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British Columbia Utilities Commission
Sixth Floor, 900 Howe Street
Vancouver, BC V6Z 2N3

Attention: Erica M. Hamilton,
Commission Secretary

Dear Sirs/Mesdames:

Re: Terasen Utilities
An Application by BC Hydro and Power Authority for the Approval of 2008 Long Term Acquisition Plan

We enclose Submissions on behalf of the Terasen Utilities in respect of the above mentioned matter. Twenty hard copies of the Submissions will follow by courier.

Yours truly,

FASKEN MARTINEAU DuMOULIN LLP

[Original signed by Matthew Ghikas]

Matthew Ghikas

MTG/fxm
Enc

IN THE MATTER OF

THE UTILITIES COMMISSION ACT S.B.C 1996, CHAPTER 473

AND

AN APPLICATION BY BRITISH COLUMBIA HYDRO AND POWER AUTHORITY (BC HYDRO)

FOR THE APPROVAL OF 2008 LONG TERM ACQUISITION PLAN (2008 LTAP)

FINAL SUBMISSIONS OF THE TERASEN UTILITIES

APRIL 27, 2009

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I. INTRODUCTION AND OVERVIEW

A. Introduction

1. BC Hydro faces a significant challenge in closing its forecasted load-resource gap. BC Hydro is to be commended for advancing a significant portfolio of cost-effective electric *load reduction* demand-side measures ("DSM") that will assist BC Hydro customers to reduce their electricity consumption. However, DSM can also be directed at electric *load avoidance*. Where energy source alternatives exist for particular end use applications, BC Hydro's resource analysis should extend to whether electricity is, in the words of the Energy Plan, the "right fuel, for the right activity, at the right time".[1]

2. "Electric Load Avoidance DSM",[2] as referred to in these Submissions, involves providing cost-effective incentive payments to customers faced with a decision to install appliances to encourage the customer not to adopt electricity for end uses where electricity is not

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[1] The BC Energy Plan states: "It is important for British Columbians to understand the appropriate uses of different forms of energy and utilize the right fuel, for the right activity at the right time. There is the potential to promote energy efficiency and alternative energy supplemented by natural gas." See Exhibit C13-5, at 61.

[2] We have used the term "Electric Load Avoidance DSM" in these Submissions, rather than the term "fuel switching" to emphasize that the purpose of these measures is to avoid inefficient electric load. Also, the term "fuel switching" is subject to being misconstrued as referring exclusively to measures directed at existing customers that have already installed electric appliances, whereas new customers that have yet to install any appliances are also a key target of Electric Load Avoidance DSM.

the most efficient energy source from a Total Resource Cost ("TRC") perspective. Electric Load Avoidance DSM incentives can be structured in a variety of ways, but have as their common objective to mitigate the potential for the customer to choose electricity as an energy choice for particular end use applications, thereby adding load that must be served at BC Hydro's significant marginal cost of supply, based on (i) the prospect of paying electricity rates based to a significant extent on BC Hydro's embedded costs,[3] or (ii) any differential in capital cost between electric appliances and appliances using another energy source. The incentive leaves the customer free to make the choice as to the appropriate energy source for a particular application based on a more efficient price signal from a TRC perspective. The right energy source for a particular customer, for a particular application, in the customer's particular circumstances might be electricity, natural gas, or some other energy source.

3. The starting place for the Commission's analysis of whether Electric Load Avoidance DSM should be used to produce more efficient price signals must be its favourable impact on the rates paid by BC Hydro customers. The importance of examining BC Hydro's strategies to meet the growing load-resource gap from the perspective of BC Hydro's ratepayers is evident from the legislated requirement in the *Utilities Commission Act* ("UCA") for BC Hydro to explain in its LTAP why it intends to acquire new higher-cost supply rather than to pursue this cost-effective DSM.[4] From a TRC perspective, BC Hydro customers collectively stand to benefit from the pursuit of Electric Load Avoidance DSM identified as having a TRC ratio of benefits to costs of more than one. The new emphasis in the UCA on encouraging public utilities to pursue cost-effective DSM is realized by BC Hydro pursuing cost-effective Electric Load Avoidance DSM.

4. "Government's energy objective" in the UCA "to encourage public utilities to reduce greenhouse gas ["GHG"] emissions", which reflects the Province's overall support for mitigating climate change as outlined in the Energy Plan, is also a valid consideration in the assessment of Electric Load Avoidance DSM. The evidence in this proceeding supports the

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[3] BC Hydro's Residential Inclining Block ("RIB") rate structure, which introduced a trailing block rate that moves towards BC Hydro's marginal cost of supply, helps to promote efficient energy choices by customers; however, as discussed later in these Submissions, many residential customers will see mostly the Step 1 rate, and the Step 2 rate will necessarily lag behind BC Hydro's true marginal supply cost.

[4] UCA, s. 44.1(2) (b), (f).

potential for cost-effective Electric Load Avoidance DSM to reduce GHGs on a regional basis. There are three equally compelling reasons why this is the case. Further, the end use consumption of natural gas in BC is already subject to a carbon tax, which provides price signals reflecting the cost of carbon much like BC Hydro's purchased carbon offsets will do for gas-fired electricity generation after 2016. BC Hydro should therefore regard Electric Load Avoidance DSM as a means of reducing (all else equal) electricity rates with confidence that Electric Load Avoidance DSM is consistent with government's interest in mitigating climate change.

5. The Terasen Utilities are encouraged by BC Hydro's apparent willingness to study further the potential for Electric Load Avoidance DSM.[5] The preferable approach to rejecting a part of the LTAP is for the Commission to identify key parameters of that initiative through its findings and directions in this proceeding. The Commission should require BC Hydro to file its next LTAP within 12 to 15 months of the Commission's decision in this proceeding, which represents a continuation of the two-year cycle between LTAP filing dates. BC Hydro should be directed to include in the next LTAP a proposal to pursue cost-effective Electric Load Avoidance DSM based on the outcome of its further study. Maintaining the current two-year regulatory cycle for BC Hydro's LTAP will help to ensure that pursuit of Electric Load Avoidance DSM does not languish while new, higher cost, supply initiatives (e.g. the Clean Call) proceed.

B. Organization of These Submissions

6. These submissions are organized as follows:

(a) Part II discusses the contribution of avoidable (space and water heating) load to the increasing load-resource gap faced by BC Hydro.

(b) Part III addresses the potential to avoid part of the load with cost-effective Electric Load Avoidance DSM.

(c) Part IV explains why the TRC test is appropriate for measuring the cost-effectiveness of Electric Load Avoidance DSM. It also describes the benefit to BC Hydro customers to pursuing cost-effective DSM in the form of rates that are

[5] See Transcript, Vol. 11, at 2038.

lower than they otherwise would have been in the absence of the Electric Load Avoidance DSM.

(d) Part V sets out the evidence regarding how the pursuit of cost-effective Electric Load Avoidance DSM can reduce overall GHG emissions on a regional basis.

(e) Part VI discusses how the current policy and legislative context supports the use of Electric Load Avoidance DSM to send efficient price signals to customers faced with a fuel choice for a particular application. It discusses why the policy arguments advanced by BC Hydro do not outweigh the demonstrated benefits associated with pursuing cost-effective Electric Load Avoidance DSM.

(f) Part VII contains a summary of findings supported by the evidence in this proceeding, as well as proposed Commission directives that should guide the further study of Electric Load Avoidance DSM and inputs in the next LTAP.

II. CHOICE OF ENERGY SOURCE AND BC HYDRO'S LOAD RESOURCE GAP

7. Electric Load Avoidance DSM represents an important opportunity to address a portion of the widening load-resource gap in a cost-effective manner. The following points are addressed in this Part:

(i) BC Hydro faces a difficult task in meeting its forecasted energy and capacity requirements, and attaining self-sufficiency. The load forecast in the LTAP may understate the load requirements given the potential for developments in areas such as electric plug-in vehicles.

(ii) Residential space and water heating, for instance, contributes significantly to BC Hydro's energy and capacity requirements. This creates the imperative for BC Hydro to send effective price signals to encourage its customers to make efficient fuel choices.

(iii) Cost-effective Electric Load Avoidance DSM can help to overcome inefficient price signals on a TRC basis arising from electricity rates based on embedded costs and differential capital costs, with the result that customers may choose an alternative to electricity as an energy source for particular end use applications.

A. Forecasted Energy and Capacity Shortfall and Implications for BC Hydro

8. BC Hydro's Evidentiary Update shows a forecasted energy resource deficit, before factoring LTAP initiatives, of 3,500 GWh in F2012, 7,700 GWh in F2016, 10,600 GWh in F2017, and 13,600 GWh in F2021.[6] BC Hydro acknowledges that the resource deficit is "a

[6] Exhibit B-10, Table 2-6.

significant gap to close."[7] The resource deficit to meet energy demand is increasing even with the DSM adjustment, from a 3,000 GWh shortage in F2017 and to 3,700 GWh in F2021. In F2027, BC Hydro predicts an energy shortfall of 19,100 GWh before 2008 LTAP actions and a 7,500 GWh shortfall after adjusting for DSM. Thus, even with adjustments from currently proposed DSM, the deficit between forecasted energy load and resource more than doubles within a ten-year span (from F2017 to F2027).[8]

9. The forecasted capacity resource deficit is 350 MW in F2012, 1,120 MW in F2016, 1,190 MW in F2017, and 1,720 MW in F2021.[9]

10. BC Hydro has identified several factors that may increase BC Hydro's energy requirements. First, although BC Hydro predicts DSM savings of 7,600 GWh for F2017, 9,900 GWh for F2021, and 11,600 GWh for F2027,[10] it also readily concedes that it "faces uncertainty with respect to . . . DSM savings."[11] Second, electrification of oil and gas facilities may add to the future load forecast.[12] Third, there exists the potential for significant load associated with electric plug-in vehicles.[13] Fourth, as discussed further below, since BC Hydro's load-resource balance assumes that in future years the percentage of residential customers with electric space and water heating will remain more or less as it is today (based on BC Hydro's billing data), BC Hydro's energy requirements will increase if existing customers switch to electric space and water heating during the next 20 years or if the capture rate for new customers increases materially during that time.[14]

11. These potential developments will also have capacity consequences.

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[7] Transcript, Vol. 3, at 257.

[8] Exhibit B-10, Table 2-9.

[9] Exhibit B-10, Table 2-7.

[10] Exhibit B-10, Table 2-9.

[11] Exhibit B-10, at 24; Transcript, Vol. 3, at 258.

[12] Exhibit B-10, at 12; Exhibit C13-5, at 6.

[13] Exhibit B-10, at 11; Exhibit C13-5, at 6.

[14] Transcript, Vol. 3, at 259-260; Exhibit B-10, at 11-12; see also Exhibit C13-7, at 15, BC Hydro states that all residential spacing heating and water heating load migrating from other energy sources to electricity is a low probability.

12. BC Hydro's ability to close the load-resource gap in a timely manner is critical for BC Hydro to meet the requirement to reach self-sufficiency by 2016. Lower than anticipated DSM savings will mean, for instance, that "there would likely not be time to recover through standard acquisition process. This would likely result in BC Hydro relying on the Canadian Entitlement and other market contingency options, something that is contrary to Special Direction No. 10 to the BCUC."[15] The fact that it is easier to "ramp down" DSM than "ramp it up",[16] when combined with the implications for not achieving the expected DSM savings associated with BC Hydro's proposed DSM expenditures, suggests that BC Hydro should be pursuing cost effective Electric Load Avoidance DSM at this time, rather than waiting until closer to 2016.

B. Contribution of Residential Space and Water Heating Load to Load-Resource Gap

13. Electric space heating and water heating are notable contributors to BC Hydro's forecasted energy and capacity shortfall. The addition of new electric space and water heating customers, either in the form of new BC Hydro customers (i.e. new construction) or existing BC Hydro customers replacing their end-of-life gas appliances with electric appliances, will add incremental load.

