14 Table 1 below. This table also provides a regional overview of the projects currently
- in the Net Metering program.

^{**} Please note that in some cases, a single phone call or email may contain multiple inquiries.



Table 1 Net Metering Projects by Region

	Generation Type	Number of Projects	Capacity (kW)
Central Interior	PV	24	111
	Wind	1	2
	Wind & PV	1	8
East Kootenay	Hydro	1	25
	PV	26	129
Kelly/Nicola	Hydro	2	8
	PV	28	128
	Wind	1	2
Lower Mainland	Biogas	1	20
	Hydro	4	177
	Hydro & PV	1	4
	PV	173	1,036
	Wind	1	5
	Wind & PV	1	5
North Coast	PV	20	92
	Wind	1	3
Peace River	Hydro	1	100
	PV	17	77
South Interior	Hydro	3	112
	PV	54	286
	Wind	3	15
Vancouver Island	Hydro	2	56
	PV	271	1,381
	Wind	1	3
	Wind & PV	2	7
Total		640	3,794

- 2 Table 2 provides a summary of the customers that applied for Net Metering or had
- projects that came into service in F2014 through F2016.



Table 2 Net Metering Activities for F2014 through F2016

Net Metering Activity for F2014						
	Generation	Reached In	-Service	Applications I	Received	
	Туре	No. of Projects	Capacity (kW)	No. of Projects	Capacity (kW)	
Central Interior	PV	3	13	4	21	
	PV	2	29	7	51	
Kelly/Nicola	PV	3	14	3	16	
Lower Mainland	Biomass			1	10	
	Hydro	1	100			
	PV	27	186	28	116	
	Wind	1	5	1	5	
	Wave			1	5	
North Coast	PV	2	7	3	9	
	Wind & PV			1	3	
Peace River	Hydro			1	100	
	PV	1	5	2	10	
South Interior	Hydro	1	50	1	50	
	PV	8	26	12	73	
	Wind			1	4	
Vancouver Island	Hydro	1	45			
	PV	26	103	30	112	
Total		76	583	96	583	



	Generation	Reached In	-Service	Applications Received	
	Туре	No. of Projects	Capacity (kW)	No. of Projects	Capacity (kW)
Central Interior	PV	3	21	7	39
East Kootenay	PV	6	37	8	58
	PV	3	27	3	27
	Other			1	0
Lower Mainland	Biogas			1	100
	Hydro	1	4		
	PV	21	93	31	178
North Coast	PV	1	5	1	5
Peace River	PV	2	16	3	17
South Interior	PV	12	81	10	72
	Wind	1	4		
	PV	67	352	91	486
	Wind & PV			1	1
Total		117	640	157	983
		Net Metering Activ	rity for F2016		
	Generation	Reached In	-Service	Applications Received	
	Туре	No. of Projects	Capacity (kW)	No. of Projects	Capacity (kW)
Central Interior	PV	8	54	9	62
East Kootenay	PV	7	33	5	93
Kelly/Nicola	PV	8	37	10	78
	Wind	1	2	1	2
Lower Mainland	Hydro			2	200
	PV	54	367	79	602
	Wind			1	5
North Coast	PV	5	48	7	88
Peace River	Hydro	1	100		
	PV	7	27	7	27
South Interior	PV	13	92	22	152
South Interior Vancouver Island	PV Bio-oil	13	92	22	152 10
		13	92		
	Bio-oil	13	92 623	1	10
	Bio-oil Hydro			1 1	10 100



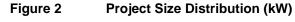
- Figure 1 shows the growth of the Net Metering program from the program's inception to F2016.
 - Figure 1 **Project Growth** kW # cust 700 5,000 600 4,000 500 3,000 400 300 2,000 200 1,000 100 0 F2007 F2005 F2009 F2011 F2013 F2015 Year # of customers capacity, kW
- 4 Figure 2 shows the distribution of the Net Metering project sizes. Since BC Hydro
- increased the maximum size of Net Metering projects to 100 kW, we have not seen
- a significant increase in larger projects. Ninety per cent of the Net Metering projects
- 7 are 10 kW or less. This reflects the fact that most Net Metering customers are
- 8 installing small solar PV systems to offset their load.

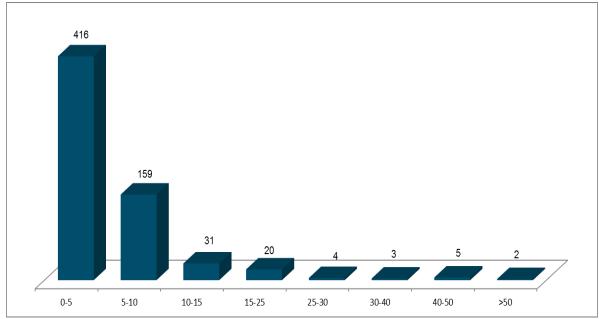


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2 6.3 Net Metering Energy Deliveries, Credits and Payments

- In F2016, the volume of energy associated with Net Metering customers has grown
- in comparison to the volumes reported in 2013 Report No. 3.

	F2012	F2016
Number of NM customers	154	640
Total installed generation capacity, MW	0.9	3.8
BC Hydro delivered to Net Metering customers, MWh	29,545	163,543
Energy credits, MWh*	107	2,748

* Generation delivered to BC Hydro over and above the customer's load at the time of delivery and applied against the customer's energy charges.

	F2012	F2013	F2014	F2015	F2016
Number of customers	13	14	24	63	104
Surplus energy, MWh**	529	763	850	1,651	1,722

^{**} Any excess Energy Credits (surplus energy) at the customer's anniversary date is paid at the Energy Price. The surplus energy purchases would include some energy delivered in the previous fiscal year.



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7 RS 1289 - Costing Data

- 2 Table 3 below reflects BC Hydro's costs to administer the Net Metering program.
- The costing data reflects the timeframe for F2014 to F2016.

Table 3 Net Metering Costing Data

Activity	Estimated Costs (\$000)				
	F2014	F2015	F2016	Total	
Administration	68	71	85	224	
Technical Review	5	6	12	23	
Billing	3	5	8	16	
Marketing	0	0	1	1	
Engagement (external)	4	6	3	13	
Evaluation Report Preparation	3	0	0	3	
Transformer Heavy-Up	0	7	3	10	
Total Cost	83	95	112	290	

- 5 Table 3 illustrates the rising costs to administer the Net Metering program. A few
- 6 highlights explaining these changes are noted below:
- Due to the growth of the Net Metering program, costs to administer the program
 have increased from one to two people to process applications, respond to
 telephone and email inquiries, and deliver presentations and outreach to Net
 Metering customers;
- Due to higher volume of applications, total technical review costs have also increased, while the costs per application have not appreciably changed;
- Billing automation in F2014 saw costs associated with billing dropping from
 \$21,000 in F2013 (230 customers) to \$3,000 in F2014 (300 customers). Due to
 the increase in customer projects from F2014 to F2016, billing automation costs
 have now increased to \$8,000 in F2016 (nearly 700 customers);
 - Bill processing costs associated have increased over the past three years, due to the higher levels of participation; and



