Dear Commission Secretary Mr Wruck and Dear Erica Hamilton

SITE C - EXECUTIVE SUMMARY & CONCLUSIONS

BCUC requested submissions, relevant to the terms of reference which ask
a whether the project is on time and within budget;
b the cost to ratepayers of suspending the project;
c the cost to ratepayers of terminating the project &
   Mechanisms to recover c
 d what portfolio of generating projects and
   demand-side management“initiatives could provide similar benefits; and
 e what are expected peak capacity demand and energy demand.

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i/SITE C is uneconomic and should be checked to be safe ,before
   continuing or restarting ,so i focused on providing portfolios of cheaper
   replacements complying with the Paris climate change accord

 ii/ BCUC may safely conclude BC Hydro have enough plants and storage.
   to supply domestic electricity growth for a minimum of 13 years, and probably
   25 years, without building site C, or any high dam, or flooding any land ,or
   more IPPs
   iii, BC hydro have 5 years lead time( till the next election) to b/suspend
   work on Site C and minimize cash and deferred costs involved

 iv BC Hydro should thoroughly explore and report on all portfolios in d/.
   and any material changes in load

 v/ Premier Horgan appointed former Powerex CEO Peterson chairman of
   BC Hydro , who could potentially lower hydro cost and rates, by taking
   advantage of a huge growing energy glut (6 times capacity of SiteC) in the US
   northwest and replace, Site C energy at around ¼ cost

 vi/ Former premier Clark had good intentions to create jobs ,but was
   incompletely informed by BC Hydro managers’ advice (.un-reviewed by
   BCUC)., that “building uneconomical "upgraded" Site C is urgent and the only
   alternative

 vii MLAs must fly blind if they don’t get unbiased, unvarnished, reliable
 planning of all feasible alternatives completely independent of BC Hydro and
 politically correct Victoria
viii Huge Lake Williston could be operated like the world’s largest” battery” and provide 4500 gwhrs (90% of Site C energy) at no cost.

ix/BC is also entitled to free 4000 gwhrs (90% of Site C) at no cost under the terms of the Columbia River Treaty (CRT), subject to ten years notice.

x/ Adding generators at Keenleyside and Duncan dams could provide 976 gwhrs (20% of Site C) at much lower cost.

xii/In 2008 BC Hydro tabled 15 hydro plants with BCUC which I listed in “DETAILS” They range from 17% to 250% of Site C capacity, They all produce cheaper power around $58 to $73/mwhr, compared to $132/mwhr for Site C.

xiii/ There are also 4 “run of river” plants on the Columbia which flood no land above natural high water. In total they can supply more energy than Site C at lower cost... They are listed in DETAILS and explained in referenced Amazon book “Clean Energy Starvation in the Midst of Plenty”, about the Columbia River Treaty, which is not a issue today:

xiii/ DSM is a type of energy conservation and so is engineering to conserve the energy of water spilling over the dam.

Conservation initiative Step 1. In Nov 2012 I was invited by the US State Dept and May 2013 by BPA to explain options on the Columbia. BPA published that fish and irrigation water releases cost them 1000 MW, ( = 95% capacity of Site C) and $750 million per year. They wanted to increase fish water plus save millions. But BPA shelved the project because they didn’t think the then BC government would approve it.

Conservation Step 2. BPA spills energy over their dams (around 9000 mw= 8 times the capacity of Site C). By cooperatively scheduling Lake Williston with BPA, in future BC Hydro can get lots of power at low cost. The new BC Government could tell BPA they are interested in cooperative scheduling of Lake Williston” It can be done anytime, since the Columbia River treaty doesn’t cover Peace river.

Xiii/i believe it is unreasonable for ratepayers to pay to a/continue or b/suspend and restart Site C, unless it’s checked to be safe for people downstream.
Xiv/I directed the team including Keith Kidd (ex Ontario Hydro), that originally designed Peace River dams A B C D E. Though retired as a registered BC professional engineer, I earlier wrote an Information Request (IR) to BCUC, because I believe, not only is the new "upgraded" design weaker, but it requires more material and cost to build, and reinforce from earthquakes, and it may be weaker geotechnically because it is not tied into the midstream island. The press reported failures that needed repairs (eg. July 2016, Feb 2017 etc.) See 3 pictures, 1. Original Dam (Gordon Campbell) 3.3 billion

2. Upgraded dam (Christie Clark) 9 billion; 3. Example of damage

Xv/ I taught "Engineering Economics" at UBC for 14 years and taught students that Vancouver's Second Narrows Bridge falling down showed BC professional engineers are #1 legally responsible during and after construction, and for recommending the most Economical SAFEST alternative. I believe BCUC should recommend that both dam designs be reviewed by independent engineers outside of BC, to ensure the best value for ratepayers' money, and above all, to ensure SAFETY of communities living downstream of the dam.

Original Dam (Gordon Campbell)
Upgraded dam (Christie Clark)

Example picture of damage

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-REFERENCES
3. BPA stops wind power generation for the first time in four years | Wind ...
   https://www.wind-watch.org/.../bpa-stops-wind-power-generation-for-the-first-time-in
4. BC Hydro > 2008 LTAP - Appendix F8
   https://www.bchydro.com/content/dam/hydro/.../info/.../2008_ltap_appendix_f8.pdf
I agree with former CEO Eliesen load forecasts are over optimistic but sympathize
Hydro engineers were chained to follow orders and be “politically correct”, I believe
the new CEO engineer Chris O Reilly will free them

Dal Grauer, president BC Electric (the predecessor of BC Hydro), hired me in
1955, after Vancouver suffered a total blackout. I became Director, Planning
Division with a 45 person staff.,best in Canada.

It included Keith Kidd, ex Ontario Hydro engieer ,for PeaceRiver,and Bill
Weymark ,ex GenNaughton’s staff engineer for Columbia.We planned designed
budgeted contracted and made progress payments for more than ten dams in BC
including Site C. on Peace River and 4 dams on Columbia. The system design
objectives were to supply dependable power at the lowest price world wide to
attract business to BC,ad avoid any more blackouts /the flexible system made sure
there would be no more blackouts to BC, its now called the heritage system and
to this day supplies 80% of BC Hydro’s loads at low $7 per mwhr cost

I next formed my own company and ,built and ran the first computer model
of the Columbia River in Canada to check down stream benefits for Gen
McNaughton in Ottawa and BC Hydro. I then expanded into the US with offices in
Bellingham, San Francisco, Los Angeles, Chicago, Atlanta and Cincinnati. We served
31 electric and gas utilities and pipelines in Canada and in the US and over 100
other customers (names upon request)

I retired to Vancouver in 1992

Later I did independent unpaid nonpartisan volunteer research I gave to John Hogan,
when he was NDP energy critic and to engineer( Liberal )MLA Ralph Sultan,.But both
get a deaf ear from the govt ministers
around 2010 public protest stopped Premier Campbell from raising sales tax, so he brought in the BC Clean Energy Act. He muzzled BCUC and ordered 18 billion dollars of IPP contract to replace Burrard Thermal Plant and wanted to build the original Site C design by BC Electric estimated at 3.3 Billion dollars. He deregulated BC hydro, so kept BCUC just as a charade. Electric rates are now decided by the minister like the price at the liquor control board store and set. BY WHAT TRAFFIC WILL BEAR (and he directed BCUC to add a hidden sales tax by adding non-existing income tax with around 46% bringing in around 2.5 billion dollars “pseudo sales tax” in 2016, all hitting ratepayers which are only 1 in 3 people.

**A1. Whether the project is on time and within budget:**

The Site C project is not on time. According to multiple press reports and photographs attached picture ref 1) Site C continues to develop serious defects which require time and money to repair. Hydro CEO O'Reily earlier stated these problems were unforeseen. It logically follows site C cannot be on time and within budget.

