

## Wiltshire, Farrah EMPR:EX

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**From:** Gudmundson, Sydney <Sydney.Gudmundson@bchydro.com>  
**Sent:** Thursday, October 5, 2017 3:58 PM  
**To:** Sanderson, Melissa EMPR:EX; Haslam, David GCPE:EX; McNish, James EMPR:EX; Zadavec, Don GCPE:EX; Grewar, Colin GCPE:EX; Beaupre, Darren GCPE:EX  
**Cc:** Pillon, Lawrence; Dyson, Cynthia; Scott, Mora; Magre, Leela; Conway, David; McEwan, Alicia; Muir, Jerry  
**Subject:** MEMPR/BCH Communications Update meeting materials  
**Attachments:** MEMPR BCH Comms meeting October 6.pdf; 2017-10-05 BCH Upcoming Issues and Opportunities.pdf

Hi everyone,

Please find materials attached for tomorrow's Communications Update meeting.

Thank you,  
Sydney

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**Sydney Gudmundson** | Administrative Assistant

**BC Hydro**

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## Upcoming Issues and Opportunities

Updated: Oct. 5, 2017

CURRENT (30 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: BCUC review of Site C	Sept. 23 to Oct. 11: BCUC community input sessions Oct 4: BC Hydro responds to questions raised in preliminary report Oct 11: BC Hydro reply to BCUC preliminary report Oct. 14: Technical session Nov 1: BCUC final report Nov./Dec. (TBD): government consultation with First Nations on Site C Dec. (TBD): decision from government	Major Regional Legislative
	Issue: Industrial load curtailment pilot	Oct. 4: extension of the pilot for a third year	Regional Legislative
	Opportunity: fall conservation campaign	Oct.: Will run the entire month	Major Regional
s.17			Regional Major Legislative
	Issue: F18 Q1 financial results	Early Oct: Financial results for the first quarter of fiscal 18 will be posted	Major Legislative
	Issue: RRA	TBC: BC Hydro submission regarding Fiscal 2019 Early Oct.: BCUC decision	Major Regional Legislative

## FOR DISCUSSION

s.16,s.17			Regional
s.17			Major Regional
	Issue: Waneta Dam Application to BCUC	Mid-late Oct.: Submission due to BCUC	Major Regional Legislative
	Issue: Metro North Transmission Project	Oct. 11: Presentation to Metro Vancouver Regional Parks Committee regarding additional transmission line in and adjacent to Belcarra Regional Park	Regional
	Issue: Public Information Session in Pemberton	Oct 18: BC Hydro hosting a public information session on the rezoning and development application to rebuild its Pemberton field office.	Regional
	Opportunity: Salmon River Diversion Project	Oct. 20: Salmon River full site remediation. Tour with Minister Trevena confirmed.	Regional
	Issue: Metro North Transmission Project fall consultation	Mid-late Oct: project update sent to Anmore residents and those along the preferred routes in Vancouver and Burnaby; property owners along the overhead right-of-way will be invited to meet with the project team.	Regional
s.17			Regional
	Issue: Winter Moratorium pilot filing	End Oct.: Filing to the BCUC with the results of the Winter Moratorium pilot	Regional Major Legislative

## FOR DISCUSSION

	Issue: Site C procurement	Oct.: RFPs for acid rock drainage, turbidity monitors, and safety services and supplies. Contract awards for truck washing stations and environmental monitoring and erosion and sediment control	Regional Major Legislative
	Opportunity: John Hart	Oct to early Dec.: Mark milestones achieved and look ahead to commissioning stage. Planning event with Minister Mungall and two local MLAs (Min Trevena Leonard)	Major Regional
	Opportunity: New Vernon district office	Oct: Completion ceremony	Regional
	Issue: West Kelowna Transmission Project	Nov. 7-9: open houses in West Kelowna, Peachland and Kelowna	Regional

UPCOMING (30-60 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: Terrace to Kitimat Transmission Project	Nov (TBC): next meeting of Project Review Committee Meeting (stakeholders and First Nations)	Regional
	s.17		Major Legislative
	Issue: Site C procurement	Nov.: RFPs for engineering services and remediation/planting. Contract awards for forestry consulting services and safety services and supplies	Regional
	s.17		Regional



## FOR DISCUSSION

s.17			Major
	Opportunity: Prince George Chief Lake substation	Nov (mid to late): Completion	Regional
	Opportunity: EV charging station installation	Nov - Dec (TBC): Installation of 21 new EV charging stations in a number of B.C. communities between Vancouver Island and the Kootenays.	Regional Major
	Issue/Opportunity: Clean Energy BC Conference	Nov 27 - 29	Major Regional
	s.17		Regional Major Legislative
			Regional Major Legislative

<b>FUTURE (60-90 DAYS)</b>	<b>Issue/Opportunity</b>	<b>When/Where</b>	<b>Media</b>
	Issue: F18 Q2 financial results	Dec: Financial results for the second quarter of fiscal 18 will be posted	Major Legislative
	Issue: Site C annual progress report	Dec.: Will be submitted to the BCUC	Regional Major Legislative
	Issue: Semi-annual smart meter fire report	Dec.: Will be submitted to the BCUC	Regional

**FOR DISCUSSION**

	Issue: Site C procurement	Dec.: RFPs for engineering specialist, shoreline stability monitoring, turbidity monitors	Regional Major Legislative
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## **Government Communications / Minister's Office / BC Hydro Communications Update Meeting**

**Time:** Friday, October 6, 2017, 10:00am – 11:00am

**Location:** BC Hydro Corporate Offices, 333 Dunsmuir St. D15, Meeting Room 1 and Conference Call.

**Call in:**

- Toll Free (Canada & USA) s.17
- Participant Access code:s.17

**Attendees:**

**Government Communications and Minister's Office**

- GCPE: Don Zadravec, David Haslam, Darren Beaupre and Colin Grewar (via phone)
- MO: James McNish, Melissa Sanderson

**BC Hydro:**

- Lawrence Pillon, Acting Chief Communications Officer
- Leela Magre, Policy & Research
- David Conway, Site C
- Alicia McEwan, Site C
- Mora Scott, Media Relations & Issues Management

**Purpose:** Bi-weekly meeting to review upcoming BC Hydro issues and opportunities, seek guidance and formulate direction on policy and communications issues, keep apprised of MEMPR needs and requirements, develop and review processes and systems to build synergies amongst the two teams.

**Agenda: October 6, 2017, 10:00am – 11:00am**

<b>Topic</b>	<b>Purpose</b>	<b>Lead</b>	<b>Time</b>
<b>1) BC Hydro Issues &amp; Opportunities</b>	<ul style="list-style-type: none"><li>• Short, medium and long term look ahead at issues and opportunities</li><li>• Top Issues:<ul style="list-style-type: none"><li>○ BCUC/Site C: Next Steps</li><li>○ Power Smart campaign</li></ul></li></ul>	<b>Leela Mora</b>	<b>50 min</b>
<b>2) Processes and systems</b>	<ul style="list-style-type: none"><li>• Current processes to identify issues</li><li>• Information sharing across GCPE / MO / BC Hydro Systems being put in place to close gaps</li></ul>	<b>Lawrence</b>	<b>5 min</b>
<b>3) Next Steps</b>	<ul style="list-style-type: none"><li>• Confirm priorities for next meeting</li><li>• Confirm date / time for next meeting</li></ul>	<b>ALL</b>	<b>5 min</b>

**Documents for meeting:**

- Issues and Opportunities Calendars (including Site C)

## Wiltshire, Farrah EMPR:EX

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**From:** Gudmundson, Sydney <Sydney.Gudmundson@bchydro.com>  
**Sent:** Thursday, September 28, 2017 3:59 PM  
**To:** Sanderson, Melissa EMPR:EX; Haslam, David GCPE:EX; McNish, James EMPR:EX; Zadavec, Don GCPE:EX; Grewar, Colin GCPE:EX; Beaupre, Darren GCPE:EX  
**Cc:** Pillon, Lawrence; Dyson, Cynthia; Scott, Mora; Magre, Leela; Conway, David; McEwan, Alicia; Muir, Jerry  
**Subject:** MEMPR/BCH Communications Update meeting materials  
**Attachments:** MEMPR BCH Comms meeting agenda\_September 29.pdf; Site C Overview Briefing - Sept. 29, 2017.pdf; For GCPE MO meeting - Table of Contents - BC Hydro 2017 Estimates Binder....doc; Template - Estimates Note.docx; 2017-09-28 BCH Upcoming Issues and Opportunities (3).pdf

Hi everyone,

Please find materials attached for tomorrow's Communications Update meeting.

Thank you,  
Sydney

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**Sydney Gudmundson** | Administrative Assistant

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Upcoming Issues and Opportunities

Updated: Sept. 28, 2017

CURRENT (30 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: BCUC review of Site C	Aug. 30: BC Hydro filing to BCUC Sept. 8: Deloitte report Sept 14: Letter regarding handling of confidential information Sept 20: BCUC preliminary report Sept. 23 to Oct. 11: BCUC community input sessions Oct 4: BC Hydro responds to questions raised in preliminary report Oct 11: BC Hydro reply to BCUC preliminary report Nov 1: BCUC final report Nov./Dec. (TBD): government consultation with First Nations on Site C Dec. (TBD): decision from government	Major Regional Legislative
	Issue: Fall Legislative session	Sept. 8 – Nov. 30	Major Regional Legislative
s.17			Regional Major Legislative
s.17			Regional Legislative

## FOR DISCUSSION

	Issue: PRHP layoffs	Sept. 23: PRPH notified BCH that 200 workers are being laid off for the winter season	Regional Major Legislative
	Issue: UBCM	Sept. 25 – 29: in Vancouver	Regional Major
	Issue: FIA	Sept. 29: Will be posted to bchydro.com	Major Legislative
	Issue: Site C quarterly progress report	Sept. 29: eighth report will be submitted to the BCUC	Regional Major Legislative
	Issue: Customer Emergency Fund	Sept. 29: supplementary information on set-up and operating costs	Major Legislative
s.17			Regional Legislative
	Issue: RRA	TBC: BC Hydro submission regarding Fiscal 2019 Early Oct.: BCUC decision	Major Regional Legislative
	Issue: F18 Q1 financial results	Early Oct: Financial results for the first quarter of fiscal 18 will be posted	Major Legislative
	Opportunity: fall conservation campaign	Oct.: Will run the entire month	Major Regional

## FOR DISCUSSION

	s.17		Regional
	Opportunity : John Hart	Oct. 2: First unit of existing station taken out of service; media event planned.	Regional
	s.17		Regional Major Legislative
	s.16,s.17		Regional
	Issue: Waneta Dam Application to BCUC	Mid-late Oct.: Submission due to BCUC	Major Regional Legislative
	Issue: Metro North Transmission Project	Oct.: Presentation to Metro Vancouver Regional Parks Committee regarding additional transmission line in and adjacent to Belcarra Regional Park	Regional
	Issue: Metro North	Oct. 10: Geotechnical drilling to begin on three properties in Anmore as part of ongoing field work. Two residents are refusing access. One resident has compiled and sent a petition, with 350 signatures to the BCUC, media, Federal MPs, the Premier of BC, Ministers, and local MLA	Major Regional
	Opportunity: Salmon River Diversion Project	Oct. 20: Salmon River full site remediation. Tour with Minister Trevena confirmed.	Regional



## FOR DISCUSSION

	Opportunity: Prince George substation building demolition	Oct: Completion of demo stage; full project completion March 2018.	Regional
	Issue: Winter Moratorium pilot filing	End Oct.: Filing to the BCUC with the results of the Winter Moratorium pilot	Regional Major Legislative
	Issue: West Kelowna Transmission Project	Oct 23: Presentation to Regional District of Central Okanagan.	Regional
	Opportunity: New Vernon district office	Oct: Completion ceremony	Regional
	Opportunity: BC Aboriginal Business Awards	Oct. 26: BC Hydro corporate sponsorship. Nominations not yet out; opportunity for BC Hydro business relationships to be featured.	Major
	Issue: Site C procurement	Oct.: RFPs for acid rock drainage, turbidity monitors, and safety services and supplies. Contract awards for truck washing stations and environmental monitoring and erosion and sediment control	Regional Major Legislative
	Opportunity: Campbell River Substation	Oct.: Project update	Regional
	Opportunity: John Hart	Oct to early Dec.: Mark milestones achieved and look ahead to commissioning stage. Planning event with Minister Mungall and two local MLAs (Min Trevena Leonard)	Major Regional
	Opportunity: New Vernon district office	Oct: Completion ceremony	Regional

FOR DISCUSSION

UPCOMING (30-60 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: Final report on Site C	Nov. 1: BCUC issues final report on Site C	Regional Major Legislative
	Issue: West Kelowna Transmission Project	Nov. 2: Presentation to Regional District of Okanagan-Similkameen	Regional
	Issue: West Kelowna Transmission Project	Nov. 7-9: open houses in West Kelowna, Peachland and Kelowna	Regional
	Issue: Terrace to Kitimat Transmission Project s.17	Nov(TBC): next meeting of Project Review Committee Meeting (stakeholders and First Nations)	Regional
			Major Legislative
	Issue: Site C procurement	Nov.: RFPs for engineering services and remediation/planting. Contract awards for forestry consulting services and safety services and supplies	Regional
	s.17		Regional
			Major
	Opportunity: Prince George Chief Lake substation	Nov (mid to late): Completion	Regional

FOR DISCUSSION

	Issue/Opportunity: Clean Energy BC Conference s.17	Nov 27 - 29	Major Regional
			Regional Major Legislative
			Regional Major Legislative

<b>FUTURE (60-90 DAYS)</b>	<b>Issue/Opportunity</b>	<b>When/Where</b>	<b>Media</b>
	Issue: F18 Q2 financial results	Dec: Financial results for the second quarter of fiscal 18 will be posted	Major Legislative
	Issue: Site C annual progress report	Dec.: Will be submitted to the BCUC	Regional Major Legislative
	Issue: Semi-annual smart meter fire report	Dec.: Will be submitted to the BCUC	Regional
	Issue: Site C procurement	Dec.: RFPs for engineering specialist, shoreline stability monitoring, turbidity monitors	Regional Major Legislative

## **BC Hydro Estimates Binder 2017 – Table of Contents**

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### **A. Top 10 Notes**

1. Highlights and Accomplishments
2. Site C Review
3. Rates (including 10 Year Rates Plan)
4. Rate Freeze
5. Fiscal 2017–Fiscal 2019 Revenue Requirements Application
6. Review of BC Hydro
7. Lifeline Rate
8. Independent Power Producers – renewals, terminations
9. Standing Offer Program
10. Liquefied Natural Gas

### **B. Finance, Regulatory & Rates**

1. Operating Costs
2. Dividend and Net Income
3. Debt
4. Regulatory and Deferral Accounts
5. Quarter 1 Financial Results
6. 2015 Rate Design Application
7. 2017 Rate Design Application
8. Pension Costs
9. Surplus Property Sales
10. Information Technology/SAP
11. Supply Chain Applications
12. Capital Projects and Expenditures Review

### **C. Human Resources**

1. Workforce Overview
2. Compensation – Board, Executive, Powerex, Employees
3. CEO Termination and Severance
4. Accenture Repatriation

### **D. Planning & Operations**

1. May 2016 Load Forecast
2. Demand Side Management
3. 2018 Integrated Resource Plan
4. Waneta Purchase
5. Climate Leadership Plan
6. Federal Infrastructure Study
7. BC-Alberta Intertie
8. Mining Customer Payment Program
9. Imperial Metals
10. Burrard Facility

11. Customer Strategy
12. Customer Emergency Fund
13. Wildfire Efforts and Costs
14. Safety
15. Smart Meters
16. First Nations
17. Fall Campaign

#### **E. Capital Investment**

1. Capital Projects Overview
2. Capital Projects List
3. Revelstoke Unit 6 Project
4. Interior to Lower Mainland Transmission Project
5. Peace Region Electricity Supply and Dawson Creek/ Chetwynd Area Transmission projects
6. John Hart Generating Station Replacement Project
7. Metro North Transmission Project
8. South Fraser Transmission Relocation Project
9. Downtown Vancouver Electricity Supply (seed, note includes Property Purchase)
10. Ruskin Dam and Powerhouse Upgrade Project
11. West Kelowna Transmission Project
12. Big Bend Substation
13. Peace Region to Kelly Lake Transmission Project
14. WAC Bennett Rip-Rap Upgrade
15. Terrace-to-Kitimat Transmission Project
16. Jordan River
17. Dam Safety

#### **F. Site C**

1. Project Overview, including an update on current status (layoffs, commercial relationships)
2. Cost Estimate
3. Aboriginal consultation, agreements and accommodation
4. Procurement
5. Properties
6. Community agreements
7. Quarterly report no. 8
8. BCUC review process and our submission
9. Environmental oversight and compliance

#### **G. BC Hydro Basics**

1. Quick Facts
2. System Map
3. Mandate Letters
4. Service Plan Update and Briefing Note
5. Annual Report and Briefing Note
6. Financial Information Act Return Issues Note

## **Government Communications / Minister's Office / BC Hydro Communications Update Meeting**

**Time:** Friday, September 29, 2017, 12:30pm-2:30pm

**Location:** BC Hydro Corporate Offices, 333 Dunsmuir St. D15, Meeting Room 1.

### **Call in:**

- Toll Free (Canada & USA): S.17
- Participant Access code S.17

### **Attendees:**

#### **Government Communications and Minister's Office**

- GCPE: Don Zadravec, David Haslam, Darren Beaupre and Colin Grewar (via phone)
- MO: James McNish, Melissa Sanderson

#### **BC Hydro:**

- Lawrence Pillon, Acting Chief Communications Officer
- Cynthia Dyson, Marketing Communications
- Leela Magre, Policy & Research
- Jerry Muir, Community Relations
- Diane McSherry, Site C
- Alicia McEwan, Site C
- Mora Scott, Media Relations & Issues Management

**Purpose:** Bi-weekly meeting to review upcoming BC Hydro issues and opportunities, seek guidance and formulate direction on policy and communications issues, keep apprised of MEMPR needs and requirements, develop and review processes and systems to build synergies amongst the two teams.

