BC Hydro F2020-F2021 Revenue Requirement Application (RRA) David Ince (INCE) – Final Argument

May 4, 2020

Opening

As an individual intervenor, I appreciate the opportunity to participate in this important proceeding. My motivation is the realization of reliable low-cost electricity service. Despite the inherently adversarial nature of this process, and the challenges related to the length and complexity of the proceedings, my impression is that all parties involved conducted themselves with cooperative professionalism.

More than any time in its history, BC Hydro is providing an essential service. During this health and economic crisis, BC Hydro is encouraged to provide reliable low-cost power to its customers, while maintaining the safety of its workers, contractors and members of the public.

The current environment is challenging and dynamic, and BC Hydro, the government and the BCUC may have to flexibly initiate and adopt new measures, based on advice provided by health authorities.

My best wishes to the employees, contractors and legal counsel of BC Hydro during this difficult time. And to the Commission Panel, the staff and consultants, and to Allwest.

My submission is set out under the following major headings:

1. The Challenges of the Current Environment
2. Position with respect to the Peace Region Electric Supply project, the Minette Station to LNG Canada Interconnection project and investment in electric vehicle charging infrastructure
3. The Impact of Policy on the Costs Incurred by BC Hydro
4. Capital Planning Process: The Asset investment planning project
5. Load Forecast and Elasticity
6. Need for coordination on load forecasting and additional development of the Clean BC Plan
7. DSM and Energy Conservation
8. Miscellaneous

Subject to any other concerns identified by the Commission or other interveners, this intervenor submits that general, BC Hydro has taken reasonable and required to manage costs, maintain reliability and safety, and to set appropriate priorities during the Test Period.

This intervenor looks forward to the opportunity to participate in a Commission proceeding to review the BC Hydro Integrated Resource Plan. As the proud grandparent of a girl (Helena), born May 4, 2020, I have enhanced motivations towards the long-term provision of low-cost reliable electricity supply to customers.

Key issues and Recommendations

1. The Challenges of the Current Environment

Developments resulting from the pandemic have overtaken this proceeding. In the Final Submission of BC Hydro dated April 1, 2020, BC Hydro implies that the extent and duration of the impacts of the pandemic on BC Hydro's

revenues and costs are “uncertain”. Given the dire economic and employment information over the last 4 weeks, this is an obvious underestimation.

The pandemic has resulted in deep drops in demand for all global commodities, which will have a detrimental effect on the BC industrial sector, and employment and taxation shortfall spillover effects in the commercial and residential sectors. The stimulus-lowering of Bank of Canada rates to almost zero will lower BC Hydro financing costs, but increase its pension liability. The extraordinary volume of recent requests from individuals and companies seeking government assistance portent sharp increases in unemployment, at a rate exceeding that in 1929-1930.

The April 30, 2020 Federal Parliamentary Budget Officer (PBO) Yves Giroux's economic update indicates that Canadian real GDP is forecast to contract by an unprecedented 12 per cent this year and help push the federal debt-to-GDP ratio to 48.4 per cent.

As indicated in Exhibit B-1 Appendix Q page 28 of 32, with respect to its Monte Carlo load forecasting model: “Currently, BC Hydro assumes a mean GDP elasticity of 0.67 for the residential sector and 0.78 for the commercial and industrial general service sectors.” In its SAE load forecasting model, as per BC Hydro’s response to Exhibit B-6 INCE IR 1.8.15 Attachment 3, BC Hydro applies a Commercial Sector GDP elasticity of approximately 0.25 averaged across the regions of the province.

Therefore, assuming the higher estimation of the economic elasticity range, by applying a 0.67 elasticity to one third, and 0.78 to two thirds of BC Hydro’s load, and the PBO 12% economic contraction, implies an almost 9% reduction in BC Hydro’s electricity demand. Applying the lower range commercial-sector elasticity of 0.25 still results in a significant revenue hit to BC Hydro.

Admittedly, the Federal CERB, which pays $2,000 a month, should mute the effects on financially challenged residential customers, but for up to only 16 weeks.

The effect of the shrinking economy is definitely being experienced hardest in the commercial and industrial sectors, as indicated by StatsCan on April 29, more than 50% of Canadian companies have lost at least one-fifth of their revenue to COVID-19.

With BC Hydro’s approximate $5.5 billion annual revenue requirement, a 9% load reduction would translate into a revenue shortfall of close to $500 million per year.

This simple calculation does not include the forgone rate revenues due to BC Hydro’s recently announced residential customer Relief Fund.

Given the recent developments, it is obvious that BC Hydro will be substantially under recovering relative to forecast, that the BC Hydro’s net deferral account balances will increase, and that significant eventual rate increases will be required to recover this.

In an earlier draft of this Final Argument, this intervenor had prepared a detailed argument for a smoothed rate approach: that the Powerex trade windfall of Fiscal 2019 be returned to customers over a multi-year period, consistent with the Bonbright principle of rate stability. This was the argument that BC Hydro made in its F2017-2019 Revenue Requirements Application, when it was faced with the opposite environment of revenue under-recoveries and the apparent overriding necessity to shelter customers (and the government) from rate shock.

Nevertheless, recent developments have caused me to pull this argument for obvious practical considerations.

This intervenor admits that in the current environment, there is no appetite for near-term rate increases of any magnitude.

In its Final Submission, BC Hydro argues that its deferral accounts will capture the under recoveries:

> However, BC Hydro's regulatory accounts will mitigate much of the uncertainty caused by the pandemic by capturing variances from forecast which can then be returned to or recovered from customers in the next test period in accordance with existing BCUC orders.

And in the same document, BC Hydro makes the following proposal:

> Nonetheless, in this unprecedented situation, it is impossible for BC Hydro or any party to foresee all potential impacts of the pandemic. Therefore, if any particular approval from the BCUC is required over the remainder of the Test Period due to the pandemic, BC Hydro will bring forward requests to the BCUC in separate applications as needed. Filing such requests separately from the current RRA proceeding will enable the BCUC to consider them in a more expedited manner reflective of the COVID-19 crisis.
>
> As noted above, BC Hydro's regulatory accounts will largely mitigate the impacts of the pandemic and BC Hydro will bring forward any proposals for any particular relief needed over the remainder of the Test Period in separate applications.

Recommendation: this intervenor recommends, that within this regulatory process, to require BC Hydro provide as soon as is practical, an update on the most recent (high-level estimated) load and revenue impacts, including 5 year rate projections, and associated deferral account balances.

Recommendation: subject to the delivery by BC Hydro of the update requested above, given that this regulatory process is already one month into the second year of the two year test period, the BCUC is encouraged to approve BC Hydro's general rate request, subject to specific directives aimed at improving efficiencies, lowering costs, and improving safety and reliability.

BC Hydro is forecasting significant demand growth due to LNG production electrification, and associated (NE BC) upstream natural gas production, processing and pipeline compression. There is an obvious link between these activities, made clearer by the corporate ownership (Petronas and others) positions in both LNG and upstream gas production. Several factors have made this robust demand increase questionable, including the overall global move towards renewable sources of energy, the development of LNG in other jurisdictions closer to BC's most lucrative LNG markets, and the vagaries of Canadian provincial or federal environmental, First Nations and business development intentions.

To this uncertainty can be added the pipeline protests that were the daily front-page news before the pandemic. The most recent progress on Coastal GasLink is that the Wet'suwet'en pact between traditional chiefs and with Ottawa and B.C. is rejected by the elected chiefs:

https://www.pipelinenewsnorth.ca/wet-suwet-en-pact-with-ottawa-and-b-c-disputed-by-elected-chiefs-1.24127672

Quoting the article:

> "Elected chiefs of a First Nation that's split over a natural gas pipeline through their territory say they will not sign a deal on rights and title, a day after the hereditary chiefs backed the agreement…

> The elected chiefs of the Wet'suwet'en Nations say they don't support the proposed memorandum of understanding on rights and title reached with the federal and British Columbia governments."

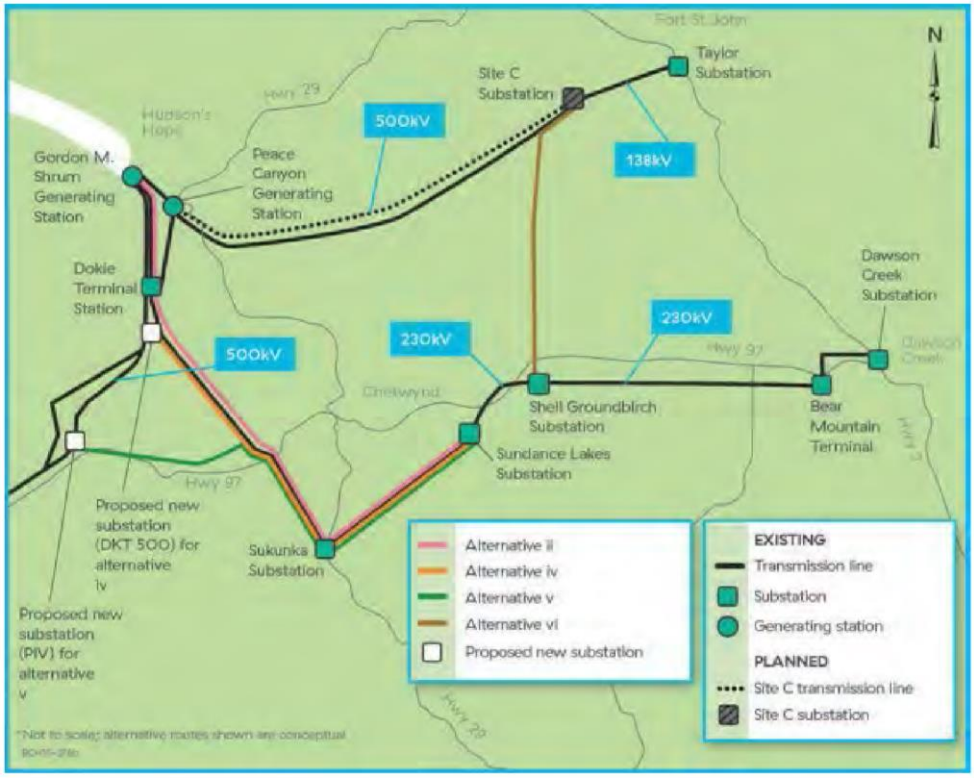
This ongoing uncertainty cannot increase the investor confidence in LNG and upstream natural gas projects. This development will also further increase the uncertainty in the Trans Mountain expansion, for which BC Hydro is expecting significant load growth due to expected expansions to the electric-drive oil pumping stations currently embedded in its load forecast.