**A2.1: The Implications to ratepayers of completing the project**

**A2.1 Building money-losing Site C costs every BC Hydro customer $5300**

**A2.3 Site C will raise rates by 40% because adding $9 billion Site C raises BC Hydro Property and Plant from around $22 to $31 billion, which raises by 40% the allowed return from electricity sold to ratepayers at raised rates. But in turn it also raises by 40% the incentive pay “to BC Hydro top managers under contract, who can cheer when Site C cost surges.**

**A2.4 In July 2011, BC Hydro tabled their “Rate Impact Model” with BCUC. Which assumed that $9 billion Site C would be included plus also around $18 billion of IPP contracts, with the latest windmills around $120/mwhr according to Mr Coleman.**
A2.2 Any ordinary IPP business producing at $132/mwhr and selling at $82/mwhr (let alone at $56/mwhr) will go bankrupt and its stockholders would vote to change managers and directors. But BC Hydro tenured managers already spent $2 billion dollars on Site C to date, and want to let it surge to $9 billion dollars. So BC hydro must then surcharge its rates to collect $5300.

Even if Minister Coleman cuts a 32% rate increase the difference is put into a deferred “rate rider” account and will be collected eventually plus interest from each of 1.7 million captive ratepayers, or their kids. Worse it’s a never ending rate spiral far beyond Canada’s inflation index.

It turns out that the government is collecting a hidden tax, around 46% on all hydro bills by “directing” BCUC to charge for non-existing mythical income tax they never paid. History shows Premier Campbell tried to raise sales taxes but was stopped by public protest. Thereupon, he passed the “Clean Energy Act”, de-regulated BC Hydro, muzzled BCUC.

I submitted a 100 page brief to BCUC which is in your files. It suggested among other things that BCUC should seek clarification of its duty as the sole protector of captive ratepayers from BC Supreme Court, or Canada Supreme Court under the bill of rights, to prevent rate gouging of captive ratepayers by utility monopolies like BC Hydro, and stop them gold plating their facility rate base.

BCUC was muzzled and (wrongly?) prohibited to review site C for seven years since 2010, when Vancouver Sun reported that liberal MLA’s said “BCUC has outlived its usefulness “So do BC premiers or ministers, unlike Harper, Trudeau and Obama, Trump, remain above the law? “ The King Can Do No Wrong.”

The impact of any Site C cost jump is bad for ratepayers but good for the government.
BCUC was muzzled and (wrongly?) prohibited to review site C for seven years since 2010, when Vancouver Sun reported that liberal MLA’s said “BCUC has outlived its usefulness “So do BC premiers or ministers, unlike Harper, Trudeau and Obama, Trump, remain above the law? “The King Can Do No Wrong.”

In around 2011, after the” Clean Energy Act” was passed, and it de-regulated BC Hydro, I submitted a 100 page brief to BCUC which is in your files. It suggested among other things that BCUC should seek clarification of its duty from BC Supreme Court, or Canada Supreme court under the bill of rights, to prevent rate gouging of captive ratepayers by utility monopolies like BC Hydro, and stop them gold plating their facility rate base.

4.3 The Rate Spiral will continue because the cost of Site C at $132 per mwhr.

In 2011 Van Sun printed that three BC government deputy ministers reviewed BC Hydro and minced no words reporting to then premier Clark: “The "gold-plated" corporate culture in BC Hydro is not for lowest Cost and greatest Value for ratepayers money"." It’s focused on justifying rate increases and associated costs"

2.5 Impact from completing Site C on ratepayers permanent Jobs.

BC Hydro rate spiral which hurts ratepayers’ pockets, and will hit ratepayers kids with “deferred” rate increase” time bombs”. BC Hydro website stated $9 billion Site C added around 1700 construction jobs for 7 years (at gross cost of $755,000 per employee per year) But Site C will increase power rates 40%, which will REDUCE PERMANENT JOBS because industries eg lumber, pulp, paper, plywood, mining, manufacturing need cheap power to remain competitive in world markets.
Moreover, $9 billion could possibly create more construction and permanent jobs building housing, hospitals and transit.

"\n
b/ the cost to ratepayers of suspending the project;

B1

B1.1 Apart from the payments to contractor Deloitte was asked to figure out there is no point in paying extra to mothball the project unless it’s checked to be safe for downstream people, if it is restarted

B1.2 The data attached are 4 pictures:

1. Original Dam (Gordon Campbell)
2. Upgraded dam (Christie Clark)
3. Example picture of damage

Original Dam (Gordon Campbell)
B2.1 “Upgrading” Site C Dam Design May have Compromised Safety.

Van Sun reported, in 2005 that site C cost had increased from $3.3 billion when BC Hydro had earlier tabled BC Electrics standard design of Site C with the BC Utilities Commission. I note that was the design and estimated cost when Premier Campbell brought in the Clean Energy Act.
BC Electric designed ten (slightly curved) standard dams, which everyday produce most of BC's electricity at around $7/mwhr. And have all stood a 50 year test of time, (IPP's produce electricity around $86/mwhr). By 2011, BC Hydro documents show their consulting engineers had upgraded “the Site C dam, from using BC Electric’s standard (slightly curved) dam to a “right angle” dam – (see picture) raising the cost to $7.9 billion. The “upgrade” has resulted in around $4 billion surge in contractor cost, and about $200 million more for engineer’s supervision of construction: I believe cost is only one item affecting ratepayers, but safety of people downstream of the dam is paramount.

B2.2 Engineering Questions

/though retired as a registered BC professional engineer, I am legally obligated to raise engineering safety questions: (see pictures).

I believe, Not only is the new “upgraded “design weaker, but it requires much more material and cost to build, and reinforce from earthquakes. (Or nowadays from terrorists) I also believe it may be weaker geotechnically because it is not tied into the midstream etc land. The test of time showed eg In July 2016 and Feb 2017 etc the press reported slope and other failures that needed repairs.

I taught “Engineering Economics” at UBC for 14 years and 2 years for the Association of BC Professional Engineers, and taught students that Vancouver’s Second Narrows Bridge falling down showed BC professional engineers personally and firms (eg Dominion Bridge Co) s are #1 legally responsible for their work during and after construction, and #2 getting a second expert opinion for anything they are not sure of #3 for recommending the most Economical SAFEST alternative. It also answers your question re one potential mechanisms for recovery by ratepayers etc.

B 2.3.2 For the public record

Before considering mothballing and restarting Site C, I believe BCUC should caution the BC govt and BC Hydro it is imperative that both dam designs be reviewed by independent engineers outside of BC, to ensure the best value for public money - if the dam moves forward. The BC Energy Board formed by WAC Bennett set a precedent in 1960, by engaging engineers outside BC (Sir Wm Hacrow and Partners) in Connection with Peace ad Columbia dams, and to ensure SAFETY of communities living downstream of the dam.

If Site C is to be suspended for some time, there will be enough time to the outside of BC independent engineers report, and BCUC has the right to engage them under the terms of reference.
BC ratepayers will be billed at least with $2 billion already paid on Site C and there are several potential mechanisms to recover costs.

B 2.4.1 BCUC was set up under the "BC Utilities Commission "Act as designated "public watchdog" with fiduciary responsibility on behalf of captive ratepayers . BCUC could legally stop BC Hydro gouging ratepayers with $billions unnecessarily spent or "deferred" on site C by ordering a future credit or rate decrease (I recall BCUC ordered future credits and rate decreases before, to offset overcharges, when I testified on rate applications with BC Electric). But the BC government owns BC Hydro and might just get it back in taxes.

B2.4.2 Errors and omissions Insurance?

In the event that

1/an independent outside engineers report concludes That the 'upgraded' design (costing around 4 billion more) is just equally, or is less safe.