(i) Differential Contribution to Energy and Capacity Requirements

14. Customers with electric space and water heating contribute disproportionately to BC Hydro's energy requirements relative to customers without electric space and water heating. Existing customers with non-electric space and water heating consume about 9,200 KWh/year, while customers with primary electric space and water heating systems use approximately 15,728 KWh/year, with a net difference of over 6,500/KWh per year.[17]

15. Space heating load has a significant seasonal aspect – it occurs primarily during the winter system peak – thus contributing disproportionately to BC Hydro's capacity

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[15] Exhibit B-10, at 24.

[16] Exhibit B-10, at 24. "It is easier to ramp DSM down than up. Ramping DSM down involves cancelling DSM programs or restricting eligibility criteria, which BC Hydro can do on its own; whereas ramping DSM up requires trade ally cooperation and action, which can be difficult or slow to secure."

[17] Exhibit C13-7, at 20.

requirements.[18] This is illustrated by the graph from the 2007 BC Hydro Rate Design Application that has come to be known as the "Terasen Graph."[19] The "Terasen Graph" depicts BC Hydro as having a pronounced winter system peak in the months of November through February, with residential space heating load being the single greatest contributor to the winter system peak while all the other rate classes' loads are relatively flat.[20] Adding new electric space heating load will, all else equal, result in an increase in the system peak.[21] The peak will, in fact, become more pronounced. Exhibit B-73, filed after the close of the oral hearing, demonstrates that approximately 64% of incremental space heating load will fall in the months of November, December, January and February. Eighty-five percent of the incremental space heating load is encompassed if the six-month period of October to March is considered. Exhibit B-73 further indicates that approximately 55% of the incremental space heating load would be expected to fall in the Peak or Super-Peak periods.[22] The potential for new space and water heating load to make BC Hydro's system peak more pronounced was also illustrated in the hypothetical scenario where all residential space heating load migrates from other fuels to electricity by 2020, with more than half of the incremental 22,000 GWh/year occurring during Super-Peak or Peak periods.[23]

(ii) Potential Sources of New Space and Water Heating Load

16. There are two potential sources of new space and water heating load. First, new BC Hydro customers or developers may choose to install electric appliances. Second, existing BC Hydro customers who currently use another energy source for space and water heating may convert to electricity as their appliances reach end of life.

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[18] Exhibit B-73; Exhibit C13-7, at 11.

[19] Exhibit C13-7, at 11; see also Exhibit B-10, at 7, where BC Hydro stated that in mid-December 2008, its domestic system peak demand reached approximately 10,000 MW.

[20] Exhibit C13-7, at 18; Transcript, Vol. 6, at 877-878.

[21] Transcript, Vol. 6, at 878.

[22] Exhibit C13-7, at 43. The Peak and Super-Peak periods are the periods of high demand within the day when higher prices will be paid for supply based on Time-of-Delivery Factors in BC Hydro's Clean Power Call. The Time-of-Delivery Factors for electricity supplied in the Peak and Super-Peak periods are the highest in the winter months when most space heating occurs.

[23] Exhibit B-12, Response to Terasen IR 3.7.2 and Exhibit C13-7, at 43. The Terasen Utilities are citing this evidence to illustrate the seasonal nature of the load, not to suggest that this unlikely scenario will materialize.

Space and Water Heating Capture Rate (New BC Hydro Customers)

17. BC Hydro's load forecast assumes that, as new customers are added to the BC Hydro system, approximately 20% of new customers will install space heating and approximately 35% of new customers will install water heating, increasing to 21% and 38% respectively by the end of the 20 year forecast horizon.[24] These percentages of new customers that adopt particular end uses are referred to as "capture rates". BC Hydro's capture rates for space and water heating are extrapolated from BC Hydro billing data and reflect the current percentage of existing BC Hydro customers that have electric space heating and electric water heating (20% and 35% respectively).[25] The forecasted capture rates translate into over 5,500 new electric space heating customers per year over the forecast period and more than 8,600 new electric water heating customers per year.[26] The load associated with these additions compounds each year, and represents 12.8% of the forecast load growth between F2008 and F2027.[27] Looking at F2027 as a point in time the cumulative incremental annual space and water heating load attributable to customers captured between F2008 and F2027 is 1,933 GWh in F2027[28]. Of the 1,933 GWh, 1,409 GWh is for primary residential space heating, 483 GWh is for water heating and 41 GWh is for secondary space heating.[29]

18. BC Hydro's witnesses downplayed the importance to the overall load-resource gap of load associated with the capture of new space and water heating customers. Mr. Matheson implied, for example, that reducing the capture rate was of greater interest to the Terasen Utilities as natural gas utilities.[30] This view is at odds with BC Hydro's noted concern about the growing load-resource gap. The longer term nature of the investment made by customers in

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[24] Exhibit B-10, at 11-12.

[25] Exhibit B-10, at 11; see also Exhibit C13-7, at 30; Transcript, Vol. 6, at 887. BC Hydro agreed that the increase in the capture rate for space and water heating will be higher than 1% and 3% over the 20 year planning horizon because the 21% and 38% reflect the percentage of total residential stock in 2028.

[26] Exhibit B-4, Response to Terasen IR 2.5.4.

[27] Exhibit C13-8; Transcript, Vol. 6, at 881-882. BC Hydro accepted that all numbers contained in the Witness Aid were correct.

[28] The 1,933 GWh of incremental annual space and water heating load is also 25.8% of the forecast gap in F2027 between the Mid-Load Forecast after DSM and Existing and Committed Supply or 10.1% of the forecast gap in F2027 between the Mid-Load Forecast before DSM and Existing and Committed Supply (Exhibit B-10, Table 2-10).

[29] Exhibit C13-8.

[30] Transcript, Vol. 11, at 2039.

appliances means that there is a higher probability that the load will be avoided if another energy source is adopted upon installation as compared to encouraging the customer with DSM incentives to reduce his electricity consumption associated with the installed electric appliance. Moreover, BC Hydro intends to take measures to address lesser contributors to the forecasted load. For instance, the impact of space heating load during the 20 year forecast period is greater than the additional load being addressed by the proposed FNU3.[31] It represents close to the same amount of energy as the post-attrition Clean Call of 2,100 GWh.[32]

19. The evidence suggests that 1,933 GWh in F2027 may understate the amount of load contributed by residential space and water heating over the planning horizon. The capture rates of 20% and 35%, from which the above figure is calculated, are an extrapolation from billing data. BC Hydro is not confident that its billing data is accurate.[33] BC Hydro's 2006 Residential End Use Survey ("REUS") suggested that the percentage of existing BC Hydro customers that have electric space heating is in excess of 30%, not 20%.[34] The amount added annually for electric space heating based on a 20% capture rate is about 74 GWh.[35] A 50% increase in the electric space heating capture rate (up from 20% to 30%) would therefore add approximately a further 37 GWh/year. [Although Mr. Matheson suggested that increasing the capture rate by 50% (from 20% to 30%) would only increase the load by about 9 GWh/year[36], mathematically this cannot be the case. Mr. Matheson appears to have incorrectly performed his calculation based on a 10% increase rather than a 50% increase and BC Hydro accordingly uses a figure of 10% in its Submission.] The 50% increase in space heating capture would represent

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[31] Exhibit B-10, at 5, shows the change over 20 years in Fort Nelson as close to 800GWh, or less than half the amount attributable to new space heating alone.

[32] Transcript, Vol. 12, at 2208, lines 10-13.

[33] Exhibit C13-7, at 23; Transcript, Vol. 6, at 889-890.

[34] Exhibit C13-7, at 35-36; Transcript, Vol. 6, at 893-894.

[35] Exhibit B-4, Terasen Utilities IR 2.5.1 (attached to the witness aid filed in Exhibit C13-8) and Terasen Utilities IR 2.5.4. The annual load increase of approximately 74 GWh/year attributable to new primary space heating customers can also be confirmed from the response to Terasen IR 2.5.4. For example, multiplying the new electric space heating customers for F2010 of 5,517 customer by the annual space heating load per new account of 13,412 kWh/customer = 74 GWh. The average annual load per new account in Table B of Terasen IR 2.5.4 was confirmed in the BC Hydro 2007 Rate Design hearing as being solely attributable to space and water heating.

[36] Transcript, Vol. 11, at 2003. BC Hydro cited this evidence on page 61 of its Submissions.

additional annual load of approximately 705 GWh by F2027 (i.e., 50% of the 1409 GWh attributable to growth in primary electric space heating in F2027).[37]

Existing BC Hydro Customers Adopting Electric Space and Water Heating

20. In F2006, BC Hydro's residential customers consumed about 16,100 GWh[38], with space heating alone accounting for about 24% of that consumption.[39] That level of consumption is based on only a minority of BC Hydro's residential customers (20%-30%) having electric space heating. BC Hydro's load forecast, and the 12.8% or 1,933 GWh in F2027 cited above, assumes that none of the 70%-80%[40] of BC Hydro customers that currently have space heating appliances operated using another energy source will convert to an electric appliance during the next 20 years.[41] Given the age of the housing stock in BC, there are going to be households and businesses with gas heating systems that have reached end of life and require replacement. Some of these customers will convert to electric space and water heating if they continue to receive price signals based primarily on embedded costs, thereby further increasing the energy load and BC Hydro's supply requirements.[42]

(iii) Importance of Encouraging Efficient Choices among Energy Sources

21. Avoiding even a portion of the load associated with potential *new* customer captures of electric space and water heating will make a material contribution to closing the load-resource gap. Avoiding the potential for some of the 80% of *existing* customers to install electric appliances when their current non-electric appliances reach end-of-life will reduce the potential for exceeding the current load forecast. When other end uses for which energy source alternatives exist are included in the analysis, Electric Load Avoidance DSM takes on considerably more importance as a tool for BC Hydro to close the growing load-resource gap. Price signals that more closely reflect BC Hydro's marginal supply cost leave the customer free to make efficient choices for their particular circumstances.

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[37] Exhibit C13-8

[38] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 51.

[39] *Ibid*, at 52. Space heating share is much higher in electrically heated homes.

[40] The percentage of these customers depends on whether one uses 20% or 30% as the percentage of existing BC Hydro customers with electric space heating, per the billing data and REUS respectively.

[41] Transcript, Vol. 6, at 884-885.

[42] Transcript, Vol. 9, at 1483, where BC Hydro's witness agreed that BC Hydro's flat rates based on the embedded costs of supply were inadequate to encourage the efficient use of electricity.

III. THE ROLE OF ELECTRIC LOAD AVOIDANCE DSM IN SENDING EFFICIENT PRICE SIGNALS

22. Electric Load Avoidance DSM involves providing cost-effective incentive payments to customers faced with a decision to install appliances to encourage the customer not to adopt electricity for end uses where electricity is not the most efficient energy source from a TRC perspective. The incentive payments mitigate the potential for the customer to choose an energy source based on (i) the prospect of paying electricity rates based to a significant extent on BC Hydro's embedded cost of supply, or (ii) any differential in capital cost between electric appliances and appliances using another energy source.[43] Structuring Electric Load Avoidance DSM programs is a matter for future work; but, incentives can be based, for instance, on energy saved, square footage (for space heating), volume (for water heating), or the incremental capital cost of adopting an alternative energy source.[44] Electric Load Avoidance DSM encourages the customer not to adopt electricity, but is neutral in that it leaves the customer free to make the choice as to the appropriate energy source for a particular application based on a more efficient price signal. The right energy source for a particular customer, for a particular application, in the customer's particular circumstances might be electricity, natural gas, or some other energy source.[45]

23. BC Hydro customers pay rates primarily reflecting embedded costs, and are insulated from BC Hydro's true marginal cost of supply. The BC Hydro RIB rate improves the conservation price signals experienced by residential customers; however, there is still room for improved conservation signals as, by its design, many customers see mainly the Step 1 rate. The Step 2 rate changes lag behind BC Hydro's marginal cost of supply. BCUC Order No. G-124-08 and the RIB Decision set the residential Step-2 rate at 8.27 cents per kWh (equal to $82.70 per

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[43] Transcript, Vol. 9, at 1509.