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- Marketing costs related to website/collateral material like post cards have declined, however, renewed emphasis on engagement and promotion through presentations have increased seeing these costs nearly double in F2016.
- 4 New in this report is the introduction of transformer heavy-up costs that are currently
- being incurred by BC Hydro. Transformer heavy-up costs may be incurred when a
- 6 new Net Metering customer' installs a generator that fits within their existing
- electrical service, but is larger than the existing BC Hydro distribution transformer.
- 8 BC Hydro funds transformer upgrade work out of our minor capital budget. For
- example, a rural customer has a 100 Amp service that is supplied by a 10 kVA
- distribution transformer. The customer installs an 18 kW solar PV system, which
- does not require an electric service upgrade; however, a BC Hydro distribution
- transformer heavy-up is required and is funded by BC Hydro. If this same customer
- were to install a 40 kW solar PV system, they would need to upgrade their electrical
- service to 200 Amp and they would be responsible for the cost of the larger
- transformer. BC Hydro is tracking the costs associated with Net Metering-related
- transformer heavy-ups.

8 Energy Credit and Energy Price Methodology

- The "Energy Credit" and "Energy Price" under RS 1289 continue to be of interest to
- Net Metering customers. This section of the report discusses these topics.

8.1 Value of RS 1289: Avoided Cost and Load-Resource Balance (LRB)

- 22 It is important to understand the economic value and cost of the energy generated
- by Net Metering customers to BC Hydro and its non-participating customers.
- Generally speaking, the economic value of customer self-generation to BC Hydro
- 25 and non-participating customers is measured in terms of the amount of RS 1289
- energy purchased by BC Hydro that can be used to defer purchasing new energy. In
- 27 addition to the avoided energy value, customer generation may also allow BC Hydro



- to avoid or defer system costs or regional transmission, such as upgrades to
- 2 enhance the reliability of the system in a particular area.
- 3 The cost to non-participating customers increases as BC Hydro sees greater
- 4 participation in the Net Metering program. A sustained increase in the number of Net
- 5 Metering customers will contribute to a decline in base customer revenues which
- 6 could result in upward rate pressure to BC Hydro and its customers.
- 7 RS 1289 affects the load in the BC Hydro LRB to the extent that a current RS 1289
- 8 customer's generation reduces the amount of energy delivered by BC Hydro to such
- 9 customers (and the amount of energy billed at the customer meter). However, the
- impact of RS 1289 customer generation on the load forecast is very small, given the
- size of BC Hydro's system and the amount of installed RS 1289 generation
- (3.8 MW) at the end of F2016. On the supply side, BC Hydro does not include
- surplus RS 1289 electricity in its LRB given the nature of RS 1289 and the
- associated small volume of energy. For example under RS 1289, customers are not
- obligated to generate any electricity, and in F2016, the total energy surplus from Net
- Metering customers was about 1.7 GWh.
- To BC Hydro's knowledge, there are no material system costs that have been
- avoided or deferred due to RS 1289 generation.
- At this time, the installed capacity of RS 1289 generators and the volume of energy
- 20 generated by those customers is simply too small to result in any appreciable
- 21 avoided cost benefits to BC Hydro and other ratepayers, both in terms of the impact
- on BC Hydro's LRB and avoided system costs. As participation in RS 1289 expands
- and the energy volumes grow, BC Hydro will continue to monitor the value of
- 24 RS 1289 electricity to BC Hydro and non-participating customers and consider its
- impact on the LRB and other costs.
- The remainder of this section of the report discusses the Energy Credit and the
- 27 Energy Price applicable to RS 1289.



8.2 Energy Credit

- The primary purpose of RS 1289 is to allow a customer to install and interconnect
- small, clean DG to meet the customer's own electricity requirements. From an
- economic perspective, the main benefit to most Net Metering customers is avoided
- 5 electricity payments to BC Hydro.
- 6 The majority of customers under the Net Metering program are either receiving
- 7 electricity service from BC Hydro under the residential service or small general
- 8 service rate schedule in Rate Zone I. As of April 1, 2017 (F2018), the residential
- 9 service rate is 8.58 cents¹ per kWh for the first 1,350 kWh for customers billed
- bi-monthly and 12.87 cents¹ per kWh for any additional energy consumption and the
- small general service rate is currently 11.39 cents¹ per kWh.
- BC Hydro is only able to estimate the average Energy Credit benefit realized by
- residential or commercial customers because BC Hydro does not directly meter how
- much electricity the customer generates or the amount of electricity the customer
- uses. BC Hydro only meters the amount of electricity that is exported from the
- customer to BC Hydro's system, and the amount of electricity that BC Hydro delivers
- to the customer. As such, the following analysis assumes an "average" RS 1101
- (residential service) and RS 1300 (small general service) customer load. For
- simplicity, the calculations assume a flat load and generation profile throughout the
- 20 year.
- Average residential customer consumption in F2016 was approximately 10,000 kWh
- per annum or 1,660 kWh bi-monthly. Table 4 below shows a simple example of
- estimated bill amounts at different percentages of customer self-generation to load
- percentage for the Energy Charge² portion only (before any applicable taxes) for the

Rate Schedule information is based on interim F2018 rates in the BC Hydro's Fiscal 2017 to Fiscal 2019 Revenue Requirements Application.

Energy Charge is defined in RS 1289 as: Charges for Net Energy consumed by the Customer will be in accordance with the Rate Schedule under which the Customer is receiving Service from BC Hydro. The term Energy Charge and Energy Credit is used interchangeably in the context of Net Metering.



- average residential customer under RS 1101 with a bi-monthly load of 1,660 kWh.
- The table also shows the value of the Energy Charge/Credit, expressed in
- з \$ per kWh.

Table 4 Bill Example for Residential Service Customer

	Net Metering Energy Charge/Credit and Analysis RS 1101 Residential Service Customer				
Percentage of Customer Self-Generation to Load (%)	0	25	50	75	100
Customer Bi-monthly Load (kWh)	1,660	1,660	1,660	1,660	1,660
Customer Bi-monthly Self-Generation (kWh)	0	415	830	1,245	1,660
Customer Bi-monthly Load Net of Self-Generation (kWh)	1,660	1,245	830	415	0
RS 1101 Energy Charge Step 1 – first 1,350 kWh (\$0.0858/kWh)	116	107	71	36	0
RS 1101 Energy Charge Step 2 (\$0.1287/kWh)	40	0	0	0	0
Bi-Monthly RS 1101 Energy Charge Total (\$)	156	107	71	36	0
Annual RS 1101 Energy Charge Total (\$)	936	642	426	214	0
Estimated RS 1289 Energy Charge/Credit per Annum (\$) ³	0	294	510	722	936
Estimated RS 1289 Energy Charge/Credit (\$/kWh) ⁴	0	0.118	0.102	0.097	0.094

- 6 Average small general service customer consumption in F2016 was approximately
- ⁷ 22,000 kWh per annum or 3,640 kWh bi-monthly. <u>Table 5</u> below shows a simple
- 8 example of an estimated bill amount for the Energy Charge³ portion only (before any
- applicable taxes) for the average Small General Service customer under RS 1300
- with a bi-monthly load of 3,640 kWh.