Or 2/ that BCUC finds per b (iv) there are other commercially feasible project or DSM initiatives at LOWER unit energy costs to ratepayers than Site C which were overlooked or unreasonably ignored by BC Hydro managers and directors, which in 2014 directed to proceed with Upgraded Site C. I am not a lawyer and but I believe BCUC or ratepayers can file a class suit. BCUC has the right to hire consultants or investigators under the terms of reference BCUC consultants or investigators might decide that’s the starting of Site C by BC Hydro CEO or Directors was due unforeseen errors and omissions and order BC hydro to file an insurance claim to cover cost

In their annual reports BC Hydro chairman in writing states he personally and directors are responsible; they are covered by third party or errors and omissions insurance, and ratepayers are billed for the premiums of that insurance. Insurance and Bonding also covers the CEO and officers and staff. And if the ship hits the dock, the captain is responsible because he hired the helmsman.

B 2.4.3 Pushing Site C Beyond the Point of No Return?

If BCUC finds there is no insurance coverage, one suspicious part of “trying to push Site C beyond the point of no return” by anyone, is that it was a feasible and fairly economical project BEFORE its cost was tripled by “upgrading”

I believe BCUC, acting on behalf of captive ratepayers to spend their money, Should insist on finding out i/ Who was responsible for directing to start site c ii. why did they choose site c over alternatives iii/what alternatives were considered iv/after the estimated cost jumped by billions, who authorized an “upgrade” in over $4 billion and v/. did anyone personally benefit financially or get gifts or became an officer or director of a contractor?
B 2.4.4 Bonding and insurance against theft, Potential Wrongdoing?

Another mechanism for recovery might be contractors or BC hydro’s Bonding and insurance against theft, Potential Wrongdoing?

I Believe WAC Bennett would not have hesitated to get Site C cost jump investigated, and would have called in the RCMP, even if one of his own MLA’s party’s ministers and political donors and embarrassing scandal, might be involved. BC history shows Liberal Gordon Gibson didn’t hesitate to blow the whistle about potential wrongdoing, and one of WAC Bennett’s own ministers (Somers) went to jail for accepting gift of a carpet, (which was worth far less than 4 billion dollars, but forest license contracts were worth a lot)

B 2.4.5 Potential Recovery of Cost Boondoggle?

It is possible the BC hydro Chair, directors and CEO were Misled by people wrongfully performing a boondoggle,

When costs jump sky high, watchful newspaper reporters rightly investigate potential wrongdoing and maybe kickbacks or bribes, eg “Georgia Straight” reporter Smith wrote “The beneficiaries of this white elephant have been independent contractors and businesses—including many BC. Liberal campaign contributors.....” Van Sun report Hoekstra wrote that political donors got twice as many contracts as non-donors? that does not seem to be lawful with mandatory sealed competitive bidding for contracts totaling over $2 billions

B 2.4.6 Site C mirrors regrettable “HIGH” Arrow (Keenleyside) dam, which benefited contractors when its cost jumped over double original, ii/flooded out 2300 people iii/BC Utilities Commission was muzzled to review whether it was necessary. iv/ and protesting local MP, Bert Herridge (NDP), was legally stopped by BC Hydro lawyers from testifying before a parliamentary committee

B 2.4.7 Recovery of Ratepayers costs might be impossible due to Statute of Limitations?

BC Hydro went ahead with Site C construction in 2014

B 2.4.8 Dam Boondoggles have happened before in BC.

Originally in 1957, Gen. MacNaughton asked BC Electric to design all Columbia dams, and specifically to avoid flooding the Arrow Lakes, We designed’ LOW “ Arrow dam which would not have flooded out 2300 people. But BC Hydro consulting engineers “upgraded” BC Electric’s original “LOW” dam to a “HIGH” Arrow dam, which overran
budget and cost more than double, benefiting Contractors, which built “HIGH” Arrow dam. Thereupon “BC Hydro’s Vice-Chairman Keenleyside renamed it “Keenleyside” dam,

But 17 years later in 1974, BC Assistant Deputy Minister McNabb, admitted at SFU (ref 36). “Under the Treaty, BC Hydro could have built a “LOW” Arrow dam, avoided flooding out 2300 people( or avoided building Arrow altogether).

C / The cost to ratepayers of terminating the project; and mechanism to recover costs

An independent outside report by Deloitte can confirm this cost including any current due and future payments to contractors and also deferred costs in BC hydro accounts and any future remediation costs due to Site C

MECHANISM to recover Costs for Ratepayers

BC HYDRO BECOMES HIDDEN SALES TAX COLLECTOR

For example, the cost estimate for Site C has now jumped 4.6 billion from $3.3 billion in 2005 to $7.9 billion in 2011.

Q1: is that bad for the BC Finance Minister Department?
A: NO, It’s good, WHY? We see that $4.6 billion cost increase actually costs the BC government 3.88% around, or $179 million a year more

But per Column 2 we see the captive BC Hydro customers will be charged 11.0% per year or $506 million a year more So the BC Hydro or the BC government pockets the difference of $327 million more as quietly disguised sales taxes on electric power.

Q2: Is it bad for BC Hydro top managers?
A: NO, it’s good, WHY?

The “income” of BC Hydro increases by $506 million, so their “Performance Bonus” Pay will also rise
Q3 is it bad for captive BC Hydro Customers

A: YES, They have to pay 506 million a year more, which for 1.5 million BC Hydro customers means around f $300 rate increase a year I, That’s equivalent to around 46 % over 2011, BC hydro won’t charge it until Site C goes in service in 2024, so your kids may have to pay it, plus interest

Q4: So what discourages GOLD PLATING at BC Hydro, absent proper formal regulation? Like NEB, FPC, PUC or what BCUC did (under public watchdog Dr. Angus) in line with the lower rates aims by WAC Bennett, Dr. Shrum and NDP leader Bob Strachan 40 years ago,

A: NOTHING DISCOURAGES BC HYDRO GOLDPLATING TODAY,

Sadly in 2011, the words of three BC government deputy ministers, reporting to the Premier Clark and Energy Minister Coleman. nail it:

“..the “gold-plated” corporate culture in BC Hydro” is NOT for lowest cost or greatest value for ratepayers money.’ It’s FOCUSSED on justifying... rate increases and associated costs”.

Hydro submitted to BCUC how they calculate WAAC (weighted annual capital charges) as shown below, to be applied for 2012. The following notes explain the details

COST OF MURPHY CREEK $/mwhr with DIFFERENT FINANCING
NOTES ON TABLES

Column 1 = true cost to BC Government treasury, Note actual rate for BC 4.7% bonds coupon matures 25 yrs. Price 112.73 yields 3.88 % on July 27/13

Column 2 Actual 21.53% rate of return to BC government who own equity per BCUC in 2011, per info request stated in 2012. Note BC Finance Dept. simply tell BC Hydro what return they want every year, and BC Hydro sets their rates to customers and revenue requirements accordingly.

Column 3 Ditto 18.38% in 2010

Column 4 -shows how BC Hydro nominally sets their revenue requirements and rates to their customers. These are the nominal figures of 12.75% BCUC regulators officially states, when BCUC and BC Hydro quotes cost in $/mwhr .But BCUC turns a blind eye that the actual return on equity was 21.53% in 2011vs 12.75%. Also actual rate of bonds interest is lower than BCUC allows 5.25% vs 4%. But BCUC doesn’t order a refund. NEB or BCUC under Dr Angus in 1960 would order an immediate refund.

. But BCUC is handcuffed and gagged public appearance of proper honest regulation.

Anyone familiar with formal regulation can see that public BCUC and BC Hydro financial statements show that BC quietly jacks BC Hydro rates to be roughly double their true costs, as a form of hidden taxation.

--TRUE FORMAL REGULATION

We all know that the essence of US and Canadian regulation is to set monopoly utility return at no more and no less whatever yield it takes to get new money for service extension..
Lest we forget both WAC Bennett, and NDP Leader Bob Strachan strongly advocated cheap tax-free power.

And BC Hydro managed to suspend all public rate hearings since 2010 claiming, “They take too long.”

