

From: [RogerBryenton](#)
To: [REDACTED]
Cc: [RogerBryenton](#)
Subject: Submission to the Site C Review Process
Date: Wednesday, August 9, 2017 8:24:38 AM
Attachments: [BCUC-Review-Detailed-Aug9-BCUC.docx](#)

Dear BCUC Commission Secretary and Chair,

I am writing to you to submit material relevant to the Review of the Site C project, focussing primarily on the economics and financial aspects, the impact on ratepayers, and alternatives to Site C. There are at least ten (10) alternatives, at lower cost, more electricity, more jobs, a better match to demand growth as it increases, little or no environmental impact, lower GHG emissions and greater CO2 sequestration, plus saving the Peace River Valley for agricultural and other reasons.

I trust that you will carefully consider my concerns, questions, data, analyses and conclusions, and terminate this unnecessary, destructive and expensive, wasteful project. I have included relevant, but not specifically requested information on the "jobs" question, and on "pausing the project" to save in the order of \$2 million /day; much better spent on necessary priorities than wasted "moving more dirt" at Site C.

My numbers are not generally expanded to 6 significant figures, eg 1,111 GWh or \$8.333 Billion because, in most cases they cannot be known to that level of accuracy and actually become meaningless. I have used "reasonable" numbers such as adding \$2 Billion for transmission and distributing power to the Lower Mainland, so that it presents, overall, a more accurate cost of delivered electricity, and can then be more accurately compared to electricity savings at the point of use, not at a "point of delivery".

I would be pleased to be considered for remuneration for some or all of the research and analysis, and for ongoing input to the process. I am also available for further discussion of my data, my analyses, observations, and conclusions.

I sincerely believe that the Site C project is ill-conceived, based upon an assumption of "the answer is more electricity, what was the question", was very poorly assessed and must be immediately paused, and thereafter terminated.

I have prepared this from a perspective of "how can we provide electricity based services most effectively", which I believe this paper answers.

Sincerely,
Roger Bryenton, [REDACTED]

From: [RogerBryenton](#)
To: [Commission Secretary BCUC:EX](#); [RogerBryenton](#)
Subject: Re: Submission to the Site C Review Process - Spreadsheets attached
Date: Wednesday, August 9, 2017 2:02:07 PM
Attachments: [2016-2036-Forecast-BCUC-RB-Aug 9.xlsx](#)
[BCUC-Review-Detailed-Aug9-BCUC.docx](#)

Dear BCUC Commission Secretary,

Attached are relevant spreadsheets conforming to assumptions of the 2016 BC Hydro Forecast, utilizing Columbia Treaty Power, Burrard Thermal, "Deep DSM - or Conservation Focus" assumptions, and using BC Hydro's own figures, from the 2013 Integrated Resource Plan, Appendix 3, RODAT.

Thank you,

Sincerely, Roger Bryenton, 

“Stopping Site C Dam: BCUC Review Keeping The Jobs and the Peace River Valley”

By Lower Mainland Network to Save Our Peace Valley

Summary – No Demand for Electricity, Multiple Alternatives at Lower Cost

1. Background – Site C is Not in the Public Interest
2. Terms of Reference – Problems.
3. A Badly Flawed “Approval” Process – Government Decision not a “Business Case”
4. Detailed Description of Errors and Omissions During Approval
 - No Demand for Additional Electricity
 - Economic and Financial Factors – Cost
 - No Market for Electricity
 - Intentional Reduction of Conservation Effort
 - Additional Flawed Considerations
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CONCLUSION – STOP SITE C

APPENDICES - A through I

“Stopping Site C Dam: BCUC Review Keeping The Jobs and the Peace River Valley”

SUMMARY

Analysis of recent electricity use, demand forecasts, existing supply options that were previously excluded from review such as Columbia Treaty and Burrard Thermal, plus a variety of Demand Side Management options (Electricity conservation) clearly prove that there is no need for additional electricity supplies until the 2030 time frame, all at lower or equal cost than the Site C Project.

There is no need for, nor justification for the Site C power project.

1. BACKGROUND – Site C Dam is NOT in the “Public Interest”

BC Hydro’s Site C dam and powerplant were “approved” via a political process, NOT an assessment of benefits and costs, and was not reviewed or approved by the BC Utilities Commission. Is Site C actually in the “public interest”? **NO**. Further, It must be paused while reviewed by the BCUC. **There is no actual fear of or need for “job loss” with pausing or terminating the Site C project.** Replacement jobs are outlined in the following briefing.

2. TERMS OF REFERENCE PROBLEMS

2.a “b. after ... assessment of authority's expenditures on the Site C project to date, is the commission of the view that the authority is, respecting the project, currently on time and within the proposed budget of \$8.335 billion (which excludes the \$440 million project reserve established and held by the province)?”

This question overlooks the serious problem of comparing “delivered energy costs” by overlooking those additional costs for transmission and distribution, and for costs of transmission and distribution spent to date, directly and indirectly related to delivering Site C power to the Lower Mainland and Vancouver Island. This is particularly problematic when comparing DSM or distributed supply sources with a single remote project such as Site C. It is estimated that transmission and distribution will add, or have begun to add, at least \$2 Billion to the “cost” of Site C because of transmission upgrades, line reinforcements, etc to date, as well as future planned expenses. By comparison, DSM or customer-supplied power at the point-of-use are at a distinct disadvantage for cost purposes, since T&D can add 10% or more, as well as ongoing losses to project costs.

A better system of project evaluation is required to account for T&D; one way is to increase the “real cost” of Site C by \$2 Billion to \$11 Billion, for T&D costs.

2.b 3.b.(iv) *maintenance or reduction of 2016/17 greenhouse gas emission levels*) to ratepayers at similar or lower unit energy cost as the Site C project?

GHG emissions levels should **not** be included in the terms of reference unless:

1. GHG - CO₂ and methane emission rates from the proposed Site C reservoir are provided for reference, during construction, flooding and ongoing for at least 100 years,
2. GHG – CO₂ and methane emission and sequestration rates for soils, plants and trees in the entire Peace River Valley to be flooded are to be accounted for, including those areas already cleared of vegetation, and accounting for losses to date,
3. GHG – CO₂ and methane emission and sequestration rates for downstream river and stream banks and seasonally flooded areas are provided for reference, and
4. GHG – CO₂ emissions from construction, cement production and concrete use, transportation and other sources during 2015 to 2024 are provided and accounted for.

3. A BADLY FLAWED “APPROVAL” PROCESS - “TOO MANY QUESTIONS AND UNKNOWNNS”. **Why the Review is Imperative and Site C cannot be justified.**

The Site C dam is NOT in the public interest because of the many (17 listed) errors and omissions in the process that led to its “approval”, including:

- a. Is additional electricity required? Questionable demand forecasting – over the past 10 years, demand has decreased;
- b. Cost – \$8.8 Billion plus another \$2 Billion in transmission lines. That is 15 cents/kWh. Alternatively, there was no thorough analysis, or detailed assessment of opportunities to purchase "market power" at 3 cents to 4 cents instead of building Site C;
- c. Market power – by legislation, BC was to be entirely self-sufficient in power generation;
- d. Preventing, by OIC/Terms of Reference, consideration of BC’s entitlement under the Columbia River Treaty, whose energy and capacity is approximately equal to Site C’s;
- e. Preventing, by OIC/Terms of Reference, consideration of Burrard Thermal Electricity, equal to Site C, as a peaking plant;
- f. Technical and economic information gaps regarding use of geothermal resources, equal to Site C ;
- g. Failure to consider “small, least cost” renewable and storage options, with declining costs;
- h. No viable markets for electricity from Site C, domestic or regional;
- i. Intentional reduction of DSM/Conservation programs so as to not decrease electricity use further and obviate the need for new power;
- j. Preventing, by OIC/Terms of Reference, assessment of the effect on agricultural lands, including an exclusion of Agricultural Land Reserve considerations;
- k. Ignoring First Nations treaty rights, and the multiple active legal challenges ongoing in the courts;
- l. Failure to fully assess effect(s) of water flow changes on downstream Wood Buffalo Park UNESCO site;

- m. Failure to fully assess the effects on climate change of CO₂ and methane reservoir emissions vs carbon sequestration of valley forest and farmland;
- n. Failure to fully assess the value of Peace Valley farmland and forests, tourism, cultural and recreational values, in perpetuity;
- o. Failure to adequately assess cumulative environmental impacts of all resource developments, past, present and future on First Nations, environmental resilience, and whether such impacts affect the sustainability of the region.
- p. Failure to assess a “critical impact” whether the compromise or loss of a particular biological area can have a broader impact beyond the assessment area in terms of critical species, critical ecological balances.
- q. Failure to assess the importance of the valley for migratory species and wintering grounds.