Calculated as the difference between Annual RS

³ Calculated as the difference between Annual RS 1101 Energy Charge Total (\$) at 0 per cent self-generation and the Annual RS 1101 Energy Charge Total (\$) self-generated, e.g. For 25 per cent self-generation it would be \$936 - \$694 = \$294.

⁴ Unit value (\$/kWh) calculated as the Estimated RS 1289 Energy Charge/Credit per Annum (\$) divided by Customer Bi-monthly Self Generation (kWh) multiplied by six billing periods in a year, e.g. For 25 per cent self-generation it would be \$294/(415 kWh X 6 billing periods) = \$.0118/kWh.



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Table 5 Bill Example for Small General Service Customer

	Net Metering Energy Charge/Credit and Analysis RS 1300 Small General Service Customer				
Percentage of Customer Self-Generation to Load (%)	0	25	50	75	100
Customer Bi-monthly Load (kWh)	3,640	3,640	3,640	3,640	3,640
Customer Bi-monthly Self-Generation (kWh)	0	910	1,820	2,730	3,640
Customer Bi-monthly Load Net of Self-Generation (kWh)	3,640	2,730	1,820	910	0
RS 1300 Energy Charge (\$0.1139/kWh)	415	311	207	104	0
Bi-Monthly RS 1300 Energy Charge Total (\$)	415	311	207	104	0
Annual RS 1300 Energy Charge Total (\$)	2,488	1,866	1,244	622	0
Estimated RS 1289 Energy Charge/Credit per Annum (\$) ⁵	0	622	1,244	1,866	2,488
Estimated RS 1289 Energy Charge/Credit (\$/kWh) ⁶	0	0.114	0.114	0.114	0.114

- The above tables demonstrate, based on some simple assumptions, that a typical
- residential customer would enjoy an Energy Credit of between 9.4 cents per kWh to
- 5 11.8 cents per kWh, depending on the amount of energy generated and small
- 6 general service customers would receive an Energy Credit equivalent to the same
- 7 11.4 cents per kWh rate they pay for electricity.

Calculated as the difference between Annual RS 1300 Energy Charge Total (\$) at 0 per cent self-generation and the Annual RS 1300 Energy Charge Total (\$) self-generated, e.g. For 25 per cent self-generation it would be \$2488 - \$1866 = \$622.

Unit value (\$/kWh) calculated as the Estimated RS 1289 Energy Charge/Credit per Annum (\$) divided by Customer Bi-monthly Self Generation (kWh) multiplied by six billing periods in a year, e.g. For 25 per cent self-generation it would be \$622/(910kWh X 6 billing periods) = \$.0114/kWh.



8.3 Energy Price

- The Energy Price is paid to Net Metering customers when they are left with an
- excess generation credit on their anniversary date of joining the program. As stated
- in section <u>6.3</u>, in F2016, BC Hydro purchased approximately 1.7 GWh of surplus
- 5 generation from 104 Net Metering customers.
- 6 Driven by BC Hydro's commitment to the 2013 10 Year Rates Plan, our system
- 7 needs, the changing energy market and the declining cost of some technologies, we
- are currently reviewing the SOP energy price, which we anticipate will be lower than
- 9 the current price. Since this review is still underway, we have decided to maintain
- the existing RS 1289 Energy Price. BC Hydro calculated the RS 1289 Energy Price
- of 9.99 cents per kWh⁷ in accordance with B.C. Government policy and the
- overarching principle of rate simplicity. Specifically, Policy Action No. 11 of the 2007
- BC Energy Plan provides that Net Metering prices should be "generally consistent"
- with SOP prices. The Energy Price is the same for all Net Metering customers this
- is consistent with the government's policy of "postage stamp" rates. Depending on
- the outcome of the SOP pricing review, BC Hydro may want to align RS 1289
- 17 Energy Price accordingly.

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Consistent with the 2011 SOP Report, BC Hydro used the SOP starting price of \$117.76 per MWh (2009\$). No deductions or additions were made for losses, network upgrades, or the cost of incremental firm transmission. BC Hydro used the non-firm energy price of \$48.84 per MWh (2009\$) and applied the SOP assumption that energy is 70 per cent firm and 30 per cent non-firm. All amounts were adjusted for inflation to 2011\$. The price of 9.99¢/ kWh was calculated as follows: (0.7)*(\$117.76) + (0.3)*(\$48.84), adjusted to 2011\$.



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9 Current Trends and Benchmarking Analysis

- A review of the current market shows that net metering is prevalent in North America
- 3 (Please refer to Appendix C for a list of net metering programs in North America).
- The growth in BC Hydro's Net Metering program as shown in Figure 1 mirrors the
- steep decline in the cost of solar PV equipment that has occurred since 2009.
- 6 BC Hydro continues to stay informed of net metering developments and issues in
- 7 North America through periodic jurisdictional reviews, attendance at conferences,
- and more broadly by participating in North American webinars. In particular
- 9 BC Hydro has observed the following trends: leasing of DG systems, the recovery of
- fixed utility infrastructure costs, increasing system constraints, Non-Integrated Areas
- (NIA), Virtual Net Metering (VNM), unauthorized connections, and Net Metering
- anniversary dates to optimize payback to the customer. These are each discussed in
- the following sections.

14 9.1 Current Trends

9.1.1 Leasing Solar Equipment

- While interest continues to grow in Net Metering, the upfront costs associated with
- the purchase of solar PV or wind equipment remains high for the majority of
- customers. In addition to direct ownership, leasing solar equipment may become a
- desirable option which allows customers to equalize the capital costs over the
- 20 lifetime of the equipment used to generate electricity.
- 21 Initiated by Vancouver Renewable Energy Cooperative (VREC), the Commission
- supported BC Hydro's Application to Amend RS 1289 and issued Order
- No. G-116-15 on July 9, 2015 to allow Net Metering customers to partner with
- leasing companies like VREC. This arrangement reduces the barriers to enter into
- the Net Metering program enabling customers to take economically efficient steps to
- build generation capacity. As a result, we expected to see an increase in
- participation by customers in our Net Metering program. However, at this time, we



- have only one customer who is taking advantage of leasing and we understand that
- one more project is in the planning stages.
- 3 As shown in the table in Appendix D, in addition to B.C., only Alberta and Nova
- 4 Scotia currently allow leasing in their net metering program and Ontario is
- 5 undertaking a review of this policy.