The $/mwhr charged to BC Hydro customers are about double what it actually costs the BC Finance Minister’s Department to finance new projects.

BUT In 1960 premier WAC Bennett, Dr. Shrum and NDP’s opposition leader Bob Strachan all agreed that public (tax-free) BC Hydro should take over private (tax-paying) BC Electric, in order to save federal income tax and thereby LOWER BC Electric rates. It’s a free country every people get the govt they deserve and vote in.

WAC Bennett’s policy BC could have the lowest electric rates in the world attracting permanent job in manufacturing where electricity cost robotics, pulp paper, plywood, smelting mineral mining processing.

Clark policy have competitive 3rd lowest in Canada but spiral up.

$9 billion Site C would raise Plant from around $22 billion to $31 billion, which raises by around 40% the allowed return on rate base and continues the rate spiral ALL BC parties know that $9 billion sinks BC AAA credit and squeezes money desirable for health care, housing and transit.

D2.2 Demand-side management initiatives could provide similar benefits as Site C at reduced cost.

Demand side management initiatives are really a type of “conserving energy” initiatives The latter have been overlooked by BC hydro.

D2.2 Conservation Initiatives

3/Lake Williston behind “WAC Bennett dam (Site A) holds 20 years’ Peace river flow and can be the world’s largest battery. In the US the Bath pumped storage in Virginia is called the world largest battery in Wikipedia, But it is just around 1/100 on the size of Lake Williston, BC Hydro can achieve similar results by switching Vancouver supply between Peace River generation or BPA. By “displacement” even without pumped storage and gain free energy greater than Site C.
D2.2.1 DSM Conservation initiative (= Site C-5,000 gwhrs) STEP 1

BPA’s top engineer John Hyde published fish water releases cost BPA 1000 ave MW (approx the capacity of Site C) and $750 million per year in order to release mandated 3.45 million acre feet of water for fish and irrigation.

In Nov 14,2012 I was invited by the US State Dept, and on May 30 2013 by BPA to explain future options on the Columbia; I informed Liberal Ralph Sultan MLA who advised the BC govt and NDP John Hogan, then energy critic, I wrote a book. One related option BPA wanted to investigate was swapping more power (not water) back and forth with BC Hydro, using existing Peace River generation and Lake Williston storage. They wanted to i/ to increase fish water requested by first nation tribes, ii/ while saving BPA up to $750 million per year iii/ save 1000 mw capacity.

But BPA managers shelved the project because they believed (RIGHT OR WRONG) the then BC government would not approve it, because they wanted to be anti-American to get more BC votes.

John Hogan seems more open minded, and I hope may approve the initiative because i/ it could conserve and save and provide as much energy as Site C at low cost ii/ save BPA $750 million a year ii/ increase fish water for First Nation Tribes and alleviate fish vs power controversy iii/ may potentially contribute millions of US dollars towards improving, if needed, transmission and generation or pumped storage for BC’s Lake Williston iv/ create jobs.

Details

For maximum power sales revenue BPA wants all water to run through turbo generators, but fish need most water releases in spring. Then water flows produce too much power for market needs, which causes problems i/BPA then has to spill water over the top of
the dam, which wastes energy and loses potential revenue. II/plus there's only so much water that can lawfully be spilled over the top of the dam because too much spill hurts fish.

Growing US Northwest Power Glut Continues

The press and public are not all aware that there is a huge and growing US Northwest Power Glut in hydro, wind power or solar energy.

For example under Oregon Senate Bills, wind, solar, and other renewable power are legislated and must grow from 5% in 2011, to 25% by 2025 and 50% by 2040.

D what portfolio of 1. generating projects and 2. demand-side management initiatives could provide similar benefits; and

D 1.1 The following generation projects could provide similar benefits similar to Site C 5100 gwhrs but at a small fraction of Site C cost. They are all carbon-free, complying with the latest Paris Climate Change accord.

The Portfolios can be used singly or combined if load growth is higher than estimated by BC hydro and need little lead time for changes

This provides flexibility and allow any final decision about Site C to be postponed beyond 5 years election time.

D 1.1 CYCLIC Operation of Lake Williston (can replace 90% of Site C now at no cost)

If BC Hydro operated Lake Williston it the way, BC Electric originally planned it. Cyclic "operation of its huge storage" behind WAC Bennett dam (and GM Shrum power generation could add around 4500 gwhr - (around 90% of Site C capacity)), AT NO COST

This no extra cost energy could halt the rate spiral for ratepayers.

Table 3-8 in the SITE C terms of reference has a material mistake which needs correcting, or it will mislead BCUC, ratepayers and the public.

Earlier, politicians of both NDP and Liberal politicians got the correct information, but it appears in the rush to get a quick review, BC Hydro overlooked to correct table 3-8, which is mistakenly slanted to show we need Site C now.
It is 4500 gwhrs (90% of Site C) too low for energy capacity because it is based on minimum flow for Peace River generation whereas it should be average flow of Peace River.

Earlier when he was NDP energy critic, John Hogan and I discussed the benefits of Lake Williston having world record storage.

BC Electric specially designed Williston to operate "cyclically" so average flow 17000 gwhrs can always be generated.

And any deficit in a 12500 low year can be supplemented with water carried over from a 22,700 high flow year.

I got these numbers from BC Hydro Sept 28-30 2012 (please see attached for verification) thanks to a Liberal MLA Ralph Sultan, who years ago was a young engineer doing surveys while I was BC Electric Director of Planning.

Details

The mistake is due to wrongly assuming that the BC hydro system was designed, like all other hydro systems in North America, where system firm capacity was limited by the low flow year

BUT the BC hydro system is DELIBERATELY designed based on the AVERAGE flow year which is much greater. Please see exhibit from Doug Robinson (Secretary of the Canadian entity of the Columbia River Treaty.

That was requested by BC Electric CEO Dal Grauer and VP Tom Ingledow, who in 1956 asked me to write a paper to explained why BC Hydro (despite enough untapped hydro for many future years) was installing the Buzzard Thermal plant ( ref 41 Ruskin, Vernon, “Thermal plants for firming up hydro” recommended by the American Institute of Electrical Engineers, Committee on Power generation, for presentation at the AIEE Winter General meeting in New York, Jan 21, 1957).

BC Electric successfully minimized electricity rates, using around average 750 gwhr thermal, operated very little only in low years, firmd up and gained around 5,000 gwhrs firm hydro capacity at lowered cost to ratepayers.

Lake Williston, is an underused heritage from WAC Bennett, planned by BC Electric.

It took 20 years to fill and now stores 340,000 gwhrs energy.

It holds

5 times as much water as the Grand Coulee Dam, Washington State,

.11 times more water than Lake Shasta Dam, California,

3 times more water than Hoover Dam, Lake Mead on Colorado River (bordering Arizona and Nevada).
Lake Williston is like a world-record .... “giant rechargeable battery”

We planned to operate to achieve the same benefit of lowered rates for electricity to ratepayers, using the huge Lake Williston, by multi-year (“cyclic”) carryovers of water stored over 20 years, thereby averaging low and high flows FOREVER.

Thus we don’t need Buzzard Thermal plant any longer, and the BC hydro grid is now 100% clean carbon-free energy fully, complying with the Paris climate change accord.

I also checked there was diversity between Peace River and Columbia River.

The low flow at each of these watersheds is not synchronized, so there is plenty of time for cyclic scheduling.

Technically the flows on the Columbia are now set by Bonneville Power Administration. Lake Williston behind WAC Bennett Dam (Site A) holds 20 years of Peace River flows, so it smooths out any high and low flow years. The water from Lake Williston is used “cyclically” so the combined Columbia River and Peace River gwhr energy supply uses the same average 17,000 gwhrs Peace River flow level every year. That is 4,500 gwhrs greater than the low flow level of Peace and Columbia Rivers combined which BC Hydro now refers to as ‘firm dependable’.. The average flow level is automatically updated by a moving average. (there is NO EXTRA COST for this extra 4400 gwhr power, and its assured regardless of any US power glut or famine)

The average flow level is automatically updated by a moving average.