The Site C dam is NOT in the public interest because of **at least seventeen (17) errors and omissions** in the process that led to its “approval”.

4. DETAILED DESCRIPTION OF ERRORS AND OMISSIONS IN THE “APPROVAL” PROCESS

LACK OF DEMAND FOR ELECTRICITY -

a. **No need for electricity or capacity.** Questionable demand forecasting (Appendix A). Over the past 10 years, demand has decreased. When needed, capacity and energy can be provided by conservation, demand side management, additional generators at Revelstoke, Columbia Treaty Power, Burrard Thermal, Duncan Dam, or pumped storage systems near loads. This is summarized in the spreadsheet, Table 3-8b and **clearly shows Site C is not needed, nor is any electricity needed until at least 2032**, even if LNG proceeds.

ECONOMIC AND FINANCIAL FACTORS -

b. **Cost** – At \$8.8 Billion, plus an estimated additional \$2 Billion for Transmission to major load centres – Vancouver and Vancouver Island. This cost was not reviewed by the Joint Review Panel due to time and other resource limitations of the Panel. The unit cost of electricity from Site C is \$145/MWh, far greater than at least 10 alternatives. The cost of Site C will add about 20% to BC Hydro’s debt, while providing about 7% additional energy. Reference is 2013 Integrated Resource Plan, Appendix C, RODAT – Alternatives to Site C.

Money spent to date is irrelevant in financial reviews. There is no “point of no return”. On an “investment” where there is no need, or demand, there is no point of completing the project. Any additional money spent is additional money wasted. There is no viable market for the electricity – item g. below.

Effect on Ratepayers – At \$10 Billion, Site C will provide roughly 10% additional power, 5,100 GWh/yr, and **result in an approximate rate increase of 10%**. To this will be needed

additional increases to reduce deferral and regulatory accounts, as well as routine annual increases of 2% to 3%.

c. **Market Power** - there was no thorough analysis, or detailed assessment of opportunities to purchase "market power" instead of building Site C. Market power at Mid-C of \$30US (\$40 Cdn).

d. **Preventing, by OIC/Terms of Reference**, consideration of BC's entitlement under the Columbia River Treaty, whose energy and capacity is approximately equal to Site C's;

e. **Preventing, by OIC/Terms of Reference**, consideration of Burrard Thermal Electricity, equal to Site C, as a peaking plant;

f. **Technical and economic information gaps regarding use and cost of geothermal resources**, equal to Site C as identified in the Joint Review Panel's Report;

g. **Failing to consider small, incremental and lower cost renewable sources** of electricity, and alternative storage systems equal to Site C, and which have declining costs ;

NO VIABLE MARKET FOR POWER FROM SITE C –

h. If Site C is completed, BC does not need the electricity. The idea of an "LNG" market has not and is unlikely to materialize despite former government's promotion. Alberta (Calgary), chose to generate electricity from natural gas, at roughly half to one-third the cost of Site C. Selling to the US is not feasible for two reasons, i) California requires "renewable" and "green" power, which large hydro-electric systems do not qualify and ii) solar and wind power are declining cost, solar in Nevada is under \$50/MWh while wind is similar. The remaining market is into the US at mid-Columbia where market power is under \$40 Cdn/MWh, while the cost of generating from Site C is above \$120/MWh.

INTENTIONAL REDUCTION OF CONSERVATION AND MANIPULATION OF DEMAND FOR POWER -

i. **Intentional reduction of DSM/Conservation programs** so as to not decrease electricity use further and obviate the need for new power. At a projected 10,000 households saturation for ECAP, only 15 kits were provided, and only one (1) home retrofitted!;

ADDITIONAL FLAWED "APPROVAL" CONSIDERATIONS -

j. **Preventing, by OIC/Terms of Reference, assessment of the effect on agricultural lands**, including an exclusion of Agricultural Land Reserve considerations;

k. **Ignoring First Nations Treaty rights**, and the multiple active legal challenges ongoing in the courts. Multiple legal challenges to Site C have been made by First Nations, are ongoing, and to have a project proceed while court proceedings are active is not a moral or ethical procedure.

l. Failure to fully evaluate the effect(s) of water flow changes on downstream Wood Buffalo Park UNESCO site, as per the JRP Report;

m. Failure to fully evaluate and consider the effects on climate change of CO₂ and methane reservoir emissions vs carbon sequestration of valley forest and farmland;

n. Failure to adequately assess the economic value of Peace Valley farmland and forests, in perpetuity, including tourism, cultural and recreational values;

o. Failure to adequately assess the cumulative environmental impacts of all existing and future industrial and other development on First Nations, on environmental resilience and whether the cumulative impacts are “reasonable” and sustainable, including agricultural, fisheries, plants, forests, animals, insects, amphibians.

p. Failure to assess whether there may be a “Critical Impact” the compromise or loss of a particular biological area can have a broader impact beyond the assessment area in terms of critical species, critical ecological balances. Might the loss of one or more species trigger a local shift, loss or other consequence, and whether that may have a much broader impact subsequently.

q. Failure to adequately assess the importance of valley for migratory species and ungulates; wintering and other seasonal grounds. What is the impact of loss of valley bottom, frozen river crossings, frozen marshlands as travel, food sources, protective habitat, on wildlife, predators, raptors, and other species? What are dependent species and are they well understood and documented?

CONCLUSION – IT IS IMPERATIVE THAT SITE C BE THOROUGHLY REVIEWED FOR DEMAND – NEED, COSTS AND COSTS OF ALTERNATIVES, TO PROVE THAT THERE IS NO JUSTIFICATION FOR SITE C AND THAT IT MUST BE TERMINATED.

RECOMMENDATION – THAT SITE C BE IMMEDIATELY “PAUSED” DURING SUCH A REVIEW TO PREVENT ONGOING DESTRUCTION TO THE PEACE RIVER VALLEY, AND TO RE-ASSIGN WORKERS TO BENEFICIAL WORK SUCH AS ENERGY CONSERVATION AS OUTLINED LATER IN THIS PAPER.

Appendices A through I , following Section 8 of this submission provide details of the Errors, Omissions, Exclusions and Data shortages that resulted in Site C being “Approved” by a badly flawed process, more fully addressing the economic aspects of problems with Site C approval.

5. PAUSING WORK

Necessity for Pausing Work on Site C Project, Until Project Review by BCUC Completed

- **A Pause is imperative** to minimize additional waste of funds at \$2 million/day; minimize additional environmental destruction; avoid landowner relocations; avoid farmland and road realignment conflicts; avoid destruction of First Nations sites;
- A “Project Review” by BCUC or other Panel will take in the order of 2-3 months, notionally 100 days. At a current cost of approximately \$ 2 million/day, **in the order of \$200 million could be wasted, for no good reason.** There is also the cost of additional damage to the land, ecosystems, floral, fauna and fish, some of which might be, as predicted by the Joint Review Panel, irremediable.