Recommendation: this intervenor encourages the BCUC to require BC Hydro provide as soon as is practical, a high-level update on the load forecasts specific to the LNG, oil and natural gas sectors, reflecting current information. This update should mesh with the load and revenue updates recommended above.

2. Position with respect to the Peace Region Electric Supply project, the Minette Station to LNG Canada Interconnection project and investment in electric vehicle charging infrastructure

I do not offer a legal opinion as to whether the Peace Region Electric Supply (PRES) project meets the requirements to be considered a prescribed undertaking under section 18 of the Clean Energy Act, pursuant to section 4(2) of the Greenhouse Gas Reduction (Clean Energy) Regulation. As indicated on numerous occasions while responding to information requests, and in testimony, BC Hydro considers PRES to be a prescribed undertaking. However, as indicated in BC Hydro's responses to INCE Information Requests 1.6.8 and 1.6.9 (Exhibit B-6), Appendix J of the Application (Exhibit B-1) and the Ince cross-examination of the BC Hydro Panel (Transcript Volume 12, Pages 2315 to 2321), BC Hydro admits that are several technically feasible configurations of the PRES project, whose overall objective is to serve and electrify oil and gas loads in the South Peace region. These include multiple transmission options, but in addition, combinations of transmission, local generation and energy conservation. Given the dollar value of this project, ($240 to $560 million as indicated in the response to INCE IR 1.6.9), and it being a strategic project with respect to the long-term development of the NE of the province, the selection of the optimum configuration of the PRES project would benefit from BCUC review.

BC Hydro provided a map of the South Peace region in response to INCE Information Request 1.6.15 (Exhibit B-6), in which several technically feasible alternative transmission routings are indicated.



Developments resulting from the pandemic have overtaken this regulatory proceeding, which include deep drops in global hydrocarbon demands, including LNG. A secondary effect of these lower prices is that with lower fuel gas prices, the economics of electrification shifts to traditional industry self-supply.

BC Hydro has acknowledged this in the response to Exhibit: B-23-3 Clean Energy Association of B.C. Information Request No. 4.58.1 Dated: October 30, 2019:

> In general, relative to the December 2012 Load Forecast, the June 2019 Load Forecast projects lower electrification percentages in each of the six areas making up the Peace region over the entire twenty year forecast horizon. The reasons for this are the same as those described in BC Hydro's response to CEABC IR 2.41.1. In particular, lower forecast natural gas prices favour the use of natural gas over electricity to provide gas production and processing work energy requirements relative to what was assumed in the December 2012 Load Forecast.

Consistent with this information request response, BC Hydro indicated a number of times during the oral hearing that the economics of natural gas sector electrification are currently challenging. One example:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 24, 2020 – Volume 9 Page: 1518

> MR. AUSTIN: Q So when I look at Exhibit C-10-20 and I look at the yellow line on the bottom, that assumes that the North Montney line will come into service in 2023, is that correct?
>
> MR. RICH: A No, it's not correct. It doesn't assume anything with respect to the North Montney line. And says, "If there is commitment from customers that requires the North Montney line, then we will build the North Montney line." So right now in the forecast we actually assume that there's actually a few

customers that will take electricity service because, as I stated yesterday, based on current natural gas prices, the economics generally favour self-supply and favour in preference to service from BC Hydro.

The response to the following information request is illustrative of the challenges currently faced by the oil and gas sector in BC:

Exhibit B-17 Gjoshe 3.11.0:

> QUESTION: Does BC Hydro expect the 'poor market conditions' leading to lower consumption in the oil and gas sector for the months of April and May 2019 to persist during the test period?
>
> RESPONSE: BC Hydro expects the poor market conditions leading to lower consumption in the oil and gas sector for the months of April and May 2019 to continue during the test period. The lower than expected load results from reduced gas production at existing facilities, deferred expansions at existing facilities and a cancelled facility expansion. Current market conditions driving the reduced load include:
>
> - Low natural gas prices at Henry Hub and Sumas driven by a North American natural gas supply glut; and an even lower natural gas price at AECO driven by Western Canadian pipeline constraints;
> - Lower liquids prices driven by a North American liquids supply glut; and
> - Relatively more favourable investment conditions in other North American oil and gas basins, which has resulted in reallocation of capital investment away from the B.C. Montney region.
>
> While load reductions associated with the facility expansion cancellation will be permanent, other aspects of the lower load forecast are expected to recover as gas production at existing facilities ramp up to meet supply obligations to LNG Canada. BC Hydro also notes the load reductions associated with the current market conditions are partially offset by increased load at one other facility which began commercial operations earlier than anticipated. Additional information is provided in confidence to the BCUC in BC Hydro's filing of the June 2019 20-year Load Forecast.

Exhibit B-17 Gjoshe 3.13.0:

> QUESTION: What is BC Hydro's outlook for Station 2, AECO and Sumas gas prices in the near (test period) to medium term?

RESPONSE:

The October 2018 Load Forecast outlook for AECO natural gas prices is provided in BC Hydro's response to INCE IR 1.8.30. For convenience, the outlook is reproduced below:

Natural Gas Prices - Mid and nominal (C$/MMBTU)

	2018	2019	2020	2021	2022	2023	2024
AECO	1.61	2.13	2.56	2.82	3.02	3.11	3.19

BC Hydro does not develop natural gas price forecasts for Station 2 and Sumas as part of its load forecast, but rather uses its AECO price forecast as a guideline for the other two price hubs.

Provided below is a publicly available third-party (Sproule) natural gas price outlook for Station 2 and Sumas that is consistent with BC Hydro's expectations for the AECO gas prices provided above.

Natural Gas Prices - Mid and nominal (C$/MMBTU)

	2018	2019	2020	2021	2022	2023	2024
Station 2	1.45	1.73	2.16	2.42	2.62	2.71	2.79
Sumas	2.69	2.93	3.36	3.62	3.82	3.91	3.99

It is clear that global events have overtaken this outlook; at the time of submission of this Argument, natural gas prices (spot and forwards) have been considerably suppressed relative to the forecasts provided above. This can only have a detrimental effect to the near-term activity in the oil and gas sector in the province. In addition, current lower prices can only further incent BC producers to make decisions to self-supply.

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 23, 2020 – Volume 8B Page 1330:

> MR. INCE: Q Referring to Exhibit B-6, INCE Information Request 1.6.4. And this refers to electrifying gas production. So what are the obstacles to electrifying gas production? I believe BC Hydro mentioned low cost, a low cost environment, that producers were incented to self-supply with gas-fired generation -- or, sorry, gas-fired compression because of the low cost of natural gas. Is that a realistic assessment of the current situation, that it's hard for electricity to compete against direct gas drives?
>
> MR. RICH: A Yes, that's correct. As an overriding -- I mean certain projects have different circumstances that are effecting their ability to proceed or not, but as a general commentary, yeah, the natural gas price environment generally favours new gas projects to self-supply their work energy requirements than taking service from BC Hydro.

A key development is that the role of natural-gas based generation in serving incremental loads in the province is apparently reopened for review, as indicated in the following undertaking based on a Hearing exchange:

BC HYDRO UNDERTAKING NO. 45 HEARING DATE: February 28, 2020 REQUESTOR: David Ince, TRANSCRIPT REFERENCE: Volume 12, Page 2319, line 8 to Page 2322, line 16 (underlined for emphasis):

> QUESTION: Where did the requirement that 100 per cent of new generation be from clean or renewable resources come from, and what are the specific details of this requirement?
>
> RESPONSE: The Government of B.C.'s 2016 Climate Leadership Plan mandated that 100 per cent of the supply of electricity acquired by BC Hydro for the integrated grid must be from clean or renewable sources. To reflect this mandate, the New Clean Supply performance measure was introduced in BC Hydro's 2017/18 – 2019/20 Service Plan. In December 2018 the Government of B.C. introduced the

> CleanBC Plan, replacing the Climate Leadership Plan. The New Clean Supply performance measure was not included in BC Hydro's 2019/20 – 2021/22 Service Plan, pending completion of Phase 2 of the Comprehensive Review.

A BCUC review of PRES configurations and alternatives, including natural-gas based generation, would provide a valuable input into future electricity servicing alternatives for the province as a whole, and also explore key inputs and assumptions ahead of the development of BC Hydro's pending Integrated Resource Plan.

Given the increasingly challenging oil and gas extraction economics in NE BC, and associated deep cuts in spending in the oil and gas industry, it is prudent to review transmission projects such as PRES that has a multi-year construction period, and services natural gas production that has a considerably shorter lifespan than the electrification assets. Potential transmission solutions should be compared to incremental bridging solutions, including a combination of local portable generation and customer peak load curtailment.