There is NO EXTRA COST for this extra 4500 gwhr energy, which now counts as firm dependable capacity. This no extra cost energy could halt the rate spiral for ratepayers.

Lake Williston behind“ WAC Bennett dam (Site A) holds 20 years’ Peace river flows so it evens out any high and low flow years. The water from Lake Williston is used“cyclically” so the energy supply every year remains at the same 17000 gwhrs average level every year, i.e. any deficit in a 12500 minimum low flow year can be supplemented with water carried over from a 22700 maximum high flow year. i got these flows from Doug Robinson BC hydro on Sept 28, 2012 and also discussed them with Chris Reilly please see attached exhibit X from i-phone
(in the SITE C terms of reference to BCUC was a table 3-8 by BC hydro that needs correcting, it shows 4500 gwhrs too low for dependable energy capacity because it is based on minimum flow for Peace generation)

Huge Lake Williston is a very valuable, but underused, heritage from WAC Bennett, planned by BC Electric. It stretches 150 miles like the distance from Vancouver to Seattle. It holds 5 times as much water as Grand Coulee dam IT, and 11 times as much as Lake Shasta, the biggest reservoir in California, Lake Williston acts like a world-record giant "battery" or "energy recycle bin;"

The following generation portfolios involve Powerex and could provide similar benefits, totaling around 7700 gwhrs which is 50% greater than the 5100 gwhrs from site C but at a fraction of Site C cost and do not require building any dams. The Portfolios can be used singly or combined if load growth is higher than estimated by BC hydro and need little lead time for changes. This provides flexibility and allows any final decision about Site C to be postponed beyond 5 years election time.

D 1.2 Powerex trading can replace All of Site C at 1/3 of the cost.

D 1.2.1 Growing US Northwest Power Glut
It is relevant for BCUC, for BC Hydro and the BC government to note that the physical and economic power supply situation is changing completely, due to a growing Northwest US power glut, and the load-balancing needs of wind and solar power and the inevitable northwest hydro springtime floods.

The growing US Northwest Power Glut of hydro, wind power or solar energy is due to US legislation funded by US taxpayers subsidizing carbon free electricity generation, directly or indirectly by very fast write-offs, eg under Oregon Senate Bills, wind, solar, and other renewable power are legislated to grow from 5% in 2011, to 25% by 2025 and 50% by 2040.
Bonneville Power Administration (BPA) in the US Pacific Northwest, has growing oversupply problems, since 6200 MW of US-generated wind power - six times the capacity of Site C - got curtailed and wasted because it is surplus to domestic US needs during Spring and nights. Moreover BPA spills lots of water over the dam in spring because of big floods and not enough load. Northwest US wind power is legislated to increase - to ten times the capacity of Site C - so wasted US power will further increase, BC should explore “win-win” negotiations for this huge surplus capacity (at $5 to 29/mwhr) as a much cheaper replacement for Site C (around $132/mwhr including "deferred" expenses).

The new BC Hydro Chair Keneth Peterson appointed by John Hogan has good Powerex trading experience. He doubtless knows import-export trade with US has therefore grown from around 20,000 gwhrs to around 50000 gwhrs and why this presents a long term opportunity for BC to get cheap surplus power, that would otherwise be wasted/

Engineer Ben Kujala, with the Northwest Power and Conservation Council tells it like it is. “, BPA started the wind-power curtailments in mid-March, earlier in the season than ever before. When rivers are running too high from snow melt and precipitation there is only so much water that legislation allows to be spilled over the top of dams, bypassing turbine generators. Too much spill can harm threatened and endangered fish. Add to that springtime winds and there could be too much power on the grid. That could cause a blackout, & with more solar on the grid, California’s not buying as much of the Northwest’s surplus. That leaves the extra US power with little place to go, Wind operators are made to stop producing power. Wind power producers lose money with each day they’re not generating power”

“To explain how it physically works assume US wind farm X has surplus 200 mw it cannot sell from 1 am to 6 am at night, on 100 days, because BPA’s load isn’t big enough when customers are asleep. But X will gladly sell that 1000 gwhrs for say $29 million to Powerex. X will also get say $10 million 000000 US govt subsidy or fast write off for wind power gwhrs generated. So far X ends up with $39 million, it would otherwise lose. BC Hydro will reduce Peace River generation by 1000 gwhrs, thus saving X gallons of Lake Williston water. Then BC Hydro uses that X gallons during peak load hours to generate 1000 gwhrs and transmit it to US and/or BC users

Hen assume wind farms X nearby retail customers during days cook run hot water turn on lights appliances and use 1000gwhrs at retail 100 per mwhr ad pay 100 million to water heaters, so X buys back the 1000 gwhrs from Powerex at 40 million and pays BPA 1 million transmission charges

bottom line ends up with #100+29-40-1 = 98 million, Powerex with 40-29= 11 million BPA with 1 million of course that leaves out setils like overhead and line losses but it gives you a ballpark idea

With out trading and Lake Williston X would have made zero
Without that trade nobody makes anything and 1000 gwhrs of energy I lost forever, valued at a29 to 40 of course that leaves out overhead and transmission loss but if ballparks the advantages of trading by Powerex lo million.

Thus Lake Williston is an invaluable underrated legacy by WAC Bennett. planned by BC Electric. It stores 340,000 gwhrs energy. It holds 5 times as much water as Grand Coulee dam,, like a world-record giant “battery” or “energy recycle bin”. It can recycle any surplus hydro, wind power, IPP or solar energy. It can prevent much waste of water spilling over BC or US dams.

Lake Williston allows US to save and recycle energy worth far above $500 million per year that would otherwise be wasted. Since US plans lots. more wind power that figure will grow towards $1 billion. No US President would order to stop that.

There is a huge legislated and growing power glut in the Northwest Us. Powerex imports and exports were in both the order of 20,000 gwhrs. IE that is 4 times as much as Site C would ever generate, namely 5,100 gwhrs. The ‘trade totals is around 40% of BC domestic load and lately went up to almost 50,000 ie 10 times as much as Site C capacity.

Its time some obsolete BC economists and statistician started to think about the economics of buying energy on the open market like 39 million Californians vs investing and financing new IPPs, wind farms and hydro, especially prohibitively costly Site C.

BC Hydro could profitably supply its present domestic electricity sales growth up to 25 years if they export 25% less power from BC dam (or import more)

BC Hydro/Powerex virtually uses only around 6% of Lake Williston storage, buys at around $23 per mwhr and sells it at around $42 per mwhr. This is a fraction of the site expected cost of $132 per mwhr including deferred charges. Imports are also far cheaper than the average $86 per mwhr cost of BC IPPs.

Bottom line. There is good reasons why BC Hydro could export 25% less (equal to Site C capacity 5,100 gwhrs) which appears is enough to supply 25 years of BC’s growth.

New BC Hydro Chairman Peterson is expert in power trading and could get cheap power for till for many years from Powerex trading.

Powerex free trade: BC energy and lumber; California oranges

Nobody in BC need be afraid future back and forth trading by Powerex will ever stop.
Thus growing amounts of surplus US energy (which would otherwise be wasted) could become available to BC at very low cost

Though the US NW has a power glut, BC Hydro pretend they need Site C to make BC 'self-sufficient'

I believe its unreasonable to continue the present Policies.

I believe only rich well paid political minded people would try to push Site C beyond the point of no return, trying to justify building uneconomic Site C.

NO president or premier would ever stop Powerex trading and restrict free trade in energy (where NW US has a glut) but free trade in lumber (where BC has a glut) and oranges (where California has glut).