6. RE-ASSIGNING WORKERS DURING A “PAUSE”

Site C currently employs hundreds of Workers

Labour Availability – recent reports of Site C labour force range from 1800 to 2252; (2500 Reported by Emma Gilchrist in DeSmog, July 2017). It is believed that approximately 400 are internal to BC Hydro, leaving 1800 on Site. It is also understood that there are up to 200 First Nations workers, who would be well-suited to assisting other Aboriginal communities across BC with energy conservation work and housing supply and improvement efforts.

The remaining 1300 or more are available for, in order of immediacy and time to train:

Forest Fire Fighters, across BC, to complement the hundreds of foreign firefighters being brought into BC.

a) Re-training and re-assignment for “Electricity and Energy Conservation Corps”, immediate startup to 5 year duration. Teams train and implement low cost –effective re-lamping of lights with LED’s across BC in apartments, hospitals, civic buildings, street lights, homes; Housing re-insulation, storm windows and doors; water heater blankets or tank replacement with load shedding units; installation of energy management systems in homes; assistance with energy efficient appliances; heat pump installation, etc. BC Hydro has an Energy Advisory Service with dozens of advisors across BC whom could train workers. **Immediate start: over 200,000 lighting fixtures; 180,000 to 340,000 homes,** (see below), **work could be for up to 5 years. Potentially several hundred to 1000 workers.**

Note – BC Hydro has more than 1.7 Million Residential accounts¹ – homes. 11% or 180,000 are “low Income” (LICO); 21% are LICO + 30% (340,000).The ECAP (Energy Conservation Assistance Program) reaches 15 homes per year², under BCH DSM program! It would take more than 1000 years to assist the LICO homeowners at that ineffective rate of program uptake!

¹ BCUC –BC Hydro Revenue Requirements – Document 49472, p50, para 211.

² Ibid, p 49, para204.

Electric Lighting: Re-lamping

Hospitals - There are an estimated 17,000 hospital beds, operating 24/7, which each involve up to five fixtures each, involving 85,000 fixtures.

Apartment Buildings – there are 366 high rises over 10 storeys, averaging 20 storeys (of 1619 buildings) in Vancouver city alone. An estimated 2/3 are residential, with an estimated hallway and stairwell lamps at 7 per floor for 24 hrs/day. Total lamps would be at least 36,000; with another 15,000 commercial building lamps operating at least 10 hours/day. There are also hundreds parkades and garages with 24/7 lights to be changed.

Street Lighting – BC Hydro own 91,000 street lamps available for re-lamping with LED's. There are thousands more owned by communities and businesses.

Civic Buildings – across the hundreds of communities in BC there are at least dozens of buildings with re-lamping opportunities, and later, additional electricity savings opportunities.

b) Existing and New Infrastructure Projects across BC, 1 year to 5 years duration. Community building upgrades, school and hospital seismic upgrades. There are 189 schools needing seismic upgrades, with 14 ongoing as of Sep 25, 2016. There are 47 of these approved for upgrading. **Less than one month from re-assignment to 5 years.**

c) Re-assignment to ongoing remediation and upgrades to BC Hydro facilities across BC, presently budgeted in the order of \$1 Billion/year - **less than one month from re-assignment to 5 years.**

d) Re-assignment to BC Housing projects across BC; upgrades and new. Timing – Immediate to longer term.

e) With union initiatives and cooperation, re-assignment to other construction projects across BC – Vancouver high-rise and commercial construction, Prince George, Kelowna – Okanagan, Victoria-Vancouver Island. **Less than one month from re-assignment – potential several hundred workers.**

f) Site remediation and restoration, 6 months to 1 year, from date of Site C cancellation. Removal of large tracts of mulched wood from logged reservoir areas, slope stabilization and replanting of trees and riparian areas; restoration of First Nations cultural sites; restoration of Rocky Mountain Fort. **This cannot occur until a decision to stop the project has been made by BC Hydro or BC Government. 3 month delay.**

g) BC Hydro's Energy Plus "all electric heated homes", now suffering with high electricity bills and without affordable alternatives for heating, retrofitting for lower electricity/energy use – **less than one month startup to 3 years,** limited applications

Note – the EPlus Homeowners Group advises ³ that there are “roughly 7000 homes, mostly single family homes, plus a relatively small number of commercial accounts – a few multi-unit buildings such as senior’s residences. They use roughly twice the electricity of homes that do not have electric heat. Opportunities for upgrades are limited, in that they are much likely better insulated than non-electric heated homes of similar size, thus would be capital intensive like adding heat pumps.”.

h) New renewable energy solutions, particularly assigning BC Hydro and others for investigations into feasibility and demonstration of geothermal electricity generation using oil and gas wells in the Fort St. John area, for modest cost, “base-load” electricity generation in future. Solar and wind power projects in BC.

7. MULTI-LEVEL STRATEGY AGREEMENT: BC HYDRO, BC GOVERNMENT, UNIONS, PEACE VALLEY RESIDENTS AND AFFECTED PEOPLE

Timing of the Essence. To avoid wasting \$200 Million while the Site C Project undergoes an official review, it is essential to “pause” the project. A pause will not trigger termination clauses or penalties, will not incur “delay” costs, as there is no need for the project to be completed on the original schedule. It will allow temporary and/or permanent re-assignment of existing Site C workers to alternative projects which clearly are “in the Public Interest”

8. EFFECT OF SITE C ON ELECTRICITY RATES

Adding approximately 10% additional electricity output, 5,100 GWh/yr with a 15%-20% increase in debt load is not a wise financial choice, which Site C would require. Depending upon the final project cost, which as this analysis shows, may reach \$11 Billion, resulting in a cost of \$157/MWh, (Appendix B-2) electricity rates will increase by approximately 10%. However, based upon rate approvals in the past, driven to a major extent by government decree, increases recently have not been sufficient to fully cover increased costs. Political intervention or interference has kept rates dramatically artificially low. Regulatory and Deferral accounts were used to enable increases between 3% and 7% per year, particularly in election years. These will need to be added to the 10% increase for Site C.

Given the very high rate of debt due to such accounting practices, many economists and others state that rates will need to double to correct for these accounting distortions over the past 10 years. The provincial government received or “borrowed” a substantial “dividend” typically over \$300 million per year from BC Hydro. In order to “balance the books”, BC Hydro then had to borrow this money on the open market.

³ Personal communication with Gary McCaig, EPlus Group

Further distorting the situation is that BC Hydro has contracted with Independent Power Producers to supply roughly 1/3 of the electricity needed. Since these contracts range from about \$40/MWh to over \$150/MWh, and since BC Hydro negotiated an oversupply, BC Hydro now must pay for electricity which is not needed, and excess is sold at market prices, typically \$30. See Appendix C-2 for IPP payments. Average payments have been about \$72/MWh.

Estimating that **\$10 Billion will add about 10%** to the bill, then \$1 Billion will add about 1%. Thus if we have \$6 Billion to pay to complete Site C, it will cost about 6% increase. This is for no benefit, and ongoing losses to sell the power at market prices of \$30/MWh to \$40/MWh. **It is essential therefore to not spend any additional money during a review.**

Add to this the regulatory and deferral accounts.

Add to this the annual increase of about 4%.

Instead we can choose **Deep DSM - massive conservation**. At roughly \$30/GWh (RODAT), that will be about 1/4 to 1/5 the cost of Site C. Thus for .25 cents/kWh of DSM, we can spend \$1 Billion on conservation, about 3X the present annual amount spent, for half of the power we would get from Site C (Appendix B-3).