Recommendation: The configuration of PRES should be subject to BCUC review, specifically for achieving cost savings and minimizing the risks to ratepayers of stranded assets

Similarly, BC Hydro's possible servicing of additional demand in the North Montney region has the prospect of multiple configurations involving different transmission routings and capacitor upgrades, and combinations of local generation and conservation:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – February 25, 2020 – Volume 11 Page: 2091

> D. AUSTIN: Panel 4, could you please provide an update on the North Montney project and in particular the earliest in-service date that might occur.
>
> MS. HOLLAND: A So the North Montney project was released as the next planned project into my group. We have assigned a project manager. We are in the identification phase, we are in the earliest phases of the project. We do not have a route, we have not initiated First Nations consultation. There is very little that we know at this stage and we do not have an in-service date for the project as of yet.

Recommendation: as with PRES, the configuration of the North Montney project should be subject to BCUC review, specifically for the purposes of achieving the cost savings and minimizing the risks to ratepayers of stranded assets.

I do not offer a legal opinion as to whether the Minette Station to LNG Canada Interconnection project meets the requirements of the Transmission Upgrade Exemption Regulation, as amended by B.C. Reg. 160/2018, to exempt the project from Part 3 of the Utilities Commission Act. While BC Hydro may argue that this project is a prescribed undertaking, to the extent that there are technically and economically feasible alternative configurations of this project, these warrant review by the BCUC.

Electric Vehicle Charging Infrastructure

With respect to the question as to whether British Columbia Hydro and Power Authority's investments in electric vehicle (EV) charging infrastructure should be included in rate base during the current test period and recovered from ratepayers, **it is recommend this be excluded from rate base until BC Hydro develops its company-wide EV strategy. Further, additional policies and government directions with respect to EV charging could come out of the CleanBC Plan.**

As indicated by BC Hydro, (BC Hydro – F2020-F2021 Revenue Requirements Proceedings – March 2, 2020 – Volume 13 Page: 2429):

MR. KUMAR: A Just to add to what Ms. Daschuk was mentioning, we are actually in the process of looking at a company-wide EV strategy as we speak, in terms of we know we've able to handle the EV growth in the province historically. We've installed fast-charging stations across the province, but now it's coming to a point where it could really take off and we need to understand how that's going to impact BC Hydro.

The Hearing exchange between BC Hydro and David Ince on this subject is indicative of the challenges that unconstrained EV charging can present:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – February 28, 2020 – Volume 12 Page: 2323

MR. INCE: Q So it was around electric vehicles and I'm concerned about local effects and transformer substations getting blown out because Joe on Bowen Island who had bought a Tesla with a 16 kV charging station and all his neighbour thinks that's great and they bought the same thing and pretty soon you've got localized issues. Is BC Hydro preparing for that contingency?

MR. KUMAR: A Yes. So we've done some analysis in terms of the impact on our distribution system and we focused predominantly on the Lower Mainland, and given the current load forecast that we see, and the impact of the EVs, there are obviously reinforcements that are required and we've identified at a high level what those would be. And you're absolutely right. It starts looking at building new feeders or putting in new ties between feeders for us to actually make that capacity. But what's interesting when we did the analysis was that if you look at it purely from an unconstrained EV perspective, the impact was quite significant. But as you start looking at shifting some of the load across, the timing of that, the impact of the system actually is reduced significantly. So that was the sort of scenario analysis that we did in terms of that if you assume this load that's currently in the forecast for EVs and you assume it's going to happen at the peak when the rest of the residential load happens, we were looking at significant upgrade on the feeder side. But as you start shifting that load away from the peak, the reinforcements actually go down quite a bit.

THE CHAIRPERSON: Why would you shift it? Is that something that you're observing, that the EV load is shifting away from the peak?

MS. DASCHUK: A It would be something that we would seek to incent customers to do. We can save a lot of money and reinforcements by asking our customers to turn their Tesla's to charge at midnight instead of charging when they get home at six or seven o'clock at night. So BC Hydro is looking at a number of different alternatives on how we could work with customers who have electric vehicles to have incentives to change the charging behaviour.

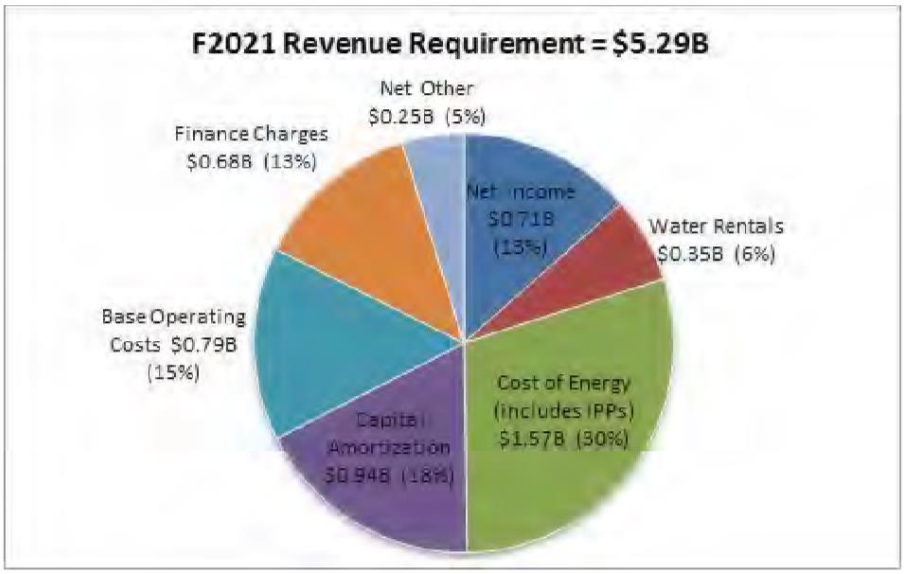
Recommendation: regardless of the eventual rate base treatment of EV charging infrastructure, it is recommended that BC Hydro continue development of company-wide EV strategy, particularly for the purpose of mitigating peak load growth and mitigating regional capacity shortages brought on by the coincident charging of EVs. Unconstrained, 16kV (fast charging) stations in residential neighborhoods create the risk of localized capacity shortages, and put local transmission and distribution infrastructure at risk. It is recommended that the EV strategy include mitigation measures such as time-based charging, and/or current limiters so that EV demand is moved away from peak demand periods.

3. Overall Observations on the BC Hydro F2020/21 Revenue Requirements Application Process: The Impact of Policy on the Costs Incurred by BC Hydro

A key observation for this intervenor from this process is that the significant majority of the BC Hydro revenue requirement is out of the control of BC Hydro, of which a large component is costs directed by government.

In the response to Exhibit B-6, INCE IR 1.13.1, BC Hydro provided a pie-chart breakdown of its approximate $5.3 Billion revenue requirement (Fiscal 2021), within which there appears to constrained flexibility in terms of reducing costs and hence rates.

David Ince Information Request No. **1.13.1** Dated: **May 1, 2019** British Columbia Hydro & Power Authority Response issued **June 6, 2019**	Page 2 of 3
British Columbia Hydro & Power Authority **Fiscal 2020 to Fiscal 2021 Revenue Requirements Application**	**Exhibit: B-6**



The cross examination on this chart was useful:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 21, 2020 – Volume 6, Page 650

> MR. INCE: Q Thank you. I have a question on overall revenue requirement. In my IR 1.13.1, BC Hydro replied in a pie chart of its revenue requirements from fiscal '20 to '24. So it's a breakdown of what's required to -- basically recovering rates. And it's very interesting to review this in that going around to the various slices in the pie chart its net income, I believe it's 710 or 712 million dollars for each of the test years.
>
> MR. WONG: A 712 million.
>
> MR. INCE: Q Thank you. Water rentals $350 million, cost of energy $1.57 billion, capital amortization $950 million approximately, and I'm going to continue through the pie chart. Finance charges close to $700 million, other $250 million, but the significant thing in the pie chart I'm looking at is base operating costs of $0.79 billion or $790 million. So out of a total review requirement of approximately $5.3 billion, the cost of actually running the company in terms of the labour, OMA, I assume to be $790 million. Is that accurate?

MR. WONG: A That's correct.

MR. INCE: Q And I assume that the cost of energy, which is one of the biggest -- or it is the biggest cost category, $1.58 billion, that's the cost of running the generation system?

MR. WONG: A And you should include water rentals with that as well.

MR. INCE: Q Thank you. So my question to Hydro, if as a result of this process Hydro is required to make cuts, cost reductions or to reduce rates, given this pie chart and given the large number of these costs that are fixed, for example water rental, I assume IPP costs, where can those cuts occur?

MR. WONG: A I agree with you that a significant amount of these costs are fixed and I think we talked about that in the workshop, actually, about a year ago. If required, and hopefully we are -- the reason we're here is to provide you the reasoning and the rationale behind why we have the costs we have here, but definitely an area that has more flexibility for us is in the operating costs area, the base operating cost area. But, I mean, I would have to suggest that those cuts would have an impact on the company. So while that would have to be the area we do, the potential ramifications of that we would have to determine and so that has relation to things like vegetation and cyber security and all these other things that we have to manage in the company.

MR. O'RILEY: A It's always a challenge answering hypothetical questions, Mr. Ince, so I think the first thing we would do is evaluate the circumstances. So what the Commission's saying and what advice they're providing the course of their decision and we would look to that to determine how to respond. But I think you've identified the tough math that we face and that a lot of the costs in the company are fixed as a result of prior decisions.