[44] BC Hydro has used similar approaches in the context of its load reduction DSM in the LTAP. See B-1, Appendix K, Sub-Appendix F, Program Summaries.

[45] BC Hydro discounted the potential for other fuel source alternatives to gain a foothold. See, e.g., Transcript Vol. 11, at 1999-2000 where BC Hydro's witness stated that "[w]e're certainly see a lot of additional interest in heat pumps currently, but I think they still represent a fairly small -- a small percentage, and I think there's some uncertainty in terms of how it's going to unfold moving forward". However, it is also necessary to consider the fact that this may reflect the current inefficient pricing of electricity from a TRC perspective as a competing energy source.

MWh) effective April 1, 2009.[46] This is well below the expected marginal supply cost identified in the LTAP proceeding of $120 per MWh. For those customers who mainly see the Step 1-rate, it is below the previous flat rate because it is set residually.

24. Relative differences in the capital cost associated with adopting a particular energy source can also represent an impediment to efficient choices regarding energy source. To illustrate, a customer faced with installing a new heating appliance might currently be expected to choose electric space heating in the absence of the right pricing signals or incentives,[47] as an electric plenum or baseboard heaters may appear to the customer to be cheaper than adopting a higher efficiency natural gas furnace, or adopting another type of technology such as heat pumps or geo-exchange systems.

25. It is important to send the appropriate price signals and messaging to customers and developers at the time the choice of energy source is made, because once the choice is made and the customer has invested in appliances it represents an obstacle to later changing to a different energy source. As BC Hydro agreed, a new house "built without ductwork and with baseboard heating... [has] an obstacle for inputting either a natural gas furnace or a heating [sic] pump in the future."[48] BC Hydro's Submissions expanded on this point:

> A customer's choice at the moment of installing space and water heating is a long term selection. Once made, it is difficult (expensive) to reverse. The appliances have useful lives of approximately 20 years and the building structures, and internal infrastructure would be much longer. Such choices are not minute to minute or day to day or year to year decisions. They are relatively permanent and have short, medium and long-term consequences.

Although BC Hydro was intending by the above submission to urge caution in pursuing Electric Load Avoidance DSM, the passage speaks much more strongly to the Terasen Utilities' point

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[46] The Commission's Decision in the RIB Application included it its design principles parameters as to when BC Hydro must come forward with a proposal to change its cost of new supply and how to phase in the change. See for instance, In re BC Hydro, Residential Inclining Block Rate Application, Reasons for Decision (September 24, 2008), at 108.

[47] Transcript, Vol. 9, at 1503-1505; see also Transcript, Vol. 11, at 2000-2001

[48] Transcript, Vol. 11, at 2001. When responding to the question of whether a new house built without ductwork and with baseboard heating would have "an obstacle for inputting either a natural gas furnace or a heating pump in the future," Mr. Hobson stated that "Depending on the type of home it is, it'll create some limitations, yes."

that these customers who are faced with a decision as to appliances using different energy sources should be the primary targets of Electric Load Avoidance DSM.

26. BC Hydro should pursue cost-effective Electric Load Avoidance DSM in tandem with its proposed portfolio of load reduction DSM. It is not in the best interest of customers for BC Hydro to wait passively for customers to adopt electrical appliances where it does not make sense from a TRC perspective, in full anticipation of spending *load reduction* DSM dollars to avoid high marginal supply costs associated with serving that added load. Load reduction and load avoidance have the same value to BC Hydro customers in terms of BC Hydro avoiding new high cost supply; however, successful load avoidance provides additional certainty that new supply will not be required over the long useful life of the adopted non-electric appliances.[49] As discussed later in these Submissions, BC Hydro and the Terasen Utilities agree that the installation of a particular type of appliance is a barrier to changing energy source during the life of the appliance. BC Hydro can target its load reduction DSM dollars to customers who have chosen electricity as an energy source based on more efficient price signals from a utility resource cost (i.e. TRC) perspective. Puget Sound Energy and Avista are examples of other utilities that use incentive programs to address the fact that their rates structures would otherwise tend to encourage adoption of electricity where more efficient fuel choices are available.[50]

IV. BENEFIT TO BC HYDRO CUSTOMERS ASSOCIATED WITH ELECTRIC LOAD AVOIDANCE DSM

27. Government has indicated its objective is "to encourage public utilities to pursue demand-side measures", and the UCA requires BC Hydro to provide an explanation in the LTAP as to why cost-effective DSM is not being pursued.[51] The Commission's overarching responsibility is to ensure that rates are just and reasonable.[52] In light of these requirements, the starting place for the Commission's analysis of Electric Load Avoidance DSM must be its

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[49] Transcript, Vol. 11, at 1996-1997.

[50] Transcript, Vol. 9, at 1518. Puget Sound Energy offers one-time incentives to eligible customers to help defray the cost of conversion to highly efficient natural gas space heating and/or domestic water heating. The incentive program is structured as a rebate to customers based on type of existing electric heating to be replaced and the amount of historic energy usage (see Exhibit C13-9, at 6). Avista offers similar home improvement incentives for space heating conversion from electric to natural gas or air/ground source heat pump (see Exhibit C13-9, at 17).

[51] UCA, s. 44.1(2) (b), (f).

[52] UCA, ss. 59 - 61.

impact on the rates paid by BC Hydro customers.[53] This Part of the submissions address the following points:

(i) The legislative scheme in the UCA requiring public utilities to look first to cost-effective demand-side measures is realized by BC Hydro pursuing Electric Load Avoidance DSM identified as having a TRC ratio of benefits to costs of more than one.

(ii) The 2007 CPR identified significant *economic potential* (determined on a TRC basis) for Electric Load Avoidance DSM. From an overall resource cost (i.e. TRC) perspective, BC Hydro customers collectively stand to benefit from the pursuit of this *economic potential*.

(iii) The *economic potential* for Electric Load Avoidance DSM will likely be higher today than in the 2007 CPR based on a much higher avoided cost of new electricity supply.

(iv) In light of the cost implications for all BC Hydro customers, Electric Load Avoidance DSM exhibiting a favourable TRC should not be eliminated from contention by means of a simple payback analysis based on current rates paid by customers that reflect, to a significant extent, embedded costs.

A. Cost-Effectiveness Determined By TRC Analysis

28. The cost-effectiveness of Electric Load Avoidance DSM is determined with reference to a TRC analysis, which focuses on the resource costs and benefits of electricity and a fuel alternative.

29. BC Hydro customers as a whole will benefit from BC Hydro making available the necessary cost-effective Electric Load Avoidance DSM to avoid load that would otherwise have to be served at BC Hydro's marginal cost of new supply. Electric Load Avoidance DSM with a TRC of more than one (identified in BC Hydro's CPR as having *economic potential*) that is not pursued represents a lost opportunity to manage resource costs for the benefit of all BC Hydro customers. BC Hydro rates will experience greater upward pressure than would be the case (all

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[53] BC Hydro stated in its Submissions at 19 line 18 to 11 that "it is the interests of its existing and future customers that are paramount, especially when compared to, say, another intervening utility, which has obvious commercial interests." The Terasen Utilities agree that the Commission should base its findings regarding Electric Load Avoidance DSM on the interests of BC Hydro's customers. The evidence is that Electric Load Avoidance DSM is in the interests of BC Hydro customers. Whether or not the commercial interests of the Terasen Utilities are aligned with the interests of BC Hydro customers is irrelevant.

else equal) if the targeted load is reduced or avoided by the adoption of other alternative energy sources including natural gas.[54]

30. Using the TRC test to assess the cost-effectiveness of Electric Load Avoidance DSM is consistent with the DSM Regulation. The Regulation references TRC as a measure to determine cost-effectiveness in respect of particular DSM programs and requires the Commission to use BC Hydro's avoided cost of supply for assessing the cost-effectiveness of measures taken by entities that receive service from BC Hydro.[55] In the Commission's recent decision on TGI and TGVI's Energy Efficiency and Conservation ("EEC") Application, the Commission endorsed the use of the TRC test more generally.[56]

B. Economic Potential Identified in 2007 CPR

31. The section of the CPR addressing Electric Load Avoidance DSM considered only natural gas as a fuel alternative to electricity for particular end uses, and referred to the measures examined as "fuel switching" measures. Opportunities clearly exist for BC Hydro to explore Electric Load Avoidance DSM involving other alternative energy sources apart from natural gas, and it would be appropriate for all energy source alternatives to be considered in future analysis of Electric Load Avoidance DSM.

32. The CPR identified whether measures had *economic potential*, defined by a TRC of greater than one.[57] Notably, the CPR equated this *economic potential* with "cost-effective" Electric Load Avoidance DSM,[58] which is appropriate. In the context of the Electric Load

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[54] Transcript, Vol. 9, at 1523.

[55] For instance, the DSM Regulation provides for the use of TRC for the low-income programs. Section 4(2) allows the use of avoided cost, rather than the purchase price, as the measure for benefit, when assessing cost effective of a DSM of a bulk electricity purchaser. Additionally, section 4(4) specifies that the Commission cannot reject DSM based on a ratepayer impact measure test.

[56] In Re Terasen Gas Inc. and Terasen (Vancouver Island) Inc., Energy Efficiency And Conservation Application, Decision (April 16, 2009) ("EEC Decision"), at 34: "The Commission Panel also takes note of the DSM Regulation which will apply to Terasen as of June 01, 2009 requiring the Commission to use, in addition to any other test it considers appropriate, the TRC test in determining whether a demand-side measure is cost-effective. While the DSM Regulation is not in effect for the purposes of this Decision, the Commission Panel does consider the TRC test to be appropriate and adequate for the purposes of this Application and accepts it as such."

[57] Exhibit B-1-1, Appendix K, CPR Summary Report, at 15; see also Exhibit B-4, Response to BCUC IR 2.201.5, 2.206.1.

[58] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 109. The CPR states "[i]n this study, 'cost-effective' means that the fuel-switching measure passes the Measure Total Resource Cost (TRC) test."

Avoidance DSM examined in the CPR, the TRC analysis considered the resource costs of both electricity and the alternative energy source (natural gas, in this case). TRC was defined in the CPR as "the net present value of energy savings that result from an investment in a fuel-switching measure." It is equal to "its full or incremental capital cost (depending on application) plus any change (positive or negative) in the combined annual energy and operating costs."[59] The CPR used BC Hydro's avoided cost of electricity ($88/MWh based on the results of the F2006 Open Call for Power[60]) to determine any applicable changes in operation costs.[61] In simple terms, the measures identified as having *economic potential*, i.e. a TRC Benefit/Cost ratio of greater than one, have the potential to provide a net benefit to BC Hydro customers as a whole based on BC Hydro's avoided supply costs.

33. The CPR identified significant *economic potential* for Electric Load Avoidance DSM that uses natural gas as an alternative fuel in the residential, commercial and industrial sectors.[62] The *economic potential* of Electric Load Avoidance DSM in the BC Hydro CPR was found to be 24.02 PJ equivalent (6,674 GWh/year) by 2026 in the current gas supply cost scenario, and 11.85 PJ equivalent (3,293 GWh/year) by 2026 in the high gas supply cost scenario.[63] BC Hydro's 2007 CPR concluded that

> [u]nder the Current supply cost forecast, there are a number of fuel-switching measures . . . that have a positive Measure TRC [i.e. TRC for the measure expressed in dollars is positive] and a Measure Benefit/Cost ratio that is equal to, or greater than one. This result suggests that from a provincial economic perspective, there are opportunities where switching from electricity to natural gas may be beneficial.[64]

C. Increase in BC Hydro's Avoided Cost of Supply Increases Economic Potential

34. BC Hydro's avoided cost of supply is a key input in the determination of *economic potential*, and the avoided cost of supply has increased markedly since the 2007 CPR

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[59] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 21.

[60] Exhibit B-1-1, Appendix K, Summary Report, at 15.

[61] Exhibit B-1-1, Appendix K, Summary Report, at 53.