9.1.2 Recovery of Fixed Infrastructure Costs

- As solar generation becomes more accessible, BC Hydro expects to see greater
- participation in the Net Metering program. A sustained increase in the number of Net
- 9 Metering customers will eventually contribute to a decline in base customer
- revenues which could result in upward rate pressure. At some point, this may
- become a significant issue for BC Hydro, as these partially self-sufficient customers
- still require energy from BC Hydro on demand. Yet, under our current rate structure,
- they would not pay their proportionate share of the utility's infrastructure cost as
- BC Hydro recovers the majority of its fixed demand related costs through the
- variable energy rate. This means the majority of our infrastructure costs and
- upgrades may be borne by a declining number of non-participating customers.
- This is evidenced in numerous other jurisdictions, such as California, Nevada,
- Arizona, and Hawaii. For example, in December 2015, the Nevada Public Utilities
- 19 Commission found that high growth rates in net metering has shifted the cost of
- 20 rooftop solar to non-participating customers. The Nevada Public Utilities
- 21 Commission added a small energy charge and created a separate customer class
- for residential rooftop solar producers because their impact on the system is different
- from that of other residential customers. Other utilities are considering imposing
- similar charges, e.g., fixed charges, demand charges, grid access charges, installed
- capacity fees or standby fees as well.
- Although not concerned yet, as the participation in the Net Metering program
- increases we may need to review the recovery of fixed infrastructure costs from



- BC Hydro's Net Metering customers and apply appropriate charges to these
- 2 customers as necessary.⁸

9.1.3 System Constraints

- 4 Certain areas of the BC Hydro electrical grid are becoming constrained due to the
- number and size of generators that are injecting energy back into our grid. BC Hydro
- 6 has had to signal to Independent Power Producers (IPPs) and potential Net
- 7 Metering customers that we need to carefully manage the number and size of the
- 8 generation being installed in some areas on our grid. At this time, the majority of
- 9 these constraints are caused by larger IPPs that inject power into the distribution
- grid and are not the result of a high penetration of Net Metering customers.
- If more generation is added at these locations, even small Net Metering projects
- could require the replacement of substation transformers. BC Hydro is currently
- reviewing individual Net Metering applications on a case by case basis at certain
- substations and is contemplating either rejecting applications, or in some cases,
- limiting project sizes to reduce power injection into the grid to avoid overloading
- equipment. This review involves undertaking a thorough technical assessment of all
- generation applications, including Net Metering applications received for projects
- located in a constrained area and determining an available generation capacity for
- the area. While all Net Metering project applications require acceptance from
- 20 BC Hydro to proceed, BC Hydro may decide to amend the language in RS 1289 to
- more clearly state that BC Hydro has the ability to reject a project application of any
- size or complexity if it triggers substantial costs not recoverable by RS 1289 or
- creates safety and/or risk to BC Hydro's system.
- As the number of Net Metering customers increases along with the amount of DG
- installed under other power procurement offers, we expect to see a greater number
- of locations in the system that will reach the capacity limit, as described in the

As March 31, 2017, BC Hydro has approximately 920 Net Metering customers. This is a growth rate of 44 per cent since March 31, 2016.



- previous paragraph. Adding more generation at these locations will require capital
- 2 upgrades such as new distribution feeders, upgrading substation equipment, or even
- building new substation or transmission facilities. The cost of these upgrades must
- either be borne by BC Hydro ratepayers or the customer who is adding the
- 5 generation. Where feeder generation capacity is already restricted, customers may
- be unable to connect generation at their chosen location. Going forward, it may be
- 7 useful to identify generation capacity restrictions at the feeder level, to provide an
- early signal to customers so that they do not develop projects that are not
- economically feasible to interconnect and to prevent BC Hydro from being pressured
- by Net Metering customers in areas that require costly upgrades to complete those
- upgrades at the cost of other ratepayer.
- According to BC Hydro's benchmarking review, nearly all other Canadian utilities
- include some type of feeder generation capacity limit in their net metering programs
- to manage the amount of generation connected to each feeder to prevent equipment
- from being overloaded, to maintain power quality, ensure correct operation of
- system devices, and to eliminate capital upgrades.
- For example in Ontario, capacity limits are usually managed by the Local Distribution
- 18 Company and are set to a percentage of the existing load on a feeder. Also,
- because Ontario has a net metering program that does not pay for excess
- 20 generation, customers tend to limit the size of their system to their annual electrical
- 21 consumption.
- Based on our benchmarking analysis, BC Hydro is the only utility that pays almost
- the entire cost to connect generators to our system (we pay all costs associated with
- connection to our system except for customers who utilize a synchronous generator,
- take service at a primary potential, or have projects over 50 kW). All other Canadian
- utilities require the customer to pay the full costs to connect, with the exception of
- Alberta, which in some circumstances gives the utility the ability to be reimbursed if



- the costs are considered to be extraordinary. This is an area we will continue to
- 2 monitor.

9.1.4 Non-Integrated Areas

- 4 BC Hydro performs a thorough technical review of all Net Metering applications
- received for projects located in our NIA. Since the NIA systems are balancing a
- small regional load against a variety of generation resources (including diesel,
- 7 existing or proposed IPP renewable generation and new intermittent renewable
- 8 energy via Net Metering), it requires a comprehensive and more detailed review of
- each individual Net Metering application to ensure that BC Hydro continues to
- provide reliable and cost-effective electricity to its NIA customers. To manage
- expectations in these constrained areas, BC Hydro has recommended that NIA
- customers not purchase their generating equipment until their Net Metering
- application is accepted by BC Hydro as we may be required to reject applications.

14 9.1.5 Virtual Net Metering

- VNM refers to a system that allows bill crediting across multiple customers for a
- shared net metering project. Essentially VNM allocates credits to each subscriber's
- electric bill for excess energy produced by their share of the net metering project.
- 18 Currently the following jurisdictions that have policies and/or incentives that allow
- VNM in North America are: Nova Scotia, California, Colorado, Connecticut,
- Delaware, Hawaii, Maine, Maryland, Massachusetts, Minnesota, New Hampshire,
- New York, Vermont, Washington State, Washington D.C. Some of the
- implications/issues for BC Hydro with VNM is that our current billing process
- requires a bill to be associated with a single customer premise; the notion of sharing
- the credits of a project installation would require us to dramatically overhaul our
- billing process to allow VNM. While we have received several requests to support
- this type of program, we have responded to these requests by suggesting that one
- customer "own" the net metering installation and perform the administrative task of
- sharing any energy offsets between the participating customers.



- BC Hydro views VNM as a growing trend that is starting to gain popularity with
- community groups, in particular island and coastal communities who see the merits
- of a cooperative type of solar installation, we will also continue to monitor this trend.

4 9.1.6 Unauthorized Generator Connections

- 5 Some BC Hydro customers have installed generation at their residences or
- businesses without BC Hydro's knowledge or approval. This unauthorized
- 7 generation may pose a safety hazard to BC Hydro employees and other customers,
- and can negatively impact power quality and reliability. In one case a solar PV
- 9 system was installed with inverters that were not approved for use in Canada, which
- could have resulted in a serious safety issue. To address this issue, BC Hydro may
- consider revising the language in the Electric Tariff to clarify that customers must
- seek and receive approval to connect generation under RS 1289 or have a signed
- interconnection agreement. Our Distributed Generation Interconnection Practices
- graphic in Appendix B, under the Other Program Type category, outlines the process
- to be followed by customer generation projects that do not fit into the suite of DG
- offers.