I believe 50 years history shows its unreasonable to continue the past Policies.

i/that BC must get all new power from more expensive Independent Producers (IPP), or

ii/and restrict free trade in energy (where NW US has a glut) but free trade in lumber (where BC has a glut) and oranges (where California has glut).

D.1.3. Columbia River Treaty (CRT) (can supply 90% of Site C at no additional cost)

In 1960-63 my company developed and ran Canada's FIRST Computer model of the Columbia river for Gen. McNaughton in Ottawa and BC hydro to check BC's Downstream benefit calculated by the US Army Corps of Engineers

BC Hydro/Powerex is "entitled" to 4100 gwhrs generated in the US under the Columbia River Treaty (CRT).

So that is enough for 13 more years with BC's present electricity growth.

Instead Powerex could sell it at around 1/3 the cost of Site C which is not cost effective.

President Eisenhower signed the CRT to build BC flood control dams to prevent recurrence of floods, killing 15 Americans and wiping out the second largest town in Oregon. BC downstream benefit entitlement is calculated according to fixed rules five years ahead and does not vary with actual flows.
The CRT treaty can only be canceled with ten years’ notice. By law any US president (eg Trump) needs 2/3 votes in the Senate to change it. Thus BC’s growing electricity needs are safe for 13 years. No President will issue an executive order to stop energy BC is lawfully entitled to and endanger Americans and flood protection of their homes. Because US Army Corps of Engineers are tasked with flood protection they will intend to re-negotiate only about lower costs and water releases for fish ... never for canceling the treaty.

D 1.4 Adding generators to existing dams produces around 1000 gwhrs otherwise spilled and wasted which is 20% of Site C at reduced costs.

Note Revelstoke #6 with 488 mw and only 26 gwhr is $1500 /mwhr = not cost effective

D 1.4.1 Every spring a tremendous amount of water spills over existing dams at Keenleyside and Duncan, which needlessly wastes around 1,000 gwhrs of energy, (nearly 20% of Site C energy), because they have insufficient or no generator installed. I researched conserving energy from needless spill in 2012 and Vancouver Sun published my paper.

D 1.4.2 Keenleyside dam originally had no generators and BC hydro later installed only 185 mw, but installing additional 165Mw can produce an additional 700 gwhrs and CONSERVE energy that would otherwise spill and be wasted., at a fraction of site C unit cost, without building any new dam. This is shown on page 109 of my referenced book

2.2.3 Duncan dam has sat without generators for over 50 years. Installing around 100 mw generators can add around 276 gwhrs and CONSERVE energy that would otherwise spill and be wasted. BC Hydro has a report showing it needs a short transmission line, and it causes no environmental problems to add generators. The report needs updating since it is based on old 5.5% interest and 28% contingency, my preliminary estimate subject to detailed study is far below Site C unit cost of $132/, mwhr

D 2.2.2 DSM Conservation initiative
Step 1? 95% Capacity of site c)

IN 2010 BPA Top engineer John Hyde published that fish and irrigation water releases cost BPA 1000 MW, (equivalent to 95% of the capacity of Site C) and $750 million per year, in order to release mandated 3.45 million acre feet of water for fish and irrigation.

For maximum power sales revenue, BPA wants all water to run through turbo generators, but fish need most water releases in January and in spring. Then water flows produce too much power for market needs, which causes problems. i/ BPA then has to spill water over the top of the dam, which loses potential revenue. ii/ there's only so much water that can lawfully be spilled over the top of the dam because too much spill hurts fish.

BPA is an agency of the US State Dept. In Nov 14, 2012, I was invited by the US State Dept and MAY 30, 2013, BPA to explain future options on the Columbia. (The CRT is an option about which I wrote a book is not an issue now) but One option BPA wanted to investigate was swapping more power (not water) back and forth with BC Hydro, using existing Peace River generation and Lake Williston storage. They wanted to i/ to increase fish water requested by first Nation tribes, ii/ while saving BPA up to $750 million per year. But BPA shelved the project because they believed (right or wrong) the then BC government would not approve it because they might get more votes with an anti-American stance.

John Horgan seems more open-minded, and I hope may approve it because i/ it could increase fish water for First Nation Tribes and ii/ may contribute millions of US dollars towards improving transmission and generation, and possibly even pumped storage) at the existing GM Shrum power plant on the Peace River, and create jobs.

D2.2.2 DSM Conservation initiative Step 2- $40000 gwhrs? (8 TIMES Capacity of site c

STEP 2 “Upstream Benefits”
Thanks to WAC Bennett legacy of Lake Williston, the BC govt can be the world
leader in Energy Conservation, BC could reverse the rate spiral, by getting free
energy from water that would otherwise be spilled and wasted (The WA and OR
state govt can potentially also achieve savings in energy cost).
I regard that as “BC UPSTREAM BENEFITS”. (similar to Gen McNaughton’s BC
Downstream benefits”)

Columbia flow and spill; records at various dams (available on internet) I find that
despite all the energy saved by Powerex recycling US hydro spill, there is around ⅓ of
US Columbia River flow gets spilled during 4 months. That is roughly 9000 MW at
around 50% load factor, for 4 months per year or 40,000 gwhrs, or 8 times the
capacity is now spilled over US dams.
That’s just 12% of Lake Williston.

Pro rata I expect the water spilled and wasted over BC hydro dams is around 10,000
gwhrs per year or twice the capacity of Site C.

Bottom line, by cooperatively scheduling Lake Williston with BPA in future I
estimate BC Hydro can get many times the capacity of Site C at very low or no cost.

I hope the new BC Government will inform BPA they are willing to consider
cooperative scheduling of Lake Williston with BPA.
If feasible, BC could horse trade the “Upstream Benefits” it can be done anytime
since the Columbia River treaty doesn’t cover the Peace river.

I believe Lake Williston may turn out be the most valuable legacy of WAC Bennett
and his descendants might collect his posthumous Nobel prize for hydro energy
conservation preventing climate change per Paris accord.

---------------------------------------------
According to Wikipedia the US, there are 60 dams in the watershed, with 14 on the Columbia, 20 on the Snake, seven on the Kootenay, seven on the Pend Oreille / Clark, two on the Flathead, eight on the Yakima, and two on the Owyhee. Averaging a major dam every 72 miles (116 km), the rivers in the Columbia watershed combine to generate over 36,000 megawatts of power, with the majority coming on the main stem. Grand Coulee Dam is the largest producer of hydroelectric power in the United States,\[1\] generating 6,809 megawatts, over one-sixth of all power in the basin.

**D 3.1. Alternative Power Sources Portfolio**

14/Sixty years ago BC Electric engineers diligently surveyed and designed four HIGH DAMS on the Columbia plus five on the Peace river (A B C D E), when buying flooded land was cheap and NOBODY cared about environment

15/Subsequently Rachel Carson wrote:" Silent Spring:" which inspired environmentalism and caused creation of the EPA

16/ Today, flooding land is no longer cheap and carefree. BC Hydro management simply picking the same HIGH DAM sites as BC Electric fails reasonable due diligence, when they employ around 700 MODERN BRIGHT YOUNG engineers who could diligently re-survey and re engineer the same amount of Site C power cheaper with multiple LOW DAM " run of river" plants that flood no land beyond high water

**D 3.2 CONVENTIONAL HYDRO PLANTS PORTFOLIO** (15 plants can replace Site C at lower cost)

17/In 2008 BC Hydro tabled 15 plants with BCUC that could produce cheaper power at $58 to $73/mwhr compared to $132/mwhr for Site C including deferred charges

-6.1 Peace and Columbia
<table>
<thead>
<tr>
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<th>High</th>
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<td>Direct Constr</td>
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<td>$/Kw</td>
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<tr>
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<td>Est (2011 npv)</td>
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<tr>
<td>$/mwhr **</td>
<td>87 npv</td>
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<tr>
<td>W BCH Finan</td>
<td>132</td>
<td>61</td>
<td>68</td>
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<tr>
<td>W US Finance</td>
<td>na</td>
<td>na</td>
<td>46</td>
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As to the $87 net present value price that was stated by BCH in 2011, that was based on 9 years to completion and .5 to 6% discount. But when Site C goes into service around 2020 the undiscounted cost per mwhr will be around $132/mwhr for Site C.