**Agenda: September 29, 2017, 12:30pm – 2:30pm**

<b>Topic</b>	<b>Purpose</b>	<b>Lead</b>
<b>1) Introductions &amp; Agenda Review</b>		<b>ALL</b>
<b>2) Issue Deep Dives</b>	<ul style="list-style-type: none"><li>• Site C<ul style="list-style-type: none"><li>○ Site C Project Overview</li><li>○ Contractor issues</li><li>○ BCUC Process: IR submissions</li></ul></li><li>• Estimates: Table of Contents</li><li>• UBCM</li></ul>	<b>Alicia/Diane</b>  <b>Leela</b> <b>Leela</b> <b>Jerry</b>
<b>3) BC Hydro Issues &amp; Opportunities</b>	<ul style="list-style-type: none"><li>• Short, medium and long term look ahead at issues and opportunities</li></ul>	<b>BC Hydro</b> <b>Lawrence and team</b>
<b>4) Processes and systems</b>	<ul style="list-style-type: none"><li>• Current processes to identify issues</li><li>• Information sharing across GCPE / MO / BC Hydro Systems being put in place to close gaps</li><li>• Feedback on Question Period, Budget, and Mandate Letter and Service Plan release</li></ul>	<b>Lawrence</b>
<b>5) Next Steps</b>	<ul style="list-style-type: none"><li>• Confirm priorities for next meeting</li><li>• Confirm date / time for next meeting</li></ul>	<b>ALL</b>

**Documents for meeting :**

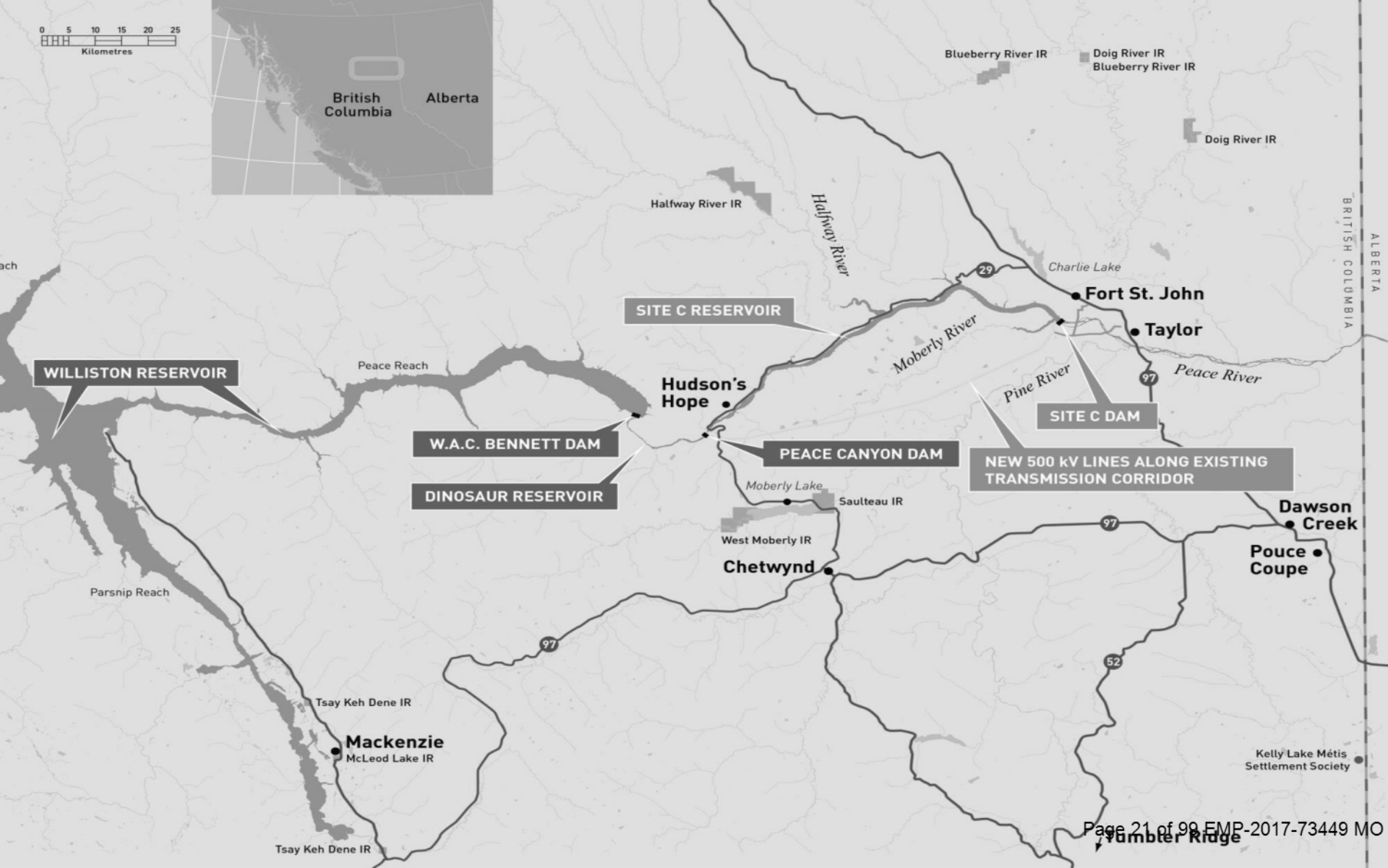
- Issues and Opportunities Calendars (including Site C)
- Table of Contents
- Estimates Note template
- Site C Project Overview

# Site C Clean Energy Project

## Overview

September 29, 2017





# Building the Site C Clean Energy Project

## Roads & highways

- Upgrades to 240, 269, 271 and Old Fort Roads
- Realignment of six segments of Highway 29

## Hudson's Hope shoreline protection

- Upgrades to DA Thomas Road
- Construction of a berm along the shoreline
- Re-paving of Clarke Ave, if required

## Peace River / Reservoir area

- Public safety signs and beacons installed upstream and downstream of the dam site
- Clearing activities, river diversion and reservoir filling

## Production & transport of materials

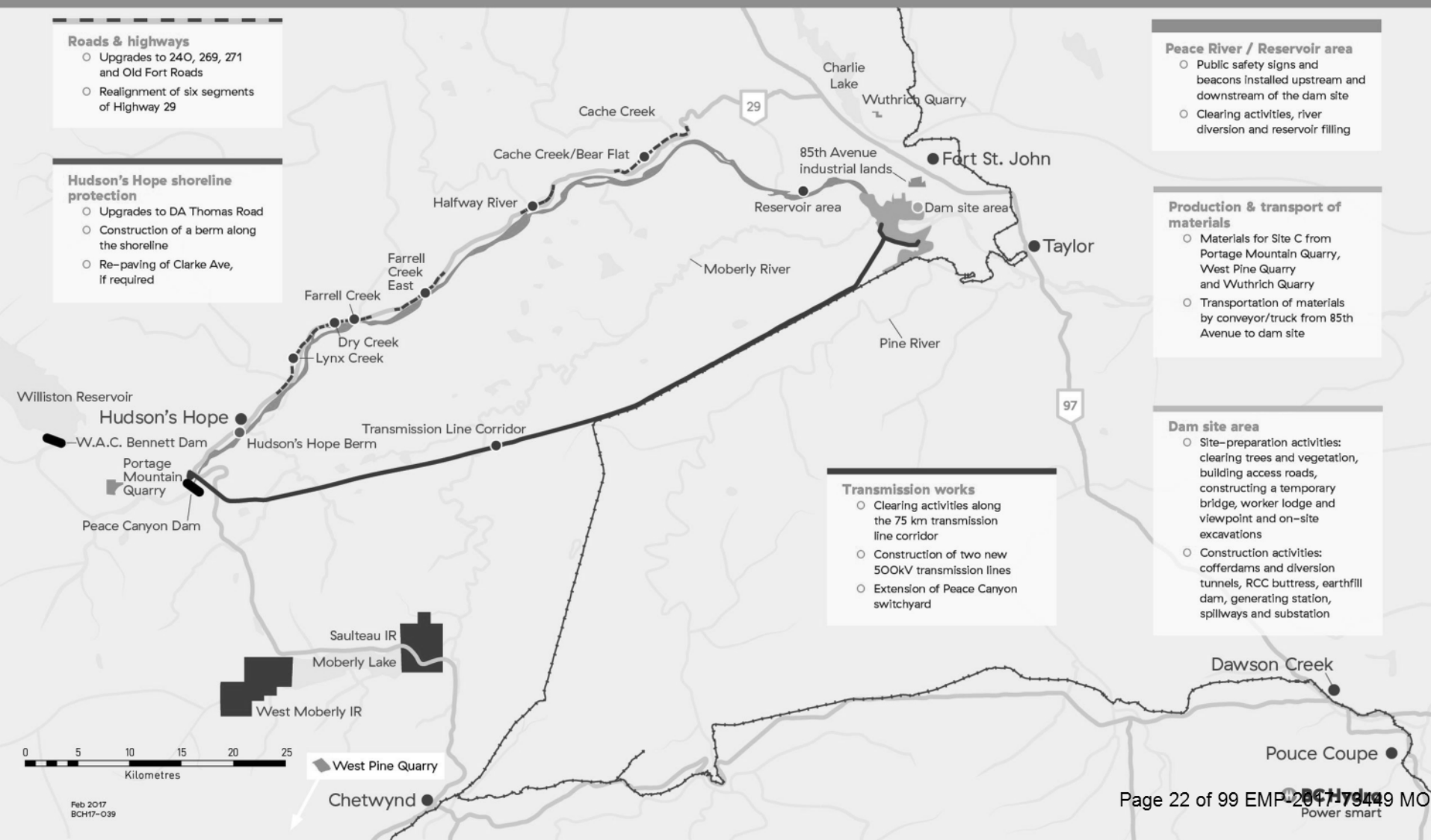
- Materials for Site C from Portage Mountain Quarry, West Pine Quarry and Wuthrich Quarry
- Transportation of materials by conveyor/truck from 85th Avenue to dam site

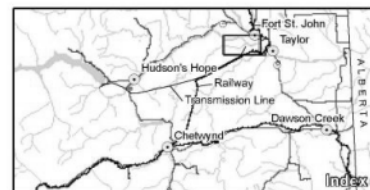
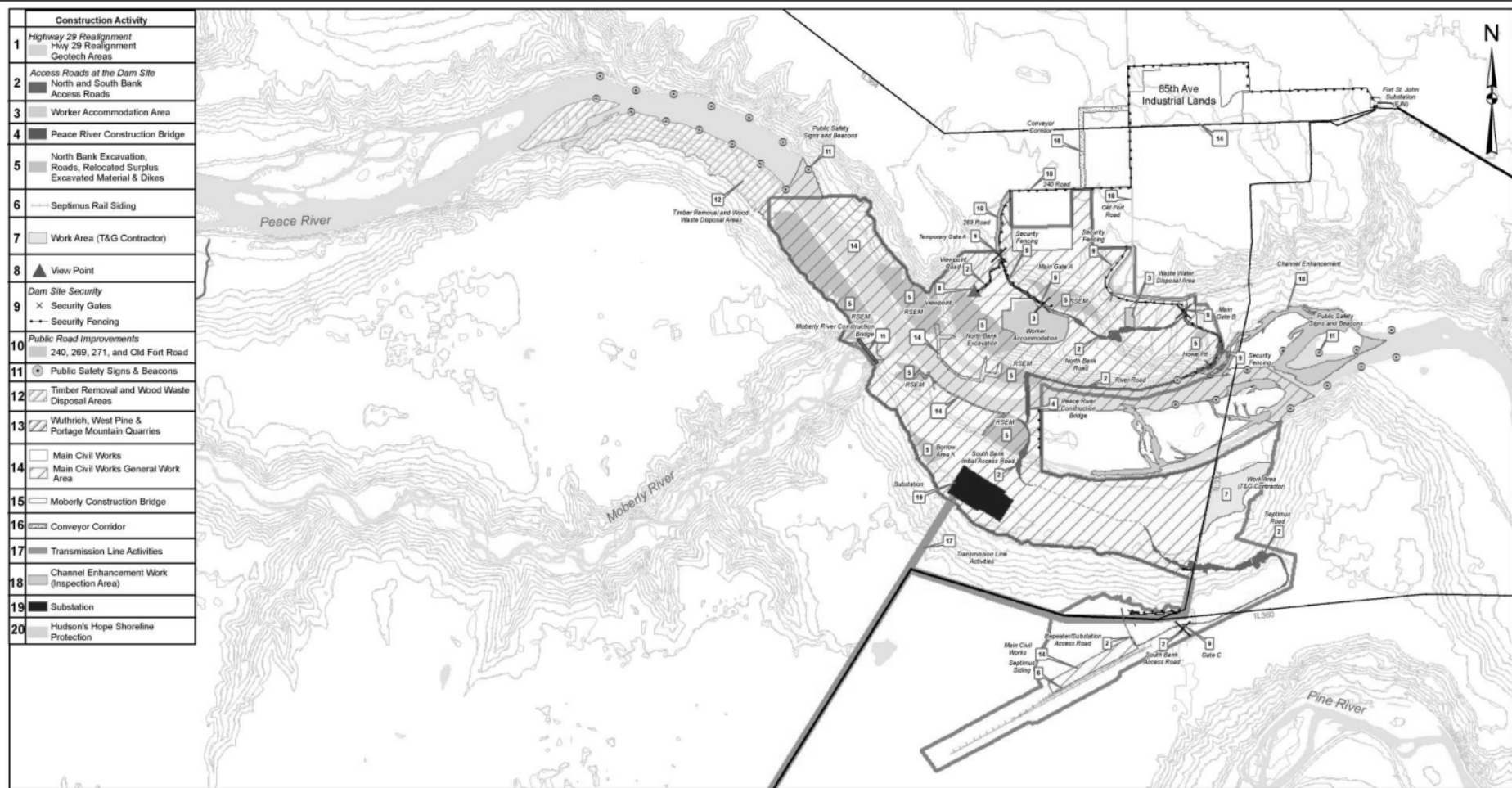
## Dam site area

- Site-preparation activities: clearing trees and vegetation, building access roads, constructing a temporary bridge, worker lodge and viewpoint and on-site excavations
- Construction activities: cofferdams and diversion tunnels, RCC buttress, earthfill dam, generating station, spillways and substation

## Transmission works

- Clearing activities along the 75 km transmission line corridor
- Construction of two new 500kV transmission lines
- Extension of Peace Canyon switchyard





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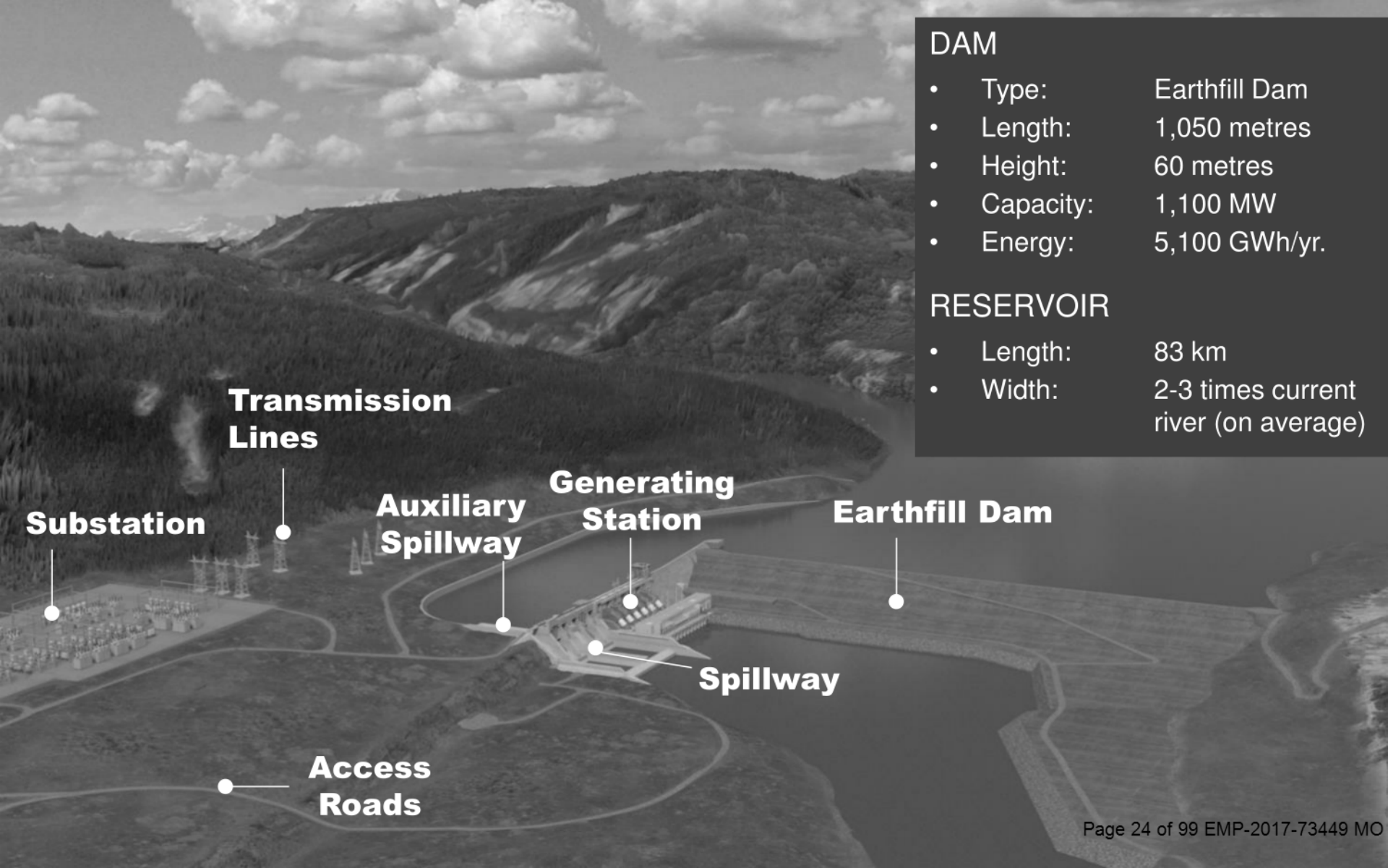
The construction activities presented in this map are indicative only and may change as a result of procurement and project planning advancements.