[62] Exhibit B-1, Response to BCSEA IR 2.28.1, Attachment 1 at 6.

[63] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 111 (current natural gas supply cost scenario); at 115 (high natural gas supply cost scenario).

[64] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 108.

was conducted.[65] All else equal, the *economic potential* increases with the increases to BC Hydro's avoided cost of supply.

35. The *economic potential* in the 2007 CPR was identified using an avoided cost of supply of $88/MWh, based on an average of the results of the F2006 Open Call for Power.[66] BC Hydro's Evidentiary Update identified an avoided supply cost of $120/MWh (F2006 dollars) for the purposes of assessing DSM portfolios.[67] This represents a proxy for the expected average bid price in the current Clean Power Call.[68] The $120/MWh avoided cost of supply does not include distribution costs or line losses for distribution,[69] which would also be incurred when delivering non-avoided electricity to end use customers. The distribution line losses alone add an additional four percent to the delivered cost of energy.[70]

36. The $120/MWh avoided supply cost also does not account for the fact that space heating load occurs in winter months when electricity is the most expensive.[71] As an example, a single customer with 4,260 kWh of space heating load would consume more than over 3,000 MWh from November to March.[72] The cost of serving space heating load, even before factoring in line losses, is likely closer to $130/MWh[73] using the most recent weighted average time of delivery percentage of 108% provided by BC Hydro.[74]

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[65] Transcript, Vol. 9, at 1522.

[66] Exhibit B-1-1, Appendix K, CPR Summary Report, at 15. Exhibit C13-12 and Transcript 11, at 2020-2021 evidence the Terasen Utilities' objections to the CPR. In calculating the TRC of electricity-to-gas "fuel switching" measures, BC Hydro used both a current and high gas forecast. However, it only employed the current forecast on the electricity side, which was then $88/MWh. The result of considering a high gas cost scenario without accounting for upward pressure in marginal electricity supply costs was to reduce the amount of economic potential. The Terasen Utilities registered its objections to this approach during the stakeholder process in the CPR.

[67] Exhibit B-10, at 25; Transcript, Vol. 9, at 1528.

[68] Transcript, Vol. 9, at 1522.

[69] Transcript, Vol. 9, at 1529-1530

[70] Exhibit B-12, Response to Terasen IR 3.7.1.

[71] See Transcript, Vol. 6, at 915-918, for an explanation of the correlation between peak months and energy prices.

[72] Exhibit B-73, BC Hydro Undertaking No. 10.

[73] $120/GWh x 1.08 = $129.6/GWh

[74] Exhibit B-73, BC Hydro Undertaking No. 10. The undertaking response filed by BC Hydro as Exhibit B-73 was based on the time of delivery pricing from the 2009 Call for Tenders webpage. (Exhibit C13-7, at 43). The undertaking response corrected an error in BC Hydro's response to Terasen Utilities IR 3.7.3 (Exhibit C13-7, at 42), in which BC Hydro had accounted for the consumption of electric space heating customers for all end uses rather than just space heating. See also Transcript, Vol. 6, at 913.

37. Natural gas cost is a component of the TRC analysis for Electric Load Avoidance DSM examined within the CPR. The Terasen Gas combined commodity cost and midstream charge based on service to the Lower Mainland was $8.551 per GJ at the time of the hearing, well within the scenarios examined in the CPR, and within the BC Hydro long-term natural gas price forecast.[75] The carbon tax would have to be added to this value, but as $8.551 per GJ is less than one third the cost of BC Hydro's avoided cost of supply there is a significant margin to allow for this and yet still yield a favourable TRC. $120/MWh corresponds to an equivalent gas cost of $30.00 per GJ.[76]

38. The significant increase in the avoided cost of new electricity supply from the $88/MWh used in the 2007 CPR, combined with the fact that the current gas cost forecast remains within the scenarios employed in the 2007 CPR, indicates growing opportunities for BC Hydro to address a portion of the load-resource gap with cost-effective Electric Load Avoidance DSM.

D. Customer Payback Calculated Based on Embedded Cost Rates

39. The CPR did not identify any *achievable potential* for the Electric Load Avoidance DSM considered[77] because customers paying rates that reflect the low embedded cost of electricity do not see the "payback" necessary from these measures to consider adopting another energy source.[78] The Terasen Utilities, which were involved in the CPR stakeholder process, have consistently expressed concerns about eliminating measures based on payback established with reference to rates based to a significant extent on embedded costs.[79] The embedded cost of electricity does not produce effective price signals for conservation, a fact

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[75] Exhibit B-1, at 4-16, Figure 4-2.

[76] Exhibit C13-11; Exhibit B-33.

[77] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 108 and footnote 65..

[78] Exhibit B-1-1, Appendix K, BC Hydro CPR 2007, Summary Report, at 55. The simple payback, according to the CPR, is "a measure of the length of time required for cumulative savings from a project to recover its initial investment cost and other secured costs, without taking into account of the time value of money." Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1,at 21-22. See also Exhibit C13-5, at 38, where the excerpt from the CPR states: "This somewhat contradictory result (i.e. measure passes the economic screen but has excessively long payback period) is explained by the large discrepancy between the wholesale and retail prices for natural gas and electricity."

[79] Exhibit C13-12, at 23; Transcript, Vol. 11, at 2020-2021.

which BC Hydro recognized in adopting the RIB rate structure.[80] BC Hydro has a responsibility to its customers to identify incentive models to turn the identified *economic potential* into *achievable potential.*

E. Summary

40. A proactive approach by BC Hydro to developing appropriate Electric Load Avoidance DSM incentives will help to ensure that customer choices are not made based on inefficient price signals to the detriment of customers as a whole. The significant increase in the avoided cost of supply from the $88/MWh used in the 2007 CPR provides greater opportunities for BC Hydro to use Electric Load Avoidance DSM to address a portion of the load-resource gap.

V. REGIONAL REDUCTION IN GREENHOUSE GAS EMISSIONS

41. BC Hydro's objection to Electric Load Avoidance DSM is rooted in the assumption that natural gas is the logical alternative energy source for particular end uses, discounting the potential for British Columbians to adopt other alternative energy sources that have the potential to attract a larger market share with efficient pricing of electricity. The Terasen Utilities agree that natural gas can provide appropriate energy solutions and could be the right choice for some customers. However, the potential for natural gas consumption in direct use applications within BC to reduce GHG emissions on a regional basis, combined with the obligation on British Columbians to pay the carbon tax on domestic natural gas consumption, eliminates BC Hydro's primary policy basis for opposing natural gas as part of Electric Load Avoidance DSM. In this part we make the following points.

(i) There are three equally compelling reasons why Electric Load Avoidance DSM involving natural gas can, on a regional basis, "reduce greenhouse gas emissions" as contemplated in "government's energy objectives". They are:

(A) First, the use of natural gas or alternatives for specific end uses in British Columbia will make additional hydroelectricity available

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[80] In re BC Hydro, Residential Inclining Block Rate Application, Reasons for Decision (September 24, 2008), at 50, 95, 107. Dr. Orans also noted in the RIB Application proceedings that to assess the RIB as a mechanism to encourage conservation, BC Hydro "should be probably looking at a total resource cost perspective and looking at the choices customers have and the choices that BC Hydro has for meeting a new supply." (Exhibit C13-9, at 3). BC Hydro should similarly be approaching Electric Load Avoidance DSM from a TRC perspective.

for export to displace coal or gas-fired generation on the margin in the Western Interconnection.

(B) Second, Electric Load Avoidance DSM reduces the need for BC Hydro to import electricity that is frequently generated through the relatively inefficient consumption of gas or coal.

(C) Third, natural gas will be consumed at a higher efficiency, with a lower emission factor, in end-use appliances than if it is exported for use in generating electricity.

(ii) Efficient pricing of natural gas is achieved in part by requiring domestic consumers to pay the carbon tax or (in BC Hydro's case after 2016) acquiring offsets. The focus in this proceeding should be on achieving the right pricing for electricity, which will permit energy consumers to arrive at the optimal balance among alternative energy sources.

42. Electric Load Avoidance DSM represents a means of reducing (all else equal) electricity rates for all customers while remaining aligned with government's interest in mitigating climate change through the right pricing of energy sources.

A. Electricity Exports Displace Coal and Gas Fired Generation on the Margin

43. The Commission has concluded twice previously that exporting surplus electricity achieved by using a more efficient resource alternative in British Columbia will displace coal or gas-fired generation at the margin in the Western Interconnection. The evidence in this proceeding continues to support those determinations.

(i) Previous Commission Decisions

44. In the Commission's October 26, 2007 Decision on BC Hydro's 2007 Rate Design – Phase 1, the Commission stated:

> Commission Panel commends Terasen for its initiative in leading evidence both concerning the use of electricity for space and water heating in BC Hydro's service area, and concerning the potential growth in demand for electric space and water heat that BC Hydro is forecasting. The implications of the growth in demand were among the reasons that led the Commission Panel to encourage and guide BC Hydro to implement an inclining block residential rate, so that customers receive the correct pricing signal in this regard. <u>The Commission Panel agrees with Terasen that the use of natural gas (as opposed to electricity) for space</u>

> and water heating in B.C. will make additional energy available to displace coal or gas-fired generation at the margin in the Pacific Northwest [Emphasis added].[81]

45. The Commission repeated in December 2007 that it "continues to agree with Terasen that the use of natural gas (as opposed to electricity) for space and water heating in BC will make additional energy available to displace coal."[82]

46. In the Commission's recent decision on the Terasen Utilities' EEC Application, the Commission found "that the 'optimal balance' as between natural gas and electricity has not been established" on the evidentiary record in that Application and "that the efficiency of other energy sources over and above that of electricity has not been adequately established."[83] The EEC Panel determined that there was insufficient evidence on the record to conclude that "a regional approach should be adopted as a justification for EEC expenditures aimed at substituting natural gas as a fuel to replace electricity."[84] The evidentiary record in this proceeding, unlike the EEC Application, contains voluminous evidence with respect to the relative efficiency of electricity and gas, and the benefit to BC Hydro customers associated with Electric Load Avoidance DSM. BC Hydro's CPR considered, in a TRC analysis, the benefits and costs of particular measures in light of the resource costs of both electricity and the alternative energy source.[85] The *economic potential* for particular Electric Load Avoidance DSM is quantified, and the positive impact on BC Hydro customers in the form of reduced rates (all else equal) is clear. The CPR concluded that "This result suggests that from a provincial economic perspective, there are opportunities where switching from electricity to natural gas may be beneficial."[86] The measures envisioned in the CPR do not require any determination to be made, either by BC Hydro or the Commission as to the "optimal balance" among energy sources. Rather, by putting in place appropriate price signals, British Columbians will make appropriate choices based on their own requirements. The evidence in this proceeding as to BC Hydro's

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[81] In re British Columbia Hydro and Power Authority 2007 Rate Design Application – Phase 1, Decision (October 26, 2007), at 191.

[82] In re Terasen Gas (Vancouver Island) Inc. and Terasen Gas Inc., System Extension And Customer Connection Policies Review, Decisions (December 6, 2007), at 50.

[83] EEC Decision, at.17.

[84] EEC Decision, at18.

[85] See, e.g., Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 90-108.

[86] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 108.

approach to purchasing offsets outside BC in order to reduce the cost of those offsets for BC Hydro customers (discussed below) also supports the regional approach to considering GHGs.

(ii) Evidence in this Proceeding

47. The evidence in this proceeding supporting the conclusion that the use of an alternative energy choice for applications such as space and water heating in BC will make additional energy available to displace gas and coal-fired generation is summarized below. The evidence comes from documents on the record, BC Hydro's written evidence (i.e. Application and IR responses), and the cross-examination of BC Hydro witnesses. As such, it was unnecessary for the Terasen Utilities to call evidence in this regard.