Costs are given both how BC Hydro Financing, the way BCUC calculates it to set rates, also the cost if it were financed by the US per WAC Bennett recipe. The reason for the 33% lower cost /mwhr with US financing will be explained later.

-6.2 Elaho, Homathko, McGregor Rivers-

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Costs are given both how BC Hydro Financing, the way BCUC calculates it to set rates, also the cost if it were financed by the US per WAC Bennett recipe. The reason for the 33% lower cost /mwhr with US financing will be explained later.
3.2. Elaho, Homathko, McGregor Rivers=

<table>
<thead>
<tr>
<th></th>
<th>Elaho</th>
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<th>McGregor</th>
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<tr>
<td></td>
<td>Mosley</td>
<td>Wadd</td>
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<td>MW</td>
<td>200</td>
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<tr>
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Direct Const Cost

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<th>$/KW</th>
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Inflated Cost Millions

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W US Finance | 67 | 67 | 44 | 55 | 38 |
### 3.3, Liard, Iskut Rivers

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<th>Plant</th>
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**Direct Const**

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<td>5429</td>
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**BCH Inflated Millions**

<table>
<thead>
<tr>
<th></th>
<th>Est 2008</th>
<th>Prorated $/Mwhr</th>
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<td></td>
<td>6986</td>
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<tr>
<td></td>
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<td></td>
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<td></td>
<td>923</td>
<td>75</td>
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<td></td>
<td>2596</td>
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BC hydro has shelved BC Electrics designs for 4 "run of river" plants on the Columbia, and could find more.
Demand-side management initiatives could provide similar benefits; and

Conservation is the objective of DSM. Judging by very slow growth of Domestic sales DSM works and there is a portfolio of i/prohibiting incandescent bulbs and ii/the new rate proposal of discounts for overnight water and house heat using smart meters but iii/the spiralling rates must also work. Nobody can tell how much each contributes.

Conservation of energy by reducing spill over the dam

But the biggest energy conservation could come from reducing unnecessary spill over the dam as shown by springtime pictures see pictures on BC Hydro report just by adding generators or replace them in the bigger ones to existing dams Duncan Revelstoke Keenleyside and GM Shrum

1 Duncan dam has sat 50 years without generators and Keenleyside lacksenouh generators and together could total 976 gwhr at fraction of Site C cost.

Previous Minister Bill Bennett criticized me on CBC for saying that, but CBC would not
grant me any time to point out the report he sent me showed Duncan had no environment problem and cost a lot less than Site C Keenleyside spills a whole lot of water needlessly which is like dollar bills spilling over dam I estimated just those two alone could add 976 gwhrs 20% of Site C, lots water spills at GM Shrum I got BPA spill and flows on internet records. Does BC Hydro publish theiers?

D 3.1, ( ) .2.0 portfolios Without building Site C or any dam or more IPPs

2. unvikvinfg poerox

No one can accurately forecast loads a long ie ahead because to fch WITHOUT BUIIING SITE C or any dam Alternative power sources
2 BC has enough existing power for minimum 13 years If additional projects are needed see my book p 109

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E   w We welcome submissions of (1)data and/or (2) analysis until August 30, 2017

E what are expected peak capacity demand and energy demand

"I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging the future but by the past."

by: Patrick Henry

I have carefully analyzed the data see below and based on my personal experience for 5 years in successfully planning and running the BC electric heritage system

I conclude BC hydro has more than enough energy for guarantee 5 years plus 5yrs lead time till 2027 to review actual growth every year, well past the next elections. BC doesn’t need uneconomic and possibly unsafe site c now.

I suspect the judgment and experience of anyone that tries to push site c forward beyond the point of no return.

BC Hydro already has enough electricity for next 13 years and longer without Site C
2/BC Hydro annual reports show domestic power sales grew around

2000 gwhrs over ten years,

In 2015 Hydro/Powerex imported around 1400 gwhrs but was “entitled” to

4100 gwhrs generated in the US under the Columbia River Treaty (CRT).

So, BC is entitled to another 2700 Gwhr - enough for 13 more years with BC’s present
electricity growth

..

in the SITE C terms of reference issued by BCUC, directed by Energy Minister Michelle

Mungall was a table 3-8 by BC hydro that needs correcting

it is slanted to show we need site C now

it is 4500 gwhrs (90% of Ste C) too low for energy capacity

because it is based on minimum flow for Peace R generation

but should include average flow for Peace)

John and I discussed that Lake Williston took 20 years to fill and has around 340,000
world record storage

BC Electric specially designed Williston to operate “cyclically”

so average flow 17000 gwhrs can always be generated

and any deficit in a 12500 low year can be supplemented with water carried over from

a 20500 high flow year

I got these numbers from Doug Robinson BC Hydro around Sept 28-30 2012 and also
discussed it with Chris O’Reilly, see attached

Lake Williston is an underused heritage from WAC Bennett, planned by BC Electric It

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Technically the flows on the Columbia are now set by BPA. Lake Williston behind“ WAC

Bennett dam (Site A) holds 20 years’ Peace river flows, so it evens out any high and low
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and Peace gwhr energy supply remains at the same average 17000 flow level every year

That is 4500 gwhrs greater than the low flow level of Peace and Columbia combined

which BC hydro now counts as firm dependable. The average flow level is automatically

updated by a moving average. (there is NO EXTRA COST for this extra 4500 gwhr

power, now counts as dependable. The average flow level is automatically updated by

a moving average. (there is NO EXTRA COST for this extra 4500 gwhr power, and its

assured regardless of any US power
The sales dept can provide a list of signed future contracts and letters of intent with deposit from large customers. In BCUC files you can verify in 2012 I submitted a detailed brief to BCUC that BC Hydro boasting of cleverly (?) rolling dice at Monte Carlo, .with millions of dollars of ratepayers money, to justify future electric transmission lines to provide power from Site C for “clean” Monterey gas compression (at projected inflating prices) was unreasonably risky for ratepayers.

I was hired by BC Electric in 1955 after Vancouver suffered a blackout , to plan, engineer, budget and check progress and costs of generation and transmission.

I learned the successful planning method CEO Dal Grauer wanted for the heritage system. It enabled him and directors to select the 10 “heritage” plants that over 50 years to this day at $7 per mwhr (0.7 cents per kwhr) provide the lowest cost power worldwide.

First he wanted a yearly updated report to CEO and directors by me summarizing independent, nonpolitical, non-lobbied planning by engineers trained in detailed design and engineering economics and getting independent reports from surveys and geologists and cost estimates.

That report had a yearly updated 5 year plan. Budget with plants underway, % completion, projected overruns.

A table of Five year capacity and expected load.

A yearly updated 25 year list of all feasible alternatives we surveyed, designed and engineer, ranked in order of lowest delivered cost to Vancouver customers.

A list of lead times and start dates needed for each project.
It was up to Grauer, not up to planners, to listen to the current government and 
lobbyists and customers and directors and decide what project to select, and ask
permission for the project from BCUC, which was the watchdog with teeth on
behalf of captive ratepayers.

But with all due respect, I submit the so-called “integrated planning” like
misleading Table 3-2), with input by vote-hungry politicians and subservient
government and BC Hydro staffers wanting promotion, and by ratepayer groups and
lobbyists trying to turn BCUC lawyers into mediators, has led to the Site C problem
and cannot end the rate spiral hurting consumers.