1:50,000 0 2 km

BC Hydro

Construction Activities  
October - December 2017  
Page 23 of 99 EMP-2017-73449 MO

Date	Sep. 12, 2017	DWG NO	1016-C14-10038-2	R 0
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## DAM

- Type: Earthfill Dam
- Length: 1,050 metres
- Height: 60 metres
- Capacity: 1,100 MW
- Energy: 5,100 GWh/yr.

## RESERVOIR

- Length: 83 km
- Width: 2-3 times current river (on average)

**Transmission  
Lines**

**Substation**

**Auxiliary  
Spillway**

**Generating  
Station**

**Earthfill Dam**

**Spillway**

**Access  
Roads**

# Construction progress

**\$1.8 billion**  
spent as of  
June 30, 2017

**\$4 billion**  
spent and committed (signed  
contracts & agreements)

## Summary:

- Site C is two years into an eight-year construction schedule.
- Completed site preparation activities in fall 2016.
- Closed four major contracts (over \$50 million):
  - North bank site preparation: \$60 million
  - 1,600-person worker lodge: \$470 million
  - Main civil works: \$1.75 billion
  - Turbines and generators: \$470 million
- Advancing main civil works and commenced turbines and generators.
- Anticipate awarding the generating station and spillways civil works contract award in late 2017/early 2018 and the hydro mechanical in early 2018.
- Highway realignment tenders: pending outcome of BCUC review

# Employment Statistics

- Site C jobs posted to WorkBC / Employment Connections (Fort St. John) website; all contractors listed on Site C website.
- BC Hydro requires all major contractors to report employment information.
- Total of **2,549 workers** in July; **2,059** from B.C (81%). Total of **703** workers from PRRD.

Site C Employment Statistics – July 2017

	# of Total Workers	# of BC Primary Residents	% of BC Workers
Construction and Environmental Contractors	2,145	1,678	78%
Engineers and Project Team	404	381	94%
<b>Total Workforce</b>	<b>2,549</b>	<b>2,059</b>	<b>81%</b>

# North bank excavation (July 2017)





# Exterior of Voith manufacturing facility (June 2017)





# RCC placement for powerhouse buttress (August 2017)



# Aggregate crushing facility (July 2017)





# Construction Communications

## EAC condition 72

- The EAC Holder must manage effective communications for the Project by implementing measures in communication plans and a business participation plan.
- The following communication and participation plans are to be developed and implemented:
  - Business Participation Plan;
  - Construction Communication Plan; and
  - First Nations Communication Plan

# Bi-Weekly Construction Bulletins

Keeping the community informed



## CONSTRUCTION BULLETIN

January 6, 2017

### Site C Construction Schedule: January 9 – January 22

The following construction activities are scheduled to occur January 9 – January 22:

#### Dam site area and reservoir – north (left) bank and south (right) bank

- The main civil works contractor will continue to mobilize crews, material and equipment. An equipment maintenance facility is being constructed on the south bank.
- Excavation will continue on the north and south banks. This may include blasting on the south bank.
- Drilling and the installation of geotechnical instrumentation will continue on the north and south banks.
- Curtain grouting will continue on the north bank.

# Activity-specific notices

## Information Sheets and Notifications

### SITE C PROJECT CONSTRUCTION

#### Highway 29 Realignment

##### Bear Flat/Cache Creek: Route Selection

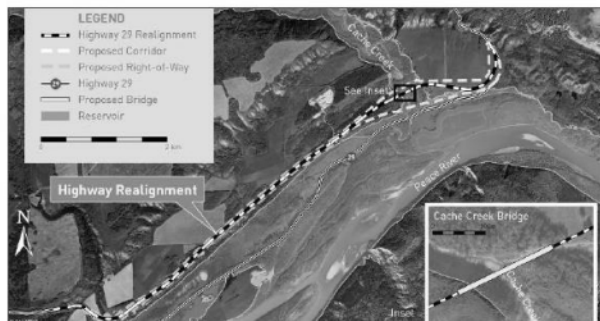
The Bear Flat/Cache Creek segment of Highway 29 is located approximately 49 kilometres east of the Hudson's Hope town site and 31 kilometres west of Fort St. John. In this area, the existing highway will be flooded by the reservoir, requiring relocation of approximately 8.5 kilometres of highway including the construction of a new bridge at Cache Creek. The route for the realignment is indicated on the map.

BC Hydro evaluated two alignment options at Bear Flat/Cache Creek — a shoreline route and an inland route — taking into account the relative safety, technical, environmental, social and cost implications for each option.

A shoreline route is preferred over an inland route for several reasons:

- Improved safety for the travelling public by increasing the length of passing opportunities for drivers
- Better geotechnical conditions
- Fewer technical challenges, resulting in lower costs and reduced construction risks
- A smaller area of private land is affected
- Less impact on agricultural land

#### Consultation with Property Owners



### SITE C PROJECT CONSTRUCTION

#### Watson Slough Clearing

As part of Site C mitigation measures, BC Hydro is committed to avoiding and reducing project effects to wetlands. Where effects cannot be avoided, BC Hydro will replace lost wetland habitats by either improving existing wetlands or creating new wetlands with similar functions to those lost. To achieve this, BC Hydro is partnering with Ducks Unlimited to develop its wetland mitigation plan for wetlands. As part of this plan, priority will be given to wetland sites within one kilometre of the project area, followed by existing Ducks Unlimited projects in the Peace region, and then other areas further away.

#### Cache Creek/Bear Flat Clearing

Clearing work in the Cache Creek/Bear Flat area is taking place in early 2017 to prepare the area for the realignment of Highway 29. This area includes the Watson Slough, a wetland area that will be lost to inundation when the reservoir for Site C is created in 2022.

In February 2017, the Peace River Regional District (PRRD) requested that BC Hydro delay clearing Watson Slough until reservoir filling. In response to this request, BC Hydro reviewed its clearing plans and determined that it could reduce the number of trees to be cleared at this time. As a result, only 10 per cent of the trees will be cleared at Watson Slough in early 2017, leaving 90 per cent of the trees in place until prior to



# Site C Public Enquiries

Multiple ways to get information about construction



Website info and email sign ups at: **sitecproject.com**



Twitter handle: **@sitecproject**



Construction info: **1-877-217-0777**



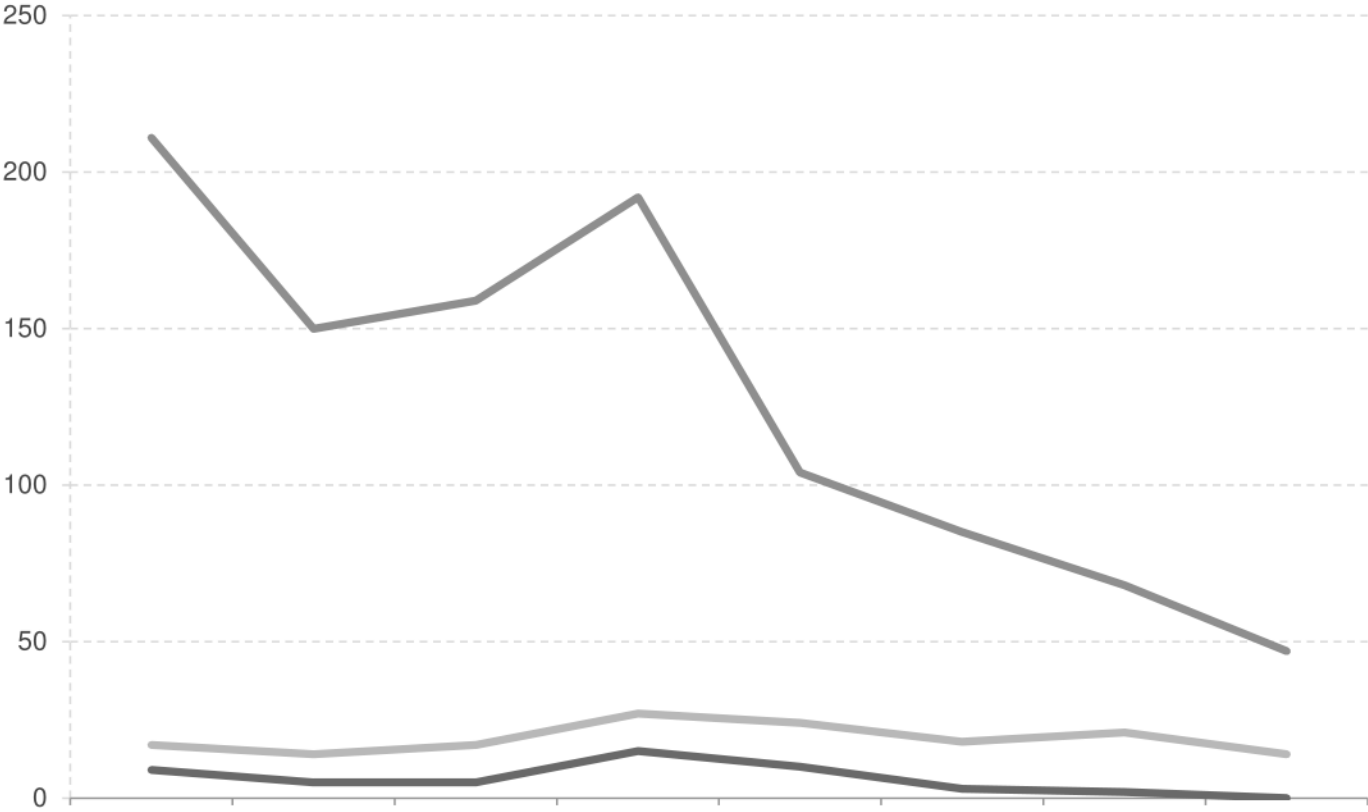
Email enquiries: **sitec@bchydro.com**



Online Feedback Form

# Site C Public Enquiries – 2017

— Job Enquiries — Business Enquiries — Construction Impacts



	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17
Job Enquiries	211	150	159	192	104	85	68	47
Business Enquiries	17	14	17	27	24	18	21	14
Construction Impacts	9	5	5	15	10	3	2	0





## BC Hydro Estimates Note

### Title

---

*Summary – why is this topic important?*

#### **Key Facts**

- Point 1
- Point 2

#### **Key Questions**

- Point 1
- Point 2

#### **Background**

- Point 1
- Point 2

## Wiltshire, Farrah EMPR:EX

---

**From:** Gudmundson, Sydney <Sydney.Gudmundson@bchydro.com>  
**Sent:** Friday, October 6, 2017 9:34 AM  
**To:** Sanderson, Melissa EMPR:EX; Haslam, David GCPE:EX; McNish, James EMPR:EX; Zdravec, Don GCPE:EX; Grewar, Colin GCPE:EX; Beaupre, Darren GCPE:EX  
**Cc:** Pillon, Lawrence; Dyson, Cynthia; Scott, Mora; Magre, Leela; Conway, David; McEwan, Alicia  
**Subject:** RE: MEMPR/BCH Communications Update meeting materials  
**Attachments:** 2017-10-05 BCH Upcoming Issues and Opportunities.pdf

Hi everyone,

Please find an updated Issues & Opportunities calendar attached.

Thank you,  
Sydney

---

**From:** Gudmundson, Sydney  
**Sent:** 2017, October 05 3:58 PM  
**To:** 'Sanderson, Melissa MEM:EX'; 'Haslam, David GCPE:EX'; 'McNish, James EMPR:EX'; 'Zdravec, Don GCPE:EX'; 'Colin.Grewar@gov.bc.ca'; 'Darren.Beaupre@gov.bc.ca'  
**Cc:** Pillon, Lawrence; Dyson, Cynthia; Scott, Mora; Magre, Leela; Conway, David; McEwan, Alicia; Muir, Jerry  
**Subject:** MEMPR/BCH Communications Update meeting materials

Hi everyone,

Please find materials attached for tomorrow's Communications Update meeting.

Thank you,  
Sydney

---

**Sydney Gudmundson** | Administrative Assistant

**BC Hydro**  
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**Upcoming Issues and Opportunities**

Updated: Oct. 5, 2017

CURRENT (30 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: BCUC review of Site C	Sept. 23 to Oct. 11: BCUC community input sessions Oct 4: BC Hydro responds to questions raised in preliminary report Oct 11: BC Hydro reply to BCUC preliminary report Oct. 14: Technical session Nov 1: BCUC final report Nov./Dec. (TBD): government consultation with First Nations on Site C Dec. (TBD): decision from government	Major Regional Legislative
	Opportunity: fall conservation campaign	Oct.: Will run the entire month	Major Regional
	Issue: F18 Q1 financial results	Week of Oct. 9: Financial results for the first quarter of fiscal 18 will be posted	Major Legislative
	Issue: RRA	TBC: BC Hydro submission regarding Fiscal 2019 Early Oct.: BCUC decision	Major Regional Legislative
	s.16,s.17		Regional
	s.17		Major Regional

## FOR DISCUSSION

		s.17	
	Issue: Waneta Dam Application to BCUC	Mid-late Oct.: Submission due to BCUC	Major Regional Legislative
	Issue: Public Information Session in Pemberton	Oct 18: BC Hydro hosting a public information session on the rezoning and development application to rebuild its Pemberton field office.	Regional
	Opportunity: Salmon River Diversion Project	Oct. 20: Salmon River full site remediation. Tour with Minister Trevena confirmed.	Regional
	s.17		Regional
	Issue: Site C procurement	Oct.: RFPs for acid rock drainage, turbidity monitors, and safety services and supplies. Contract awards for truck washing stations and environmental monitoring and erosion and sediment control	Regional Major Legislative
	Opportunity: John Hart	Oct to early Dec.: Mark milestones achieved and look ahead to commissioning stage. Planning event with Minister Mungall and two local MLAs (Min Trevena Leonard)	Major Regional
	Opportunity: New Vernon district office	Oct: Completion ceremony	Regional
	Issue: West Kelowna Transmission Project	Nov. 7-9: open houses in West Kelowna, Peachland and Kelowna	Regional

FOR DISCUSSION

UPCOMING (30-60 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: Terrace to Kitimat Transmission Project	Nov (TBC): next meeting of Project Review Committee Meeting (stakeholders and First Nations)	Regional
	Issue: Site C procurement s.17	Nov.: RFPs for engineering services and remediation/planting. Contract awards for forestry consulting services and safety services and supplies	Regional
			Regional
	Opportunity: downed line campgain	Mid Nov.	Regional Major
	Opportunity: Prince George Chief Lake substation s.17	Nov (mid to late): Completion	Regional
			Major
	Opportunity: EV charging station installation	Nov - Dec (TBC): Installation of 21 new EV charging stations in a number of B.C. communities between Vancouver Island and the Kootenays.	Regional Major
	Issue/Opportunity: Clean Energy BC Conference	Nov 27 - 29	Major Regional