Deep DSM equivalent to Site C will cost about \$2 Billion, and save about \$4 to \$6 Billion, for roughly the same power as Site C. This saved power can then be sold for roughly the same cost as the conservation measures, for \$30 to \$40, thus we get conservation for free, and no rate increases!

Thus there is little to no net cost to ratepayers.

9. PROJECT REVIEW DURING PROJECT PAUSE

BC Utilities Commission Site C Project Review Option:

- It is possible that a “two-phase” review will be conducted. Phase I is focused on the need and business case for building Site C, and, if built, the likely effects on consumer electricity rates in BC. A second phase, if required, would more broadly consider First Nations treaty rights, environmental damages, fishing and fish habitat destruction, and the economic loss associated with removing 5,000 hectares of prime agricultural land from the ALR;
- Panel: Peace Valley Representative, First Nations Representative, Financial – Economics Representative
- Structure for Phase 1 Review – written submissions; Short Timing – 6 weeks; Based on No Need for electricity; High Cost of Site C; Lower Cost Alternatives to Site C (10)- Columbia Treaty, Burrard Thermal, “Deep Conservation”

BC Hydro “Internal Review” Option.

- With a new Board of Directors and Management, **BC Hydro can terminate, or pause Site C based upon an “internal review” of the Site C “business case”,** for which there is little/no

evidence to support its construction. Rather, the 10 year load decrease, the high cost of Site C, and the much lower cost of at least 10 alternatives all argue against building it.

Site C Contractors.

-With reported timing and completion difficulties (Quarterly Site C Progress report to BCUC), contractors may be having concerns about cost over-runs, and if contracts do not ensure over-runs would be fully compensated, or if contracts can be implemented by BC Hydro minimizing or not paying for cost over-runs, contractors may be willing to unilaterally withdraw from portions, or all, of some contracts. **Discussions and negotiations with contractors should be immediately entered into to explore possible contract termination.**

10. FUTURE OPPORTUNITIES – BEYOND SITE C

Although not within the terms of reference for the BCUC Review, it is informative to consider the possible future of the Peace River Valley once the Site C project is terminated. In particular that many quality employment options are possible, along with new businesses and industry.

- Economic Development – Horticulture and Agriculture Industry, Research and Development

- A “World Class Centre for Excellence”- Converting the “\$470 Million workers camp” to a modern, multi-disciplinary “University for the Future”. This expands BC’s Hi-tech business capability for world exports in future.

-Electricity Intensive Industry -

Attract electricity intensive industry, processes, products with high margins: graphene and composites manufacturing, product development

- Housing –

Substantial numbers of BC’s housing stock are in need of repair and or replacement. This issue is often raised by First Nations, particularly along damp coastal locations. A “housing upgrade” program has been discussed with an Aboriginal organization, (personal communication), which could require a number of Site C workers to participate.

CONCLUSION:

There are thousands of possible Jobs, immediate to longer term, for existing Site C workers and a productive future for the Peace River Valley. “Job Loss” is not an issue.

11. POLICY ISSUES TO BE ADDRESSED PRIOR TO TERMINATING SITE C.

- a. Were parties entering into agreements relating to Site C acting in “Bad Faith”? Yes. Under a recent Supreme Court Ruling, there is an obligation to both perform and by inference, to enter into contracts under the precept of “Good Faith”.

As such, all parties to contracts are not bound to such contracts. Thus unilaterally BC Hydro, the Province of BC and a Contractor can terminate one or more contracts without penalty or further obligation.

Reference - Letter to the Editor: Printed in "Common Ground" magazine, 2017

Is BC Hydro's Site C Dam on the Peace River "IN BAD FAITH", and does it uphold our concept of "Social Contract"?

To All Parties: Contractors - Acciona Canada; Samsung C&T; Petrowest; Voith Hydro; BC Hydro; BC Hydro Board of Directors; Government of BC

Contractors: You have knowingly entered into contracts with BC Hydro, the BC Provincial Government, and possibly others, to provide goods and services for the Site C power project.

At the time of your signature to these contracts, you were well aware of opposition to the project;

- multiple legal challenges,
- over 100,000 signatories, over 300 scientists and scholars, the Royal Society, numerous organizations,
- the Union of BC Municipalities, and the Union of BC Indian Chiefs,
- no increase in domestic use of electricity for the past ten (10) years; no need for the project,
- myriad alternatives: Columbia River, Burrard Thermal, upgrades to other BC dams and power houses, and electricity conservation - 2x the power at 1/6th the cost,
- other renewable sources of electricity solar and wind, and geothermal.

You were also aware that: 1. the former Chair of the Joint Review Panel, Dr. Harry Swain, 2. A former CEO of BC Hydro, and 3. a former Premier Harcourt all publicly opposed.

You were aware that First Nations Treaty rights were not being honoured, and that First Nations were strongly opposed to the project.

You were aware that the Government of BC:

1. excluded review of the project by the BC Utilities Commission,
2. excluded land areas to be affected from review by the Agricultural Land Commission, and
3. excluded both the Columbia River Treaty and Burrard Thermal power from consideration.

BC Hydro, BC Hydro Board of Directors, and BC Government: You have intentionally created a situation which circumvents essential aspects of major project approvals. That approval process forms the basis of “social contracts”, being those developments that improve the standard of living while being “socially acceptable and desirable”. The aspects of project review and approval denied:

- Review by government established agencies, such as BCUC,
- Using legislation to exclude specific areas of review to enable projects to proceed
- Using legislation to facilitate approval of projects
- Ignoring legal challenges to projects.

Acting in BAD FAITH?

Contractors, BC Hydro, BC Hydro Board of Directors and BC Government:

Despite this knowledge, all parties wilfully agreed to proceed with signing contracts for goods and services to build the Site C project.

A serious legal question, is raised, “Did the various parties **ACT IN BAD FAITH**”?

In a 2104 Supreme Court decision, there is a REQUIREMENT that all contracts, to be valid, can only be agreed upon if all parties are acting in Good Faith. Justice Thomas Cromwell wrote, “... good faith contractual performance is a general organizing principle of the common law of contract ... recognizes obligations of good faith contractual performance. ... a common law duty ... applies to all contracts to act honestly in the performance of contractual obligations.”

This would apply to entering into contracts as well as contract performance.

Reference: <http://business.financialpost.com/legal-post/supreme-court-of-canada-updates-common-law-to-make-good-faith-an-implied-term-of-all-contracts>

Evidence of “BAD FAITH”

Lack of Project Need, Lower Cost of Alternatives and Public Opposition -

It has been clearly shown that there is no clear need for the project. It has also been clearly shown that there are at least ten (10) lower-cost alternatives, and very strong public opposition.

Given these there compelling facts, it is **probable that all parties “ACTED IN BAD FAITH”, and did not honour basic tenets of the “social contract”**. As a consequence, and as a result of a recent election and impending change of government, and management of BC Hydro, it is **probable that the Site C project will soon be paused and or terminated**. The consequences are: **all work must stop, and equipment orders delayed, renegotiated or cancelled**.

To continue with further work may be greatly to your detriment. You are being asked to withdraw your services and goods at the earliest possible time, to prevent failure of payment, as such services and goods will not be necessary.

FURTHER – any contracts entered into beyond this date by yourselves, jointly or severally, will not be honoured by the residents of British Columbia.

Signed

Roger Bryenton, [REDACTED]
[REDACTED]

Policy Issues cont'd -

b. Contract Termination or Cancellation Clauses

Contract termination clauses have not at the time of writing, August 2nd, 2017 been released to the public, nor is it likely that they will be. Thus determining the nature and extent of “penalties”, “payments” or other terms is not possible.

However, given that the contracts were entered into in “Bad Faith” by all parties as outlined above, will negate such termination clauses.

c. Alternatives to Payment for Penalty Clauses

There are a number of “creative solutions” to comply with “penalty clauses” in contracts. Similar to cost over-runs, pausing, cancelling, and terminating involve reaching mutually satisfactory terms.