48. Renewable power generated in British Columbia that is surplus to the domestic load requirements in any one time period will be exported into the Western Interconnection.[87] In the vast majority of the time (over 80%), the marginal source of electricity supply in the Western Interconnection is generated from natural gas-fired or coal-fired generation facilities.[88] During such times, the injection of BC renewable power in to the Western Interconnection will displace existing or new gas or coal-fired generation.[89] As the Global Energy report included with the LTAP stated, "the renewables will run to meet the load, thereby displacing natural gas-fired generation that would otherwise be needed to meet loads…. In the cases with high penetrations of renewables, economic dispatch would sometimes displace coal-fired generation rather than natural gas-fired generation….".[90]

49. The pursuit of cost-effective Electric Load Avoidance DSM will result in reduced electric load in BC. The Terasen Utilities submit that this also logically will lead to BC

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[87] Exhibit B-3, Response to Terasen IR 1.2.2, 1.2.6.

[88] Exhibit B-3, Response to Terasen IR 1.2.6.. When asked whether in the Western Interconnection, either natural gas-fired or coal-fired generation would be on the margin more than eighty percent of the time, BC Hydro responded that this is "generally" true. (See Exhibit B-4, Response to Terasen IR 2.4.2).

[89] Exhibit B-3, Response to Terasen IR 1.2.6; see also Transcript, Vol. 3, at 271-272.

[90] Exhibit B-1-1, Appendix H, at 11-12. In Exhibit B-3, Response to Terasen IR 1.2.6, BC essentially confirmed the cited statement by stating "adding any resource into the WECC grid, be it renewable or non-renewable, will displace the marginal unit if the resource that is being added has a lower variable operating cost than the marginal unit." As described later in these submissions, this same displacement occurs with natural gas produced in British Columbia. The combined emissions factor associated with the production of BC natural gas and its consumption in either direct use applications or an efficient CCGT is well below the emissions factor attributed to BC Hydro's imports in 2006. Therefore, the use of BC's natural gas in the WECC region results in a GHG benefit. (Citations provided below.)

renewable power that would otherwise serve BC load being available for export (the evidence supporting this logic and BC Hydro's argument to the contrary is addressed below). These exports associated with Electric Load Avoidance DSM will reduce GHGs in the region even where BC Hydro customers have chosen natural gas as the alternative fuel because of the difference in combustion efficiency between domestic gas appliances and gas and coal-fired generation that is displaced by the clean power made available for export. Combustion efficiency is important in terms of lowering GHG emission.[91] A modern combined-cycle gas-fired generator (CCGT) operates at about 50% efficiency, and the efficiency rate of a coal-fired generator is even lower.[92] In contrast, modern domestic gas furnaces and hot water heaters operate at much higher efficiency – typically between 85 percent and 95 percent efficiency.[93] The emissions factor for furnaces is 200 tonnes / GWh[94], the emissions factor for a CCGT operating at 50% efficiency is 360 tonnes / GWh and BC Hydro's imports are assigned an emissions factor of 550 tonnes/ GWh.[95]

50. BC Hydro witnesses conceded that during the two-year LTAP period, if more customers choose direct use of natural gas for heating applications, particularly for spacing heating, there will be "more electricity available for export from British Columbia."[96] BC Hydro's evidence and its submissions regarding its own planning response to reduced load in the medium to long term[97] do not speak to the potential for IPPs to build in excess of BC Hydro's load requirements and export the surplus power. BC Hydro confirmed that it was not the only potential purchaser for renewable power generated in BC over the medium to long-term, and that

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[91] Transcript, Vol. 12, at 2171-2173.

[92] Exhibit B-3, Response to Terasen IR 1.2.5.

[93] Transcript, Vol. 11, at 2039-2040. BC Hydro witnesses agreed that a modern space heater operated on natural gas is rated as generally between 85 and 95 percent efficiency. See also Exhibit C13-9, at 11, 14. According to Puget Sound, direct use of natural gas to fire a home furnace would make use of 80% of the original energy content of the gas as heat for the home. Avista is using a 90% efficiency rate.

[94] CPR, Exhibit B-4, BCSEA IR 2.28.1, Attachment 1, at page 121, notes that the GHG emission intensity factor for natural gas is 180 tonnes/GWh for direct use of natural gas. However, this appears to correspond to 100% efficiency. 90% efficiency, by our calculations, is closer to 200 tonnes per GWh, so we have used this amount in these Submissions.

[95] Exhibit B-4, BCSEA IR 2.28.1, Attachment 1, at.121. Also, it is clear that emissions levels in the WECC regional will remain at this level for some time, as estimated average performance standard in Alberta, Arizona, New Mexico, Montana, Utah, Colorado, Nevada, Idaho, and Wyoming. A performance standard is the GHG emissions level above which **offsets** must be acquired. (Exhibit B-1, at 4-20, lines 14-21).

[96] Transcript, Vol. 6, at 824.

[97] Exhibit B-4, Response to BCSEA IR 2.29.2.

neither law nor policy precludes IPPs from continuing to build for direct export.[98] The provincial government is contemplating an export market for BC power. Former Minister Richard Neufeld said in a CBC interview on the subject of IPP power: "We have huge opportunities in this province to build generation for export, also, between jurisdictions south of us that generate with coal."[99] A transmission line from Canada to Northern California is currently under consideration to capitalize on such potential clean power export.[100] The Terms of Reference for the Commission's pending Section 5 Inquiry similarly contemplate pursuing the Province's potential for exporting clean, renewable energy.[101] The Terms of Reference also state that when making assessment of generation resource development, the Commission should consider that "other jurisdiction will continue to pursue the reduction of greenhouse gas emission…".[102] The Climate Action Team recommended building for surplus for export.[103] Additional evidence regarding the demand for BC renewables is referenced by BC Hydro on pages 68 and 69 of its Submissions.

51. This same approach is evident in the decision of the Manitoba Public Utilities Board with respect to the effect of exporting clean power, which was referred to during the hearing.[104]

52. BC Hydro relies in its argument[105] upon Dr. Jaccard's evidence regarding the need to move to electrification of space and water heating in order to make a significant impact in climate change. Dr. Jaccard's analysis is premised on the very long-term horizon when there is no longer gas and coal-fired generation on the margin in the Western Interconnection that can be displaced by the high-efficiency direct consumption of natural gas in domestic and commercial applications in British Columbia. Jurisdictions within the Western Interconnection have made significant investments in gas and coal-fired generation (they account for 58% of the energy

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[98] Transcript, Vol. 3 at 297-298.

[99] Exhibit C13-5, at 70; Transcript, Vol. 3, at 298-299.

[100] Exhibit C13-5, at 68.

[101] Terms of Reference (available at http://www.bcuc.com/sectionfiveinquiry.aspx). One of the recitals is: "Whereas the 2007 Speech from the Throne stated: Government will pursue British Columbia's potential as a net exporter of clean, renewable energy."

[102] Terms of Reference, Section 6 (b) (vi).

[103] BC Hydro Submissions, at 55. See Item 15.

[104] Transcript, Vol.6, at 811 to 814.

[105] BC Hydro Submissions, at 56.

generation),[106] and it will be decades before these are displaced by a cleaner domestic resource. Notably, California, Washington and Oregon have used a CCGT operating at 50% efficiency level as their performance standard for clean electricity.[107]

53. BC Hydro has made an unjustified leap in logic in assuming that exports from BC will only displace higher cost renewables. In the Western Interconnection, gas and coal-fired generation collectively represent about 58% of the energy generation, and are on the margin over 80% of the time.[108] Renewables currently represent approximately 6% of energy generation in the WECC.[109] Appendix H of the LTAP Application, Global Energy's Renewable Energy Market Analysis Report, contemplates that introducing renewable power into supply resources of the Western Interconnection will displace gas-fired and coal-fired generation. For instance, the Report states:

> Global Energy is also aware that the WCI is reviewing studies done by the California Energy Commission (CEC) that show amounts of GHG reductions in each Western state under different penetrations of energy efficiency and renewables.
>
> The CEC studies discussed in the above paragraph were performed by running hourly simulations of the WECC power grid, with hourly loads across WECC being served by economic dispatch of generation available in the region. In its "current conditions extended into the future" case, the CEC studies demonstrate the reality that much load in WECC is served by natural gas-fired generation. As the CEC increased penetration of renewables in the future in its alternative views of the future, the renewables will run to the meet the load, thereby displacing natural gas-fired generation that would otherwise be needed to meet loads. The CEC ran a few sensitivities with high GHG taxes in place. In the cases with high penetrations of renewables, economic dispatch would sometimes displace coal-fired generation rather than natural gas-fired generation because coal generation emits about twice the amount of GHG/kWh than does natural gas-fired generation. The CEC concludes that a good way to reduce GHG is to reduce thermal generation levels by causing higher penetrations of energy efficiency and renewable power supplies.[110]

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[106] Exhibit B-3, Response to Terasen IR 1.2.3; 2.4.2.

[107] Exhibit B-1, at 4-20, lines 4-10. This means that GHGs are offset to the level of a 50% efficient CCGT only, which implicitly means that gas-fired generation will continue to play a role in the WECC region to displace coal-fired generation on the margin.

[108] Exhibit B-3, Response to Terasen IR 1.2.3; 2.4.2.

[109] Exhibit B-3, Response to Terasen IR 1.2.3

[110] Exhibit B-1-1 Appendix H, at 11 and 12.

54. Also, fulfilling RPS targets is not the only reason that parties from U.S. jurisdictions may seek to acquire green power from BC. Mr. Youngman noted, for instance, the potential for significant changes under the Obama Administration in the areas of cap and trade and more aggressive climate change policies and legislation.[111] This suggests that changes imposed at the U.S. federal level could begin to overtake the RPS requirements imposed at the state level. It is clear, however, that if BC's renewable electricity is consumed for space and water heating in BC, then it will not be available to reduce the heavy reliance on fossil fuel-based electricity generation in other jurisdictions.

55. Based on the evidence discussed above, the Commission should reject BC Hydro's argument on page 68 of its Submissions that the premise of regional impacts "can only be derived by two events simultaneously occurring: (1) BC Hydro having surplus it did not plan for as a result of fuel switching or BC Hydro building for export; and (2) No U.S. entity wanting to acquire BC Hydro's clean or renewable energy to fill that entity's RPS targets."

B. Avoidance of Imports of Electricity Generated from Coal and Natural Gas

56. BC Hydro is a net importer of electricity in most years.[112] More than 50% of BC Hydro's imports come from low-efficiency gas-fired and coal-fired generators elsewhere in the Western Interconnection.[113] BC Hydro's reliance on these imports would decrease as load requirements associated with, for instance, space and water heating decreased. According to BC Hydro's 2007 CPR, a GHG factor of 550 tonnes per GWh was assigned for BC Hydro's electricity generation based on actual values for imported electricity in F2006, whereas the Greenhouse Gas Emission Factor for a high efficiency furnace is 200 tonnes/GWh.[114] Thus, there is a clear GHG reduction advantage to using natural gas in direct end use applications to reduce BC Hydro's requirements to import electricity produced by gas or coal-fired generation. BC Hydro has acknowledged this environmental benefit in previous proceedings: "In the past

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[111] Transcript, Vol.9, at 1583 to 1585.

[112] Transcript, Vol. 3, at 270; Transcript, Vol. 6, at 814.

[113] Transcript, Vol. 3, at 271; Exhibit C13-5, at 40.

[114] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 121. As indicated in a later footnote, the 200 tonnes/GWh figure was derived from evidence that suggests natural gas at 100% efficiency produces 180 tonnes/GWh. The Terasen Utilities recalculated this based on 90% efficiency.

BC Hydro encouraged customers to use natural gas instead of electricity for space heating, based on economic and environmental considerations." [Emphasis added.][115]

57. Self-sufficiency is a "red herring" in this analysis. BC Hydro will remain a net importer until it achieves self-sufficiency,[116] but will continue to import power after 2016 as self-sufficiency is determined on an annual net basis.[117] From the perspective of GHG emissions, the relevant consideration is what resource is on the margin in the Western Interconnection at the time of the imports. Where imports occur during the peak winter months, space heating load can be expected to drive a disproportionate amount of the imports of electricity generated from the combustion of gas and coal.