FOR DISCUSSION

FUTURE (60-90 DAYS)	Issue/Opportunity	When/Where	Media
	Issue: F18 Q2 financial results	Dec: Financial results for the second quarter of fiscal 18 will be posted	Major Legislative
	Issue: Site C annual progress report	Dec.: Will be submitted to the BCUC	Regional Major Legislative
	Issue: Semi-annual smart meter fire report	Dec.: Will be submitted to the BCUC	Regional
	Issue: Site C procurement	Dec.: RFPs for engineering specialist, shoreline stability monitoring, turbidity monitors	Regional Major Legislative



**From:** Gudmundson, Sydney  
**To:** [Sanderson, Melissa EMPR:EX](#); [Haslam, David GCPE:EX](#); [McNish, James EMPR:EX](#); [Zadravec, Don GCPE:EX](#); [Grewar, Colin GCPE:EX](#); [Beaupre, Darren GCPE:EX](#)  
**Cc:** [Pillon, Lawrence](#); [Dyson, Cynthia](#); [Scott, Mora](#); [Magre, Leela](#); [Conway, David](#); [McEwan, Alicia](#)  
**Subject:** RE: MEMPR/BCH Communications Update meeting materials  
**Date:** Thursday, September 21, 2017 5:12:08 PM  
**Attachments:** [2017-09-21 IS - Quarterly Report No. 8 to the BCUC.pdf](#)

---

Hi everyone,  
Please also find attached a just approved Issues Note for the Site C Quarterly report.  
Thank you,  
Sydney

---

**From:** Gudmundson, Sydney  
**Sent:** 2017, September 21 4:48 PM  
**To:** Sanderson, Melissa MEM:EX; Haslam, David GCPE:EX; McNish, James EMPR:EX; Zadravec, Don GCPE:EX; 'Colin.Grewar@gov.bc.ca'; 'Darren.Beaupre@gov.bc.ca'  
**Cc:** Pillon, Lawrence; Dyson, Cynthia; Scott, Mora; Magre, Leela; Conway, David; McEwan, Alicia  
**Subject:** MEMPR/BCH Communications Update meeting materials

Hi everyone,  
Please find materials attached for the Communications Update meeting tomorrow.  
Please note, we have attached a currently confidential Site C Quarterly Report (redacted) to be released September 29<sup>th</sup>. It is not for distribution.  
Thank you,  
Sydney

---

**Sydney Gudmundson** | Administrative Assistant

**BC Hydro**

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---

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# BC HYDRO ISSUES SHEET

Issue:	QUARTERLY PROGRESS REPORT NO. 8 TO THE BCUC
Spokesperson:	Dave Conway, Community Relations Manager, Site C

## ISSUE SUMMARY

On September 29, BC Hydro will submit its eighth Site C Quarterly Progress Report to the British Columbia Utilities Commission (BCUC) and will post the report on the Site C project website. The report shows that some of the main civil works activities are behind schedule but the project is still on track for overall schedule and budget.

## HISTORY OF THE ISSUE

- Information from previous reports has been reported on by major, legislative and regional media.
- Project opponents also typically discuss the quarterly reports on social media.

## FACTS

- The quarterly report includes information on project status, project schedule, project costs and financing and material project risks.
- The report covers the period of April to June 2017, and may differ from the information submitted by BC Hydro as part of the BCUC review of Site C, which commenced on August 9, 2017. The timeframe reviewed in BC Hydro's quarterly submission is different from the BCUC's Site C Inquiry.
- The report provides the following key points about the project that are of note and may receive media coverage:

### Construction Activities

- **Highway 29 re-alignment at Cache Creek/Bear Flat:** While the BCUC review is underway, and until government makes a decision on the project, the Ministry of Transportation and Infrastructure has put both the grading and paving tender and the Cache Creek bridge tender on hold. BC Hydro extended the leases for two occupied residences in the area.
- **Main Civil Works:** The project is facing challenges with the main civil works contractor in areas including safety, schedule, First Nations commitments and environmental performance.
  - In February, a tension crack developed on the left bank excavation while constructing a haul road, resulting in the temporary stoppage of some construction excavation activities. BC Hydro and Peace River Hydro Partners (PRHP) agreed on a plan to stabilize the slope. Construction recommenced in April with contract costs and schedule remaining within estimates. Final remediation of the crack was completed in June.
  - In May, a second, smaller tension crack was observed in the temporary excavation area above the future diversion tunnel inlet portal on the left bank. It extended locally into the final slope, requiring a solution integrated with the final slope. At that time, the crack was approximately 100 metres long and has since extended eastward to approximately 250

metres in length. A plan was developed to safely continue excavation and the contractor is presently resolving this tension crack. A constructability review was also conducted involving BC Hydro's engineers, the contractor's engineers and the Technical Advisory Board, to confirm opportunities to further resequencing work to meet contract milestones and reduce risk of future delays.

- Stability issues and tension cracks on the left bank were expected, which is why the slope is being excavated prior to completion of the Permanent Works.
- The Right Bank Drainage tunnelling started in February 2017, but work was stopped by WorkSafeBC due to issues with silica dust; later than scheduled mobilization of equipment for concrete production; and issues related to contract specifications for concrete mixes. To address these issues, the contractor has changed excavation methods in the right bank drainage tunnel to mitigate the amount of silica dust; recently procured a larger crusher to meet aggregate production requirements; and refined production processes to meet contract specification for concrete.
  - These issues have the potential to impact the site handover date for the Generating Station & Spillways Contractor. BC Hydro is reviewing handover dates with the generating station and spillways contractor.
- The Right Bank Approach Channel and Powerhouse excavation milestone for 2017 was substantially achieved on May 31, 2017. The contractor began placement of conventional concrete in the stilling basin in June, however there was a delay and Peace River Hydro Partners have proposed means to allow work to be extended into the winter period which mitigates the risk of the handover date for the generating station and spillways contractor.
- The main civil works contract value increased by \$39 million to reflect approved change orders to date.
  - In December 2015, BC Hydro awarded a \$1.75 billion contract for main civil works to Peace River Hydro Partners. This amount does not include contingency funding for changes that are expected over the term of the contract. For example, changes can arise from variation in the quantities of materials, differing site conditions, or changes in the scope of certain activities.
- **Generating Station and Spillways:** contract award is on hold until BCUC review is complete and a decision is made by government.

#### Environmental Compliance

- In May 2017, the Canadian Environmental Assessment Agency (CEAA) issued an Order related to erosion and sediment control at the dam site. The Order included 19 'measures to be taken' which had to be implemented by June 9. All the measures identified were implemented prior to the deadline or on an ongoing basis as specified in the Order.

#### Budget

- The Interest-During-Construction savings and unallocated budget amounts totalling \$401 million was added to the original contingency allocation of \$794 million, resulting in the revised total contingency budget of \$1,194.6 million.

- As of June 30, 2017, \$356 million (or approximately 30 per cent of the total update contingency budget of \$1,195 million) has been allocated to work packages in order to fund contract award and/or contract contingency.

#### Material Project Risks

- The primary risk highlighted is that the main civil works contractor has experienced delays on several of their critical path activities, requiring a re-sequencing of planned work.

#### **KEY MESSAGES**

- Each quarter, we voluntarily file quarterly reports with the BCUC on the Site C project.
- The reports include information on construction progress, project milestones, project costs and financing and material project risks.
- The report shows that construction of Site C is on time and on budget.
- The report covers the period of April to June 2017, and may differ from information submitted by BC Hydro as part of the BCUC review of Site C, which commenced on August 9, 2017 and is ongoing.

#### **TOP QUESTIONS AND ANSWERS**

Question	Answer
<b>1. Why are you submitting another report to the BCUC? Is this part of the review?</b>	<ul style="list-style-type: none"> <li>• Since the start of construction, BC Hydro has voluntarily provided the BCUC with quarterly reports on Site C progress, accomplishments, costs and risks.</li> <li>• These reports are separate from the current BCUC review of the Site C project.</li> <li>• This report is the eighth quarterly report to the BCUC and covers the period of April to June 2017. All of the quarterly reports can be found on our project website at <a href="http://sitecproject.com">sitecproject.com</a>.</li> </ul>

<p><b>2. Can you tell me about this report?</b></p>	<ul style="list-style-type: none"> <li>• We provide the BCUC with quarterly progress reports on construction progress, accomplishments, costs and risks. The current report covers the period April to June 2017.</li> <li>• Highlights of the quarter include: <ul style="list-style-type: none"> <li>○ The quarterly report shows that construction of the Site C project is on time and on budget.</li> <li>○ Construction continues to progress. We completed lower reservoir clearing in the quarter; left and right bank site preparations were completed; public road improvements were completed; and we're advancing main civil works.</li> <li>○ In June 2017, there were 2,224 construction and non-construction workers on site and a total workforce of 2,633 working on the project.</li> <li>○ Voith Hydro, the successful proponent for the turbines and generators contract, arrived on-site in April to begin work for its temporary manufacturing facility on the right bank.</li> </ul> </li> </ul>
<p><b>3. Why is the work on the right and left banks on the project's critical path?</b></p>	<ul style="list-style-type: none"> <li>• The current work on the right and left banks is on the critical path because it must be done in order to divert the river in 2019.</li> </ul>
<p><b>4. You note the main civil works contractor is behind schedule in several areas. This includes the right bank drainage tunnel and the placement of roller-compacted concrete. What is happening here?</b></p>	<ul style="list-style-type: none"> <li>• The project continues to be on time and on budget.</li> <li>• It's not uncommon on a large infrastructure project for certain activities to advance faster or slower than planned. That's why we build in schedule and cost contingency in our contracts.</li> <li>• When an activity falls behind schedule, we work with our contractor to find a solution; that's why our contractor accelerated excavation, as we note in the quarterly report.</li> <li>• We also meet weekly with Peace River Hydro Partners — our main civil works contractor — to review construction performance, quality and safety.</li> </ul>
<p><b>5. You note in the report that the main civil works budget has been increased by \$39 million. Isn't this an indication you are now over budget?</b></p>	<ul style="list-style-type: none"> <li>• The project remains on track for overall schedule and budget.</li> <li>• In December 2015, BC Hydro awarded a \$1.75 billion contract for main civil works to Peace River Hydro Partners. This amount does not include contingency funding for changes that are expected over the term of the contract. For example, changes can arise from variation in the quantities of materials, differing site conditions, or changes in the scope of certain activities.</li> <li>• As of June 30, 2017, \$39 million has been added to the contract value for main civil works.</li> </ul>

<p><b>6. Table 14 shows a \$479 million variance. Does this mean you are over budget by \$479 million?</b></p>	<ul style="list-style-type: none"> <li>• The project continues to progress on budget.</li> <li>• Variances like this can occur when project activities are accelerated. For example, there were earlier-than-planned expenditures for the worker accommodation, main civil works and early works contracts.</li> </ul>
<p><b>7. The reports state you had three WorkSafeBC Orders. Is there a safety problem at the dam site?</b></p>	<ul style="list-style-type: none"> <li>• Safety is our top priority. That's why BC Hydro has a detailed Contractor Safety Program that reflects BC Hydro's safety commitment for all workers, including employees, agents and contractors.</li> <li>• We continually develop and foster a strong working relationship with WorkSafeBC, and we are committed to meeting all WorkSafeBC health and safety regulations.</li> <li>• We take these Orders from WorkSafeBC very seriously and are working closely with the contractor to ensure they are in compliance. This is a priority.</li> </ul> <p><i>Supporting Points:</i></p> <ul style="list-style-type: none"> <li>○ Our major contractors on Site C are subject to the Construction Safety Plan and are directly responsible for managing safety in their work areas for their workers and subcontractors.</li> <li>○ To monitor this, BC Hydro has an on-site team of safety professionals that work with the major contractors to ensure they're meeting all safety requirements.</li> <li>○ We track and manage all safety incidents and potential safety incidents, including near misses or observed hazardous conditions, in a centralized incident management tool.</li> <li>○ Once an incident is reported in the incident management system, it is reviewed by the safety team and corrective actions are developed, where needed.</li> </ul>
<p><b>8. You received an Order from CEAA in May 2017. What are you doing about this?</b></p>	<ul style="list-style-type: none"> <li>• BC Hydro is committed to meeting the conditions of our environmental approvals for the Site C project.</li> <li>• On May 25, 2017 we received an Order from CEAA that re-affirmed the contents of the earlier Notice of Intent to Issue an Order and outline measures to further improve our existing erosion and sediment control measures and expand on our already robust reporting in the three work areas identified.</li> <li>• All the measures identified were implemented prior to the deadline or on an ongoing basis as specified in the Order. We provided evidence of the improvements to the regulator once they were in place</li> </ul>

<p><b>9. Will there be any impacts to the project with Petrowest being terminated from PRHP and entering receivership?</b></p>	<ul style="list-style-type: none"> <li>• BC Hydro carefully manages all contracts on the project to protect our customers from commercial disputes and risks.</li> <li>• We're confident that the two remaining partners have the resources and ability to perform and deliver on the work they are contracted to provide, and we do not expect this development to have any impact on employment on the project.</li> <li>• Both Acciona and Samsung are large, multi-national corporations with extensive operations and experience in the development, engineering and construction of significant infrastructure projects.</li> <li>• The main civil works contract is setup as "joint and several", which means that if one partner is unable to continue, the other partners are responsible for completing the work.</li> </ul>
--	--

## Wiltshire, Farrah EMPR:EX

---

**From:** Magre, Leela <Leela.Magre@bchydro.com>  
**Sent:** Thursday, October 19, 2017 8:06 AM  
**To:** Haslam, David GCPE:EX  
**Cc:** Pilon, Lawrence; Zdravec, Don GCPE:EX; Grewar, Colin GCPE:EX; Scott, Mora; Sanderson, Melissa EMPR:EX; McNish, James EMPR:EX; MacLaren, Les EMPR:EX  
**Subject:** RE: Site C / BCUC  
**Attachments:** 2017\_10\_18\_SiteC\_BCH\_ALT\_PRTF.PDF

Good morning,

Here is the filing attached. There is a good summary from page 1 to the top of page 4. In short --

We identified a number of issues with the October 11th alternative portfolio sent around by the Commission for comment, which we discussed at a high level in our Saturday technical presentation. Altogether, these issues would increase the cost of the October 11th portfolio by approximately \$4 billion. The main issues are as follows:

- The portfolio assumes BC Hydro is stopping DSM if we build Site C, which is not correct
- It assumes BC Hydro builds and finances all alternative resources, also not correct
- The battery costs in the portfolio incorrectly exclude capital costs other than balance of system, operating costs of approximately \$10 million per year (for a 100MW installation) and operating energy losses of approx.7%, effectively understating the costs of batteries

I'm out of the office today, but you can reach me on my cell or email at any time if you have any questions.

Thanks,  
Leela

---

Leela Magre | Manager, Policy & Research

BC Hydro  
333 Dunsmuir St, 15th floor  
Vancouver, BC V6B 5R3

P 604 623 4008  
M 236 993 0338  
E leela.magre@bchydro.com

bchydro.com

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-----Original Message-----

From: Haslam, David GCPE:EX [mailto:David.Haslam@gov.bc.ca]  
Sent: 2017, October 19 6:48 AM  
To: Magre, Leela



Cc: Pillon, Lawrence; Zdravec, Don GCPE:EX; Grewar, Colin GCPE:EX; Scott, Mora; Sanderson, Melissa EMPR:EX; McNish, James EMPR:EX; MacLaren, Les EMPR:EX  
Subject: Re: Site C / BCUC

Thx. Including mo staff and Les.

Sent from my iPhone

> On Oct 18, 2017, at 9:10 PM, Magre, Leela <Leela.Magre@bchydro.com> wrote:

>

> Good evening,

>

> Attached is today's filing regarding the October 11th alternative portfolio. It will be posted by the BCUC sometime tomorrow.

>

> Thanks,

> Leela

>

> \_\_\_\_\_

>

> Leela Magre | Manager, Policy & Research

>

> BC Hydro

> 333 Dunsmuir St, 15th floor

> Vancouver, BC V6B 5R3

>

> P 604 623 4008

> M 236 993 0338

> E leela.magre@bchydro.com<mailto:leela.magre@bchydro.com>

>

> bchydro.com<<http://www.bchydro.com/>>

> Smart about power in all we do.

>

> From: Magre, Leela

> Sent: 2017, October 18 10:32 AM

> To: Pillon, Lawrence; David Haslam (David.Haslam@gov.bc.ca); Zdravec,

> Don GCPE:EX (Don.Zdravec@gov.bc.ca); Grewar, Colin GCPE:EX

> (Colin.Grewar@gov.bc.ca)

> Cc: Scott, Mora

> Subject: RE: Site C / BCUC

>

> Good morning,

>

> As a follow-up to Lawrence's email, we are filing today our comments on the October 11th alternative portfolio that the Commission requested feedback on (you will recall we discussed this in our meeting on Friday). We already addressed this topic with the Commission in our presentation on Saturday, and are providing more detail in writing as requested by the Commission. They have requested feedback from other parties as well.