- i) It is possible, that given the nature of challenges facing contractors at Site C, and continuing challenges such as “tension cracks”, cost over-runs, etc that the existing contractors may be willing to excuse themselves from further work at the job site.
- ii) It is possible that Site C contracts could be modified with mutual agreement, for restoration work when the project is cancelled, for work at other sites and/or for future contracts.

Examples - Renegotiate w. existing suppliers re extensions and re-assignment to alternative projects: Voith – turbines for Revelstoke and Duncan dams, future powerplant upgrades; Peace River Hydro Partners – Site C remediation, dam work at Williston and other reservoirs.

Conclusion – it is possible that work on Site C can be cancelled without serious additional costs involved.

Cancel the Site C Project - In the event that cancellation clauses must be paid, it is to the benefit of BC Hydro and BC Hydro's customers that such amounts be paid, in order to terminate a project which will involve selling the electricity for approximately 1/3 of the cost of producing it.

12. POLICY ISSUES TO BE ADDRESSED SUBSEQUENT TO TERMINATING SITE C.

This Section does not directly pertain to the first submission and review of Economic Factors relating to Site C and Electricity Rates, however, it is related as to BC Hydro conducts and develops relationships between "suppliers, customers and BC Hydro", whether as a traditional utility or as an "evolved" agency which seeks to "facilitate" solutions vs. "Build power plants"

Examination of BC and BC Hydro Policy Issues – Solving Possible Problems

- a. Preferential Rate Reviews: Forestry Thermo-Mechanical Pulping and Mining company preferential rates and deferrals, including the recent "E-drive" rate announced for LNG plants;
- b. Lack of low income "life-line" rates for low-income customers;
- c. Rate Restructuring – revenue neutral "sloped line" rates vs. steady or stepped rates to allow modest users to pay modest rates, and large users to pay greater rates, related to marginal cost increases with additional electricity supply;
- d. Pricing of Electricity related to Marginal Costs. Cost of incremental capacity at Site C - \$18,500/kW vs sale price at \$12/kW (Average output of Site C is 582MW; cost \$10.8 Billion. \$8.8 plus \$2Billion for Transmission to Lower Mainland/ major load centre. This is \$18,500/kW. 400 Amp service costs \$240 more than 200 amp service or \$12/kW).
- e. Focus on Conservation and Demand Side Management vs New Supply - "Deep DSM" – "Conservation Corps" programs across BC

CONCLUSION

Demand and Economics: Given that-

- a. there is no demand for electricity,
- b. that there are at least two additional sources of power, Columbia Treaty and Burrard Thermal, at very low cost
- c. that there is "Deep DSM" or Conservation which can provide roughly double what the Site C project would provide, at 1/3 to ¼ what Site C will cost,
- d. that there is a multitude of small, renewable sources of electricity with little or no detrimental environmental impact such as solar, wind and geothermal, again with much more output than Site C, better matched to load growth, and at lower or equal cost to Site C, and
- e. that there are no viable markets for electricity from Site C, and that selling electricity at market rates will incur major financial losses,

- f. that the true value of the agricultural and other opportunities for the Peace River Valley have not been adequately assessed or accounted for,

SITE C MUST BE IMMEDIATELY TERMINATED, IN PERPETUITY.

Prepared by Roger Bryenton, et al

Based on input from Peace Valley residents', First Nations, and other's inputs



August 2, 2017

APPENDICES

- A. Demand Forecasting Errors
- B. Cost Of Site C and Alternative Sources of Electricity
- C. Market Power
- D. Preventing by OIC/Terms of Reference BC's Entitlement to Columbia Treaty Electricity
- E. Preventing by OIC/Terms of Reference the use of Burrard Thermal Plant
- F. Failing to Assess the Use of Geothermal Energy
- G. Failure to Consider Small, Incremental and Lower Cost Renewables
- H. No Viable Market(s) for Site C Power
- I. Intentional Reduction and Manipulation of Demand for Power

Appendix A – Demand Forecasting Errors

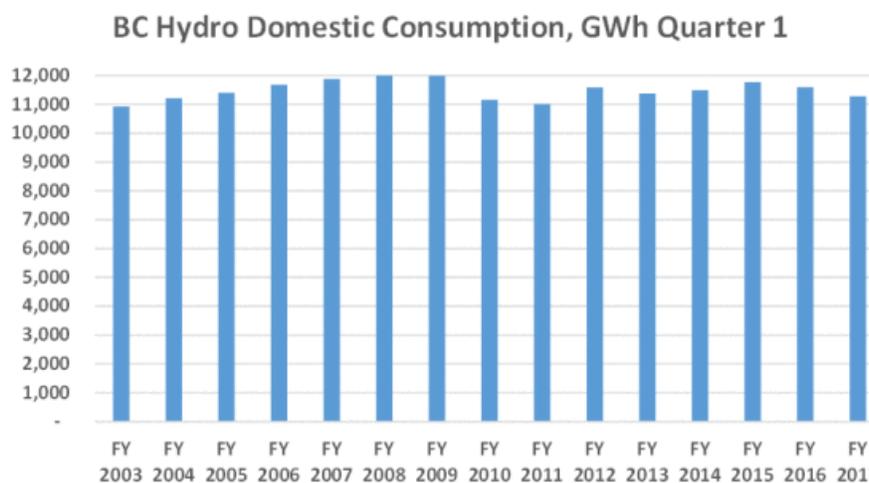
A-1 Record of Errors in Forecasting Electricity Requirements, consistent over-forecasting during 23 years

- In 1994, BC Hydro said BC demand for electricity would grow 52% by 2004. It grew 18%.
- In 2005, BC Hydro said demand would grow 20% by 2016. It grew 0%
- In 2011, BC Hydro said demand would grow 20% in the following five years. It grew less than 1%.
- In 2012, BC Hydro said demand would grow 9% in the following four years. It dropped by 1%.

Source - In-Sights, “By the Numbers”, By Norman Farrell on September 30, 2016

Conclusion – BC Hydro’s forecast of electricity requirements is consistently high and cannot be used for planning additional capacity or energy needs.

A-2 Actual Electricity Consumption During Last 14 years



Source - In-Sights, “By the Numbers”, By Norman Farrell on September 30, 2016

Conclusion – Despite clear proof that electricity use has not increased, BC Hydro continues to assert that it will, and thus any “forecast” of additional needs must be disregarded.

Appendix B – Cost Of Site C and Alternative Sources of Electricity:

B – 1 Estimated Cost of Site C by Year of Estimate

In 1981, the “original” Site C Dam cost was \$1.1 Billion

In 2007, the updated cost was \$6.6 Billion. Allowing for inflation, the \$1.1 cost would have risen to \$2.1 Billion. BC Hydro’s increase is roughly 3 times!