MR. INCE: Q Are some things on the table such as water rentals or IPP costs, potentially?

MR. O'RILEY: A No.

MR. WONG: A I should also mention related to base operating costs, I mean a substantial portion of that is related to labour. And then also there are fees and other commitments that BC Hydro has made, and I don't have the exact number, but that is a significant component of base operating costs as well. So that becomes -- there's a certain portion of that that is fixed.

MR. INCE: Q Can you provide the approximate split of base operating costs? I mentioned $790 million, approximately how much of that is labour? INFORMATION REQUEST MR. WONG: A Subject to check I think it's about 50 percent or so, but I'd have to -- it could be more, I'd have to check.

Not diminishing the critical importance of this and other regulatory processes intended to extract efficiencies out of the regulated utilities, but the significant majority of BC Hydro's revenue requirement is uncontrollable, fixed or mandated by policy.

As per BC Hydro's response to Exhibit B-6 INCE IR 1.7.10 regarding IPP costs, BC Hydro indicates approximately $50 billion (nominal or approximately $20 billion Real) of outstanding Independent Power Producer contract costs, a commitment that with some suppliers exceeds 40 years. Coincidentally, BC Hydro's rate base is approximately $20 Billion.

It is understood that BC Hydro is attempting to mitigate these costs in renegotiations as IPP contracts come up for renewal, but absent their ability to unilaterally breach these commitments, these power supply costs will form a major component of BC Hydro's future costs well into the future.

More than any other observation from this complex and lengthy process, this contrast between controllable costs and costs and commitments driven by policy, highlights the overriding impact of policy in impacting future costs borne by BC Hydro and its customers.

It is for this reason that BC Hydro's pending Integrated Resource Plan is a critical driver of future costs incurred by BC Hydro and the future trajectory of customer rates. More broadly, the outcome of this process will affect the energy future of the province for decades to come.

It is imperative that BC Hydro's Resource Plan be subjected to full and broad review, particularly with respect to cost and technical viability.

4. Capital Planning Process: The Asset investment planning project

In cross examining the BC Hydro panels, I attempted to obtain a 'line of sight' between BC Hydro's risk identification and prioritization processes, and its resulting capital planning and expenditures. Although BC Hydro has an apparently robust 'risk based' process, the next step – specifically how this translates into coherent analytics and process to prioritize capital expenditures seems to be absent.

A significant source of confusion relates to the multiple dimensions around which BC Hydro evaluates risk. In the response to INCE IR 1.10.1 (Exhibit B-6), BC Hydro provides its (unranked) two dimensional risk matrix, which forms the basis of its current risk-based framework. This framework requires risks to be ranked according to consequence and frequency, in each of the following 5 risk categories:

- safety,
- environmental,
- financial loss,
- reputational loss and
- reliability.

In information requests and in the following oral hearing, it appears that BC Hydro attempts to balance multiple risk dimensions, while not quantifying key risk parameters, particularly safety, financial loss and reliability.

BC Hydro is attempting to implement a: 'Asset Investment Planning Tool' as indicated in Exhibit B-1, Section 6.5.6: Investment to Enhance Business Capability. BC Hydro indicates that:

> The Asset Investment Planning Tool project is to enable a consistent, transparent and more objective approach to asset investment planning and management across BC Hydro, leading to improved investment decisions and results;

BC Hydro additionally characterizes this investment as following in Exhibit B-1, Appendix X: BOARD BRIEFING – BC HYDRO F2020 - F2024 CAPITAL PLAN:

> "To refine BC Hydro's framework for capital prioritization, and develop abilities to optimize investments across the Enterprise Portfolio, the Asset Investment Planning tool project has been initiated to develop an Enterprise Wide Value Framework and common IT platform. This project's objective is to maximize portfolio value at the enterprise level, by providing a framework and tool to optimize the scope and timing of investments. This project is currently in the definition phase, and is forecasting completion between F2020 & F2021."

Further clarification as to this tool and approach is provided in Exhibit B-6 in the response to Commercial Energy Consumers Association of British Columbia Information Request No. 1.43.4. BC Hydro responds:

> In addition, BC Hydro is implementing a value-based decision making approach that will build on our existing capital investment planning processes as part of the Asset Investment Planning tool project (line 27 on page 9 of Appendix I of the Application). The project will develop and implement an enterprise value framework. Using this tool and the enterprise value framework, the capital portfolio can be optimized by selecting the investments that will bring the highest total net economic value to BC Hydro while satisfying a variety of financial, resource, or timing constraint scenarios. These optimization scenarios will help inform the development of the capital portfolio in the future.

From Exhibit B48- BC Hydro Undertaking 30, BC Hydro further indicates the objectives of this planning tool:

Objectives:

- Developing a value framework and governance to enable a value-based approach to portfolio optimization.
- The ability to characterize and capture the risk and benefits of performing an investment as it relates to key business priorities.
- The ability to value all investments in common economic units to directly compare different Investments and assess trade-offs.
- The ability to understand how the risk and value associated with assets and investments will change over time (typically a 10 to 20 year window).

BC Hydro further elaborates on the purpose of the tool in the Oral Phase of the proceeding:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – February 25, 2020 – Volume 11 Page 1843:

> MR. C. WEAFER: Q ….Can you elaborate for the panel what the project is and at a high level what the $5.8 million would go towards? I think you mentioned it's a software project, is that correct?
>
> MS. PINKSEN: A That's correct. So this is a technology project that would look at a new software platform for our capital planning processes. And the cost would also include the development of what we call a value framework, which is a means of taking the various types of benefits that BC Hydro can achieve through our capital investments and quantifying those onto a common economic scale. Through doing that, it would improve upon our existing prioritization framework by building more objectivity and transparency.
>
> MS. PINKSEN: A That's correct. So this is a technology project that would look at a new software platform for our capital planning processes. And the cost would also include the development of what we call a value framework, which is a means of taking the various types of benefits that BC Hydro can achieve through our capital investments and quantifying those onto a common economic scale. Through doing that, it would improve upon our existing prioritization framework by building more objectivity and transparency.

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – February 28, 2020 – Volume 12, Pages: 221-226

> MR. INCE: Q Good afternoon Mr. Chair, panel members, and BC Hydro. I'm between you and the weekend. So I see some good news in terms of BC Hydro's Undertaking No. 30, that's what I want to start off on in terms of the capital planning process. So when I was cross-examining Panel 1, I was asking about a clear line of sight between the risks that BC Hydro identifies and why you spend capital. So the

risk matrix and the prioritization process – and Mr. Kumar, you spoke about this in terms of the risk matrix – and then that translates into actual investment. And I see significant investments or investments and opportunity in terms of this planning tool. Can you describe the name of this tool and how -- what is the progress of the development of the tool as identified at Undertaking 30?

MS. PINKSEN: A So this is the Asset Investment Planning Tool. As I mentioned previously, we are in the definition phase. We've completed the first stage of definition and that work was on engaging with a software vendor to look at a conceptual level framework of what a value framework could look like. This project is currently on hold at the moment. One of the reasons is we are really looking at the cost of undertaking the project and looking at the value of the incremental improvement to our capital planning process. It's -- I just want to note that the risk based framework that we use is a very foundational and widely used framework within the industry, and in general BC Hydro has advanced maturity here, and so we're trying to balance the incremental improvement in this investment with the value to the ratepayer.

MR. INCE: Q Yes, I can see that in it. I asked information IR, I think it's B-6, 1.10.1, and this is BC Hydro's unranked risk matrix. So this is, if you remember from cross-examination of Panel 1, it's a two-dimensional matrix that has risk on one side, the frequency of the risk and the consequence of the risk on the other side of the matrix. And obviously you don't want to be in the upper right-hand corner in which we have lots of very serious risks. So, you know, I think it's excellent that BC Hydro has this framework, but nonetheless the next step, would you agree with me, then you have to take these risks, the identification of those risks, and then you have to prioritize them. And is this what's embedded in this tool? I assume you have to assign a value to the mitigation of each of those risks?

MS. PINKSEN: A So currently our risk framework is in use in our enterprise capital planning process, so that is the existing prioritization framework. And so the risk scores that are ranked on the matrix that you described are in an input into the capital planning process and they are one of the tools that we use to prioritize the portfolio. This asset investment planning tool project would build upon the current risk framework and develop what's called a value based framework.

MR. INCE: Q Right. So within the matrix my understanding is that BC Hydro has three -- five risk metrics and quoting from that IR response there's safety, environmental, financial loss, reputational loss and reliability. So I think, Mr. Kumar, you mentioned this in cross-examination, that when BC Hydro spends money, presumably there's some benefit in terms of mitigating those risk, increasing safety, increasing performance, reducing downtime, et cetera. Presumably there's a line of sight between money spent and improvements in those risk scores?

MR. KUMAR: A That is correct. One thing I should add to what Ms. Pinksen was saying is when we look at the risk score -- and this is one of the areas that the risk framework lacks compared to the value framework, is a project can actually address many risks. And in our current risk framework you pick the highest risks that the project is addressing. So it could be reliability, it could be environmental, it could be safety. It doesn’t mean that the project doesn’t have other benefits of reducing risk. So that is why we end up picking the highest risk.

On the value side, you can actually quantify the value on multiple dimensions and add them up. Whereas on the risk score you have to pick the highest one in figuring out what the risk impact would be for the organization.

MS. PINKSEN: A And that's really why the risk assessment is just a tool into our prioritization. So, aside from the risk score, we are applying some judgement where we know that the project is actually providing multiple risk benefits to the organization.