C. Natural Gas is Consumed at Higher Efficiency

58. The combustion efficiency of natural gas is important in terms of lowering GHG emission, irrespective of the status of British Columbia's (or BC Hydro's) electricity imports / exports.[118] From a GHG perspective, consuming natural gas in domestic appliances at 80%-95% efficiency is preferable to using it in gas-fired generation at less than 50% efficiency. Whereas the emissions factor for furnaces is 200 tonnes / GWh, the emissions factor for a CCGT operating at 50% efficiency is almost double that amount (360 tonnes / GWh).[119] Natural gas production has a strong future in British Columbia. The Energy Plan, for instance, expresses government's intent to "take B.C.'s oil and gas sector to the next level to enhance a sustainable, thriving and vibrant oil and gas section in British Columbia."[120] The provincial budget and fiscal plan for 2009/10 – 2011/12 shows Government's continuing support for the expansion of British

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[115] Exhibit B-3, Response to Terasen IR 1.3.1.

[116] Transcript, Vol. 3, at 270-271.

[117] Special Direction 10, s.3

[118] Transcript, Vol. 12, at 2171-2173..

[119] See Exhibit C13-5, at 75 (rebate according to efficiency rate). Exporting natural gas for consumption in a gas-fired generator could still reduce GHG's in the Western Interconnection, although to a lesser extent that if it is consumed in domestic applications, if it displaces coal-fired generation. According to BC Hydro's 2007 CPR, Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 121, the GHG emission intensity factor for natural gas combustion is 180 tonnes/GWh (it appears this assumes 100% efficiency). Thus, the emissions factor for natural gas consumption at 50% efficiency is 360 tonnes/GWh, which is better than the emissions factor assigned to BC Hydro's imports in 2006 of 550 tonnes / GWh.

[120] Exhibit C13-5, at 64.

Columbia's "abundant natural gas resources."[121] The same logic that favours the consumption of natural gas in high efficiency appliances applies regardless of where the natural gas is produced.

D. The Price of Natural Gas Consumption Within BC Includes the Cost of Carbon

59. The optimal balance of energy sources is achieved through efficient pricing, allowing British Columbians to make their own decisions regarding the appropriate energy source for particular end uses and paying the associated cost. This requires both electricity and the energy alternatives to be priced efficiently from a resource cost perspective. BC Hydro's opposition to Electric Load Avoidance DSM based on its potential to increase consumption of natural gas within BC fails to account for the fact that the cost of associated GHGs is already factored into the natural gas resource cost by virtue of consumers having to pay the carbon tax. Customers are expected to respond to that price signal by reducing consumption. The focus in this proceeding should instead be on getting the right price signals on the electricity side that reflect BC Hydro's marginal cost of supply.

60. The Province's Strategic Plan 2009/10-2011/12 emphasizes the role of the carbon tax in sending appropriate price signals to enabling customers to make choices with respect to energy consumption: "The tax has the advantage of providing an incentive without favoring one way to reduce emissions over another. It gives British Columbians a choice on how they wish to adapt their behavior to reduce their consumption of fossil fuels."[122]

61. Although BC Hydro has referred to its own emissions associated with FNU3 and Burrard as GHG-free after 2016 by virtue of a legislative requirement to purchase offsets, obviously the emissions within British Columbia associated with the operations of these facilities are not suddenly disappearing in 2016. The effect of offsets is really to add the cost of GHGs on to BC Hydro's cost of acquiring electricity from gas-fired generation. The requirement to purchase offsets sends efficient price signals to BC Hydro to ensure that it is not incented to generate electricity in this manner without considering the GHG cost. Logically, BC Hydro's GHG argument against Electric Load Avoidance DSM should fall away if consumers of natural

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[121] Exhibit C13-5, at 79.

[122] Exhibit C13-6, The BC Strategic Plan 2009/10-2011/12.

gas in BC purchased offsets. Natural gas consumers are, of course, currently free to purchase offsets but are not obligated to do so. Instead, domestic natural gas consumers are required to pay the carbon tax.[123] The carbon tax provides the desired price signal that would be provided by acquiring offsets.

62. BC Hydro has implicitly acknowledged that offsets and the carbon tax provide alternative price signals for GHG emissions[124] by requesting confirmation from the Province that it will not be necessary for BC Hydro to purchase offsets and pay the carbon tax after 2016.[125] The fact that BC Hydro received that confirmation from the Province[126] reinforces that the Province shares BC Hydro's view in this regard.

63. The Terasen Utilities are not suggesting that offsets are merely a "paper exercise", in the pejorative sense, as BC Hydro has understood. Rather, the submission is that the carbon tax and offsets are different ways of achieving a real, measurable reduction in GHGs through efficient pricing. The amount of the carbon tax paid in respect of domestic natural gas consumption and the amount of offsets required by BC Hydro to address emissions from its gas-fired generation would reflect the relative efficiency of end use consumption (80-95%) versus gas-fired generation (30% for Burrard). Ultimately, the right pricing in either case should result in the efficient amount of consumption.

64. Later in these submissions we address the fact that BC Hydro's GHG offsets for its gas-fired generation are unlikely to be acquired exclusively from within BC, meaning that the GHG benefit that forms the basis of the offset occurs regionally. Offsets within BC have the same value from a climate change perspective as offsets acquired outside BC, but acquiring offsets exclusively within BC will cost upwards of three times as much for BC Hydro's customers. This is another illustration of the importance of taking a regional view to GHG emissions, and not examining only provincial GHG emissions.

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[123] Transcript, Vol. 6, at 872.

[124] Transcript, Vol. 6, at 866 (BC Hydro's witness acknowledged that both offsets and carbon taxes provide "provide an economic disincentive..."; see also Transcript, Vol. 6, at 871-872.

[125] Transcript, Vol. 6, at 823-824; Transcript, Vol. 6, at 870 (confirming Ms. Van Ruyven's statement).

[126] Transcript, Vol. 6, at 823-824.

65. In sum, on the natural gas side of the resource analysis, efficient pricing has been achieved by the GHG emissions associated with the consumption of the natural gas being subject to the carbon tax or a requirement to purchase offsets. The task at hand is to ensure that electricity is also priced appropriately.

E. Summary Regarding Regional GHG Emission Reduction and Efficient Pricing of GHGs Within BC

66. BC Hydro's objection to Electric Load Avoidance DSM is rooted in the assumption that natural gas is the logical alternative energy source. BC Hydro discounts the future potential for British Columbians to adopt other alternative energy sources without considering the effect low electricity rates have on the development of the market for these alternatives. The potential to reduce GHG emissions on a regional basis, combined with the obligation on British Columbians to pay the carbon tax on domestic gas consumption, eliminates BC Hydro's primary policy basis for opposing Electric Load Avoidance DSM. BC Hydro should be pursuing Electric Load Avoidance DSM to the economic benefit of BC Hydro ratepayers as a whole with the comfort that its initiative is consistent with the worthwhile objective of mitigating climate change.

VI. EXISTING POLICY FRAMEWORK SUPPORTS EFFICIENT CHOICES AMONG ENERGY SOURCES

67. BC Hydro must, by virtue of section 44.1(2)(b) and (f) of the UCA, explain why it is not pursuing cost-effective Electric Load Avoidance DSM to reduce (all else equal) electricity rates for its customers. BC Hydro's approach has been to frame the Electric Load Avoidance DSM issue as a policy choice between British Columbians using clean electricity or GHG-emitting natural gas for particular end uses.[127] A more nuanced approach is required, which recognizes the benefits to customers in terms of lower rates (all else equal), the availability of an increasing variety of energy alternatives to electricity, regional GHG benefits, and the fact that gas consumers in BC must pay for GHG emissions through the carbon tax as a form of price signal. In this Part the Terasen Utilities makes the following points:

[127] See, for instance, BC Hydro Submissions, at 51-71

(i) Where alternatives to electricity exist for particular end use applications, the objective should be to identify, in the words of the Energy Plan, the "right fuel, for the right activity, at the right time".

(ii) Electric Load Avoidance DSM can be used to counteract inefficient price signals inherent in rates that primarily reflect embedded costs that can cause customers to adopt electricity as an energy source where it is not efficient to do so from a TRC perspective. Customers are free to choose the right fuel for their purposes based on more efficient price signals. This cannot be equated with being "pro-natural gas".

(iii) The Province's pursuit of electrification initiatives reflects its policy of "the right fuel, for the right application, at the right time", and is not evidence of Government opposition to Electric Load Avoidance DSM.

(iv) The *Greenhouse Gas Reduction Targets Act* ("GGRTA") is not an appropriate basis to preclude BC Hydro from pursuing cost-effective Electric Load Avoidance DSM for the benefit of its customers.

(v) Electric Load Avoidance DSM represents an opportunity to reinforce the need for British Columbians to consider energy efficiency.

(vi) BC Hydro's concern about customers "locking in" to a bad fuel choice is misplaced, and BC Hydro should be concerned about the impact of its policies on its customers as a whole.

68. BC Hydro has an opportunity to demonstrate initiative in advancing Government policy through the pursuit of cost-effective Electric Load Avoidance DSM.

A. "Right fuel, for the Right Application, at the Right Time"

69. BC Hydro says that it is awaiting a clearer government directive before pursuing Electric Load Avoidance DSM.[128] However, Government's current neutral position on energy choice is not a policy void. The Energy Plan identifies a future role for electricity, natural gas, and alternative energy sources supplemented by natural gas.[129] The policy emphasis in the Energy Plan is on the importance of making efficient choices among energy sources available for particular end uses, rather than expressing a single preference for any energy source. For example:

[128] Transcript, Vol. 3, at 281-282

[129] Exhibit B-1-1, Appendix B1 at 24.

> It is important for British Columbians to understand the appropriate uses of different forms of energy and utilize the right fuel, for the right activity at the right time. There is the potential to promote energy efficiency and alternative energy supplemented by natural gas. Combinations of alternative energy sources with natural gas include solar thermal and geothermal. [130]

70. Although Mr. Elton at one point rather dubiously characterized the above quoted passage from the Energy Plan as "just one of those good statements that people put into these kinds of policies" as opposed to being an expression of policy,[131] BC Hydro did acknowledge on other occasions that Government policy emphasizes energy efficiency.[132] It would be at odds with this policy for Government to state a preference for one energy source, for all activities, for all time. BC Hydro customers will benefit from BC Hydro applying the policy of "the right fuel, for the right activity, at the right time".[133]

B. Efficient Price Signals *Versus* Being "Pro-Natural Gas"

71. BC Hydro characterizes Electric Load Avoidance DSM as "an action by BC Hydro, as part of its DSM programs, to financially incent customers (who would otherwise select electricity as the energy form) to select natural gas as the energy form."[134] The use of financial incentives is an important aspect of Electric Load Avoidance DSM; however, the implicit suggestion that pursuing cost-effective Electric Load Avoidance DSM requires BC Hydro to be "pro-natural gas" is not correct.

72. Cost-effective Electric Load Avoidance DSM acts in conjunction with the existing conservation rate structures (such as the RIB rate), to *counteract* the fact that electricity rates based on embedded costs encourage customers to adopt electricity as an energy source

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[130] Exhibit B-1-1, Appendix B1 at 24; Exhibit C13-5 at 61.

[131] Transcript, Vol. 3, at 280-281. Contrast this statement to Mr. Elton's characterization of other parts of the energy Plan as deliberately allowing for flexibility. In response to a question from Mr. Oulton that there is no legislated requirement on the Burrard timetable, Mr. Elton stated at Transcript, Vol. 5, at 694 that "There is no legislative requirement, therefore it's one of those areas where you – I think you seek to be in the right – in the same direction as government policy, and you seek to use the flexibility that they've offered."

[132] Transcript, Vol. 3, at 281-282.

[133] In effect, this results in BC Hydro returning to the policy it pursued until the 2007 Rate Design proceeding, exemplified by the following statement on its website: "We encourage customers to think about how they use energy. It's important to match your energy source to its best use. Electricity is best suited for lighting and powering our appliances and televisions, whereas natural gas is ideal for space and water heating." Exhibit C13-9, at 4.