9.1.7 Net Metering Price

- The SOP is currently undergoing a third party review that includes a review of
- existing pricing and program terms. It is anticipated that given technological
- 20 advancements (in particular with wind and solar PV) and our changing system
- needs, prices will be reduced under the SOP. Any changes to the pricing structure
- under the SOP will need to be reviewed against the pricing structure in the Net
- 23 Metering tariff to ensure it is aligned. The SOP review is expected to be completed
- ₂₄ by fall 2017.



9.1.8 Anniversary Date

- 2 Typically, BC Hydro sets the customer's anniversary date based on the connection
- date of their generating system. At that time, we also establish a generation account
- for each customer. If net energy is negative for that billing period, BC Hydro will
- 5 credit the net energy amount to the customer's generation account. If net energy is
- 6 positive, any credit balance in the customer's generation account will be applied to
- the positive net energy amount for that billing period until the net energy amount is
- 8 reduced to zero. This practice is repeated, so that after six billing periods (if
- 9 customer is billed bi-monthly) or at the end of the 12th billing period (if customer is
- billed monthly), the account is reconciled as prescribed by RS 1289. If any credit
- balance remains in the generation account following the anniversary date, BC Hydro
- will pay the customer for that electricity at 9.99 cents per kWh.
- 13 Customers with an anniversary date in summer months and as late as early Fall,
- face a payout of their generation credits as the summer months are when the
- majority of the credits are earned. This doesn't allow them to apply these credits to
- the months with higher consumption (fall/winter) and effectively prevents them from
- applying the generation credits against the higher Step 2 rate. What we are hearing
- is that customer's value the ability to offset their load (particularly during high
- consumption months) as opposed to receiving a payout at 9.99 cents per kWh. In
- the past year, BC Hydro has received eight requests to change the net metering
- 21 anniversary date to a date that optimizes the customer's load offset. BC Hydro has
- 22 also received suggestions to allow Net Metering customers to pick their anniversary
- dates rather than make them dependent on their connection date.
- ²⁴ Currently, approximately 10 to 15 per cent of customers are affected by a
- summer/early fall anniversary date. As the program continues to grow, we will
- 26 continue to monitor this issue and explore possible options to address.



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9.2 Benchmarking Analysis

- In this report, we limited the number of jurisdictions to include in our benchmarking
- analysis to only Canadian utilities located in British Columbia, Ontario,
- Saskatchewan, Manitoba, Alberta, Quebec, and Nova Scotia as these programs are
- 5 more comparable to BC Hydro's situation and face similar challenges. Furthermore,
- 6 net metering programs in the United States are generally not comparable to
- 7 Canadian programs as they are larger in terms of participation rate often because
- 8 they are subsidized at both the state and federal level.
- 9 Our current benchmarking analysis looked at topics that were particularly relevant to
- the feedback we received through the survey, webinars and presentations, and in
- the day-to-day requests. The key findings of our analysis have been incorporated
- into the emerging trends sections above and have been summarized in Appendix D.

10 Survey Results Summary

- In February 2017, BC Hydro sent an invitation to nearly 1,800 stakeholders to
- participate in a survey. A copy of the survey is included in Appendix A. We received
- a total of 232 responses, 162 of which were from customers and 40 were from
- installers, and 30 were from other stakeholders.
- The key areas we sought feedback on were barriers, overall satisfaction with the
- program, and concerns/improvements for the program. The section below
- 20 summarizes what we heard.

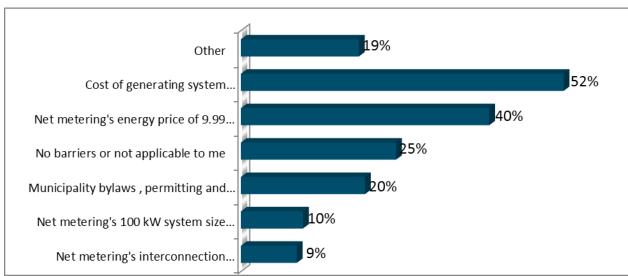
10.1 Survey Feedback

- We asked the survey participants to identify any barriers to their ability to connect an
- electricity generator to our distribution system and receive compensation for their
- 24 generation. Figure 3 shows that 52 per cent of respondents viewed the cost of
- 25 generating systems as the biggest barrier, followed by 40 per cent of respondents
- who viewed that the Energy Price paid by BC Hydro is the biggest barrier as they



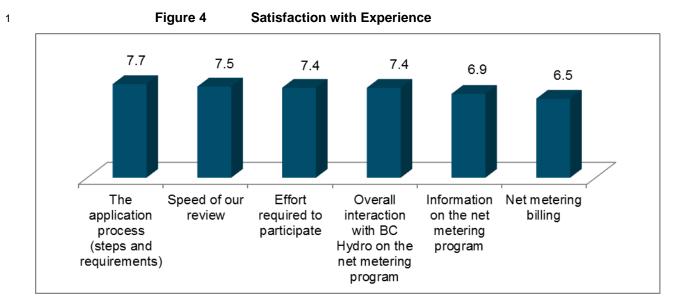
- considered it too low. Twenty-five per cent of respondents felt that there were no
- 2 barriers to their participation in the Net Metering program.
- Additionally, only 10 per cent of the respondents commented on the 100 kW system
- 4 size as a barrier.

5 Figure 3 Barriers

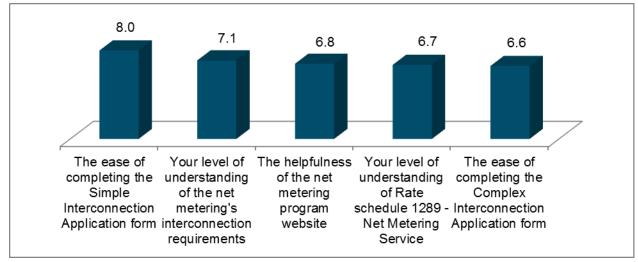


- The survey also asked respondents about their experience with the process and the
- ⁷ level of information/material available to explain Net Metering. On a scale of 1 to 10
- 8 (with 10 being the highest), Figure 4 and Figure 5 illustrate that satisfaction rates are
- 9 high among customers and installers.









- The final section was an open-ended question and asked respondents what
- 4 improvements to the Net Metering program they would like to see. Three main
- themes were identified: a) Energy Price is not high enough (32 per cent), b) lack of
- incentives (22 per cent) and, c) more promotion/education needed (18 per cent).
- 7 It is interesting to note that only a small percentage of respondents commented on
- anniversary date, VNM, and project size (i.e., the trends described in section 9).



- Based on the survey results BC Hydro considers that the Net Metering program in its
- 2 current state is meeting the needs of the majority of customers and stakeholders
- 3 participating in this area of DG development.