MR. INCE: Q Good. Within these five metrics of risk though, there has to be some prioritization and tradeoffs between them in that you cannot mitigate all the risks to the -- well first of all, agree with me that it is impossible to mitigate all risks to zero?

MR. KUMAR: A Absolutely.

MS. PINKSEN: A Absolutely.

MR. INCE: Q And risk mitigation becomes increasingly expensive, perhaps exponential costs, perhaps infinite costs at some point? MS. PINKSEN: A Yes.

MR. INCE: Q And so BC Hydro given its limited capital, the amount of capital you can spend every year, obviously has to make difficult choices in terms of how to mitigate those risks between let's say environment, safety, and so on. Would you agree there is trade-offs involved?

MS. PINKSEN: A Yes.

MR. INCE: Q Okay, and so my understanding of this framework is that the next process is trying to assign values, and then make a rigorous approach in terms of how to manage that tradeoff between those different values, is that correct?

MS. PINKSEN: A Well, I'm hesitating because I don't want to imply that we don't have a rigorous process today. I think we have a very mature prioritization process today that uses the inputs from our current prioritization framework that allow us to make those tradeoffs. I think what is also really important to think about is it is the overall process that allows us to have that trade-off discussion, and that is the asset management practices that build the bottom up plan, but it's also our portfolio management and our collaborative reviews across the organization that allow us to have those trade-offs. So, it is really the consistent process and governance that we have in addition to our existing framework that really imply that we have a rigorous process for prioritization.

MR. INCE: Q That's a credible process, but nonetheless, the ideal situation is if you had a monetization of all the different risks and values, such that -- I don't mean to be glib, but you could put all these different risks and values in one computer program and they would come up with an optimum solution given all the trade-offs between these different parameters. Is that a possible end state?

MS. PINKSEN: A That's fair, yeah.

MR. INCE: Q Okay, but then in doing so you would have to make difficult choices in terms of what's the value of reputational risk to BC Hydro. So would you have something like bit coin in terms of a reputational value quantum? Again, I'll be more serious in terms of what is the value of safety? Now, the insurance industry has to do this all the time, what is the value of a human life?

MR. KUMAR: A Yes, absolutely.

MR. INCE: Q Okay.

MS. PINKSEN: A And one of the things that we did note in an IR response is that we weren't expecting that the value framework would allow for quantification of all types of risk mitigation. Safety, particularly the really high consequence safety events is one that maybe we would not be able to capture in a value framework.

MR. INCE: Q But that's extremely difficult to know, that it is impossible to mitigate all safety issues.

Even if you spent an infinite amount of money, there is always going to be the prospect of a safety issue, am I correct?

MS. PINKSEN: A Yes.

MR. INCE: Q And so how do you cut it off in terms of the amount of spend that BC Hydro makes to achieve a certain acceptable level of safety?

MS. PINKSEN: A Well, I think -- and we've talked about this in a number of panels, but it is really the setting of our strategic objectives that is creating that healthy tension between our outcomes that we are looking for in our capital portfolio. So when I talk about outcomes it's the affordability of the capital plan traded off against the reliability of the system performance. And so I think you mentioned in a previous panel that the idea of, you know, perfect reliability, we would never look to have that because it wouldn't balance out with our affordability objectives.

MR. INCE: Q Right. At some point will you get to, let's say, outage, the value of outages? For example the loss of load probability, how do you value that? And presumably that cost goes exponential the more reliability you incur on the customer.

MS. PINKSEN: A Right. And inside the value framework this would really be a relative value as opposed to an absolute value of reliability, so it would be used and anchored in BC Hydro's strategic objectives to help us make decisions internally when we're trading off system performance and risk.

MR. KUMAR: A I think Mr. O'Riley also talked about this in his policy panel that quantification of the impact of reliability from an economic perspective is something that we would like to have some direction from the Commission also because that is a very diverse -- and it can actually lead to decisions that may increase the capital plan significantly because you can quantify those impact from an economic perspective and then you can justify a lot more projects than you currently have in your capital plan. So I think that's an area that we are going to explore, but as Mr. O'Riley said, it is something that we would be looking for the Commission to give us some direction on how to more forward because the numbers we have seen in the industry, those numbers are quite varied. European numbers are different than the American numbers in terms of the reliability impact of residential, industrial or commercial customers. So it is an area that is of interest to us but we would like to have some feedback in terms of how best to move forward with that.

MR. INCE: Q Yes, there's certainly a wide range of numbers and it depends on the customer class and it depends on whether your residential customer is willing to, I guess, have BC Hydro pay for the contents of their freezer after a ten hour outage versus a silicon chip manufacturer who’s out one millisecond and their production line is destroyed. So would that be one of the challenges is to come up, what is the value of loss load, what's a quantum for that? Is that a challenge?

MR. KUMAR: A Absolutely. In today's internet based society it's actually becoming more of a challenge. I remember a number of years ago we had an outage in the downtown core as a result of some feeders and there were companies that were impacted in such a way that they were providing service in Europe for internet services and there were customers impacted in Europe as a result of an outage that happened in downtown. So I think the economy is changing quite a bit, so it makes it even more difficult to quantify the impact of unreliability in the current way the economy is going.

MR. INCE: Q Yes. But this is definitely -- the documentation Undertaking 30 is very -- it looks very promising. Expected timelines in terms of when the next phase of this project will be flushed out and implemented?

MS. DASCHUK: A As I -- or as Ms. Pinksen mentioned, the project is currently on hold and it will -- we don't have an estimated timeline. What we would do is in the next step, which is hopefully included in the cover to the business case that we provided, is that we now believe that the best way to get competitive information on what options are available to us is to do an RFP and that's going to take some time.

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – February 28, 2020 – Volume 12 Page: 2309

MR. KUMAR: A I think Mr. O'Riley also talked about this in his policy panel that quantification of the impact of reliability from an economic perspective is something that we would like to have some direction from the Commission also because that is a very diverse -- and it can actually lead to decisions that may increase the capital plan significantly because you can quantify those impact from an economic perspective and then you can justify a lot more projects than you currently have in your capital plan. So I think that's an area that we are going to explore, but as Mr. O'Riley said, it is something that we would be looking for the Commission to give us some direction on how to more forward because the numbers we have seen in the industry, those numbers are quite varied. European numbers are different than the American numbers in terms of the reliability impact of residential, industrial or commercial customers. So it is an area that is of interest to us but we would like to have some feedback in terms of how best to move forward with that.

MR. INCE: Q Yes, there's certainly a wide range of numbers and it depends on the customer class and it depends on whether your residential customer is willing to, I guess, have BC Hydro pay for the contents of their freezer after a ten hour outage versus a silicon chip manufacturer who's out one millisecond and their production line is destroyed. So would that be one of the challenges is to come up, what is the value of loss load, what's a quantum for that? Is that a challenge?

BC Hydro's risk-based capital prioritization is a valuable tool in assisting with the decisions that allocate scare capital. Nevertheless, this topic within the written and oral hearing phases was frustrating, in that there did not seem to be a clear line of sight between BC Hydo's risk identification, prioritization and mitigation that includes a common basis for the balancing the risks being mitigated. There seemed to be no quantification of the value of reliability or safety, challenging but necessary metrics required in making difficult prioritizations.

Recommendation: for the benefit of increased accountability, transparency, and potential capital cost savings, BC Hydro should continue to improve its capital planning process, and increase the visibility in terms of how the challenging tradeoffs between risk metrics is accomplished. BC Hydro is encouraged to resume development of the Asset Investment Planning Tool. As per the testimony of BC Hydro on page 2309 above, the BCUC should provide guidance and participate in this process, particularly with respect to the subject of 'appropriate' reliability. This is a key issue that applies to all utilities regulated in the province.

5. Load Forecast and Elasticity

Notwithstanding that the consequences of the pandemic have rendered the results of BC Hydro's October, 2018 load forecasts obsolete, this intervenor is generally satisfied with BC Hydro's load forecasting methodology, and inputs over the Test Period, with specific recommendations following. My intention in participating in this

proceeding was the realization of reliable low cost electricity; I am consistently focused on appropriate cost saving measures. Nevertheless, having had direct responsibility for BC Hydro's load forecast for a decade, and having reviewed in detail BC Hydro's current load forecast processes and resourcing, it is my recommendation is that this very challenging and critical area is one where greater and not fewer resources are warranted, particularly given the immanency of BC Hydro's Integrated Resource Plan.

Notwithstanding the above, elasticity and better integration of the DSM and the load forecasts are 'sleeper' issues in which I think BC Hydro requires more work.

Utilities apply price elasticity to load short and long-term load forecasts to estimate the effect on electricity demand from rate increases.

In its decision on the BC Hydro Fiscal 2017 to Fiscal 2019 Revenue Requirements Application (March 1, 2018, Appendix B, page 6) the BCUC In its Decision acknowledged the concerns of the Association of Major Power Consumers (AMPC) regarding the price elasticity used for industrial customers.

In this previous Application, and the load forecast underlying the Application, BC Hydro applied the same -0.05 elasticity to all customer rate classes, at all rate levels, and for all time horizons. The practical application of this elasticity would be that a 10% (indicative) rate increase would result in an immediate 0.5% reduction in electricity demand, which would persist. Any further rate increases would result in compounded load reductions.

Subsequently, BC Hydro doubled the applied elasticity value to -0.10, which is applied to all vintages of load forecasts used in this Application.