>

> We've identified a number of issues with the October 11th portfolio, which we highlighted in the Saturday presentation. The main ones are as follows. All would increase the cost of the October 11th portfolio:

>

> \* The portfolio assumes BC Hydro is stopping DSM if we build Site C, which is not correct

>

> \* It assumes BC Hydro builds and finances all alternative resources, also not correct

>

> \* The battery costs in the portfolio incorrectly exclude capital costs of balancing the system, operating costs of approximately \$10 million per year and operating energy losses of approx.7%, effectively understating the costs of batteries

>

> We will send along the full filing once it has been submitted to the Commission (likely after close of business today).

>

> Thank you and let me know if you have any questions.

>

> Best,

> Leela

>

> \_\_\_\_\_

>

> Leela Magre | Manager, Policy & Research

>

> BC Hydro

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> Vancouver, BC V6B 5R3

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> bchydro.com<http://www.bchydro.com/>

>

> Smart about power in all we do.

>

> From: Pilon, Lawrence

> Sent: 2017, October 18 9:57 AM

> To: David Haslam

> (David.Haslam@gov.bc.ca<mailto:David.Haslam@gov.bc.ca>); Zadravec, Don

> GCPE:EX (Don.Zadravec@gov.bc.ca<mailto:Don.Zadravec@gov.bc.ca>);

> Grewar, Colin GCPE:EX

> (Colin.Grewar@gov.bc.ca<mailto:Colin.Grewar@gov.bc.ca>)

> Cc: Magre, Leela; Scott, Mora

> Subject: Site C / BCUC

>

> Hi

> Just a heads up that we will be filing another short submission to the

> BCUC later today, a follow-up from Saturday's proceedings. We were asked to provide comments on alternative scenarios. Leela will provide more.

>

> Lawrence

> \_\_\_\_\_

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> -BCHydroDisclaimerID5.2.8.1541  
> <2017\_10\_18\_SiteC\_BCH\_ALT\_PRTF.PDF>

# BC Hydro

Power smart

**Fred James**

Chief Regulatory Officer

Phone: 604-623-4046

Fax: 604-623-4407

[bchydroregulatorygroup@bchydro.com](mailto:bchydroregulatorygroup@bchydro.com)

October 18, 2017

Mr. Patrick Wruck  
Commission Secretary and Manager  
Regulatory Support  
British Columbia Utilities Commission  
Suite 410, 900 Howe Street  
Vancouver, BC V6Z 2N3

Dear Mr. Wruck:

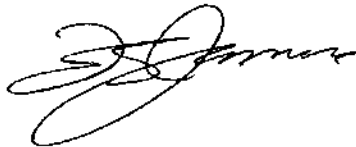
**RE: Project No. 1598922**  
**British Columbia Utilities Commission (BCUC or Commission)**  
**British Columbia Hydro and Power Authority (BC Hydro)**  
**Site C Inquiry – Alternative Portfolios**

---

BC Hydro writes to provide its comments on, and analysis of the BCUC's Alternative Site C Portfolios as requested by the Commission Panel in its letter of October 11, 2017 (A-22).

For further information, please contact Fred James at 604-623-4317 or by email at [bchydroregulatorygroup@bchydro.com](mailto:bchydroregulatorygroup@bchydro.com).

Yours sincerely,



Fred James  
Chief Regulatory Officer

fj/ma

Enclosure

---

## **Site C Inquiry**

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### **BC Hydro Submission on the BCUC Alternative Portfolios**

**October 18, 2017**

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## Attachments

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Attachment 1	BC Hydro Portfolio Cashflows
Attachment 2	October 11 Portfolio with Corrected Treatment of DSM Energy Savings
Attachment 3	October 11 Portfolio with Correct Battery Costs, Losses, and Operating Costs
Attachment 4	October 11 Portfolio with Consolidated Corrections

## Introduction

On October 11, 2017 the Commission provided a letter and attached spreadsheet requesting comment on three illustrative Alternative portfolios.

Overall BC Hydro believes that these portfolios make several assumptions regarding alternative resources that are either methodologically incorrect or unsupported. The combined cost impact of most of these incorrect or unsupported assumptions is estimated to be approximately \$4 billion under-estimate of the present value costs of the medium load scenario for the October 11 portfolio.

Further, BC Hydro is concerned with the reliance in the October 11 portfolio on resources that are not commercially feasible. Resource planning based on low probability unproven assumptions is not good utility practice and poses an unacceptable risk to ratepayers due to the potential for inadequate supply and high cost resources.

Portfolio analysis is a complex undertaking for which BC Hydro has developed its methods over the past ten years. Attempting to simplify this analysis in the manner provided in the October 11, 2017 letter (A22) and spreadsheet (A-22-1) will result in inaccuracies and the potential for errors. BC Hydro's energy planning tools and processes have been tested in technical advisory committees, Commission proceedings, and other regulatory processes. We recommend the Commission exercise caution in attempting to replace this robust analysis with an alternate methodology that is oversimplified, untested and subject to errors.

In order to provide the Commission with the information needed to understand the impacts of alternative assumptions on Site C's cost effectiveness, we have reflected the Commission's requested assumption sensitivities in our analysis provided in the response to BCUC IR 2.46.0. **We continue to believe this represents the best estimate of the impact of these assumptions on the costs to ratepayers of Site C termination.**



As highlighted in this document, simplified assumptions of what resources compete with Site C, errors in the application of planning criteria and translation of input assumptions into resource costs can have substantial impacts on the costs of portfolios. Correcting the issues with the October 11 portfolio increases the present value cost of this portfolio by approximately \$4 billion for the medium load scenario, and as a result cost comparisons based on this portfolio are not representative of the impacts to ratepayers of terminating Site C. While we have indicated how these errors may be addressed, we remain concerned that unidentified or new errors will occur with further application of this methodology.

Table 1 below summarizes BC Hydro's comments regarding the October 11 portfolio as well as approximate present value cost impacts if BC Hydro's concerns are addressed for selected items where BC Hydro has been able to conduct individual analysis. Each issue is discussed in further detail in the following sections.

**Table 1**                      **Summary of Concerns with  
October 11 Portfolio**

Issue	Document Reference	Potential Present Value Cost Impact <sup>1</sup>
A) Treats DSM as an alternative when it is included in all portfolios. This effectively assumes we cease DSM if we build Site C, which is not correct.	A-22, page 2 and A-22-1 Sheet: Med LF – portfolio Cells: Row 16	\$0.2 billion increase in cost of October 11 portfolio using Commission assumptions on cost of alternative resources. This would be a larger increase if more realistic cost assumptions are used for alternatives.
B) BC Hydro builds and finances all alternative resources. As BC Hydro has stated, we do not believe this is a realistic assumption.	A-22, page 5 (Financing costs, taxes)	\$0.8 billion increase in cost of Oct 11 portfolio.
C) Battery costs used in the analysis omitted the following: <ul style="list-style-type: none"> <li>Capital costs other than balance of system (i.e. batteries, power conversion system, construction and permitting).</li> <li>Operating costs of approximately \$10M per year for a 100MW installation.</li> <li>Operating energy losses of approximately 7%</li> </ul>	A-22, page 2 and A-22-1 Sheet: Med LF - portfolio costs Cells: D12 and D13	\$2.2 billion increase in cost of Oct 11 portfolio.

<sup>1</sup> Impacts have been estimated for the mid load scenario. Impacts may vary in the low load and high load scenarios.

Issue	Document Reference	Potential Present Value Cost Impact <sup>1</sup>
D) Capacity-focused DSM estimates are dated with significant deliverability risk	A-22, page 2 and A-22-1 Sheet: Med LF – portfolio Cells: Row 55	BC Hydro has not estimated an individual cost impact associated with this issue but expects the impact to be material.
E) Wind cost declines are optimistic.	A-22, page 7 (Wind – capital and O&M cost)	BC Hydro has not estimated a cost impact associated with this issue but expects the impact to be material.
F) Assumes Site C has less flexibility than a portfolio of alternative resources because of the size of Site C's reservoir. This is incorrect. The analysis fails to recognize Site C's flexibility is derived from Williston storage given Site C will be downstream with integrated operations.	A-22, page 8 (Shaping, Storage)	BC Hydro has not estimated a cost impact associated with this issue but expects the impact to be material.
G) Issues with assumptions regarding market pricing: <ul style="list-style-type: none"> <li>• Uses the market forwards for pricing energy surplus rather than market forecast. Market forwards are not appropriate for this purpose.</li> <li>• Assumes any Site C surplus has same export value as alternative portfolio. This fails to recognize the additional value we expect to receive for flexible generation products in external markets.</li> </ul>	A-22, pages 5-6 (Energy/Capacity surplus to BC Hydro need)	BC Hydro has not estimated a cost impact associated with this issue.
H) Other methodological issues: <ul style="list-style-type: none"> <li>• Double-counting of loss savings associated with DSM</li> <li>• Use of Total Utility Cost rather than Total Resource cost to estimate costs to ratepayers</li> <li>• Application of a 14% reserve requirement to DSM energy savings</li> <li>• Failure to recognize Site C sunk and termination cost recovery in the alternative portfolio</li> <li>• Failure to recognize Site C surplus trade value over the period of analysis</li> <li>• Does not account for the overlap between credits for energy and capacity</li> <li>• Contains errors related to calculation of timing of DSM costs</li> <li>• Does not include network upgrade costs for wind resources</li> <li>• Assumes availability of cost-effective geothermal resources.</li> </ul>	A-22 and A-22-1	BC Hydro has not estimated an individual cost impact associated with these issues but has included in our consolidated analysis.

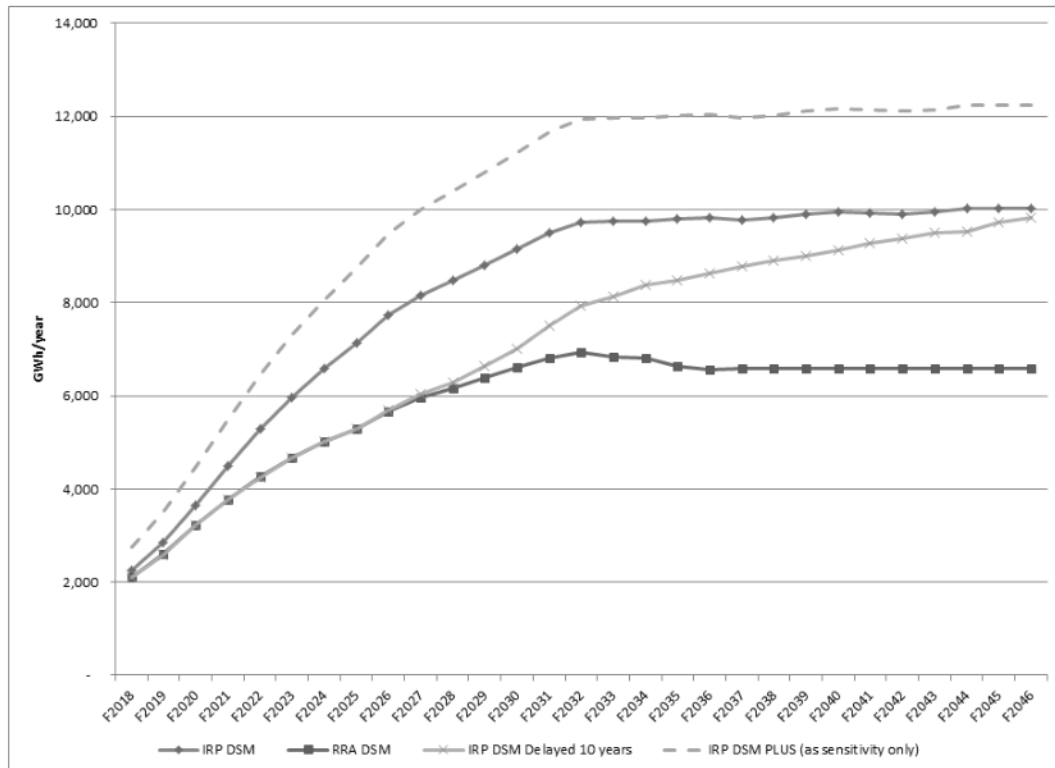
BC Hydro notes that the spreadsheet is complex and appears to have hard-coded data in the “portfolio” and “portfolio costs” sheets rather than working formulas (the “NPV” sheets have working formulas). This makes evaluation of the model more difficult as we cannot verify the calculations without reconstructing the formulas. As such, there remains the possibility of additional issues or errors in the model that BC Hydro has not identified here. In addition, we have focused our evaluation on the “Med LF” scenario. We have assumed, but not validated, that any issues with this scenario would be translated to the “Low LF” and “High LF” scenarios.

### **A) DSM is not an alternative to Site C**

The alternative portfolio provided by the Commission in its letter of October 11, 2017 shows energy and capacity resources sufficient to replace Site C. However, in selecting alternative resources it relies on DSM options that will be undertaken with or without Site C. Comparing the October 11 portfolio to Site C effectively presumes that in a future with Site C additional DSM activities will not be pursued. This is not the case, and cost comparisons from treating DSM as if it would not proceed with Site C are not representative of the impacts to ratepayers of terminating Site C.

BC Hydro expects to pursue additional DSM with or without Site C. This is because, as discussed in section 5.2.4 of Appendix L of the August 30 Filing, at \$57/MWh the levelized total resource cost of the IRP DSM plan is well below the cost of incremental alternative clean resources. As such, Site C will only change the timing of when DSM activities occur, not their overall level. Figure 1 (sourced from Figure L-1, Appendix L to the August 30 Filing) demonstrates the change in timing of DSM activities used in the mid load forecast analysis. In this scenario, the Clean Alternative Portfolio uses the “IRP DSM Plan” activity level and the Site C Portfolio uses the “IRP DSM Delayed 10 years” activity level. By 2047 the activity levels are approximately equivalent.

**Figure 1 DSM Energy Savings (Including Loss Savings, Mid Estimate)**

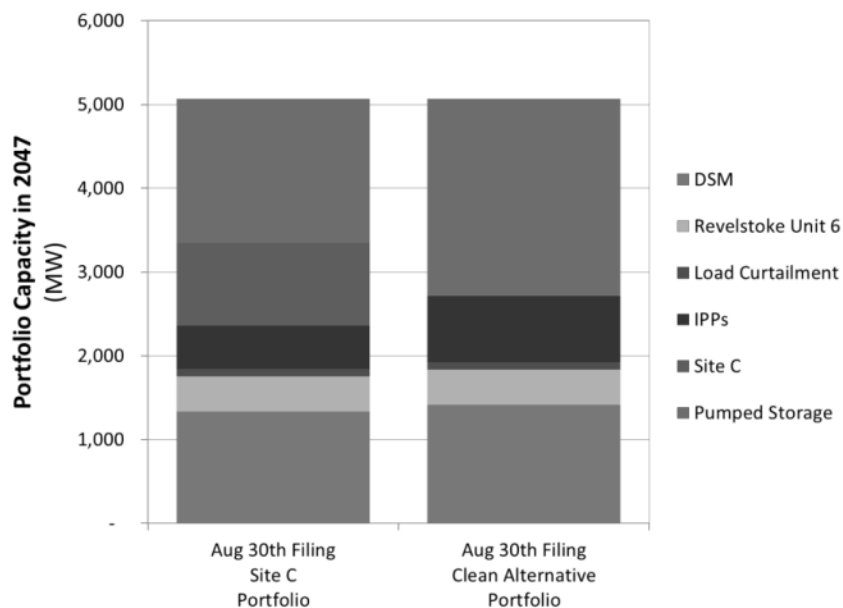


As highlighted by Mr. Reimann in our October 14, 2017 presentation, replacing Site C with incremental DSM may be representative of the short-term differences between portfolios (e.g., over a five-year timeframe), it is not sufficient for the long-term (e.g., years 6 to 70).<sup>2</sup> Figure 2 August 30 Filing Portfolio Compositions: Mid Load Forecast

compares the resources BC Hydro expects to use to meet domestic load growth over the next 30 years from a capacity perspective.

<sup>2</sup> Transcript Volume 14 (Technical Input Proceedings) page 1640.