4 11 Distributed Generation Update

- 5 The approved 2013 Integrated Resource Plan included a Clean Energy Strategy that
- 6 directed BC Hydro to broaden opportunities through standing offers for clean energy
- and promoting clean energy opportunities for First Nations. Based on this direction
- and on feedback we received from First Nations and communities during the Net
- 9 Metering engagement and the 2014 SOP Review, we developed the Micro-SOP
- specifically for First Nations and Communities for projects between 100 kW and
- 1 1 MW, complementing the existing DG programs.
- Launched in March 2016, the Micro-SOP is a simpler more streamlined process
- within the SOP. The offer aims to reduce costs to the developer and provide greater
- certainty around interconnection study costs and associated upgrade costs.
- As of March 31, 2017, there were three accepted Micro-SOP applications; including
- a 300 kW biogas project, a 1 MW hydro project, and a 1 MW solar PV project. We
- continue to meet with First Nations, communities and groups who are interested in
- developing potential Micro-SOP projects.
- As participation in the program is still ramping up, currently it is not possible to
- 20 provide an analysis of the results of the program. BC Hydro does not expect to make
- any further changes to the Micro-SOP with exception of any changes that may result
- 22 from the SOP pricing review.
- The table below compares some of the key features of the three programs currently
- included in BC Hydro's integrated DG approach.



Program	Net Metering	SOP	Micro-SOP	
Launched 2004		2008	2016	
Project Size	Up to 100 kW	100 kW to 15 MW	100 kW to 1 MW	
customers produ		Open to clean energy producers and BC Hydro customers (net of load)	Open to First Nations and community projects*, including BC Hydro customers	
Eligible meter	Smart Meter	IPP Meter	Smart Meter or IPP meter	
Energy Price	Load displacement plus Net Metering Energy Price paid for annual excess	Single price energy price varies at time of delivery	Single energy price for all energy	

* As defined in the Micro-SOP Rules.

- 2 This integrated DG approach is intended to offer a program or process for different
- developers. Increasing the Net Metering project threshold size to 100 kW and new
- 4 Micro-SOP program remove barriers for residential, municipal, and First Nations
- 5 communities who have faced challenges under BC Hydro's existing processes. It will
- 6 help customers and small developers reduce their bills, enhance their
- ⁷ self-sufficiency, and provide greater control over their energy use.
- 8 Questions we have received include how the DG programs interact with one
- another, how the requirements for each program are different, and how the costs
- associated with studies and interconnections apply to the various offers.
- In response to these questions and to the Commission's request for greater clarity
- on how these programs fit together, BC Hydro developed the graphic "BC Hydro"
- Distributed Generation Interconnection Practices" which has been updated and
- posted on our website, and can be found in Appendix B of this report.
- BC Hydro believes that by removing barriers and streamlining the interconnection
- processes, coupled with the decreasing cost of DG technologies, BC Hydro will see
- a modest growth in the Net Metering program participation rate and an increased
- interest in small-scale DG projects.



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12 Program Developments and Future Considerations

2 12.1 Net Metering Program Developments

- The following are key developments with the Net Metering program:
- On July 25, 2014, the Net Metering program received approval to expand its project size from 50 kW up to 100 kW. As of March 31, 2016, we had one project in-service that fell within the 51 to 100 kW range,⁹ with a few more applications under review. However, the number of applicants has been less than what was anticipated as compared to the level of interest in the Net Metering filing in 2014.
- On July 9, 2015, BC Hydro amended RS 1289 to allow Net Metering customers to lease solar and wind equipment. As a result of the amendment, we anticipated an increase in the number Net Metering applications where customers lease equipment, however at this time, we have only one such project in-service.
- Currently, under RS 1289, BC Hydro is able to recover any incremental costs for larger and complex (51 kW to 100 kW, synchronous generators and/or primary service) Net Metering projects. Although all project applications require acceptance from BC Hydro to participate in the Net Metering program, the wording in RS 1289 could more clearly state that BC Hydro has the ability to reasonably reject any application if the project is expected to trigger substantial costs not recoverable by RS 1289 or creates safety and/or risk to BC Hydro.
 - Unauthorized generation is a serious issue for BC Hydro as it may pose a safety hazard to BC Hydro employees and other customers and may impact power quality and reliability. BC Hydro may revise the language in the Electric Tariff text to clarify that customers need to have approval to connect generation under RS 1289 or have a signed interconnection agreement with BC Hydro.

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⁹ As at March 31, 2017 we had four projects in-service that fall within the 51 to 100 kW range.



- BC Hydro is working to develop a process to identify and remove unauthorized generation.
- With the deployment of smart meters, in the last two years, BC Hydro has a
 small number of customers with a Legacy Meter wanting to participate in Net
 Metering. While RS 1289 requires a bi-directional meter, we have had
 customers challenge this requirement claiming that Legacy Meters are also
 bi-directional. The wording in the RS 1289 metering section could be improved
 to clarify that only bi-directional Smart Meters are required. This would eliminate
 any confusion that may arise regarding Legacy Meters.

12.2 Future Considerations

- BC Hydro offers the following future next steps and considerations to improve the
 existing Net Metering program in either the next Rate Design Application review
 expected in F2018 and/or in a separate Net Metering filing in the future as required:
- 1. Leasing while this is still a new opportunity in BC, it is too early to determine if
 15 it will contribute to a significant growth in Net Metering customers. BC Hydro will
 16 continue to monitor the Net Metering participation rates.
- 2. Recovery of Fixed Infrastructure costs we will continue to monitor the growth rate of Net Metering participation and the costs being paid by Net Metering customers to determine whether changes to the RS 1289 are needed for the recovery of fixed infrastructure costs from BC Hydro's Net Metering customers.
- 3. System constraints BC Hydro will consider modifying tariff RS 1289 in the future to clarify our ability to reject projects that trigger significant costs to BC Hydro or could be a safety or risk to BC Hydro's operating systems.
- Non-Integrated Areas we have already adopted a practice identifying those
 areas that are constrained and recommending that customers not purchase any
 generation equipment before their Net Metering application is accepted by



- BC Hydro. We will consider modifying RS 1289 in the future to clarify
 BC Hydro's ability to reject applications in the NIA.
- 5. Virtual Net Metering given that this is a relatively new trend, and we've only received a few inquiries, BC Hydro will continue to monitor the level of interest and policy development in other jurisdictions.
- 6. Unauthorized connections consider modifying the Electric Tariff to clarify the treatment of unauthorized generator connections by stating that customers need to have approval to connect generation under RS 1289 or have a signed interconnection agreement with BC Hydro.
- 7. Net Metering Energy Price based on the results of the SOP pricing review, the Net Metering Energy Price will be reviewed to ensure alignment with changing technological advancements and our changing system needs.
- 8. Anniversary date given the low interest at this time, we will monitor this issue and explore possible options to address.
- 9. Smart Meter consider modifying RS 1289, eligibility and metering section in the future to clarify that the Net Metering program is available only to customers with acceptable installed smart metering equipment.

13 Conclusion

- As outlined in this report, BC Hydro's Net Metering customers and stakeholders
- 20 have indicated that they are satisfied with the program and it meets their needs.
- 21 BC Hydro has identified several potential future actions and considerations to
- improve the program and address emerging trends but we are not currently
- considering any immediate changes to the Net Metering program and rate.
- 24 BC Hydro, however, plans to continue to monitor the program and will assess any
- future changes to the program and rate through the next Rate Design Application
- review expected in F2018, and/or in a separate RS 1289 filing in the future as
- 27 required.



