

Name: Wayne Peppard

Organization: Allied Hydro Council

Date: October 10, 2017

Subject: AHC Site C Technical Presentation

British Columbia Utilities Commission

Suite 410, 900 Howe Street

Vancouver, BC V6Z 2N3

October 10, 2017

Dear Mr. Morton

Re: Site C Technical Presentation

Having sent the Allied Hydro Council's "Site C – Review" Submission on August 21, we were invited to attend a Technical Presentation Session on October 13, to make an oral presentation to the Panel focusing on issues raised in the Panel's Preliminary Report. We look forward to this opportunity.

Our attached Submission, Table 5, contains Unit Energy Cost Comparisons for a number alternative energy sources with Site C. In reviewing the Preliminary Report, and other submissions, the lack of useful information on this critical issue is apparent.

For this reason, AHC has spent some time recently working to better address this issue. In the two attachments to this letter we have two sets of analyses. The first, "Alternative Energy Sources To Site C" builds on Table 5 in our Submission, where material from BC Hydro's Submission is also shown as well as that extracted from the Deloitte LLP Submission, and that from the Clean Energy Association of BC.

The second attachment, "Replacing Site C With Wind Or Hydro Power", is an analysis based on the average size of independent power producer (IPP) wind and hydropower projects currently with BC Hydro electricity purchase agreements (EPA's) and also based on the capital and operating costs (O&M) drawn from the Deloitte LLP Submission. What this shows for the amount of Site C capacity and energy, the capital cost and unit energy (UEC) of Site C, wind and hydro power projects.

AHC believes the information contained in these attachments can help the Panel in carrying out its Site C assessment. We will be pleased to answer any questions on it in the October 13 Session.

Wayne Peppard

Council Representative

Allied Hydro Council of BC

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ALTERNATIVE ENERGY SOURCES TO SITE C

AHC SUBMISSION

<u>SOURCE</u>	<u>COST \$/MWH</u>	<u>AVAILABILITY %</u>
• SITE C \$8.8 BILLION @ 8%	153.00	53
• SITE C \$8.8 BILLION @ 6%	121.00	53
• Site C \$5.8 BILLION @ 8%*	105.00	53
• Site C \$5.8 BILLION @ 6%	84.00	53
• DSBs	105.00	37
• WIND	100.00	31
• GAS TURBINE (CCGT)	75.00	90
• HYDROPOWER	110.00	42
• BIOENERGY WOOD WASTE	90.00	90
• BIOENERGY MUNICIPAL		
• SOLID WASTE (MSW)	> 100.00	?
• SOLAR POWER	> 100.00	?

*** NOTE: BCH OCTOBER 5 INFORMED BCUC THAT DUE TO PROBLEMS THE FID IN-SERVICE BUDGET HAD RISEN TO \$8.945 BILLION. THAT INCREASE WOULD RAISE THIS UEC TO \$105.63/MWH**

BC HYDRO SUBMISSION

<u>SOURCE</u>	<u>COST \$/MWH</u>	<u>AVAILABILITY %</u>
SITE C	58.00	53
SITE C LESS SUNK COST	43.00	53
WIND AT		
INTERCONNECTION	83.00	?
WIND DELIVERED	105.00	?
COMBINED CLEAN		
ALTERNATIVE		
PORTFOLIO	153.00	?

DELOITTE LLP SUBMISSION

<u>SOURCE</u>	<u>COST \$/MWH</u>	<u>AVAILABILITY %</u>
Onshore wind	105.00	30
Offshore wind	> 135.00	35
Solar	164.00	20
Geothermal	100.00	92
CCGT	71.00	92
Run-of river hydro	132.00	36
Wood biomass	97.00	85
MSW biomass	76.00	76

CLEAN ENERGY ASSOCIATION OF BC SUBMISSION

<u>SOURCE</u>	<u>COST \$/MWH</u>	<u>Availability %</u>
Site C \$8.8 billion @8%	153.00	?
Wind	\$68.00	?
Solar	129.00	?
Clean + Thermal Portfolio		
Advantage over Site C \$34.00		
Unit Energy Cost of Portfolio	119.00	?

Allied Hydro Council Of British Columbia

Sivertson & Associates Consulting Ltd.

October 13, 2017

REPLACING SITE C WITH WIND OR HYDRO POWER

SITE C:

1,100 MEGAWATTS (MW)

5,100 GIGAWATT HOURS (GWH)

AVAILABILITY 53%

BCH CURRENT IPP ELECTRICITY PURCHASE AGREEMENTS (EPAs):

WIND

7 EPAS, 702 MW, 2,060 GWH

AVAILABILITY 33%

AVERAGE ENERGY $2,060/7 = 294$ GWH

AVERAGE CAPACITY $702/7 = 100$ MW

HYDRO POWER

80 EPAS, 3,270 MW, 12,000 GWH

AVAILABILITY 42%

AVERAGE ENERGY $12,000/80 = 150$ GWH

AVERAGE CAPACITY $3,270/80 = 41$ MW

REPLACING SITE C WITH AVERAGE SIZE IPP PLANTS:

WIND

$5,100/294 = 17$ PLANTS

HYDRO POWER

$5,100/150 = 34$ PLANTS

CAPITAL COST OF REPLACEMENTS (DELOIITE SUBMISSION #s)**WIND**

\$1.6 MILLION/MW TO \$3.2 MILLION/MW, USE \$2.4 MILLION/MW

HYDRO POWER

\$2.7 MILLION/MW TO \$8.0 MILLION/MW, USE \$5.4 MILLION/MW

CAPITAL COST FOR REPLACING SITE C:**WIND**

17 PLANTS X 100 MW X \$2.4 MILLION/MW = \$4.1 BILLION

HYDRO POWER

34 PLANTS X 41 MW X \$5.4 MILLION/MW = \$7.5 BILLION

SITE C CAPITAL COST:

AS AT OCTOBER 5, 2017 \$8.95 BILLION FROM FID DATE

DEDUCTING SUNK COSTS \$3.2 BILLION $\$8.95 - \$3.2 = \$5.8$ BILLION

CAPITAL COST COMPARISONS FOR SITE C POWER:

WIND REPLACEMENT \$4.1 BILLION

HYDRO POWER REPLACEMENT \$7.5 BILLION

SITE C \$5.8 BILLION

UNIT ENERGY COST COMPARISONS FOR SITE C POWER: ***WIND**

CAPITAL COST @ 8%, 30 YEAR LIFE	\$73.80/MWH
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O&M	\$30.60/MWH
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TOTAL UEC	<u>\$104.40/MWH</u>
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HYDRO POWER

CAPITAL COST @ 8%, 50 YEAR LIFE	\$120.65/MWH
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O&M	\$10.95/MWH
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TOTAL UEC	<u>\$131.60/MWH</u>
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SITE C

CAPITAL COST @ 8%, 50 YEAR LIFE	\$93.96/MWH
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O&M	\$11.67/MWH
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TOTAL UEC	<u>\$105.63/MWH</u>
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*** WITHOUT CONSIDERATION OF TRANSMISSION COSTS, INTEGRATION COSTS, REGULATORY DELAYS, ETC FOR WIND AND HYDRO POWER PROJECTS**

ALLIED HYDRO COUNCIL OF BC

SIVERTSON & ASSOCIATES CONSULTING LTD.

OCTOBER 13, 2017