**Figure 2 August 30 Filing Portfolio  
Compositions: Mid Load Forecast**



As shown, by 2047, there are several resources that are approximately the same in both the Site C portfolio and the Clean Alternative Portfolio, as follows:

- Demand side management
- Revelstoke Unit 6
- Load curtailment

The major differences in resources between the two portfolios are:

- Site C
- IPP energy resources (wind)
- Pumped storage

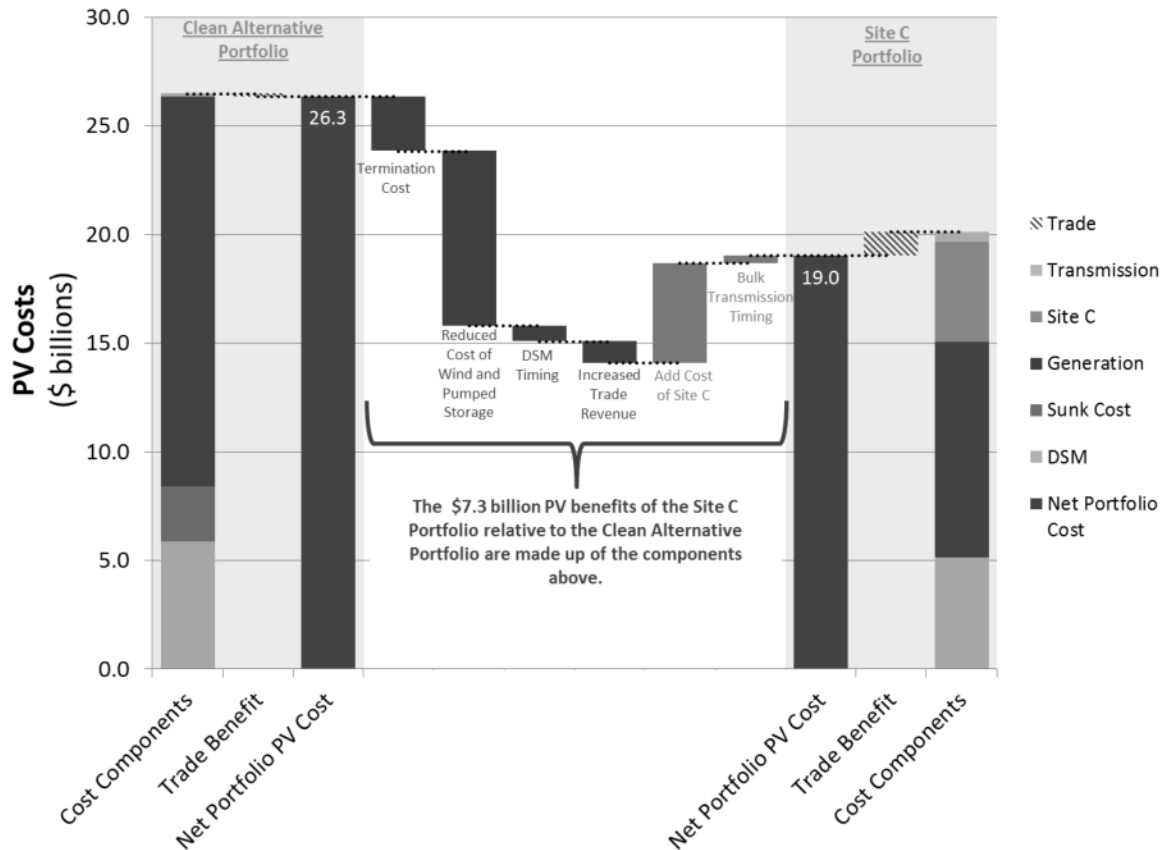
As one would expect, it is the major differences above that drive the differences in portfolio PVs.

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Figure 3 shows the key components that form the basis of the \$7.3 billion PV differential between the two portfolios identified in our August 30 Filing. The graph can be broken down into two key groups:

- The bars in the shaded areas under the headings “Clean Alternative Portfolio” and the “Site C Portfolio” demonstrate the incremental portfolio cost components of meeting the shortfall before DSM; the net trade value of each portfolio and the resulting net portfolio PV cost.
- The red and green bars between the two net portfolio PV costs show the breakdown of the key changes between the two portfolios. The red bars indicate reductions to portfolio costs and the green bars indicate increases to portfolio costs.

**Figure 3 August 30 Filing Portfolio PV Components and Differences: Mid Load Forecast**



As shown, the major difference in net portfolio PV costs results from:

- The cost of Site C net of termination costs; and
- The cost of wind and pumped storage resources.

As a result, wind and pumped storage are the true alternatives to Site C over the long term. The other three effects are DSM timing, trade revenue<sup>3</sup> and transmission

<sup>3</sup> The Site C portfolio has more trade benefits than the Clean Alternative portfolio. This is largely due to the short-term surplus created in F2025-F2031. In addition, we expect additional market value from surplus system capacity, flexibility and shaping that is not captured in our analysis.

resources,<sup>4</sup> all of which are relatively small. With respect to DSM, the Site C portfolio has a reduced DSM cost because by delaying the DSM ramp-up, the costs are also delayed. Therefore, the difference is largely the effect of discounting the incremental DSM cash flows over the DSM planned ramp up period.

In order to assist the Commission in their determinations, we have provided as Attachment 1 BC Hydro's costs of the two portfolios making up the comparison in Figure 3 above. Further, in Attachment 2 we have provided an update to the Commission's model to reflect the treatment of DSM as a timing consideration rather than an alternative and correcting other errors covered below. Isolating the correct treatment of energy-focused DSM results in portfolio costs approximately \$215 million higher on a present value basis than in the October 11 portfolio.

This is relatively low because of problems with the assumptions made with respect to wind and battery resources resulting in costs only slightly higher than DSM resources. The impact of changes to the treatment of DSM would increase substantially with more realistic assumptions regarding the costs of alternative resources as outlined in the sections below.

## **B) IPPs are better suited to building and financing alternative resources**

BC Hydro does not expect to finance alternative resources and cost comparisons that rely on the assumption that we finance IPPs are not representative of the impacts to ratepayers of terminating Site C. For over three decades, IPPs have been building run-of-river, wind and biomass resources in B.C. This is also the case worldwide. As we described in section 6.4.3 of our Reply Submission (F1-12) and our response to BCUC IR 2.42.0, this makes sense because each industry has specialized knowledge that makes them better suited for resource exploration and

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<sup>4</sup> The Site C portfolio has some differences in portfolio costs related to advanced timing of bulk system transmission resources. This is because the Clean Alternative portfolio includes significant pumped storage in the Lower Mainland which serves to delay incremental transmission requirements.



development. If BC Hydro were to explore and build these types of resources, we will hold substantially greater risk associated with their construction and operations. Further, in many cases IPPs already own the rights to resource sites, and are unlikely to sell these sites without some of their expected return on equity.

As an example, Figure 6 later in this document shows potential future cost declines for wind projects. IPP financing of a wind project that enters service in F2028 is expected to result in costs 40 per cent higher than costs that use BC Hydro financing.

BC Hydro has calculated the impact of this assumption in our consolidated corrections to the A-22-1 spreadsheet provided in Attachment 4. Isolating the effect of financing shows that IPP financing will increase the present value costs of the October 11 portfolio by approximately \$0.8 billion.

### **C) The full capital cost and losses of batteries must be accounted for**

The October 11 portfolio analysis appears to make several errors with respect to the treatment of battery resources. The largest of these is in capital costs – the October 11 portfolio bases the estimated capital costs only on Balance of System costs, and does not include other capital costs including the cost of the batteries themselves which are the largest component of this resource's capital cost.

In addition to the above, the alternative portfolio:

- Does not reflect the 7 per cent energy losses associated with the battery recharge cycle; and
- Does not include expected operations and maintenance costs for batteries (approximately \$10 million per year for a 100MW/1000MWh installation<sup>5</sup>).

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<sup>5</sup> <https://www.lazard.com/media/438042/lazard-levelized-cost-of-storage-v20.pdf>.

In addition to the cost and loss assumption errors, we note that assuming 400MW of low-cost batteries by F2025 is very unlikely and is not considered commercially feasible. In the entire US, there was approximately 500MW of utility-scale lithium ion batteries installed at the end of 2016 providing an average of 1 hour of storage – this would be an effective capacity of approximately 50MW for a 10 hour storage product. In Canada there is a total of 23 MW of installed battery capacity.

Battery storage system capital costs are made up of the following four component costs:

- Balance of system (**BOS**)
- Battery cost
- Power conversion system; and
- Engineering, permitting and construction cost.

The Commission states that,

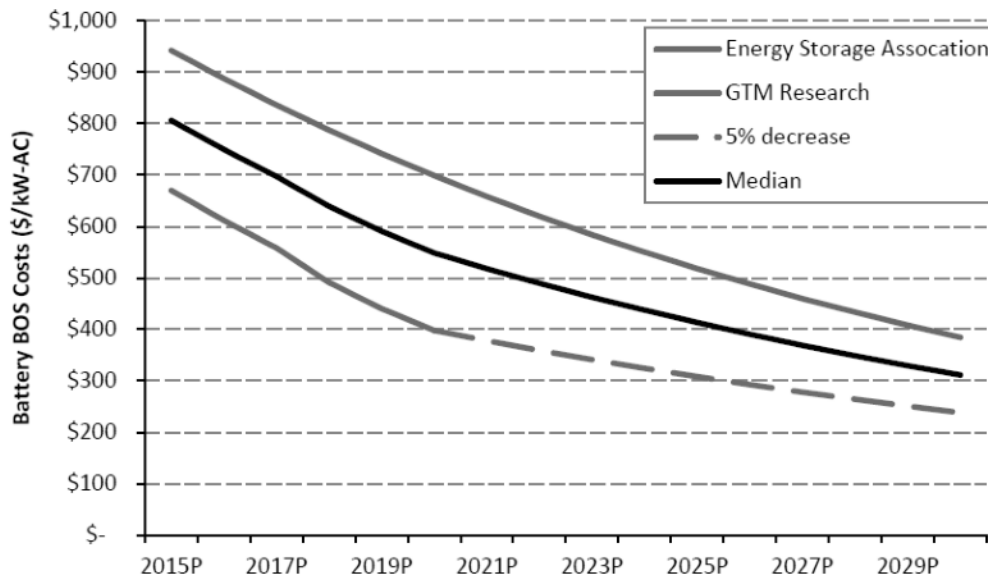
Battery costs were estimated from a graph (figure 18, median line) in an August 2016 NREL report “Exploring the Potential Competitiveness of Utility-Scale Photovoltaics plus Batteries with Concentrating Solar Power 2015-2030.” Costs were converted to Canadian dollars, and historical inflation estimates for F2015 to F2018 were taken from BC Hydro’s resource options spreadsheet. A 10-year battery life was assumed.

The cited figure from the August 2016 NREL report<sup>6</sup> is shown as Figure 4 below. It depicts the estimated capital costs of only the BOS for storage systems.

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<sup>6</sup> <https://www.nrel.gov/docs/fy16osti/66592.pdf>.

**Figure 4** August 2016 NREL Report: Estimated  
Battery Balance of System Costs,  
2015-2030



**Figure 18. Estimated battery BOS costs, 2015–2030**

Sources: GTM Research 2016; Roberts 2015

This figure does not include any of the other three cost components.

Table 2 summarizes the NREL and Lazard estimates of total installed cost for lithium-ion batteries in 2025, as provided in our response to BCUC IR 2.48.0. These costs include all four components of the installed cost described above for a ten-hour product over a 20-year life and do not include substantial annual operating and maintenance costs or the cost of battery recharge cycle losses.

**Table 2**      **Total Installed Cost of Lithium-Ion  
Batteries (100 MW/1,000 MWh System)**

<b>Cost Component</b>	<b>NREL Unit Cost (\$/kW)</b>	<b>Lazard Unit Cost (\$/kW)</b>
Batteries	5,000	6,260
Balance Of System <sup>7</sup>	800	Included in Battery Cost above
Power Conversion System	No information (assume equal to Lazard)	260
Other Costs – installation, commissioning, engineering, etc.	No Information (assume equal to Lazard)	910
<b>Total Installed Cost (\$US 2016)</b>	<b>\$6,970 (US)</b>	<b>\$7,430 (US)</b>
<b>Total Installed Cost<sup>8</sup> (\$Can 2016)</b>	<b>\$8,643 (Can)</b>	<b>\$9,213 (Can)</b>
<b>Convert to 2018 dollars and include Commission assumed 18.75% cost decline to 2025</b>	<b>\$7,306 (Can)</b>	<b>\$7,788 (Can)</b>

As discussed in our response to BCUC IR 2.48.0, pumped storage has a lower capacity cost than batteries and is therefore selected in our models as the preferred non-Site C capacity resource.

BC Hydro has updated the spreadsheet A-22-1 with corrected capital costs based corrected capital cost estimates and added in energy losses as well as operating and maintenance costs. Refer to Attachment 3. This increases the present value cost of the October 11 portfolio by approximately \$2.2 billion (from \$2.9 billion to \$5.1 billion).

<sup>7</sup> Refer to [Figure 2](#), median line for reference.

<sup>8</sup> 1US = 1.24 Can.

## **D) Capacity-focused DSM estimates are out-of-date and have significant deliverability risk**

The October 11 portfolio includes over 400 MW from optional time of use rates and up to 500 MW from demand response programs. Some of this potential has been sourced from BC Hydro's draft 2012 Integrated Resource Plan<sup>9</sup> and was based on assumptions that have since become outdated, or been refined. Overall, the October 11 portfolio assumes there is:

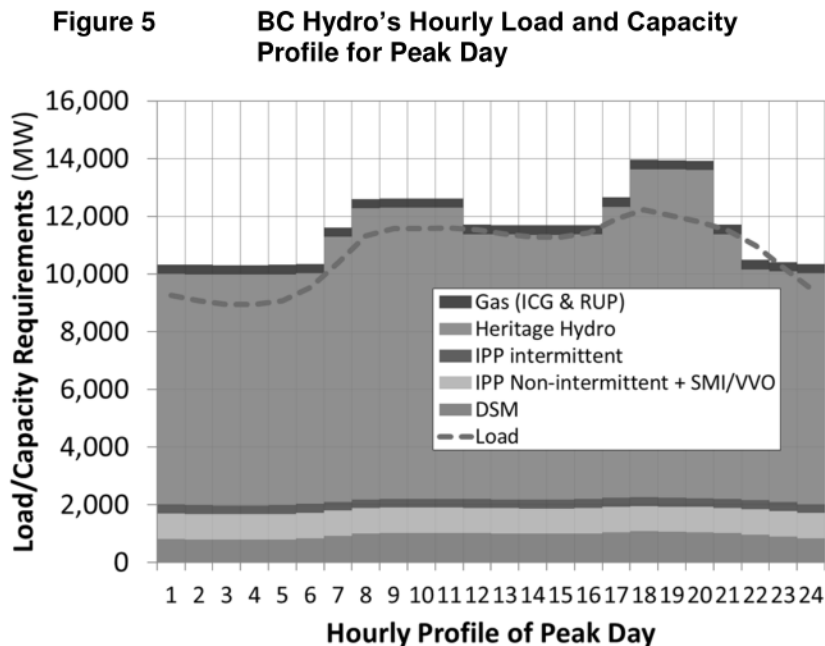
- Roughly twice the amount of capacity-focused DSM that BC Hydro believes is available (930 MW vs. 450 MW); and
- The capacity-focused DSM is at prices 70 per cent lower than BC Hydro believes is likely (\$15/kW-year vs. \$50/kW-year using Total Utility Cost – the gap is slightly larger when Total Resource Cost is used).

BC Hydro has provided updated estimates of potential capacity-focused DSM savings in our response to BCUC IR 2.73.0. While there remains significant deliverability risk with these updated estimates, we believe they are more realistic than the outdated information from the draft 2012 IRP. We believe higher levels of capacity-focused DSM are not commercially feasible.

One of the key findings since the draft 2012 IRP has been the requirement for a minimum ten-hour capacity product and not the four-hour product contemplated in the draft 2012 IRP. Figure 5 demonstrates how BC Hydro's peak capacity resources compare to BC Hydro's load shape on a day during a winter cold snap.

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<sup>9</sup> The Commission sources this information from one of the submissions of Philip Raphals to the Joint Review Panel (provided by West Moberly and Prophet River First Nations in F28-2). BC Hydro provided a rebuttal report in response to submissions of Philip Raphals available at <http://www.ceaa.gc.ca/050/documents/p63919/97291E.pdf>.



The periods when the sources of supply are closest to the load extend from the morning (6 a.m.) through to the late evening (11 p.m.) and include the shoulder time between the morning and evening peak loads. This means that if the load were to increase in a uniform manner across all hours, there is the potential to be short during these times. As a result BC Hydro needs a minimum ten-hour product to deal with shortfalls. Refer to the response to BCUC IR 3.19.0 for further discussion.

The key differences between the current analysis and the draft 2012 Integrated Resource Plan include:

- More recent research shows that the TOU response by General Service (i.e. commercial and light industrial) customers may not reach the levels contemplated in the draft 2012 Integrated Resource Plan:** The 400 MW estimate in the draft 2012 IRP assumed that 30 per cent of general service customers achieved capacity savings through optional time based rates. Response by general service customers accounted for almost half (185 MW) of the 400 MW estimated impact. Research and experience since 2012 indicates that general service customers may be less responsive to such complex pricing

schemes than other customers. Given this more recent knowledge, our refined estimate of savings from time based rates among general service customers reflects 13 per cent participation<sup>10</sup> rather than 30 per cent participation. For example,

- ▶ *Analysis of Ontario's Full Scale Roll-out of TOU Rates – Final Study, for Ontario's Independent System Operator, February 2016*, found that:  
“General service class customers show little evidence of load shifting behavior and are less responsive to the TOU prices than residential customers.”<sup>11</sup>
- ▶ Likewise, *Evaluation of the Large and Medium General Service Conservation Rate, for BC Hydro, January 2015* found that “Only a small portion of [general service] customers were able to correctly identify their rate structure....” And that that “various inputs to the rate.... were perceived as too difficult for customers to measure and manage themselves”.
- **The draft 2012 Integrated Resource Plan's time-based rates estimates included rate designs that provided capacity savings over limited durations which on their own would not be not sufficient to meet BC Hydro's peak capacity requirements:** The 400 MW estimate included approximately 140 MW of capacity savings assumed to be obtained through Critical Peak Pricing, which imposes a very high price for electricity consumed during the critical peak event. Critical Peak Pricing tariffs usually allow for a short duration and limited number of events per year. For example:
  - ▶ Southern California Edison allowed for 12 Critical Peak events per year of four hours each.<sup>12</sup>

<sup>10</sup> This participation estimate was based on Brattle Group's Pricing Program Database (PacifiCorp Demand Response potential Study; Vol. 5; Class 1&3 Appendix; February 2017).