Rate Schedule (RS) 1289 for Net Metering Service Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

Appendix A

Net Metering Survey



YOUR POWER POLL



YOUR PROGRESS

As a part of our efforts to monitor our progress and improve on the net metering program as a regulated rate, rate schedule 1289 – Net Metering Service, BC Hydro will be preparing the next Net Metering Evaluation Report for submission to the BC Utilities Commission (BCUC) by April 30, 2017

So we'd like to ask for your feedback through this survey to help us understand your experience with the net metering program and identify areas for improvements. Your responses will also be summarized and included in the evaluation report to the BCUC and will not be identifiable to you.

This survey should take you 10-20 minutes to complete, depending on how much you want to share. Thanks for taking the time to help influence and shape the net metering program.

The net metering program is BC Hydro's fastest growing customer generation program with over 900 customers generating their power and 200 more on the way. We are proud of the net metering program and of our customers who demonstrate leadership by installing clean or renewable energy resources at their homes or businesses to offset their electricity use.

BC Hydro is collecting your opinion for the purposes of understanding your experience with the net metering program and identifying areas for improvements, and to fulfill its mandate under the Hydro and Power Authority Act and the Utilities Commission Act. If you have any questions regarding the information collected in this survey, please contact Marc Beauchemin, Net Metering Program Administrator, at 604-623-4096 or at net-metering@bchydro.com.

Next



WI	ho you are
1.	We need to know a little on who you are so we can better understand your responses. Select all that apply. I'm: a net metering applicant (I have applied but I'm not on the net metering billing yet) a net metering customer (my system is operating and I'm on the net metering billing) an installer/contractor for net metering customers other, please specify
2.	What motivations are there to become a net metering customer?
Υo	ur barriers
3.	We'd like to know of any barriers to your ability to connect an electricity generator to our distribution system and to receive compensation for your generation. Please select from the list below. Cost of generating system (equipment and installation) Municipality bylaws , permitting and costs Net metering's 100 kW system size limit Net metering's interconnection requirements Net metering's energy price of 9.99 cents per kWh No barriers or not applicable to me Other, please specify
Υo	ur experience
4.	Using a scale from 1 to 10 where 1 is not at all satisfied and 10 is very satisfied, how would you rate your satisfaction with the following aspects of net metering? Information on the net metering program The application process (steps and requirements) Speed of our review Effort required to participate Net metering billing Overall interaction with BC Hydro on the net metering program Use the space below if you'd like to explain any of your ratings in more details



O Hospitals

Our Information

- 5. Using a scale from 1 to 10 where 1 is not at all satisfied and 10 is very satisfied, how would you rate your satisfaction with the following...
 - Your level of understanding of Rate schedule 1289 Net Metering Service
 - The ease of completing the Simple Interconnection Application form
 - The ease of completing the Complex Interconnection Application form
 - Your level of understanding of the net metering's interconnection requirements
 - The helpfulness of the net metering program website

Use the space below if you'd like to explain any of your ratings in more details 6. What information are you interested in reading on our website? Please select all that apply. ☐ Net metering program changes and updates ☐ Success stories ☐ Statistics e.g., number of participants, generator type and size, location ☐ Upcoming net metering program filings with the BCUC ☐ Other, please specify **Moving Forward** 7. What are the aspects of the net metering program that you like? 8. What improvements to the net metering program would you like to see? 9. What type of customer are you? Please select one response only. O Residential O Commercial Municipal government O First Nation or community group O Schools



Rate Schedule (RS) 1289 for Net Metering Service Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

Appendix B

BC Hydro Distributed Generation
Interconnection Practices





BC Hydro Distributed Generation Interconnection Practices (distribution-connected projects only**)

		Interconnections						
	Program Type	Size	Required Studies	Study Costs	Agreements	Customer Upgrades	Interconnection and System Upgrades	
	Net Metering (RS 1289) open to BC Hydro customers load displacement plus NM energy price paid for annual excess tariffed process (Rate Schedule 1289)	0 kW to 50 kW	Simple Net Metering: None Required 1 Complex Net Metering: Technical screen	907	Onema and conditions upgrade the	Customers are required to upgrade their service at their	System upgrades are paid by BC Hydro	
. 5		Over 50 kW to 100 kW	Technical screen ⁸	Incremental costs ⁴		cost.	System upgrades are paid by the Customer ^b	
Programs -	Micro-SOP		Basic Distribution Information Request.	First two requests per year - free. Additional requests - \$200		Customers are required to upgrade their service/build their interconnection facilities at their cost.	Customers will provide a deposit of \$7,500 with their Distribution Micro-Generator Project Design Application, which will be refunded when we receive the security.	
Gen	for First Nations and community projects		Screening Study	\$5,000 flet fee				
BC Hydro Offered Pr Clean or Renewable (single energy price for all energy simplified Electricity Purchase Agreement	Over 100 kW to 1 MW	If the project passes the screens in the Screening Study, then the project proceeds to the next stept the Distribution micro-generator project design stage application form. If the project fails the screens in the Screening Study, then the project proceeds through the standard generator interconnection process. ⁶	\$7,500 deposit Deposit is refunded when Letter of Credit (LOC) is received for the network upgredes			(Letter of Credit) for the estimated network upgrade costs Customers provide security (Letter of Credit) in the amount of the estimated network upgrades costs. 8 (CH covers 5150,000 per MW of Installed capacity. Reduction of security is governed by the applicable Interconnection Agreement. See also Interconnection	
	SOP open to clean energy producers and BC Hydro customers (net of load) energy price varies at time of delivery Electricity Purchase Agreement		Basic Distribution Information Request	First two requests per year free. Additional requests - \$200	Standard Interconnection Agreement	Security Methodology posted at https://www.bchydro.com/accounts-billing/new-		
		dro customers (net Over 1 MW to 15 MW	Screening Study (optional)	\$5,000 flat fee			electrical-connections/generator-interconnections.html Network upgrades costs and construction schedules are project-specific. Estimates of costs and schedules will be provided in the design stage during the interconnection process.	
			System Impact Study	\$20,000 - \$80,000°				
			Fecilities Study	\$40,000 - \$175,000*				
	Other Customer Generation Projects for projects that do not fit into programs above open to research, pilot/educational projects, projects generating intermittent energy as a result of existing industrial process no payment for energy	Up to 100 kW	Technical Screen	Same as Net Metering Incremental costs ⁴	Simplified Customers are required to interconnection supgrade their service at their Agreement cost.	Customers provide advanced payment in the amount of the estimated network upgrades costs. Final costs are		
		Over 100 kW to 1 MW	Same as Micro-SOP	Same as Micro-SOP	Simplified Interconnection Agreement	Customers are required to upgrade their service/build project specific. Estimates of co project specific. Estimates of co provided in study reports during process.	 based on actuals. Network upgrades costs and construction schedules are project-specific. Estimates of costs and schedules will be 	
		Over 1 MW to 15 MW	Same as SOP	Same as SOP	Standard Interconnection Agreement		provided in study reports during the interconnection process.	