As indicated in the Application (Exhibit B-1), Section 1.5.3, BC Hydro indicates:

> <u>Price Elasticity Inputs Have Been Updated to Reflect Independent Expert Advice</u>
>
> In March 2018, BC Hydro retained DNV GL to conduct an electricity price elasticity study for each of our customer sectors. DNV GL is a global quality assurance and risk management company, with a highly regarded energy advisory services division offering institutional, legal and technical expertise on electricity systems. The company has global operations in over 100 countries. The results of their price elasticity study are included as Appendix Q.
>
> The DNV DL study results, combined with the results of our own evaluation of the residential inclining block rate (fiscal 2013 to fiscal 2017), supports the results of our previous internal studies and third party assessments that our price elasticity estimates are consistent with what is commonly reported and on the lower end of the survey data.
>
> DNV GL's key findings were adopted in the Load Forecast prepared for this application. Specifically, BC Hydro has increased the electricity price elasticity value used for all of the main customer sectors from -0.05 to -0.10. Further information is provided in Chapter 3, section 3.2.6.2

Although a lengthy read, the following Hearing exchange between BC Hydro and Mr. Keen is useful:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 24, 2020 – Volume 9, Page 1562:

> KEEN: Q And then relative to the last revenue requirement application, the methodology changed in a couple of ways. You changed your source of inputs, as I gather, in relation to the Conference Board of Canada, that changed, and then that binary element that we just talked about, that was introduced, and then as well the elasticity factor was doubled, is that right?

MR. RICH: A That's correct.

MR. KEEN: Q Are there any other major changes that I ought to have mentioned there?

MR. RICH: A I think we -- well, I think so, I'm just running through the mental math here. We also updated the economic elasticities in the residential, commercial models as well as the temperature thresholds in terms of response to temperature in both residential and commercial sectors.

MR. KEEN: Q And that broad elasticity factor that I mentioned, it is indeed broad and it applies to each customer class, right, in 0.1?

MR. RICH: A That's correct. That was the DMV's -- the consulting outfit that we hired to review our current assumption and their recommendation was that it was still appropriate to maintain that approach.

MR. KEEN: Q So the industrial elasticity and the residential elasticity is the same?

MR. RICH: A Yes, I guess with the qualification that when we do the customer-by-customer large industrial assessment that amongst the considerations are the production costs associated with each customer, even to within the forestry sector almost on a production line by production line basis. So I would say that the influences of electricity on overall production costs are implicitly embedded in that assessment.

MR. KEEN: Q On that point, on that production line point, there is -- part of your exchange with Mr. Ince that dealt with an analogy that I quite liked, a hot tub versus an electric heater. I think you remember that discussion. And his suggestion was that those two uses within a residential household would have different elasticities applied to them. You would expect the use of a hot tub to be more elastic relative to price than would space heating. You recall that exchange?

MR. RICH: A Yes, I do.

MR. KEEN: Q All right. And you could apply that analogy as well to an industrial production line, fair?

MR. RICH: A I agree.

MR. KEEN: Q There are industrial customers that will have different operations that have different energy cost, and their operations may react differently to the price electricity, that's fair?

MR. RICH: A Yes.

MR. KEEN: Q All right. And I understand there's something called a load stock model that models within an operation or within a customer's use of electricity the different ways that the electricity will be used, am I right?

MR. RICH: A So if you're referring to the stock and flow model that Mr. Clendinning described yesterday, that's a model that's in development. It's not part of our load forecasting methodology currently.

MR. KEEN: Q I think it's been described in the information request responses as in beta form, is that right?

MR. RICH: A That's correct.

MR. KEEN: Q And does that exist for all customer classes?

MR. RICH: A No, the intent for now is to apply it to the residential sector.

MR. KEEN: Q And so you would have an aggregation of data relating to water heaters, space heaters. Presumably not heated driveways, but illustratively that sort of thing, right?

MR. RICH: A Well, yes, that's correct. That base data, if you will, is already embedded in the statistically adjusted end-use model we have for the residential sector. That's the anchor, if you will, and in the application then we described the end-use efficiency projections that come from the U.S. Energy Information Administration. The intent in the future would be to use BC Hydro stock and flow data to provide those longer term projections and ultimately replace information that we get from the U.S. with our own.

MR. KEEN: Q And the reason you have that stock and flow model is to better respond to different levels of price sensitivity, is that fair?

MR. RICH: A I don't know if it's intended to respond to different price elasticities. It's intended to capture the uses of electricity amongst our residential customers.

MR. KEEN: Q Uses in response to price.

MR. RICH: A No, price elasticity is not one of the economic drivers in that model, no.

Additionally, the exchange between BC Hydro and David Ince on the topic of elasticity adds additional value:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 23, 2020 – Volume 8B Pages: 1323-1327:

MR. INCE: Q … And so can Hydro confirm that BC Hydro applies the same minus .1 elasticity factor into all customer sectors, residential, commercial, industrial? Or should I say residential, general, transmission?

MR. RICH: A It does, and it is consistent with the recommendations of the consulting outfit we hired to review that price elasticity.

MR. INCE: Q And that elasticity is applied across all time horizons and irrespective of absolute rate levels? That the same elasticity value is applied?

MR. RICH: A Yes.

MR. INCE: Q Would BC Hydro expect that as rates increase, that the elasticity would increase? That is if customers get closer to shall we say distress, that elasticity should increase?

MR. RICH: A Well, I think if you really took a theoretical view, probably every single one of our 2 million customers has its own price elasticity. So, I think the one phrase that struck me from the consultant's report is price elasticity is more of a butcher knife than a scalpel. So, don’t expect your studies to yield accurate results, and to produce accurate when you apply it to produce accurate results. So, it really is intended to be a directional application of the impacts of electricity price increases.

MR. CLENDINNING: A And I'd add to that in terms of the magnitude of elasticity changes, all things being equal, you know, the net change we could expect on the load forecast from elasticity is on the order of 20 to 40 gigawatt hours on total, on 55,000 gigawatt hours for the system. So, although it is not a scalpel, the butcher's knife is still operating on a fairly small amount of energy.

MR. INCE: Q Right, that's over the test period. As you go further out it obviously compounds?

MR. RICH: A That's correct.

MR. INCE: Q So I have -- it's a broad brush, elasticity of minus 0.1. There is questions such as do high income customers have a higher elasticity? Or a lower elasticity? Do some customers that have space heating have a higher elasticity versus a lower elasticity? But again, it's all the same approach?

MR. RICH: A Correct.

MR. INCE: Q Is it an urban legend within BC Hydro that there is one customer that heats his driveway 365 days a year?

MR. RICH: A I don't know.

MR. INCE: Q I was implying that perhaps some customers have such high incomes that the electricity prices simply don't matter.

MR. RICH: A Maybe the prince when he arrives.

MR. INCE: Q I've also heard the urban legend perhaps that there was a BC Hydro customer, residential that consumed 700,000 kilowatt hours per year because of driveway heating and others, so 70 times the average. But you know, seriously on that point, elasticity is it possible that some high-income customers particularly with larger homes, simply don't care about electricity prices and therefore elasticity, or rate increases are not an effective signal?

MR. RICH: A Well I think that applies to the value itself. I mean, generally speaking a .1 means that all our customers are generally priced inelastic, that they don't respond to electricity price increases.

MR. CLENDINNING: A Again, as a class. So, we're talking -- I think Mr. Rich put it very well, there is 2 million different elasticities and some of those are very sensitive, some of our customer classes. It's a very important piece of it, but when taken in aggregate and applied for these levels of energy that I spoke about, that's the characteristics of our service area of the province.

MR. INCE: Q Can I also suggest there is more than two main elasticities and that each household has appliances or end uses in which there is sub-elasticities? So, let's use the example of a customer with a hot tub, perhaps a more discretionary recreational use, not to insult anybody with a hot tub. But could more discretionary end uses such as a hot tub be subject to a higher elasticity?

MR. CLENDINNING: A It's possible.

MR. INCE: Q And conversely those customers with space heating and low income presumably could be relatively inelastic because it's a life commodity?

MR. CLENDINNING: A It's possible.

MR. INCE: Q Mr. Rich, you mentioned something about low elasticity. Is it possible that BC Hydro's elasticity value could be much higher? The report that you alluded to in terms of elasticity that BC Hydro recently completed, the result that they could have produced could have been much higher based on industry benchmarks. Is that accurate, that elasticity values could have been much higher?

MR. RICH: A So just a quick summary of the consultant studies. So it was a combined jurisdictional review as well as looking at our own studies and the .1 recommendation in terms of the jurisdiction

> review was that was the one that's most commonly used by other utilities. So yes, there is a lot out there in the literature with the wide-ranging values, but that's the most common one used by other utilities and then they reviewed that value against some of our studies, and in particular our RIB evaluation which is filed as part of this application has a very similar result. So on the basis of that, DNV's recommendation was to increase our negative 0.5 to .1.

British Columbia Old Age Pensioners' Organization Et Al Information Request No. 1.14.2 Dated: May 2, 2019 British Columbia Hydro & Power Authority Response issued June 6, 2019:

British Columbia Old Age Pensioners' Organization Et Al Information Request No. **1.14.2** Dated: **May 2, 2019** British Columbia Hydro & Power Authority Response issued **June 6, 2019**	Page 3 of 3
British Columbia Hydro & Power Authority **Fiscal 2020 to Fiscal 2021 Revenue Requirements Application**	**Exhibit: B-6**

Audit Recommendations	Management Actions Status	Incorporated in October 2018 Load Forecast
9 Accelerate internal studies/development on: • **The stock and flow model.** • **Elasticity coefficients updates used in the development of the load forecast.**	**In Progress: Stock and flow model** • **The stock and flow model calibration is expected to be updated and run in parallel with existing residential forecast model as part of the January 2020 load forecast update.**	**No**

With respect to elasticity, BC Hydro's doubling from -0.05 to -0.10 is a directional improvement, but is still at a level at the low end of the literature range. It is understood that the effect of elasticity is muted in the Test Years period, but elasticity effects grow and compound over time. With rate increases pending due to cost recovery of large capital projects, and certain revenue under-recoveries due to the Coronavirus pandemic, elasticity will be a significant issue in the upcoming BC Hydro Integrated Resource Plan. Elasticity effects, if treated incorrectly, could swing the resource plan analysis, potentially in the range of billions of dollars. A particularly challenging issue is that if were BC Hydro were to commit to large future capital expenditures to serve demand, and these investments resulted in protracted rate increases, customer demand may be suppressed to the point where these investments are stranded: an unfortunate paradox.