[134] BC Hydro Submissions, at 62, lines 3-5.

where the TRC analysis demonstrates that electricity is not the most efficient fuel alternative for particular end uses. BC Hydro's low electricity rates have the unintended consequence of constraining customer choice, as illustrated by the fact that the measures identified in the CPR as having a TRC of one or more all resulted in a negative or excessive payback period for customers.[135] Electric Load Avoidance DSM drives customers to make decisions among energy sources recognizing BC Hydro's avoided marginal cost of supply, unconstrained by relative price differences in capital costs or embedded cost-based electricity rates. Natural gas was the only fuel alternative studied in the 2007 CPR, but heat pumps and other alternative energy systems also represent potential alternatives to electric baseboards, for example, that a customer could choose from when the economics make sense or where a customer's personal values play an important role in the choice. BC Hydro should not assume that electricity will be each customer's moral choice as they appear to do in their final argument.[136] Once the inefficient price signals inherent in the existing electricity rates are mitigated by Electric Load Avoidance DSM incentives, customers may choose other alternatives.

73. BC Hydro cites at page 62 of its submission's Mr. Elton's evidence that "[BC Hydro has] sought clarification on this and received the answer, it isn't government policy to encourage fuel switching from electricity to natural gas." BC Hydro also cites Ms. Van Ruyven's statement that: "I don't believe there is any government policy that specifically says that BC Hydro should encourage fuel switching from electricity to natural gas". There is nothing in either of these statements to suggest anything other than a neutral stance on fuel choice.

74. Ms. Van Ruyven also recounted government representative as indicating that government would not formulate a policy that would result in BC Hydro promoting a program that would incent an increase in GHG emissions within B.C.[137] BC Hydro has not taken such an unequivocal stance with respect to its own programs that would result in increased GHG emissions in the province. FNU3, for instance, results in greater GHG emissions within British Columbia.[138] BC Hydro's response to this is to cite carbon offsets as negating the physical GHG

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[135] Exhibit B-4, Response to BCSEA IR 2.28.1, Attachment 1, at 108 & footnote 65.

[136] BC Hydro Submissions at 62, line 7, item (2).

[137] BC Hydro Submissions at 63.

[138] FNU3 results in less GHGs per GWh, but the generation capacity will increase significantly such that GHGs will increase overall. See Exhibit B-12, Response to Terasen IR 3.8.1.

emissions; but, as discussed previously, natural gas consumption is subject to an equivalent carbon pricing mechanism in the carbon tax. All of this illustrates that Government policy must be more nuanced than to preclude BC Hydro initiatives that result in GHGs in the province.

75. The Terasen Utilities are not suggesting that the Province has a policy of favouring a particular energy source for particular end use applications, a misconception that seems to underlie a number of BC Hydro's submissions.[139] Rather, the Terasen Utilities rely on the express wording of the Energy Plan and the Government's stated preference for choosing the "right fuel, for the right activity, at the right time".

76. Where energy alternatives do exist, it is imperative that the appropriate rate and incentive mechanisms, as well as consistent messaging, are put in place to inform available energy choices and free customers to make choices among energy sources that are efficient from a TRC perspective for a particular application. BC Hydro has acknowledged that providing right price signals can "encourage customers to make energy efficient choices."[140] BC Hydro will apply Provincial policy by encouraging customers to use energy more efficiently through Electric Load Avoidance DSM.

C. Electrification Initiatives

77. BC Hydro cited in opposition to Electric Load Avoidance DSM that "one of the most significant GHG implementation uncertainties from a fuel switching perspective is the extent of BC Government electrification initiatives."[141] BC Hydro provided two examples of electrification initiatives relating to the adoption of electricity at truck stops and ports in place of diesel and marine fuel.[142] To the extent that BC Hydro is suggesting that these initiatives are the beginning of a trend towards mass electrification, or evidence of Government opposition to Electric Load Avoidance DSM, it is reading far too much into these initiatives. BC Hydro has

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[139] For example, BC Hydro's response on page 63 to the Energy Plan's reference to "right fuel, for the right activity, at the right time" is to observe that "Noticeable by its absence is any reference to encouraging fuel switching from electricity to natural gas…". The inclusion of such a statement would be at odds with the Province's emphasis on the importance of choosing the "right fuel, for the right activity at the right time".

[140] Exhibit C13-9, at 5 (IR response from RIB Application proceedings)..

[141] Exhibit B-4, Response to BCSEA IR 2.29.2, at 48.

[142] Exhibit B-4, Response to BCSEA IR 2.29.2.

stated that the Province is neutral as to fuel choice.[143] Government's support for the development of natural gas is evident.[144] The Province has also promoted initiatives that use, for instance, liquefied natural gas to fuel heavy-duty trucks.[145] In short, the electrification initiatives cited by BC Hydro, like the Province's support for the LNG initiative cited above, are simply a reflection of the Province's policy favouring "the right fuel, for the right activity, at the right time".

D. "Provincial" GHG Emissions

78. BC Hydro interprets the provincial emissions reduction target in the GGRTA as a prohibition against pursuing cost-effective Electric Load Avoidance DSM, at least in so far as the alternative fuel is natural gas. There are several reasons, addressed below, why the GGRTA is not an appropriate basis to preclude BC Hydro from pursuing of cost-effective Electric Load Avoidance DSM for the benefit of its customers.

(ii) Mitigating Climate Change *versus* Pursuing a Target

79. BC Hydro's interpretation of Government policy is exemplified by Mr. Elton's response to the question of who benefited from the position BC Hydro was taking in a circumstance where GHGs were being reduced overall and BC Hydro customers were paying lower rates. He replied that the beneficiaries are "[t]he people who are living in a province that achieves its targets."[146] This analysis unjustifiably elevates to the status of ultimate objective one *means* by which Government has chosen to pursue its ultimate objective of mitigating climate change associated with GHG emissions.

80. The passages from the Energy Plan quoted by BC Hydro in its Submissions in support of this argument regarding the GGRTA[147] are ultimately emphasizing climate change. The Premier noted for instance, that "The world has turned its attention to the critical issue of global warming" and indicated that the ultimate purpose of the steps outlined in the plan was "arrest the growth of greenhouse gases and reduce human impacts on the climate".[148] The

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[143] Transcript, Vol. 3, at 275.
[144] See, e.g., Energy Plan, Exhibit C13-5, at 61; 2010/2011 Strategic Plan, Exhibit C13-6.
[145] Exhibit C13-5, at 60.
[146] Transcript, Vol. 3, at 289.
[147] BC Hydro Submissions, at 51.
[148] Exhibit B-1-1, Energy Plan, at 4.

passage from Message from the Government in the Climate Action Plan similarly opens with the statement "Global warming is the challenge of our generation."[149] The GGRTA target and Government's ultimate objective of climate change mitigation are aligned in most cases, which makes the GGRTA a useful tool in combating climate change. However, where the legislated target and the ultimate objective are at odds, the *means* should not trump the *end goal.* It is important in the case of Electric Load Avoidance DSM to keep in mind that the ultimate objective behind the legislation is mitigating climate change because the associated GHG emission reductions are regional. BC Hydro customers (and British Columbians generally) benefit from lower GHG emissions, irrespective of whether the reduction occurs in BC or across the BC-US border.[150]

81. The Province has used other legislation to achieve its climate change objectives, which do not focus exclusively on provincial emissions. The UCA, i.e. the legislation that defines the Commission's jurisdiction, refers to "government's energy objective" as being "to encourage public utilities to reduce greenhouse gas emissions". Although the GGRTA focuses on provincial emissions, the Government objective identified in the UCA is unqualified by reference to "*provincial"* GHGs or the province's GHG targets under the GGRTA. The Western Climate Initiative ("WCI"), to which the Province is a member, is a regional initiative to combat climate change.

82. Government's promotion of natural gas development in the Province[151] is another example of a circumstance where taking BC Hydro's approach would ultimately run counter to the Province's support for mitigating climate change. The production of natural gas contributes 18% of BC's total GHG emissions.[152] However, the consumption of natural gas in end use

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[149] British Columbia Climate Action Plan,, available at: <http://www.livesmartbc.ca/attachments/climateaction_plan_web.pdf>, at 1.

[150] Transcript, Vol. 6, at 811-812.-

[151] Exhibit B-1-1, Appendix B1, at 32. Exhibit C13-5, at 64. The Energy Plan states that it "is designed to take B.C.'s oil and gas sector to the next level to enhance a sustainable, thriving and vibrant oil and gas sector." Government has since continued to sell land for resource development and the sales have attracted record levels of land sale bonuses in the last two years. See Exhibit C13-5, at 62 (Minister Neufeld's Press Conference Statement). In Exhibit B-12, Response to BCUC IR 3.248.1, BC Hydro acknowledged this fact. "Land sales in Northwest B.C. significant [sic] increased during 2008, signaling that there could be a strong potential for future development of natural gas reserves in the region."

[152] Exhibit B-1-1, Appendix B1, at 23. Mr. Elton suggested that although government is interested in promoting many activities that will increase GHG emissions in the province the GHG reduction target would have taken

appliances has a significantly lower emissions factor (200 tonnes/GWh)[153] than the emissions factor applied to BC Hydro's imports in 2006 (550 tonnes per GWh).[154] This is still the case where the natural gas is consumed in a CCGT at 50% efficiency to generate electricity (360 tonnes/GWh).[155] Thus, it is better from a climate change perspective to produce and consume natural gas anywhere in the WECC region for direct use applications or for gas-fired generation than it is to generate electricity using a higher emitting energy source such as coal. Coal generation emits about twice the amount of GHG per GWh than does natural gas-fired generation.[156]

(iii) BC Hydro's Regional Approach to Offsets

83. As outlined in Part III of these Submissions, the successful implementation of cost-effective Electric Load Avoidance DSM results in a direct benefit to BC Hydro customers in the form of lower rates (all else equal). BC Hydro is already pursuing other policies for the benefit of its customers that result in provincial GHG emissions. FNU3 and the continued use of Burrard, both of which BC Hydro advocates, will generate GHG emissions in the province.[157]

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into account these expansions in natural gas development. (Tr. Vol. 3 page 293 lines 14-23). However, at the time the 33% target was announced in the 2007 Throne Speech (Exhibit B-1, page 4-5, footnote 52, link to B.C. News Release on BC joining WCI) the gas production forecasts were indicating only modest growth. (Exhibit B-3, BCUC IR 1.67.1, Attachment 2, Climate Action Plan, Appendix I, page 100-101, which references NRCan's 2006 forecast.) The subsequent pursuit of the Horn River play has resulted in a step change in these forecasts. The CAPP letter filed by BC Hydro (Exhibit B-1-1, Appendix B1, at 23) indicates that "Production from the Horn River Basin shale gas is forecast to grow from approximately 50 mmscf/d million cubic feet per day) in 2009 to approximately 2,700 mmscf/d by 2020. The forecast is derived from a survey of the area operators of the HRPG which requested their anticipated annual drilling well count and the associated production. The well count derived is approximately 80 in 2009, growing to over 200 wells per year in 2016, then maintaining that level. It is anticipated that there could be a total of 2,200 wells producing in 2020." This step change in BC's natural gas production levels will lead to an associated increase in GHG emissions produced in BC.

[153] CPR, Exhibit B-4, BCSEA IR 2.28.1, Attachment 1, at 121 of 138, notes that the number on the record is 180 tonnes/GWh for direct use of natural gas. However, this appears to correspond to 100% efficiency. 90% efficiency, by our calculations, is closer to 200 tonnes per GWh, so we have used this amount in these Submissions.

[154] Exhibit B-4, BCSEA IR 2.28.1, Attachment 1, at 121. Also, it is clear that emissions levels in the WECC regional will remain at this level for some time, as estimated average performance standard in Alberta, Arizona, New Mexico, Montana, Utah, Colorado, Nevada, Idaho, and Wyoming. A performance standard is the GHG emissions level above which **offsets** must be acquired. (Exhibit B-1, p. 4-20 lines 14-21).