Truth will out: it’s planning by popular vote-counting, and “interim” yet
irreversible, rate setting, “directed” by the minister, by the muzzled and powerless
BCUC “regulators” with deferred “rate rider” accounting to whatever price the traffic
will bear or hidden sales tax, like the liquor control board

you no longer plan and engineer, you merely prit mountains of paper to justify
decisions your political masters, who prefer to fly blind behind closed doors

DICTATED: The major hydro heritage system was sufficient for around 50 years. Today it
still supplies most of BC Hydro’s power at around $7/WHR (0.7 cents/kwhr
which is less than any where in Canada

Premier Campbell dictated all future power should come from IPP. The latest cost of
power according to the annual BC Hydro report hows s price is $106/mwhr (10.6
cents per kwhr) for residential; $91/mwhr (9.1 cents/kwhr) or commercial an $56
PER MWHR (5.6 cents/kwhr) for large industrial s report

The The average price for site C power when completed quote in newspapers from
Mr Coleman was around 132 per mwhr equivalent 13.2 cents per kwhr.

You asked: what are expected peak capacity demand and energy demand

Whether you believe that BC’s energy demand is almost flat due to BC Hydro big
dsm budgets or just old fashioned price elasticity, I analyzed the last ten years and
quote:

"I have but one lamp by which my feet are guided,
and that is the lamp of experience.

I know of no way of judging the future but by the past."

I can claim some prior experience
CEO Dal Grauer Of BC Electric (the predecessor of BC Hydro) hired me as director of
planning in 1955 after Vancouver had a total blackout and you can verify in the five
years during which I planned and he trusted me to run the heritage system, there were
no blackouts or shortages
To answer your question d/i analyzed many feasible supply portfolios. To give you a perspective like I yearly did for Mr Grauer and directors in a yearly updated power policy report I found that i/ BCUC could safely conclude that BC hydro already has sufficient plants and storage (over twice the capacity of site C) to supply growing domestic electricity needs for a minimum of 13 years, and actually much longer, as explained under d/i, without building site C, or any high dam, or flooding any land, or any new IPPs.

e1 /will first give you a comparison like Table T3-8 and T3-9, using the mid load forecast of BC Hydro though I consider it overoptimistic, unless less you halt the rate spiral e2/i Will also give you analysis of what I consider needs correction e3\ i will give you my revised forecast and recommend a way of using and revising it. I will be glad to explain the way to anyone interested.

e1 With BC Hydro mid load forecast

<table>
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<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2010</th>
<th>2015</th>
<th>2016</th>
<th>Corrected</th>
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<td>50223</td>
<td>51199</td>
<td>51023</td>
<td>63675</td>
<td>69267</td>
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<tr>
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<td>-4672</td>
<td>-6356</td>
<td>-7%</td>
<td>-10%</td>
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<tr>
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<td>59003</td>
<td>62911</td>
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<td></td>
<td></td>
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</tr>
<tr>
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<tr>
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<tr>
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<td>4000</td>
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<td>68899</td>
<td></td>
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<tr>
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<td>10899</td>
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| Year | 2005 | 2006 | 2010 | 2015 | 2016 | ...
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<td>10899</td>
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</tr>
</tbody>
</table>

=======================================================================

INSTALLED heritage | IPP | CRT contract | ...
| 10480 | 1472 | 1000 | ...
| 10480 | 1037 | 1000 | ...

Total available | 12952 | 12517 |...

FROM TABLE 3-9
Table 3-9 also has a serious and costly errors that need correction
whoever prepared it did not understand the heritage system. the spinning reserve of
10% has proved adequate for 50 years.

the biggest outage dangers are the long transmission lines subject to earthquakes
mudslides , vast storms, lightning, terrorism, relay and breaker failure, which is how
Vancouver had its total blackout. Increasing spinning reserves on Peace and Columbia
d from 10 to 14% wastes money and doesn't help long-line outages.

We built two tie lines to BPA and joined the NW power pool which has enough spin
reserve. We also installed Port Mann gas turbine and Burrard in case lines all fail due to
big earthquake, war or terrorism with lines to power hospitals, police stations and
street lights

On Table 3-9 the statistician also forgets UNDER THE Columbia river treaty BC is
guaranteed a firm 1000 mw any time

Revelstoke# 6 is a scandalous waste of money with 448 mw and only
26gwhr it costs $1500/mwhrs and has only 0.6 % load factor
earlier I wrote BCUC which should be in your files about
The generators added at Mica and Revelstoke (according to BC Hydro
application to BCUC ) add 1000 MW peak but only 150 gwhrs energy (175 average
MW), at a cost of $800 million and around $500/mwhr. Windmills cost around
120/mwhr so if BC Hydro gets $60/mwhr revenue, so the BC Hydro CEO and CFO
“defers “the $60 loss, (not counting the $500/mwhr heavy Mica peaking backup
cost)
I hope under the new minister BC Hydro might care about wasting
ratepayers money. I suggest its more cost-effective to get 276 gwhr by installing
lacking generators at Duncan , and 700 gwhrs at Keenleyside or others that spill
water and waste money every spring
DSM - price elasticity?


Price cents/kwhr
6.4 6.4 7.4 10.0 10.6

Increase 16% 56% 66%

Without building Site C or any plant BC Hydro BC Hydro already has enough electricity for next 10 years to 2027 and longer without Site C.

I analyzed

2/BC Hydro annual reports show domestic power sales grew around 2000 gwhrs over ten years (2005/6-2015/16s eyeballed on graph paper and judgment and averaged).

ENERGY

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<td>51199</td>
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PT 1000

Heritage 47500 47500
IP 13874 12399
Crt potential 4000 4000
Potential Powerex imports 0 0

Total Avail 70699 68899

Total Powerex export (incl CRT) 12699 10899

RESERVE

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<th>PEAK</th>
<th>INSTALLED heritage</th>
<th>IPP</th>
<th>CRT contract</th>
<th>Total</th>
<th>Reserve</th>
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</thead>
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<td>9847</td>
<td>9441</td>
<td>9612</td>
<td>9800</td>
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<td>INSTALLED heritage</td>
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<tr>
<td>IPP</td>
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<td>CRT contract</td>
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<td>Reserve</td>
<td>2952</td>
<td>2517</td>
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</tr>
</tbody>
</table>
Analysis = my experience as director of planning of BC electric was plotting several years gave a general trend, but breaking it into residential Commercial Large industrial With supposed loads way ahead statistically worked badly like predicting stock markets. 

Salesmen must be optimistic to be successful so they MUST be over estimate BC has unpredictable people influx, economy, governments, politics, and weather.

CEO Dal Grauer agreed and wanted no subservient staff following top down marching orders, but insisted on an open door, open mind, non political, non lobbied "think tank" planning and said "if you agree with me every one of us is superfluous".

e/ BC Hydro’s “Integrated Planning “is Politically Correct’ Myopia

9/Site C is not needed because there are several” greener” ways to supply BC’s domestic electricity growth for up to 25 years without building site C or any high dam or flooding any land “/ Any government decision to build a $9 billion plant, or purchase $18 billion IPP contracts which last 25 years is irreversible. In 25 years governments switch 5 to 6 times, but BC MLA’s must fly blind because “subservient BC Hydro managers and deputy ministers only produce ONE, “politically correct “integrated plan”, myopically flip-flopping between IPPs, Wind power, Site C, and more gas fired plants, after shutting down Buzzard gas fired plant.

Unfortunately, BC Politicians must fly blind

B C Hydro planners don’t plan—they just justify political vote-getting decisions They fail to produce a yearly updated (unvarnished) 25 YEAR perspective, showing future costs and rates with a long list of available alternatives (like BC Electric produced every year for CEO Dal Grauer and Directors)

It enabled them to choose cost effective projects. Grauer asked me to direct 45 staff at BC Electrics to plan and design four of twelve feasible dams on Columbia, and two of BC’s electricity at bargain $7 per mwhr, (at a fraction of Site C cost) otherwise BC might have the highest rates in Canada

Conclusion
If mlas want reliable planning like Grauer had there’s too much bias in bc hydro or Victoria.