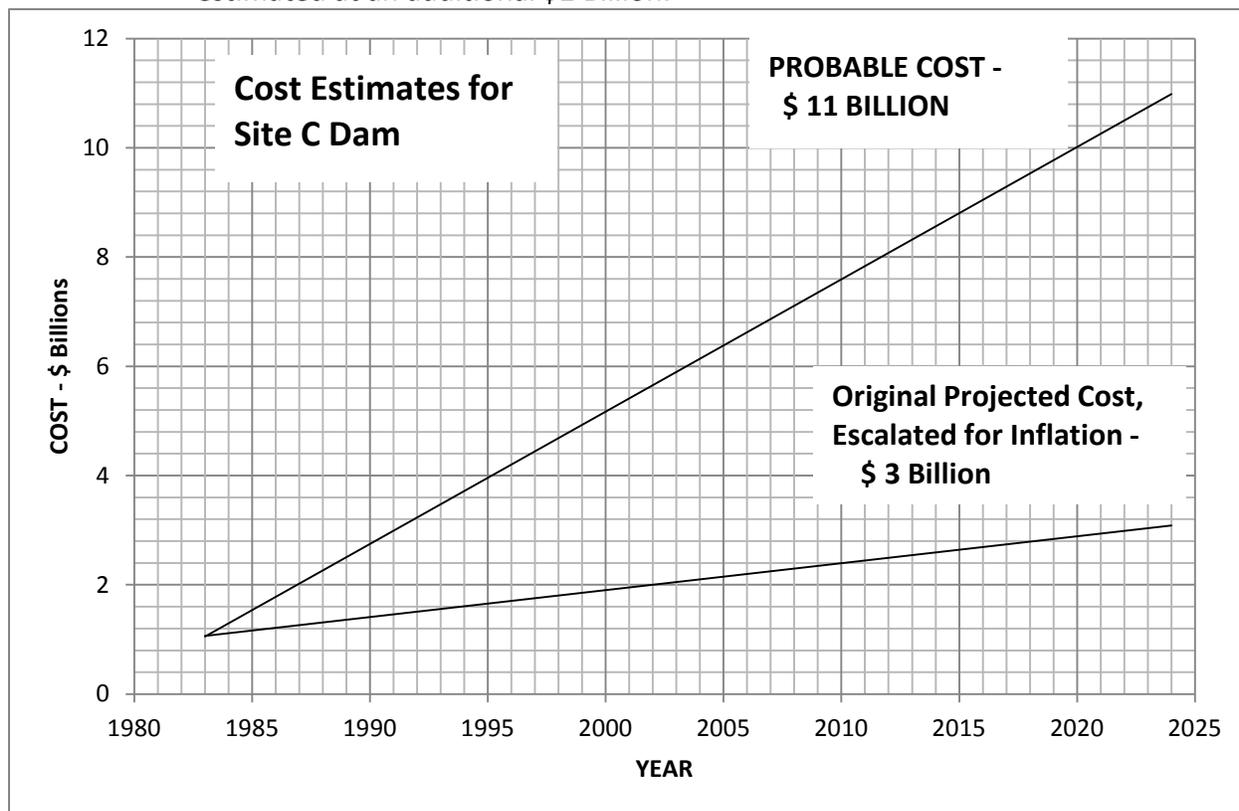
In 2011, the updated cost was increased to \$ 7.9 Billion, while inflation would have increased the original estimate to \$2.5 Billion

In 2014, the updated cost was increased to \$ 8.8 Billion, while the original estimate would have climbed to \$2.6 Billion. BC Hydro is 3.4 times more money.

By 2017, Escalating both costs at 2% inflation, gives a \$9.2 Billion estimate vs a \$2.8 Billion original cost

By 2024, allowing for 2% increases until completion, would give a probable final cost of at least \$11 Billion, vs \$3 Billion originally estimated.

This does not allow for transmission lines from Site C to major populations centres, estimated at an additional \$2 Billion.



Conclusion - BC Hydro’s estimates of Costs have varied so dramatically that they cannot be trusted to accurately predict the cost. Allowing for inflation of the original estimated cost of \$1.1 Billion to \$2.8 Billion by 2017, compared to the \$ 9.2 Billion most recently forecast exceeds a margin of error by more than three (3) times!

B – 2 – Cost of Electricity from Site C

Site C – Could be \$157/MWh at a cost of \$11 Billion, with transmission line costs.

ejf/Apr.2016	Site C Dam - High-level Cost-Benefit Analysis (2016 \$\$)									
Years from Start of Operations --->	1	6	11	16	21	26	31	36	41	Total
Figures in CAD \$Millions										
Revenue	\$ 801	\$4,004	\$4,004	\$4,004	\$4,004	\$4,004	\$4,004	\$4,004	\$4,004	\$ 32,829
Expenses										
Capital Cost (remaining balance)	\$11,000	9,625	8,250	6,875	5,500	4,125	2,750	1,375	-	
Interest on Borrowed Capital-on remaining balance)	\$ 517	\$2,262	\$1,939	\$1,616	\$1,293	\$ 969	\$ 646	\$ 323	\$ -	\$ 9,565
Operations & Maintenance	\$ 275	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$ 11,275
Depreciation (straight-line)	\$ 275	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$1,375	\$ 11,275
Total Expenses	\$ 1,067	\$5,012	\$4,689	\$4,366	\$4,043	\$3,719	\$3,396	\$3,073	\$2,750	\$ 32,115
Net P/(L)	(\$266)	(\$1,008)	(\$685)	(\$362)	(\$39)	\$284	\$607	\$930	\$1,254	

Net Present Value **\$26** Break-even
~\$157/mWh

ASSUMPTIONS		This run uses BC Hydro's 5100GWh /yr sales; 4.7% interest; \$11Billion cost w Transmission	
Saleable Power Production* p.a. (GWh)	5,100	Note: - Recovery of Site C capital cost is included in this model -5,100 GWh assumes no reduction of flow due to climate change.	
Years increment	5		
Cost of Capital/borrowing	4.7%		
Revenue per mWh	\$ 157	\$ 157 Break-even	<----- Break-even ~\$157/mWh
Ops. & Mtce. Expense Ratio**	2.50%		

References:

*

http://www.bchydro.com/content/dam/hydro/medialib/internet/documents/news/press_releases/clean_energy_act/fact_sheet_site_c.pdf

** : Page 24 of http://www.irena.org/documentdownloads/publications/re_technologies_cost_analysis-hydropower.pdf

***: BCHydro Rate for LNG facilities \$83 per MWh: <https://news.gov.bc.ca/stories/terms-finalized-for-lng-customers-using-bc-hydro-system>

Average hourly
delivered power

582

MW

(5100GWh per
annum)

Roger Bryenton - Includes cost of Transmission
to Vancouver

Accumulated interest cost during construction?

Source – Financial Analyses by Dr. Eoin Finn, Management Consultant, ex KPMG Partner and Roger Bryenton, P. Eng. (former), MBA