[155] Exhibit B-1, at 4-20, lines 4-10: "California, Washington State and Oregon require thermal plants to offset to the equivalent of a CCGT, This results in the California, Washington State and Oregon performance standards being set at 360 tonnes of GHG per GWh."

[156] Exhibit B-1-1, Appendix H, at 10-11.

[157] Transcript, Vol. 6, at 865-866. GHG emissions associated with FNU3 is discussed in Terasen IR 3.8.1. The Terasen Utilities take no position on whether FNGU3 is in the public interest, and recognize the value to BC Hydro of continuing to operate Burrard.

Unlike Electric Load Avoidance DSM, running these facilities does not deliver an offsetting GHG reduction elsewhere in the Pacific Northwest. These initiatives illustrate the need to balance government's interest in reducing GHG emissions against other competing objectives.

84. BC Hydro seeks to distinguish the "provincial" emissions associated with Burrard and FNGU3 from the emissions associated with domestic natural gas appliances by pointing to the requirement to offset the GHG emissions associated with its facilities after 2016, and the absence of any existing obligation on natural gas consumers to offset GHG emissions.[158] The inconsistency of BC Hydro's reliance on offsets with its failure to recognize the carbon tax as a means for pricing carbon was discussed above. In the context of the regional approach to GHG emissions it is noteworthy that BC Hydro will likely purchase offsets outside the province in order to reduce the costs of purchasing those offsets.[159] This requires a regional perspective towards GHG emissions, analogous to that being advocated by the Terasen Utilities. In the case of offsets acquired outside of BC, the GHGs will be emitted in British Columbia, while the GHG reduction that forms the basis for the offset will be occurring outside of British Columbia. There is no logical distinction between acquiring offsets from outside British Columbia and (i) using electricity "freed-up" by Electric Load Avoidance DSM to displace gas or coal-fired generation on the margin, or (ii) exporting BC's natural gas to reduce GHG emissions in the WECC region. Extra-provincial offsets are being considered by BC Hydro because they will cost less and ultimately save customers money.[160] Electric Load Avoidance DSM should also be considered for this reason, among others.

E. Conflicting Messages to the General Public

85. Counsel for BCSEA-SCBC raised in his Opening Statement a concern that promoting electricity to natural gas Electric Load Avoidance DSM programs would create confusion with regard to reducing GHG emissions and burning fossil fuels.[161] BC Hydro's

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[158] Exhibit B-12, Response to BCUC IR 1.22.2; BC Hydro Submissions at.67, lines.8-11.

[159] Transcript, Vol. 9, at 1532-1534.

[160] Exhibit B-1, at 4-10 and Table 4-2; The B.C. only case for establishing the cost of offsets was not considered likely by Natsource in its modeling of the cost of offsets. Table 4-2 indicates that the expected cost of offsets from a B.C. only case would be three times or more the expected cost of offsets if they were acquired from within the WECC.

[161] Transcript, Vol. 3, at 222-223.

witnesses echoed this position during the hearing[162] and BC Hydro repeated it in its Submissions.[163] There is no evidence to support this contention that the public will be confused. Rather, the evidence is that the Province has emphasized in the Energy Plan the importance of "for British Columbians to understand the appropriate uses of different forms of energy and utilize the right fuel, for the right activity, at the right time". BC Hydro, until after the 2007 Rate Design Application proceeding, adopted a nuanced approach, as exemplified by its website encouraging customers to match their energy source to its best use.[164] Other utilities in the Pacific Northwest (the examples in the record are Avista and Puget Sound Energy) continue to take a more nuanced view, with the apparent approval of regulators,[165] in the confidence that people will understand the value in making efficient fuel choices. The pursuit of Electric Load Avoidance DSM presents an opportunity to reinforce the need for British Columbians to consider and "understand the appropriate uses of different forms of energy".[166]

F. Lasting Implications of Customer Decisions Regarding Energy Source

86. During the hearing BC Hydro's witnesses suggested that BC Hydro was reluctant to encourage the adoption of natural gas as an energy source for particular end uses out of concern that customers who switch to another energy source would be subjected to high future gas prices and operating costs.[167] The concern here, as characterized by BC Hydro, is that "[i]f that choice ends up to be a bad choice, particularly if that choice was originally made when all the signposts were that electrification of space heating may be required to meet climate action targets, BC Hydro could be seen by that customer in a bad light as a result of such encouragement. Recall, customers have long memories."[168] There are a number of problems with BC Hydro's approach.

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[162] Transcript, Vol. 3, at 284.

[163] BC Hydro Submissions at 71, l.25 to 72, l.15

[164] In response to Terasen's Information Request in BC Hydro's 2007 Rate Design Application proceedings, BC Hydro stated that "in the past, BC Hydro encouraged customers to use natural gas instead of electricity for space heating, based on economic and environmental considerations. BC Hydro is reviewing this practice in light of the 2007 Energy Plan." See Exhibit C13-9, at page 5.

[165] See for instance, Exhibit C13-9, at 11-12, the staff decision from the Washington Utilities Transportation Commission in respect of Puget Sound Energy's programs.

[166] Exhibit C13-5, at 61.

[167] Transcript, Vol. 9, at 1521 - 1522.

[168] BC Hydro Submissions, at 66..

87. First, this paternalism is at odds with the Province's approach to facilitate British Columbian's ability to make energy choices based on efficient price signals, as exemplified by the carbon tax. The Province's Strategic Plan 2009/10-2011/12 emphasizes the role of the carbon tax in sending appropriate price signals *to enable customers to make choices* with respect to energy consumption.[169]

88. Second, BC Hydro's vision of the future from which it is protecting its customers is suspect. With respect to BC Hydro's reference to natural gas price increases, BC Hydro's witnesses testified as to their expectation that the sustainable long-term gas prices will be in the $6 to $8 per MMBtu range.[170] All of the gas price forecasts provided by BC Hydro (except that of its own internally developed high gas price forecast and internally developed weighted average) reside below or in the lower part of this range until 2020.[171] In contrast, electricity prices have been rising steadily and will continue to do so.[172]

89. Third, in making this judgment for customers, BC Hydro is according insufficient weight to the fact that its customers *as a whole* will pay higher electricity rates (all else equal) as a result of the customer choosing electricity over another energy source due to the embedded cost-based electricity rates or relative capital cost of adopting a particular alternative energy source.[173] Customers paying higher rates in the future (all else equal) may look back on BC Hydro's opposition to counteracting inefficient price signals that have the effect of encouraging electric space and water heating load as a "bad" decision. This is particularly so where GHGs can also be reduced on a regional basis. Once individual customers faced with a choice among energy sources for particular end uses choose electric appliances as a result of those price signals, BC Hydro is locked in to that decision, and customers as a whole must pay for it.

90. There is no justification for this paternalism evidenced in BC Hydro's submission. BC Hydro should pursue Electric Load Avoidance DSM as a means of establishing more

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[169] Exhibit C13-6, The BC Strategic Plan 2009/10-2011/12.
[170] Transcript Vol. 10 at 1888-1889.
[171] Exhibit B-32.
[172] Exhibit B-10, at 25.
[173] See, for example, Exhibit B-4, Response to BCUC IR 2.206.3.

efficient price signals, and allow the customers to make the choice as to the energy source they adopt for particular end uses.

G. Summary

91. Electric Load Avoidance DSM can be used to counteract inefficient price signals inherent in rates based to a significant extent on embedded costs, with resulting economic benefits to BC Hydro customers and a provincial and regional GHG reduction. Mitigating increases in electricity rates through cost-effective Electric Load Avoidance DSM, and reducing GHG emissions in the process, is aligned with provincial policy as reflected in the Energy Plan and "government's energy objectives". It is also in the public interest, which is the ultimate test to be applied by the Commission in this Application.

VII. COMMISSION DETERMINATIONS AND NEXT STEPS

92. As indicated previously, the Terasen Utilities are cautiously optimistic about BC Hydro's new overtures to investigate Electric Load Avoidance DSM. However, certain parameters that BC Hydro has placed on the inquiry in the high level discussion that appears on pages 57-59 of its Submissions suggest that there remain fundamental disagreements among the intended participants in the study process that require the Commission's intervention at this time. The Terasen Utilities respectfully submit that the evidence on the record supports the following findings, which should be made express in the Commission's decision in order to help to frame the study:

(i) The pursuit of cost-effective Electric Load Avoidance DSM can be used to achieve efficient pricing, which in turn will allow customers to make appropriate fuel choices.

(ii) To the extent that customers faced with efficient price signals adopt another energy source it will contribute to BC Hydro's efforts to close the load-resource gap, thus avoiding the need to acquire new higher cost electricity supply for that portion of the demand. This will result in lower electricity rates (all else equal) for BC Hydro customers as a whole.

(iii) Using cost-effective Electric Load Avoidance DSM to achieve efficient pricing is consistent with the Energy Plan's emphasis on the "right fuel, for the right activity, at the right time", and is consistent with the Province's neutral position on choice of energy source.

(iv) The potential for GHG reductions outside of the province as a direct result of pursuing cost-effective Electric Load Avoidance DSM suggests that BC Hydro should be pursuing cost-effective Electric Load Avoidance DSM.

(v) The way in which the GGRTA measures GHG emissions, i.e. on a provincial basis, does not and should not prevent BC Hydro from pursuing cost-effective Electric Load Avoidance DSM to reduce rates for BC Hydro customers (all else equal). The presence or absence of a requirement to offset GHG emissions is not determinative in the context of Electric Load Avoidance DSM as the energy alternatives adopted by customers will have the cost of carbon priced in to them by way of the carbon tax.

93. BC Hydro acknowledges the Commission's jurisdiction to direct a study of Electric Load Avoidance DSM.[174] The Commission should issue the following additional directions to BC Hydro to guide its future work. These directions are consistent with the evidence in this proceeding and are appropriate in the circumstances:

(i) The cost-effectiveness of Electric Load Avoidance DSM should be determined with reference to the Total Resource Cost (TRC) test.

(ii) In performing a TRC analysis for Electric Load Avoidance DSM, BC Hydro should be using an updated avoided cost (before line losses) of at least $120/GWh. In the case of programs directed at space heating load, BC Hydro should be using time of delivery weighting per the approach adopted in Exhibit B-73.

(iii) Cost-effective measures (i.e. those with a TRC ratio of benefits to costs of greater than 1.0) should not be eliminated from consideration as a means of addressing the load-resource gap based on a simple payback analysis using current rates paid by BC Hydro customers.

(iv) Part of BC Hydro's study must include exploring different incentive models within the framework of Electric Load Avoidance DSM.

94. The Terasen Utilities submit that it is unnecessary to reject any part of the LTAP provided that appropriate Commission directives are in place and that the current two-year LTAP cycle is maintained.

[174] BC Hydro Submissions, at 22

VIII. CONCLUSION

95. BC Hydro has an opportunity to close the forecasted load-resource gap by pursuing Electric Load Avoidance DSM in tandem with its proposed *load reduction* DSM. BC Hydro customers will benefit from lower rates than would otherwise be the case if BC Hydro pursues Electric Load Avoidance DSM having a TRC benefit/cost ratio of more than one. British Columbians will benefit from reduced GHG emissions in the region. The legislative and policy context, exemplified by "government's energy objectives" and the Energy Plan policy of "right fuel, for the right activity, at the right time", supports the pursuit of cost-effective Electric Load Avoidance DSM in priority to acquiring higher cost supply. The Terasen Utilities look forward to working productively with BC Hydro and other stakeholders to develop appropriate terms of reference for the further study of Electric Load Avoidance DSM in line with the Commission's direction.

ALL OF WHICH IS RESPECTFULLY SUBMITTED,

[Original signed by Matthew Ghikas]

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Matthew Ghikas
Counsel for the Terasen Utilities

[Original signed by Song Jin Hill]

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Song Jin Hill
Counsel for the Terasen Utilities

April 27, 2009