- This table is intended as an overview of current practices only. Project-specific requirements may vary.
- 1 Sasic technical screen no detailed studies. For areas of high penetration, SC Hydro may reject project.
- 2 For synchronous generation and customen connected at a primary potential and customen with generating facilities with a nameplate rating greater than 50 kW, customen are responsible for incremental costs.
- 3 Technical Screen scope for DG >50 kW includes a review of power flows and DC liydro equipment retings, a comparison of generator size to minimum feeder section load, a check of total generator on the feeder, and a short circuit study and protection review.
- 4 Typical range of interconnection review costs for Net Metering applications up to 50 kW, other than at primary potential or with synchronous generators

Frijed Type Technical Techni

- 5 Costs are dependent on location, generator site, feeder swillable capacity, condition/limitations of the substation. Note: There are no pioneer rights.
- 6 Projects that fall any of the screens will be required to complete the System impact Study and/or Facilities Study.
- 7 Costs may be less or greater depending on project specifics.

BC Hydro Distributed Generation Interconnection Practices

Version 1.01 - August 2016

Link to document:

https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/independent-power-producers-calls-for-power/standing-offer/distribution-interconnection-practices-august-2016.pdf.



Rate Schedule (RS) 1289 for Net Metering Service Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

Appendix C

Net Metering In North America



Table C-1 Net Metering Programs (Canada)

Implementing Sector	Province
Alberta Energy	Alberta
BC Hydro	British Columbia
Fortis BC	British Columbia
Manitoba Hydro	Manitoba
NB Power	New Brunswick
Newfoundland and Labrador Hydro (Under Development)	Newfoundland and Labrador
Northwest Territories Power Corporation	Northwest Territories
Nova Scotia Power	Nova Scotia
Hydro One	Ontario
Alectra Utilities (Powerstream)	Ontario
Toronto Hydro	Ontario
Waterloo North (Under Development)	Ontario
Maritime Electric	Prince Edward Island
Hydro Quebec	Quebec
SaskPower	Saskatchewan
Yukon Energy Corporation (Under Development)	Yukon Territories

Table C-2 Net Metering Programs (U.S.)

Implementing Sector	State/Territory
State	AK
State	AR
State	AS
Salt River Project	AZ
State	AZ
Los Angeles Department of Water and Power	CA
State	CA
State	СО
State	СТ
State	DC
State	DE
State	FL
State	GA
State	GU
State	HI



Implementing Sector	State/Territory
State	IA
Idaho Power	ID
Rocky Mountain Power	ID
Avista Utilities	ID
State	IL
State	IN
State	KS
State	KY
State	LA
City of New Orleans	LA
State	MA
State	MD
State	ME
State	MI
State	MN
State	MO
State	MP
State	MS
Montana Electric Cooperatives	MT
State	MT
Blue Ridge EMC	NC
State	NC
State	ND
State	NE
State	NH
State	NJ
Farmington Electric Utility System	NM
State	NM
Valley Electric Association	NV
State	NV
PSEG Long Island	NY
State	NY
State	ОН
State	ОК
Ashland Electric	OR
EWEB	OR



State OR State PA State PR State PW State RI State SC Austin Energy TX Green Mountain Energy Renewable Rewards Program TX City of Brenham TX El Paso Electric TX San Antonio City Public Service (CPS Energy) TX City of St. George UT Murray City Power UT Washington City Power UT State VA City of Danville VA State VI Grays Harbor PUD WA State WA State WA	Implementing Sector	State/Territory	
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Washington City Power UT State UT State VA City of Danville VA State VI State VT Grays Harbor PUD WA State WA State WA State WI	City of St. George	UT	
State UT State VA City of Danville VA State VI State VT Grays Harbor PUD WA State WA State WA State WI	Murray City Power	UT	
State VA City of Danville VA State VI State VT Grays Harbor PUD WA State WA State WI	Washington City Power	UT	
City of Danville VA State VI State VT Grays Harbor PUD WA State WA State WI	State	UT	
State VI State VT Grays Harbor PUD WA State WA State WI	State	VA	
State VT Grays Harbor PUD WA State WA State WI	City of Danville	VA	
Grays Harbor PUD WA State WA State WI	State	VI	
State WA State WI	State	VT	
State WI	Grays Harbor PUD	WA	
	State	WA	
	State	WI	
State WV	State	WV	
State WY	State	WY	



Rate Schedule (RS) 1289 for Net Metering Service Compliance with Commission Order No. G-104-14 Directive 6

Net Metering Evaluation Report No. 4

Appendix D

Benchmarking Analysis



Table D-1 Benchmarking Analysis – March 2017

Topic	Question	Jurisdictional Review
Project size	What is the maximum size allowable under each Net Metering program?	BC: FortisBC – 50kW, BC Hydro - 100 kW AB: 150 kW SK: 100 kW MB: 200 kW ON: 500 kW (currently under review) QC: Generating capacity must not exceed the estimated capacity required to meet all or part of the customer's power needs, or 50 kW (whichever is less) NS: 100 kW (was previously 1,000 kW)
Leasing	Which jurisdictions allow leasing of equipment?	BC: Yes AB: Yes SK: No MB: Information not available ON: No (currently under review) QC: No NS: Yes
System constraints	What are the system capacity constraints in each Jurisdiction?	BC: BC Hydro is looking to modify RS 1289 to be able to reject applications in constrained areas (including NIAs) AB: Service size and transformer SK: Service size and transformer MB: Systems that are funded are limited by the consumption, and service size and transformer ON: Constraints are per LDC, typically 15 per cent of daily load. QC: For a single-phase meter - 20 kWh, for a three-phase meter - 50 kWh, for Self-Generation without compensation, more than 50 kW is possible. NS: The system must be sized to not exceed the annual energy consumption of the property.



Topic	Question	Jurisdictional Review
Cost Recovery to connect customer	Who is responsible for paying for costs to connect and under what conditions?	BC: BC Hydro covers the cost to connect. AB: The owner of the electric distribution system is responsible for the costs of connection to the system. If, in the opinion of the owner of the electric distribution system, the costs of connecting a particular micro-generation generating unit are extraordinary, it may require that the customer to directly reimburse it for the extraordinary portion of the costs. SK: The Generator owner is responsible for the total cost of the interconnection facilities required to integrate the generator facilities into the SaskPower distribution system. MB: The Generator Owner is obligated to pay for the actual cost of constructing all of the facilities as well as any other costs associated with accommodating the interconnection ON: A distributor may bill a customer for incremental metering and other costs incurred in order to connect the eligible generator's generation facilities to its distribution system in accordance with the Board's Distribution System Code QC: Hydro-Quebec is responsible for the cost of connection. NS: The customer is responsible for all costs incurred by Nova Scotia Power to deliver the net metering service that are beyond standard connection costs to regular customers.
VNM	Which jurisdictions have VNM?	BC: No AB: No SK: No MB: No ON: No (currently under review) QC: No NS: Yes (The Nova Scotia Department of Energy will be piloting a community solar program shortly)