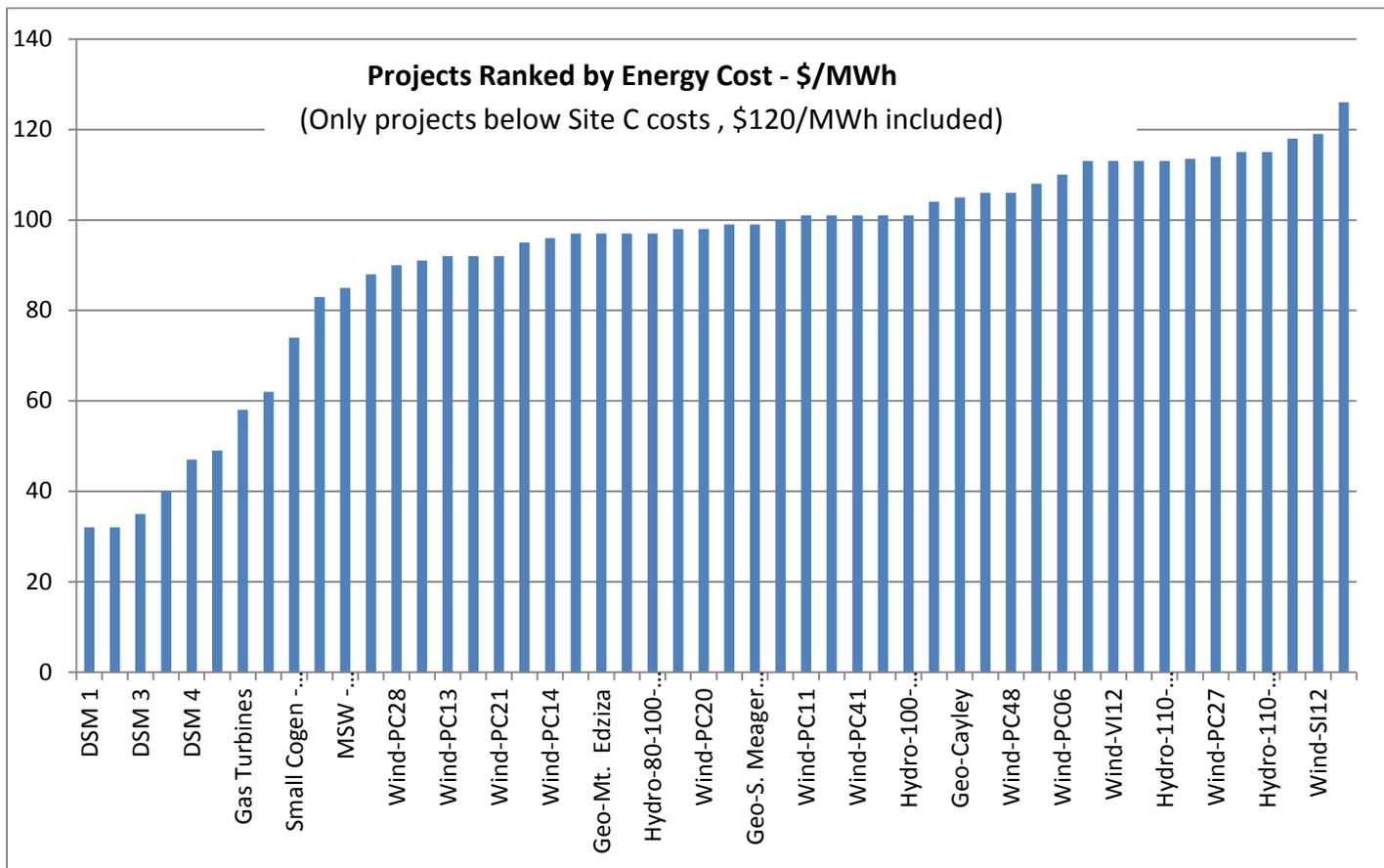
Conclusion – Given “reasonable assumptions” about output, interest rates, a “final cost” of \$11 Billion, including transmission lines to deliver the power to major load centres in Vancouver and Vancouver Island, the “breakeven cost” of Site C electricity could exceed \$150/MWh or 15 cents/kWh.

Choosing to construct such an expensive project directly contravenes BC Hydro’s stated goals of “least cost” and “incremental” power sources for future needs.

When compared with the costs of alternatives, below in Appendix B-3, there are at least ten (10) alternatives that will provide , or save, approximately an equivalent of electricity, for a much lower cost, ranging from \$30/MWh upward. All have much lower to minimal environmental and other impacts, and none involved flooding a productive, agricultural valley.

There is NO justification for Site C. It is a financial and environmental disaster. Site C must be halted at the earliest possible opportunity.

B-3 Cost of Alternatives to Site C, ranked by \$/MWh



Source – Report on Site C – Costs and Jobs, by Roger Bryenton & Associates, 2017,

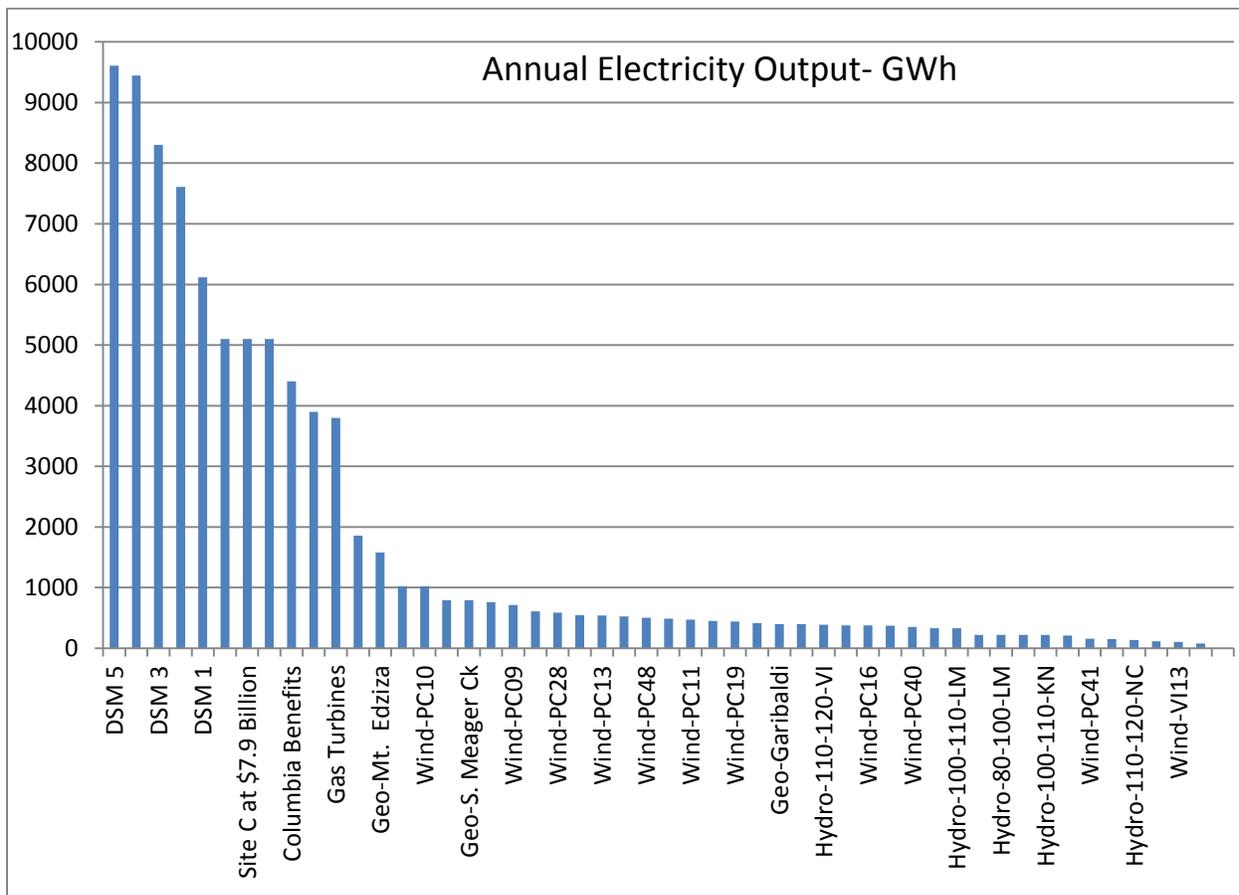
Data Source – BC Hydro 2013 Integrated Resource Plan, Appendix C, RODAT (extracted, formatted and ranked by cost by Roger Bryenton)

Conclusion – There are numerous alternatives to Site C, at far lower cost. Conservation, or DSM (Demand Side Management) is equivalent to Columbia River Treaty repatriation, both at \$30/MWh.

DSM 5, or "Deep DSM" will provide almost double the power that Site C would provide at as much as 1/5 of the cost, as the chart below indicates.

Appendix B – cont’d

B-3 Annual Energy Production for Various Alternatives



Source – Report on Site C – Costs and Jobs, by Roger Bryenton & Associates, 2017,

Data Source – BC Hydro 2013 Integrated Resource Plan, Appendix C, RODAT (extracted, formatted and ranked by cost by Roger Bryenton)

Conclusion – DSM is a far better option than Site C, and at a far lower cost. There is no justification or business case supporting Site C, and it is imperative to stop the project immediately.