<sup>11</sup> The study's definition of “General Service” is equivalent BC Hydro's small general service customers and the smaller of our medium general service customers.

<sup>12</sup> Cal. PUC Sheet No. 60078-E, Rate Schedule TOU-D effective September 30, 2016.

- ▶ San Diego Gas & Electric Company allowed for 18 Critical Peak events per year, at seven hours each.<sup>13</sup>
- ▶ Xcel energy in Colorado allowed for 15 critical peak events per year, at four hours each.<sup>14</sup>

As a result of these restrictions, the timing and availability of capacity savings from critical peak pricing is limited, and other supply and demand side resources are more likely to be pursued. Given this limitation, BC Hydro has not included critical peak pricing in our refined estimate of savings from time based rates that was presented in our response to BCUC IR 2.73.0.

- **The October 11 portfolio assumes more demand response savings than are available:** BC Hydro is uncertain of the source of the 500 MW demand response estimate. The 2012 draft Integrated Resource Plan shows approximately 250 MW of potential by F2032 so it is unclear what the basis is for the October 11 portfolio's estimate of up to 500 MW of demand response programs. Since the draft 2012 Integrated Resource Plan we have better information on demand response technologies as a result of our pilot activities in this area showing 210 MW of potential savings, which has been reflected in the estimates provided in the response to BCUC IR 2.73.0..

Table 3 provides BC Hydro's refined estimates of optional time based rates savings, load curtailment and demand response, as provided in our response to BCUC IR 2.73.0. As shown:

- Available volumes are roughly half of the 930 MW that have been included in the October 11 portfolio.
- Pricing is over three times the effective cost of capacity DSM used by the October 11 portfolio (calculated to be \$15/kW-year from spreadsheet A-22-1).

<sup>13</sup> California Public Utility Sheet No. 21479-E, effective January 1, 2010.

<sup>14</sup> COLO. PUC No. 8 Electric, Rate Schedule PG-CPP effective January 2017.



**Table 3**      **Estimated Capacity Savings from  
BC Hydro's Capacity Focused DSM  
Programs**

	<b>Estimated Capacity Savings (MW)</b>		<b>Levelized Costs (\$/kW-year)</b>	
	in F2023	in F2027	TUC	TRC
Direct Load Control Programs (Res, SGS, MGS)	170	210	55	70
LGS Load Curtailment	100	120	75	60
Time of Use Rates (all classes, incl. EV)	80	120	10	10
<b>Total</b>	<b>350</b>	<b>450</b>	<b>50</b>	<b>55</b>

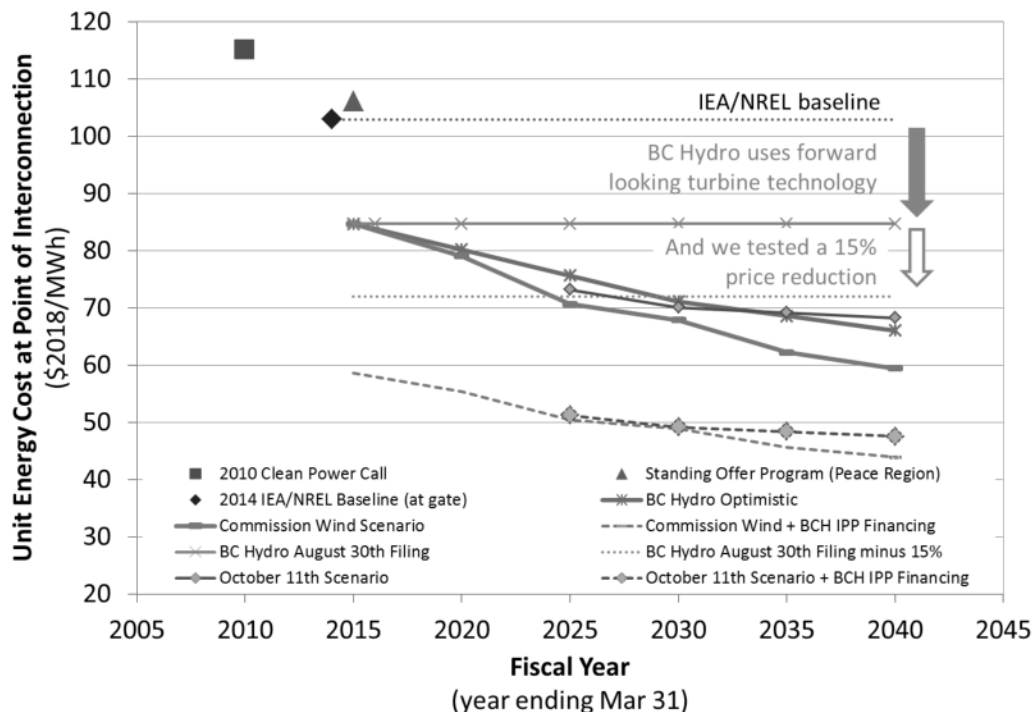
These assumptions were included in the capacity focused DSM values modelled in BC Hydro's Optimistic Portfolio Sensitivities described in our response to BCUC IR 2.46.0. These potential savings may grow beyond F2027 (as much as 133 additional MW) as electric vehicle penetration increases.

We note that these volumes and prices come with substantial deliverability and cost risk as they make assumptions regarding uncertain future customer response. Portfolios which rely on these resources will have higher availability risk overall. BC Hydro does not believe these resources are sufficiently certain to include in our resource stack, and thus did not include these resources in our August 30 Filing analysis. We have tested the inclusion of these resources in our Optimistic Portfolio Sensitivities.

## **E) Wind cost declines are below median estimates**

As described in the response to BCUC IR 2.44.0, BC Hydro examined an optimistic wind cost decline in our BC Hydro Optimistic Portfolio sensitivities. [Figure 6](#) demonstrates a comparison of wind costs from recent acquisition processes relative to our current wind cost scenarios presented in BC Hydro's August 30 Filing and the sensitivity analyses described in the response to BCUC IR 2.44.0.

**Figure 6 Wind Cost Decline Assumptions**



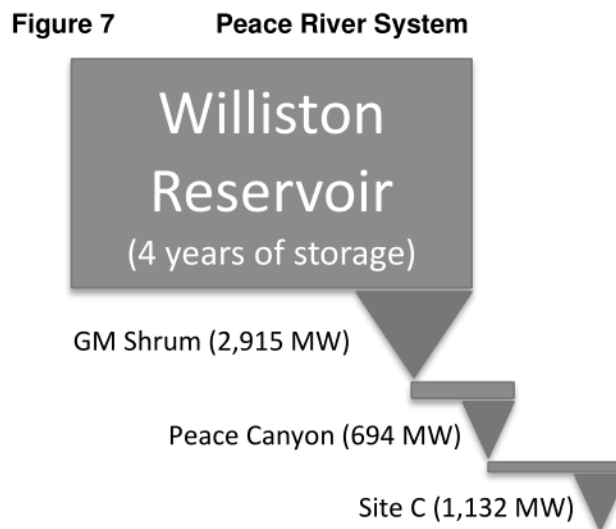
BC Hydro's August 30 Filing included sensitivity analysis with a 15 per cent reduction in our forward-looking price for wind. BC Hydro's Optimistic Portfolio sensitivity assumes that future B.C. onshore wind unit energy costs drop by 16 per cent, 22 per cent and 27 per cent by 2030, 2040 and 2050, respectively. [Figure 6](#) demonstrates that the October 11 scenario is very similar to BC Hydro's Optimistic Portfolio Sensitivity provided in the response to BCUC IR 2.46.0. The decline represents a 36 per cent reduction in unit energy cost since the 2010 Clean Power Call by fiscal 2025.

## F) The Williston Reservoir is the key source of Site C's seasonal shaping capability

The October 11 portfolio description states that "The Site C reservoir does not have sufficient storage volumes to provide seasonal shaping of generation. The Alternative Portfolio also does not provide seasonal shaping of generation." This

assessment of Site C is incorrect. Site C has seasonal shaping and firming capabilities, primarily due to its location downstream of Williston Reservoir (rather than due to the Site C reservoir itself).

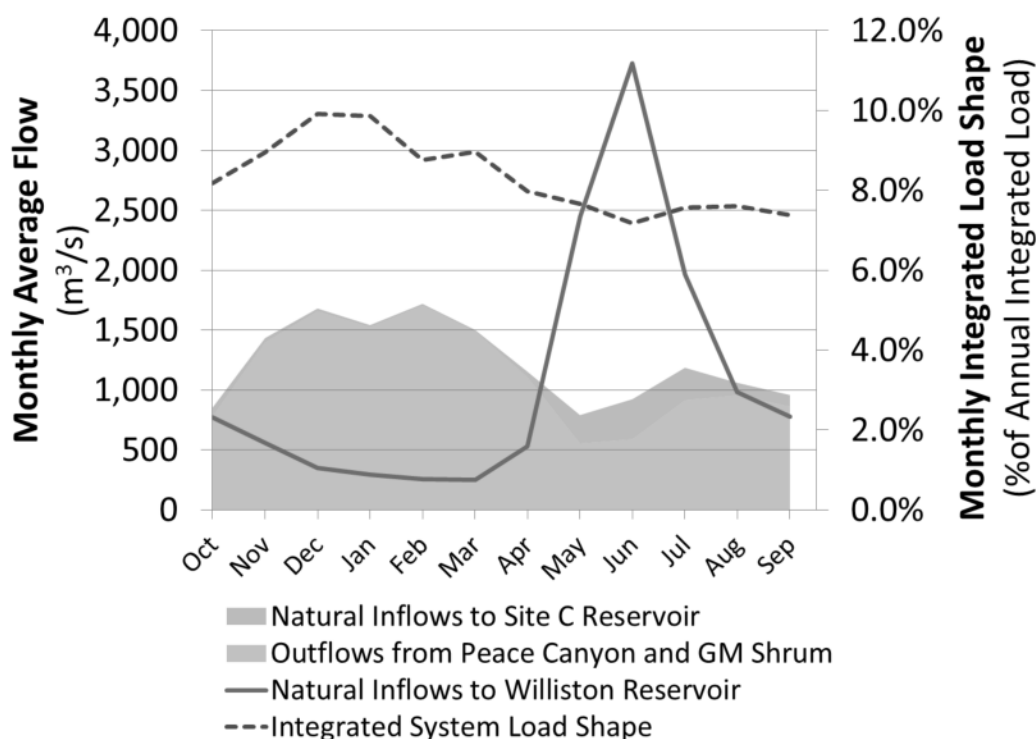
Figure 7 shows that Williston Reservoir provides over four years of storage capability and can be used for seasonal shaping of generation at Site C. Outflows from Williston go through Peace Canyon and will go through Site C, with only minor delays (refer to the response to BCUC IR 2.22.6 for the Site C monthly generation profile). As a result, the seasonal shaping benefits of the Williston Reservoir will also apply to Site C.



When GM Shrum is operating, BC Hydro also operates Site C and Peace Canyon in a similar manner to ensure coordination between the projects. BC Hydro shapes the operation of these projects to high value periods according to system needs and surplus value.

Figure 8 demonstrates that the inflows into Williston are shaped into high value periods in the winter to match BC Hydro's monthly load profile – i.e. Site C inflows are already seasonally shaped.

**Figure 8 Monthly Inflows to the Site C Reservoir**



Site C generation enhances the value of the storage in Williston Reservoir and adds to overall system seasonal firming and shaping capability. In addition, the Site C reservoir provides both daily and multi-day firming and shaping benefits that can be used to integrate intermittent wind and solar resources. The seasonal shaping and firming benefits of downstream reservoirs are seen today at our existing facilities at Peace Canyon and Revelstoke.

## **G) Issues with market price assumptions**

### **1. The forward price is not a long-term price forecast**

The October 11 portfolio assumes a fiscal 2025 forward market price for Mid-C power of \$30/MWh (USD) to apply to surplus spot market energy sales in their portfolio analysis. The forward market curve is a record of real short term electricity transactions that are completed to lock in prices. This is not, however, a market price forecast for the following key reasons:

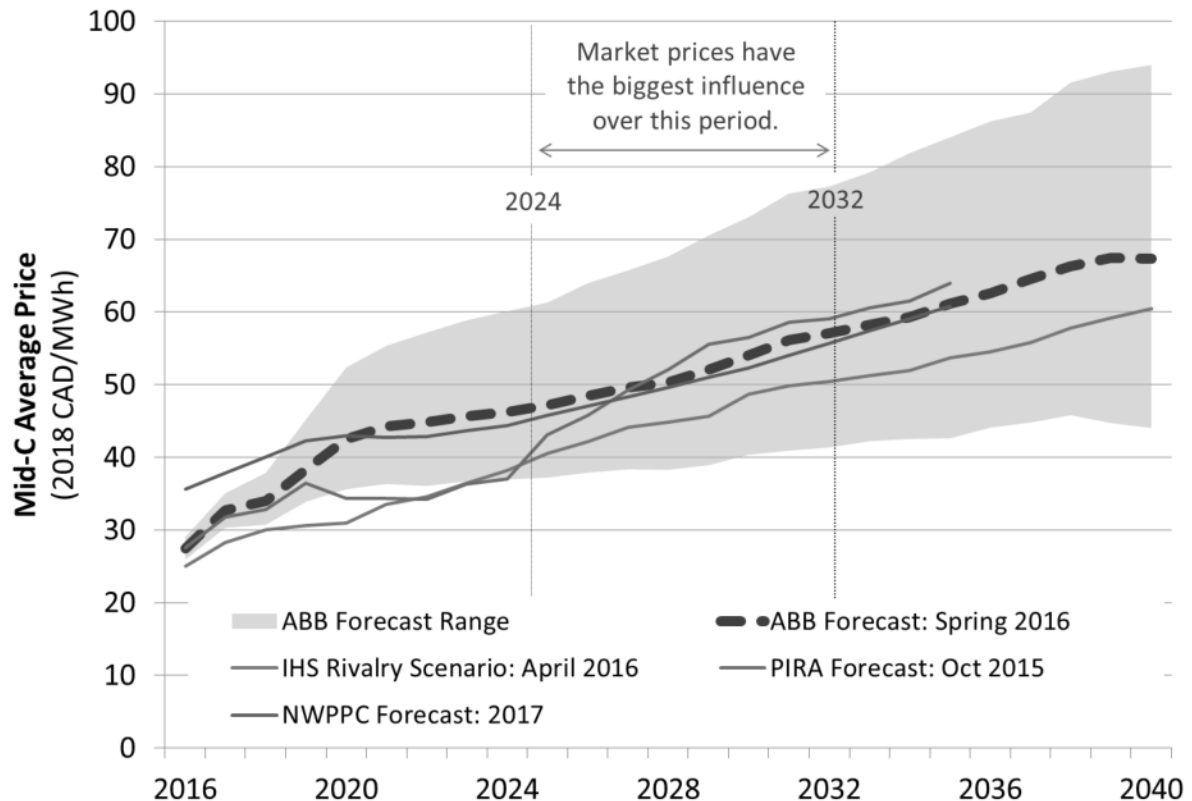
- As discussed by Mr. Bechard on October 14, 2017 the number of transactions for electricity in later years (e.g., in fiscal 2025) declines significantly because customers today aren't as willing to commit to prices so far out in time. As a result, forward prices for a year such as fiscal 2025 are not representative of the highly liquid Mid-C spot electricity market prices that are expected to be seen in fiscal 2025; and
- Forward prices are established based on what participants are willing to pay today for price certainty, rather than their true expectations of future market fundamentals and prices.

As discussed in BC Hydro's response to BCUC IR 2.22.1, BC Hydro subscribes to the ABB reference case which simulates the operation of over 40 locations in the WECC to determine the market clearing price on an hourly time step. For each region, the ABB model considers:

- Individual power plant characteristics including heat rates, start-up costs, ramp rates, and other technical characteristics of plants;
- Transmission line interconnections, ratings, losses, and wheeling rates;
- Forecasts of resource additions (including renewable resources and pricing declines) and fuel costs over time;
- Forecasts of loads for each utility or load serving entity in the region; and
- The cost and availability of fuels that supply the plants.

ABB's reference case is used by over 100 customers worldwide. [Figure 9](#) below demonstrates that the ABB reference case forecast for the Mid-C market is in the range of three other Mid-C market price forecasts and is well above the \$37.60/MWh (\$2025 CAD) that is adjusted to \$25/MWh (\$2018 CAD, adjusted for wheeling and losses) and used in the October 11 portfolio.