In addition to updating the elasticity value that BC Hydro applies, BC Hydro needs a more sophisticated the approach to the application of this value. A single invariant value is inadequate to capture the complexity of the underlying issue, and results in load forecast errors.

In the BC Hydro F2017 to F2019 Revenue Requirements Application - Key Findings – Load Forecast dated August 25, 2017 - the Panel's key findings on the 2016 Load Forecast for the fiscal 2017 to fiscal 2019 test period. Quoting:

> The Panel acknowledges the concerns of AMPC regarding the price elasticity used for industrial customers and notes that it does not suggest adjustments for the test period but rather argues for changes going forward. The Panel also acknowledges BC Hydro's observation that using a higher elasticity factor (such as

> the -0.16 cited by AMPC), without recognizing that the impact of prices is already reflected in the customer-specific assessment, would therefore lead to double-counting.
>
> Notwithstanding, the Panel observes that the capped rate increases for 2017, 2018 and 2019 have been prescribed by Direction No.7 at 4.0 percent, 3.5 percent and 3.0 percent respectively. The Panel accepts these increases were known to industrial customers when BC Hydro's key account managers conducted their forecast surveys. Accordingly, the Panel is satisfied that the issue of price elasticity for future, unknown price increases is not an issue in the test period.

In its key findings, the Commission Panel was correct in identifying that the test period rate changes would have been known by industrial customers, and that significantly affected customers would have adjusted their operations to account for these input costs. Therefore, any marginally economic customers in which electricity prices were a key input would have planned to contract their output and therefore their forecast electricity consumption. In this case, rate elasticity can be assumed to be embedded in the customer by customer load forecast. However, during this current RRA process, rate predictability has been far less certain than in the previous proceeding, such that the industrial load forecast cannot be assumed to incorporate rate impacts in the analysis undertaken by BC Hydro.

Regardless of the short-term treatment of industrial elasticity, and long term rate trajectories being unknown, industrial customers cannot be assumed to incorporate these unknowns into their current planning and operations. Industrial customers, many of whom are competing in a global 'price taker' environment, are obviously price sensitive. AMPC's credible argument during the previous RRA proceeding, that BC Hydro's elasticity is understated, needs to be revisited.

Elasticity is far more complex than the simple BC Hydro treatment, which assumes a single elasticity value for all customer classes, over all time periods, for all absolute rate levels, and for all end-uses (classes of electricity demand such as heating, cooling, electronics etc.)

For a number of years, BC Hydro has been working on a stock turnover (or stock and flow model), as referenced in BC Hydro's F2017 to F2019 Revenue Requirements Application. Presumably due to time and monetary constraints, this has not been realized. This model, if appropriately implemented, would solve two key problems: the issue of elasticity, and the challenge of integrating of BC Hydro's load forecast and its DSM planning (forecast seams issues).

This model when properly executed, would solve these persistent issues. This is a complex issue; I would be pleased to present more information if requested.

Recommendation: This intervenor agrees with BC Hydro in its Final Argument that price elasticity assumption has a minimal impact on the load forecast during the Test Period. Nevertheless, elasticity is an underappreciated 'sleeper' issue in which erroneous starting assumptions compound and could create significant long-term load forecast errors, and adverse consequences in planning processes.

Towards the final resolution of this issue, BC Hydro needs to continue work on its stock turnover model. Due to the complexity of the issue, the scarce expert resources required, and the long lead time required for a solution, the initiation of work should not wait for the review of BC Hydro's Integrated Resource Plan. The results of this work should ready in time for the first phases of the IRP review.

6. Need for coordination on load forecasting and additional development of the Clean BC Plan

This regulatory process reiterated 'seams' issues between BC Hydro's load forecast and DSM forecast, which have been somewhat covered in multiple previous forums. At a higher level, there are other regulated (gas and electricity) utilities in BC, who undertake load and DSM forecasts independently using somewhat different approaches.

Further, the unfolding CleanBC strategy and plan requires both load forecasts for all energy consumption in the province, and Greenhouse Gas Emissions, as well as future energy and capacity conservation savings. Given the critical strategic outcomes that which will result from this Plan, it is essential that a well-informed and consistent approach be applied.

The following Hearing exchange touches on this issue:

BC Hydro – F2020-F2021 Revenue Requirements Proceedings – January 24, 2020 – Volume 9 Page: 1388

> MS. QUAIL: Q So is it fair to say then that there isn't a process where Hydro is saying, "This is what we forecast," you know, broad strokes, Fortis is saying, "This is what we forecast," broad stroke, the Commission has not provided some information about where there may be agreements or disagreements in those perspectives.
>
> MR. CLENDINNING: A I think that's an accurate description.
>
> MS. QUAIL: Q Do you agree that it would be a good thing to arm the regulator with this information to help it oversee the energy transformations that are now getting underway within the Commission's jurisdiction?
>
> MR. CLENDINNING: A I can see there would be some benefit. How that would actually work in terms of modelling, you know, we often have -- the government, in terms of its -- does modelling, for example, for CleanBC, setting up models to work off the same baseline and process and methodology. So I think there's an opportunity for increased collaboration, but I don't think there's a -- to use an earlier metaphor A + B = C approach to getting this in order to inform the Commission. But I think, you know, to achieve provincial objections collaboration wouldn't hurt in that area.

Recommendation: BC Hydro needs to continue work on its stock turnover model. As argued above, this model could resolve persistent issues related to elasticity and identified seams between its DSM forecasting and load forecasting. At a higher level, if properly executed, a consistent approach between the regulated electricity and natural gas utilities in the province would result in further benefits – specifically improved accuracy and consistency in energy forecasts created by all entities. This could yield significant cost savings when applied to planning processes.

A properly executed modeling process inherently tracks GHG emissions, allowing for decision makers to consider the costs (metric: $/tonne of savings) for making key decarbonization choices. This is obviously a critical metric for future policy development, such as with the CleanBC plan.

Due to the complexity of the issue, the scarce resources required, and the lead time required for a solution, the results of this work should be ready in advance for the development of BC Hydro's Integrated Resource Plan – hence the need to drive early progress. For the purposes of regulatory efficiency, it is suggested that the key assumptions, inputs and preliminary results of this modeling be made available to the BCUC and ratepayer advocates prior to advanced development of BC Hydro's Integrated Resource Plan.

7. DSM and Energy Conservation

BC Hydro's DSM plan included in its Fiscal 2017-2019 Revenue Requirements Application was scaled back relative to the conservation targets in its 2013 Integrated Resource Plan. This was due to reduced load growth expectations, combined with 'competition' from supply-side options such targeted Independent Power Producer initiatives, including contract renewals, a standing offer program, and the commitment to build Site C. Basically the 'gap' between supply and demand was substantially reduced relative to that expected in the 2013 IRP.

The current situation is that BC Hydro is in an energy surplus position and has the stated objective to manage upwards pressure on rates and limit future forecast rate increases.

In Exhibit B-1 of the Application Section 10.3.1.3: Traditional DSM Continues Moderation Approach Consistent with the 2013 Integrated Resource Plan, BC Hydro indicates that:

> "The selected level of DSM expenditures continues a moderation approach that was recommended in the 2013 Integrated Resource Plan (IRP) for fiscal 2014 to fiscal 2016. This moderation strategy was subsequently continued for fiscal 2017 to fiscal 2019 in response to an extended energy surplus and to limiting forecast rate increases. The BCUC found that the moderation approach was a balanced response to these circumstances and accepted BC Hydro's proposed expenditure schedule. In this application, BC Hydro has continued the moderation approach given the ongoing energy surplus and to limit forecast rate increases."

Exhibit: B-6: David Ince Information Request No. 1.2.1

BC Hydro quantifies the duration of the energy and capacity oversupply in its responses to INCE IRs 1.2.1 and 1.2.2 respectively:

> 2.0 LOAD SURPLUS Reference: Appendix BB, Section 2.2. Reference: Section 4.2.2 in Comprehensive Review of BC Hydro. "Although BC Hydro has not conducted competitive calls for power since 2011, it is projected to have an energy surplus into the 2030s."
>
> INCE 1.2.1 Please confirm that BC Hydro is forecast to be in an energy surplus with committed domestic resources (including Site C) until the year F2033.
>
> RESPONSE: The most recent load resource balance (LRB) is described in Attachment 1 to BC Hydro's response to BCUC IR 1.15.3. Table 1 in that attachment shows the planning view of the energy LRB based on existing and committed resources, and Table 3 shows the planning view of the energy LRB after planned resources. With committed domestic resources (including Site C), the planning view LRB shows an energy surplus until fiscal 2027. However, if planned resources (e.g., incremental DSM and EPA renewals) are also considered, the LRB shows an energy surplus until fiscal 2032.