Appendix C – Market Power

C-1 During the 2013 to 2014 Joint Review Panel hearings, BC Hydro acknowledged anticipated low prices for power sales. “But times have changed, and BC Hydro’s expectation is that it might sell Site C surpluses for only about one-third of their costs, leaving B.C. ratepayers to pay for the rest”.

Yet BC Hydro proceeded with the project knowing that the project would not be financially viable.

Source – JRP Report, page 286.

C-2 Actual Market Prices – see table below. Column 5, “Price per MW received by BC Hydro in trade sales”. This should read “Price per MWh ...”. The \$/MWh for “market power” sold to Alberta or the US.

Note that the IPP power price, Column 3, is between two to three times the “market price” of Column 5. The “true cost” of Site C power, delivered to major use centres in Vancouver and Vancouver Island is not the purported price of \$65 to \$ 85, depending upon the discount rate used, but is very much higher, **possibly reaching \$150/MWh.**

	Megawatts purchased from IPPs	Price paid per MW	IPPs by BC Hydro for private power purchases Payments to	Price per MW received by BC Hydro in trade sales	IPP power valued at BC Hydro's trade market value	Payment above Market Value
FY 2004	6,133,000	\$ 59.84	\$ 367,000,000	\$ 30.70	\$ 188,272,054	-\$178,727,946
FY 2005	6,444,000	\$ 61.14	\$ 394,000,000	\$ 34.37	\$ 221,481,317	-\$172,518,683
FY 2006	6,741,000	\$ 66.61	\$ 449,000,000	\$ 35.98	\$ 242,537,150	-\$206,462,850
FY 2007	6,041,000	\$ 60.09	\$ 363,000,000	\$ 27.09	\$ 163,642,095	-\$199,357,905
FY 2008	7,765,000	\$ 61.94	\$ 481,000,000	\$ 27.00	\$ 209,623,899	-\$271,376,101
FY 2009	8,374,000	\$ 64.96	\$ 544,000,000	\$ 35.84	\$ 300,138,752	-\$243,861,248
FY 2010	8,893,000	\$ 63.87	\$ 568,000,000	\$ 20.24	\$ 180,003,651	-\$387,996,349
FY 2011	10,805,000	\$ 62.56	\$ 676,000,000	\$ 17.64	\$ 190,557,841	-\$485,442,159
FY 2012	10,827,000	\$ 69.18	\$ 749,000,000	\$ 26.46	\$ 286,488,182	-\$462,511,818
FY 2013	10,675,000	\$ 71.19	\$ 760,000,000	\$ 23.47	\$ 250,548,023	-\$509,451,977
FY 2014	11,025,000	\$ 74.83	\$ 825,000,000	\$ 36.38	\$ 401,060,657	-\$423,939,343
FY 2015	13,377,000	\$ 79.54	\$ 1,064,000,000	\$ 35.34	\$ 472,782,516	-\$591,217,484
FY 2016	14,319,000	\$ 85.83	\$ 1,229,000,000	\$ 31.22	\$ 447,104,263	-\$781,895,737
FY 2017 Q1	4,022,000	\$ 72.60	\$ 292,000,000	\$ 21.13	\$ 84,966,761	-\$207,033,239
			\$ 8,761,000,000		\$ 3,639,207,160	-\$5,121,792,840

Source - In-Sights, “By the Numbers”, By Norman Farrell on September 30, 2016

Conclusion – Developing a power plant that could cost \$150/MWh and then selling that power at \$20 to \$30/ MWh is absolutely ludicrous! There is no justification for Site C.

Appendix D – Preventing by OIC/Terms of Reference BC’s Entitlement to Columbia Treaty Electricity.

The Federal – Provincial Joint Review Panel of Site C, chaired by Dr. Harry Swain was given specific guidelines for the Panel’s review. Previously, the BC Government had passed legislation relating to BC Hydro’s mandate and restrictions, and the terms of reference for the JRP.

One restriction was that BC was to be “self-sufficient” in electricity generation, and that electricity from the Columbia Treaty Agreement was not allowed to be considered.

Conclusion – artificially restricting the terms of reference and limiting prudent sources of electricity results in artificially determining a non-sensical and erroneous answer.

Appendix E - Preventing by OIC/Terms of Reference the use of Burrard Thermal plant

Burrard Thermal plant, near Vancouver, is a functioning, recently upgraded natural gas powered plant. It can readily meet electricity shortages, either capacity during the few hours per year of peak load, or for energy, should a shortage arise. It also has the advantage of supply resilience, should transmission line or other system problems arise.

The JRP was not able to include power from Burrard Thermal in their assessment.

Conclusion – artificially restricting the terms of reference and limiting prudent sources of electricity results in artificially determining a non-sensical and erroneous answer.

Appendix F- Failing to Assess the Use of Geothermal Energy

Both BC Hydro and the JRP acknowledged the shortfall of design, cost and other information regarding the use of geothermal energy for electricity production. This is despite a study by CanGea clearly showing a lower cost and “base load” capability for firm power at a cost of less than or equal to Site C. Given that no additional power is required until at least 2032, there is ample time for research and demonstration of the geothermal potential.

Conclusion – it is entirely possible that geothermal energy, known to be available in the Peace River region, and elsewhere across BC, could supply an equivalent amount of firm power, 600MW (approx) to Site C at a lower or comparable cost.

Appendix G – Failure to Consider Small, Incremental and Lower Cost Renewables

The Independent Power Producers' community has demonstrated that electricity can be supplied from IPP's at prices lower, and in some cases, much lower than Site C. There is a problem with BC Hydro's contracting policies, in that they have continued to over-purchase IPP power, at prices that in many cases, do not seem reasonable. Prices range from \$40/MWh to over \$200/MWh, with no obvious explanation of the differences, other than the earlier contracts tend to be lower priced.

To date, IPP's have supplied over 15,000 GWh annually, about three times the output of Site C. Small projects are much better matched to load growth enabling resilience and versatility in the system.

In future, with solar and wind prices declining, they are well-suited to match load growth, and when located near the point of use, have the additional benefit of reducing transmission and distribution costs.

The 100 MW Playa Solar 2 project is a photovoltaic power station proposed by First Solar with a 20-year power purchase agreement with NV Energy for \$0.0378 per kilowatt-hour. This is lower than the lowest price available in the previous year of \$0.046^[3] (from the 100 MW Boulder Solar plant) (Wikipedia)

[3] *Forbes* (July 13, 2015). "First Solar Signs PPA With A Record Low Rates".

At \$40/MWh (4 cents/kWh) US, or \$50 Canada, and at approximately half the output in BC as Las Vegas, the cost of solar is very close to the cost of Site C, with scalability to match load growth, resilience due to distributed generation sites, and reduced transmission and distribution costs.

Conclusion – small scale renewable electricity systems hold many advantages over a single massive hydro-electric plant, located thousands of kilometres from major users. Cost advantages of solar, wind and small hydro require further examination but appear significant over Site C.

Appendix H – No Viable Market(s) for Site C Power

With a cost upward of \$100/MWh, Site C power cannot compete in the marketplace, where power sells for from \$20 to \$30/MWh. Alberta has installed natural gas burning plants, industrial users are installing and using natural gas in preference to purchased electricity, and California's requirement for Green Energy has foreclosed the option of selling Site C power there.

Conclusion – Proceeding with Site C will result in massive financial losses into the foreseeable future and must not be allowed.

Appendix I – Intentional Reduction and Manipulation of Demand for Power

Electricity conservation programs at BC Hydro have been scaled back, and “targets for conservation have been met eight (8) years early”. The ECAP program had a target of 10,000 households for electricity saving kits, where 15 were supplied, and only one home was retrofitted.

Conclusion – BC Hydro intentionally reduced DSM – conservation spending so as to not further decrease electricity sales, and thus make it more obvious that Site C was not needed and would be a complete waste of money.