**Figure 9 Mid-C Average Price Forecast Comparison**



In addition, these comparator forecasts shown in [Figure 9](#) are all higher than the “Low Market Price” scenario (shown as the bottom of the “ABB Forecast Range”) which was tested in the BC Hydro Optimistic Portfolio Sensitivities and the Commission Portfolio Sensitivities provided in BC Hydro’s response to BCUC IR 2.46.0.

## 2. BC Hydro expects to market capacity products at a premium

While BC Hydro is pursuing Site C to serve domestic load, it is expected that any short-term surplus energy and capacity will have additional value over and above what is currently captured by our long-term market forecast. As discussed by Mr.

Bechard in our October 14, 2017 presentation to the Commission, the clean, flexible capacity offered by Site C is expected to be increasingly needed in western markets as renewable resources (wind and solar) replace base load resources, such as coal and nuclear generation. These benefits are in addition to the value provided on Site C capacity in BC Hydro's portfolio modelling.

In terms of surplus markets, BC Hydro and Powerex are seeing significant retirements from western base load coal, nuclear and natural gas resources in the next ten to 15 years. For example:

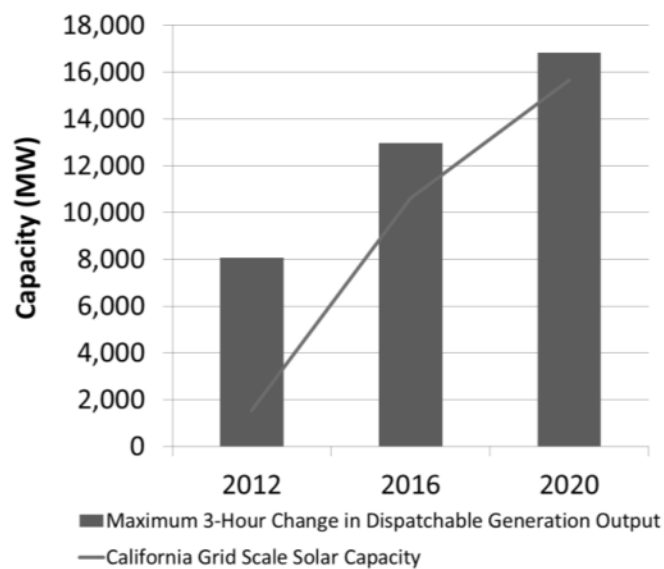
- Pacific Northwest: over 2,500 MW of coal generation shut down by 2025;
- Alberta: over two-thirds (>6,000 MW) of coal generation shut down by 2030; and
- California: 7,500 MW of nuclear and natural gas generation shut down by 2025.

With significant regional renewable energy targets, much of this generation will be replaced with renewable resources which provide limited reliable capacity and require flexible backup capacity to respond to changes in generation. With the increased penetration of such variable resources, Alberta and California are looking to develop new markets for capacity and flexibility, respectively.<sup>15</sup> [Figure 10](#) demonstrates the growing requirement for flexible, dispatchable capacity in California in response to increased solar generation penetration.

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<sup>15</sup> Refer to the response to BCUC IR 2.22.1.

**Figure 10**      **Solar Generation Penetration and  
Dispatchable Generation  
Requirements in California**

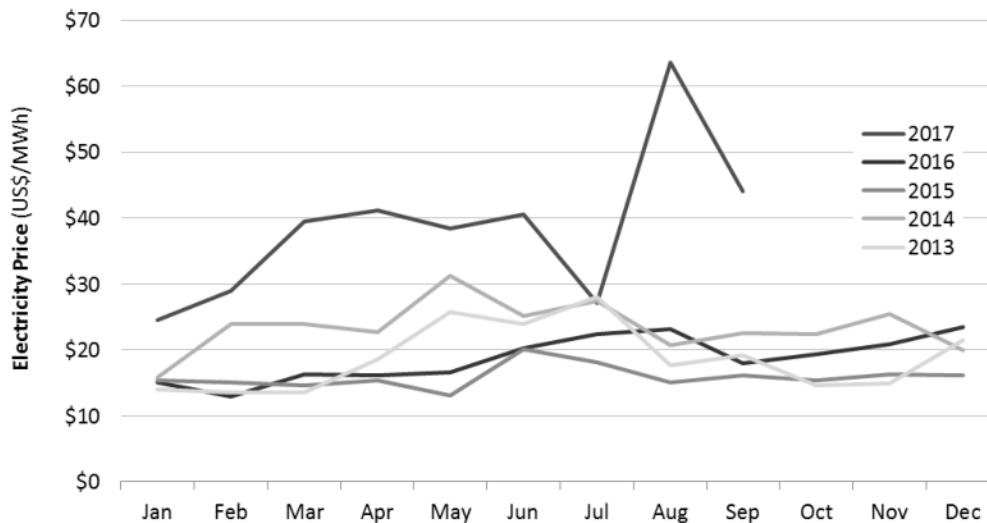


This flexibility is particularly important for solar because the time when the sun goes down in California coincides with an increase in peak load, amplifying the need for dispatchable resources that can increase generation quickly as more solar resources are added to the system. For wind, the dispatch requirement is more to respond to intermittency within the hour – Site C can also provide this flexibility.

Powerex can provide up to 2,500 MW of the identified need using its existing transmission rights to California and its sources of flexible generation, including Site C. [Figure 11](#) below demonstrates the monthly averages of price differences between the highest priced four hours and lowest priced four hours for each day from the California Independent System Operator (CAISO). It shows that 2017 is starting to see some significant growth in pricing differentials which aligns to the trends forecasted in [Figure 10](#).



**Figure 11 CAISO Intra-day Price Volatility  
(Average Difference between Highest  
Prices Four Hours and Lowest Priced  
Four Hours by Day)**



As discussed above, the storage behind Williston Reservoir will allow Site C generation to preferentially use and store water at appropriate times of the day to take advantage of these differentials during the day and during the year. Based on this higher premium for flexible resources, portfolios including Site C would expect to obtain higher prices on market exports than portfolios excluding Site C.

## H) Other Methodological Issues

BC Hydro notes that there are several other methodological issues with the assumptions in A-22 and the calculations in the A-22-1 spreadsheet.

### 1. The energy-focused DSM volumes double-count loss savings.

- As stated in A-22 on pages 6 to 8, the October 11 spreadsheet applies 11 per cent loss savings on top of the volumes provided by BC Hydro in the response to BCUC IR 2.64.0.
- The volumes provided in BCUC IR 2.64.0 already included loss savings. As stated in BCUC IR 2.64.0:

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*“The information presented in Appendix L and Attachment 1 to this response reflects energy savings **grossed up to the system level to reflect losses** and the cost reflects adjustments for the value of capacity.” (emphasis added)*

- Thus the October 11 portfolio has applied the 11 per cent gross-up factor twice. This over-estimates DSM savings by approximately 380GWh/year by year 20 of the analysis period.

## **2. DSM costs use the Total Utility Cost rather than the Total Resource Cost**

- A-22 states on page 7, “...societal costs/benefits of energy efficiency DSM have not been included” and “The cost of energy efficiency DSM has therefore been included at the utility cost to BC Hydro...”. BC Hydro notes that the costs included in the Total Resource Cost are real direct costs to its ratepayers from either rate impacts or customer costs of implementing DSM. Refer to the response to BCUC IR 2.64.0 for further discussion on why Total Resource Cost is the appropriate metric to use for comparing resource options.
- The impact of utilizing Total Utility Cost rather than a Total Resource Cost is an under-estimation of the present value cost to ratepayers of the DSM portfolio of \$220 million over the period to 2047. This under-estimation will increase for longer analysis periods.
- As reference in the response to BCUC IR 2.64.0, the Commission acknowledged that the total resource cost test was the appropriate metric to compare DSM to supply-side resources in its 2009 Decision on BC Hydro’s 2008 Long-Term Acquisition Plan Application:

The Commission Panel agrees with BC Hydro and finds that when comparing the [unit energy cost] UEC of a DSM program with the [unit energy cost] UEC of a supply-side option, the appropriate metric upon which to compare levelized \$/MWh is the TRC. [p. 72]

**3. The portfolio applies a 14 per cent reserve requirement to DSM**

- BC Hydro uses a 14 per cent reserve requirement on capacity from generating resources (e.g., Site C or wind). However, we do not require the 14 per cent extra from demand side resources (such as energy focused DSM) – rather, we treat DSM and its uncertainty as an offset to load.
- Note that we expect greater deliverability risk associated with capacity focused DSM than energy focused DSM. As such, we expect to apply a planning reserve requirement from capacity focused DSM.
- As a result, the October 11 portfolio has more DSM capacity resources than would be required under BC Hydro's planning criteria to replace a generation resource such as Site C.

**4. Any comparisons to Site C must include recovery of sunk and termination costs and trade revenues**

- The October 11 portfolio does not include the recovery of Site C sunk costs, nor the costs associated with termination of the Project and remediation of the site. These are costs that occur in any Site C termination scenario, and should either be added to the alternate portfolio or subtracted from the cost of the Site C portfolio.

**5. Surplus energy value must be applied to Site C to allow for a comparison with the October 11 portfolio.**

- As stated in A-22 on page 5, the October 11 spreadsheet calculates surplus energy revenue for energy that exceeds the gap to fill and is surplus to BC Hydro requirements. BC Hydro notes that a Site C portfolio would also have surplus energy revenues during the period F2024 through to F2031, when Site C energy is surplus to BC Hydro requirements. Any comparison of the October 11 portfolio to Site C should include a credit for

the value of any surplus energy as has been done for the October 11 portfolio.

#### **6. Overlap between energy and capacity credits**

- As stated in A-22 on page 6, the October 11 spreadsheet applies a 50 \$/kW-year credit to any capacity of the Alternative portfolio that exceeds the capacity required to fill the load resource gap and is used to meet BC Hydro's domestic load requirements. The October 11 spreadsheet also proportionately reduces the cost of the October 11 portfolio if the energy of the October 11 portfolio exceeds the gap and is used to meet BC Hydro's domestic load requirements. These two adjustments are calculated independently and credited additively. This applies a capacity credit to the full-size portfolio, failing to recognize that the proportional reduction done for energy would also reduce the capacity credit by the same proportion.

#### **7. Error in timing of DSM costs**

- BC Hydro notes that the October 11 spreadsheet has erroneously applied DSM costs one year later than the associated savings. This understates the cost of the October 11 portfolio.

#### **8. Wind resources will require network upgrade costs**

- Network upgrade costs are the costs of upgrades required between the point of interconnection of a new resource and the bulk transmission system. These costs must be added to the overall cost of alternative resources. BC Hydro has estimated the network upgrade costs for resources with low capacity factor (e.g., wind, run-of-river) to be \$6/MWh

and for resources with high capacity factor (e.g., biomass, geothermal) to be at \$3/MWh.<sup>16</sup>

- In comparison, Site C interconnects directly to the bulk system and the associated network upgrade costs are already included in its cost estimate. Similarly for pumped storage, BC Hydro has already included network upgrade cost into its cost estimate at point of interconnection because the 1000 MW facilities modeled are expected to interconnect directly to the bulk system.

#### **9. Assumes availability of cost-effective geothermal resources**

- BC Hydro continues to believe that relying on assumptions regarding inexpensive geothermal resources is inconsistent with good utility practice given the lack of commercially proven resources in B.C. Refer to the response to BCUC IR 2.61.0 and Appendix L to our August 30 Filing.
- BC Hydro notes that the two Borealis geothermal projects that Ms. Thompson (CanGEA) stated have 81 MW confirmed at a P90 level<sup>17</sup> have not yet drilled a well.

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<sup>16</sup> These estimates are based on weighted average of network upgrade cost from the Clean Power Call results (2010). Network upgrade costs were provided in the interconnection studies conducted for each project in the Clean Power Call.

<sup>17</sup> Transcript Volume 14 (Technical Input Proceedings) pages 1497-1498

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## Consolidated Analysis of Identified Issues

BC Hydro has modified the October 11 spreadsheet (A-22-1) to address the consolidated effect of the following issues:

- Inclusion of DSM in the analysis as a timing consideration rather than a true alternative to Site C.
- Application of IPP finance costs to alternative resources rather than BC Hydro finance costs.
- Correction of battery costs to include the omitted capital components, energy losses, and operating costs, with an option to utilize pumped storage capacity costs instead.
- Correction of most of the methodological issues identified in section H.

This spreadsheet is provided as Attachment 4, and demonstrates that the consolidated impact of these corrections is estimated to be \$3.9 billion. This analysis has been done on a preliminary basis only to demonstrate the magnitude of the impacts of these changes. This analysis is not intended to replace BC Hydro's existing portfolio analysis provided in the August 30 Filing and in the response to BCUC IR 2.46.0.

This analysis includes a switch of the capital cost for non-DSM capacity resources to be based on pumped storage rather than battery costs. Batteries are substantially more expensive than pumped storage even with potential future cost declines, and had this change had not been made the October 11 portfolio present value costs would have increased by \$9.9 billion rather than \$3.9 billion.

## Conclusion

The October 11 portfolio is not a portfolio of commercially feasible generating projects and demand-side management initiatives that provides similar firming, shaping, storage, grid reliability, and greenhouse gas benefits at a similar or lower cost than a portfolio including Site C provides. As shown in this response, the October 11 portfolio is:

- More expensive than a portfolio with Site C.
- Includes resources that are not commercially feasible.
- Does not provide the same firming, shaping, and storage capability as Site C.

In response to section 3(b)(iv) of the terms of reference, BC Hydro has developed portfolios of commercially feasible generating projects and demand-side management initiatives at optimistic prices and provided portfolio unit energy costs in our responses to BCUC IRs 2.46.0 (with assumptions shown in BCUC IR 2.44.0). That analysis showed that these portfolios are all more expensive than Site C, even with significant Site C cost overruns and low load growth.

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**Site C Inquiry**  
**BC Hydro Submission on**  
**the BCUC Alternative Portfolios**

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**Attachment 1**  
**BC Hydro Portfolio Cashflows**



## **REFER TO LIVE SPREADSHEET MODEL**

**Provided in electronic format only**

**(Accessible by opening the Attachments Tab in Adobe)**

**Site C Inquiry**  
**BC Hydro Submission on**  
**the BCUC Alternative Portfolios**

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**Attachment 2**  
**October 11 Portfolio with**  
**Corrected Treatment of DSM Energy Savings**

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**Site C Inquiry**  
**BC Hydro Submission on**  
**the BCUC Alternative Portfolios**

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**Attachment 3**  
**October 11 Portfolio with Correct Battery Costs,**  
**Losses, and Operating Costs**

**Site C Inquiry**  
**BC Hydro Submission on**  
**the BCUC Alternative Portfolios**

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**Attachment 4**  
**October 11 Portfolio with**  
**Consolidated Corrections**

**From:** [EMPR FOI EMPR:EX](#)  
**To:** [Wiltshire, Farrah EMPR:EX](#)  
**Subject:** FW: Submissions to BCUC - EMP - 2017-73449  
**Date:** Monday, January 8, 2018 12:50:30 PM

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From: Sanderson, Melissa MEM:EX  
Sent: Friday, September 29, 2017 4:44 PM  
To: Lawrence.Pillon@bchydro.com  
Subject: Submissions to BCUC

Hi Lawrence,

I do not see your submissions on the BCUC site - can you tell me where I can find them?

Sent from my iPhone

**From:** [EMPR FOI EMPR:EX](#)  
**To:** [Wiltshire, Farrah EMPR:EX](#)  
**Subject:** FW: Submissions to BCUC - EMP 2017-73449  
**Date:** Monday, January 8, 2018 12:48:11 PM

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**From:** Sanderson, Melissa MEM:EX  
**Sent:** Friday, September 29, 2017 5:29 PM  
**To:** Magre, Leela  
**Cc:** Pillon, Lawrence  
**Subject:** Re: Submissions to BCUC

Thanks Leela - I saw those but didn't see today's submission. Wondered if you posted them on your site.

Sent from my iPhone

On Sep 29, 2017, at 5:21 PM, Magre, Leela <[Leela.Magre@bchydro.com](mailto:Leela.Magre@bchydro.com)> wrote:

Hi there,

The submissions can be found here: <http://www.sitecinquiry.com/submissions-and-comments/?sorts%5BidNumber%5D=1>

It appears they haven't yet posted the small number of IR responses that were filed today. I can forward those to you.

Thanks!  
Leela

Sent from my iPhone

On Sep 29, 2017, at 5:02 PM, Pillon, Lawrence  
<[Lawrence.Pillon@bchydro.com](mailto:Lawrence.Pillon@bchydro.com)> wrote:

Leela - can you help on this? Thx

-----Original Message-----

**From:** Sanderson, Melissa MEM:EX  
[\[mailto:Melissa.Sanderson@gov.bc.ca\]](mailto:Melissa.Sanderson@gov.bc.ca)  
**Sent:** 2017, September 29 4:44 PM  
**To:** Pillon, Lawrence  
**Subject:** Submissions to BCUC

Hi Lawrence,

I do not see your submissions on the BCUC site - can you tell me where I can find them?

Sent from my iPhone

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