Exhibit: B-6: INCE Information Request No. 1.2.2:

> 2.0 LOAD SURPLUS Reference: Appendix BB, Section 2.2. Reference: Section 4.2.2 in Comprehensive Review of BC Hydro. "Although BC Hydro has not conducted competitive calls for power since 2011, it is projected to have an energy surplus into the 2030s." 1.2.2 Please indicate the last surplus year for capacity.
>
> RESPONSE: The most recent load resource balance (LRB) is provided in Attachment 1 to BC Hydro's response to BCUC IR 1.15.3. Table 2 of that attachment shows the planning view of the capacity LRB

based on existing and committed resources, and Table 4 shows the planning view of the capacity LRB after planned resources. Accounting for planned resources (e.g., incremental DSM and EPA renewals), the most recent LRB shows that the last surplus year for capacity is fiscal 2030; however, this will be updated through BC Hydro's next Integrated Resource Plan.

With respect to the value of avoided energy consumption, as enabled by BC Hydro's conservation efforts, the response to the following information request provides the best summary:

Exhibit: B-6: Commercial Energy Consumers Association of British Columbia Information Request No. 1.78.5 Dated: May 2, 2019 British Columbia Hydro & Power Authority Response issued June 6, 2019:

BC Hydro
Power smart

Appendix X
Fiscal 2020 to Fiscal 2022 Demand-Side Management Business Plan – Conservation and Energy Management
Appendix B

Timeframe for DSM Plan Analysis	Fiscal 2020-fiscal 2022: Aligns with the Annual Plan.
Inflation	2.0 per cent.
Discount Rates	6 per cent nominal and 4 per cent real, representing BC Hydro's corporate discount rates.
Avoided Costs	**Electric energy:** • Long Run Marginal Cost: $105 per MWh (Fiscal 2018 $) • Market Price: $30/MWh (Fiscal 2018 $) over a 15-year period from fiscal 2020 to fiscal 2034 **Generation capacity:** • Fiscal 2020 to fiscal 2022: $38 per kW-year (Fiscal 2018 $) • Fiscal 2023 to fiscal 2031: $60 per kW-year (Fiscal 2018 $) • Fiscal 2031 onwards: $123 per kW-year (Fiscal 2018 $) **Bulk transmission capacity:** • $0 per kW-year (Fiscal 2018 $) **Regional transmission and substation capacity:** • $13 per kW-year (Fiscal 2018 $) **Distribution capacity:** • $1 per kW-year (Fiscal 2018 $) **Natural gas:** • BC Hydro's forecast of wholesale natural gas prices at Sumas, or for the purposes of the modified TRC test, 100 per cent of the long-run marginal cost of electricity, converted to GJ.

QUESTION: What are the Generation Capacity costs of based on differing periods of time whereas the other avoided costs are single values?

RESPONSE: The generation capacity costs vary over the planning horizon because they are based on the different marginal resources applicable for different periods over the planning horizon. The period for which each applicable marginal resource is determined by our system-wide load resource balance. Please refer to BC Hydro's response to AMPC IR 1.5.8 where we explain the basis for generation capacity avoided costs. The regional transmission capacity, substation capacity, and distribution capacity costs are system wide averages. In contrast to generation capacity, the concept of a system-wide load resource balance is not an appropriate approach for the transmission and distribution (T&D) system because T&D costs are driven by location specific constraints. These constraints happen at different times for different locations

and therefore, different feeders across the system. Accordingly, a single, levelized value is used to represent this system-wide average T&D capacity cost. With regards to the Electric Energy avoided costs:

- The market price value of $30/MWh is a levelized value (fiscal 2018$) presented for ease of reference. The market price forecast used in the DSM cost-effectiveness calculation is a forecast of prices with values that vary year to year. It was calculated based on the market price forecast over a 15– year period from fiscal 2020 to fiscal 2034; and
- The energy LRMC of $105/MWh is a value used for the duration of the forecast period, as discussed further in BC Hydro's response to AMPC IR 1.5.9.

BC Hydro has surplus energy and capacity for at least 10 years. The economic fallout of the Covid pandemic will certainly extend this period of surplus.

It is appropriate for BC Hydro to value to cost of incremental DSM savings at the 'market price value', which is currently estimated by BC Hydro at $30/MWh. Any incremental energy brought into the BC Hydro system will effectively result in more energy being sold for profit into adjacent markets: Alberta and Mid C - at the current market value.

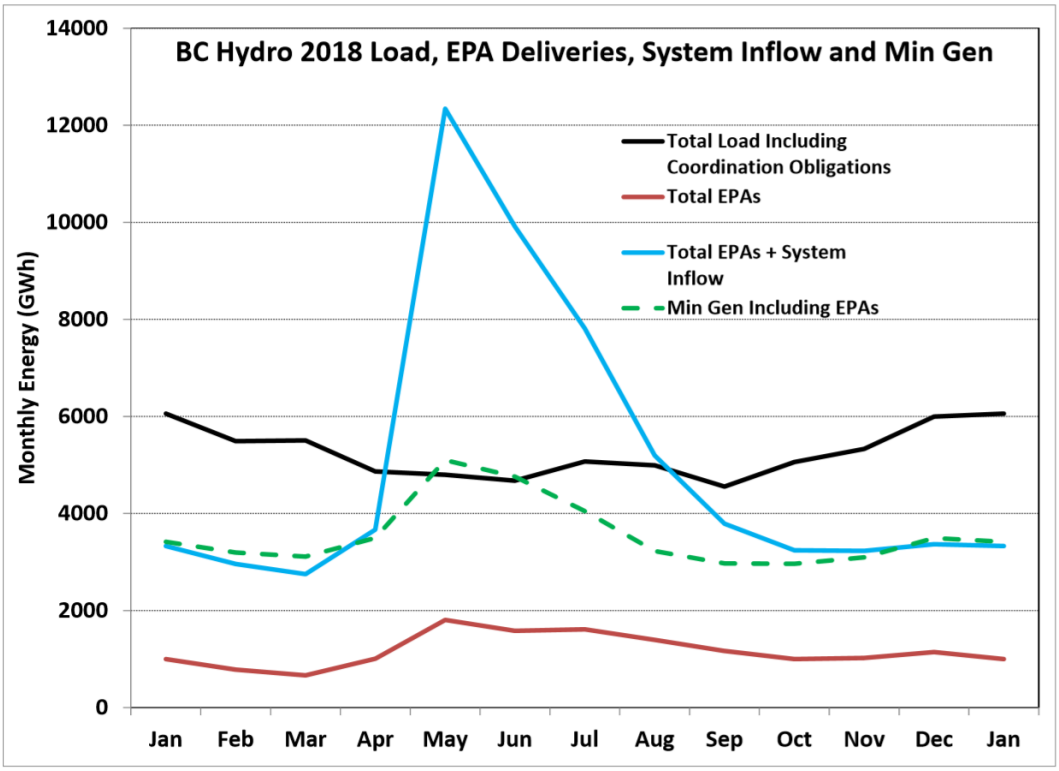
Recommendation: BC Hydro has presented ample evidence that its applied-for DSM plan is cost effective relative to supply-side options, particularly new generation. As long as incremental savings can be shown to be cost effective relative to a market export price, these savings are in the best interest of ratepayers, and should be approved.

8. Miscellaneous

The response to INCE IR 1.7.5 (Exhibit B-6) regarding the operational challenges BC Hydro faces during the freshet (spring runoff) warrants another review, as (any) incremental energy brought into the integrated system during this period is likely to be sold into an oversupplied export market, or result in spill from BC Hydro's own generation assets. This seasonal oversupply needs to be a primary consideration in pending IPP contract renewals. The seasonal value of energy should also be a key consideration in BC Hydro's upcoming Integrated Resource Plan.

David Ince Information Request No. **1.7.5** Dated: **May 1, 2019** British Columbia Hydro & Power Authority Response issued **June 6, 2019**	Page 2 of 2
British Columbia Hydro & Power Authority **Fiscal 2020 to Fiscal 2021 Revenue Requirements Application**	**Exhibit:** **B-6**

The graphic below represents the same data, but actuals for 2018 (calendar year) with the addition of a minimum generation line, as requested.



This graphic summarizes the single greatest operational issue faced by BC Hydro: whereas electricity demand reaches a peak during the winter months due to higher lighting and space heating requirements, its primary 'fuel' (water) has the opposite profile. The fuel is delivered during the freshet, and if not for WAC Bennett's foresight and near dictatorial powers, BC Hydro would currently face near insurmountable challenges in operating its system. However, as indicated by the green line (minimum generation) in the graphic above, the storage capabilities of the BC hydro-based system are reaching their ability to take additional freshet (or solar) energy, given the growth of non-storage generation feeding its system.

This intervenor agrees with BC Hydro that IPP contracts should be renewed at a market price proxy, as this energy is surplus to domestic needs, and in the best case will be sold into adjacent markets such as Alberta or Mid-C. If incremental energy comes into the BC Hydro system during the height of the freshet, it may result in outright spill from BC Hydro's storage facilities, which has occurred with increasing regularity. This is an issue not only for IPP delivered energy, but incremental DSM and customer load curtailment or self-generation. Any future design of solar or small-scale hydro programs needs to consider the operational and revenue impacts of seasonality and BC Hydro storage.

For additional information, please refer to the responses to (Exhibit B-17) INCE Information Requests 3.26 to 3.31 inclusive.

Prices for surplus energy should reflect the seasonal market conditions at the time, which during the freshet are consistently over-supplied and feature deeply suppressed pricing.

Recommendation: consideration be given to the possibility that incremental energy coming into the BC Hydro system during the freshet be are compensated at actual (daily) Mid-C market prices less wheeling costs and Powerex marketing fees.