




- Thank you, everyone
- We all recognize that the decision around Site C is momentous for Cabinet and for our Government. This is a tough decision as the pundits have been saying.

s.13,s.22



BRITISH COLUMBIA

Today

# Backstory Chapters 1-4

# Decision-making Chapters 5-8

Cabinet Confidential

2

The rest of my presentation to you today will provide information on the upcoming process, some context for our upcoming decision, which includes additional information on power systems and utility planning practices.

s.12,s.13



## **Forward: Process**

- Cabinet Information Session (Today)
- Expert Panel of Advisors (November 30)
- Caucus Briefing (December 5)
- Cabinet Decision Meeting (December 6)
- Green Party Caucus Briefing (TBD)

Cabinet Confidential

3

After today's information session, we will hear from the expert panel of advisors. Following in that we have our caucus discussion planned for December 5<sup>th</sup> The Cabinet Decision meeting will be on December 6<sup>th</sup>. The briefing with the Green Caucus meeting will be held on [TBD].

 	
<b>Expert Panel of Advisors – November 30</b>	
<u>Panelists</u>	<u>Perspective</u>
David Austin	Power industry
David Craig	BC Hydro ratepayers
Colleen Giroux-Schmidt	Power industry, clean energy investors
Dr. Mark Jaccard	Climate change
Robert McCullough	Power industry and Peace Valley landowners
Karen Tam Wu	Environmental
Cabinet Confidential	
4	

As part of the Provincial Cabinet’s deliberations on Site C, an expert advisory panel has been asked to provide their views to Cabinet on the Site C Project and the BC Utilities Commission’s Final Report. We will be hearing from them tomorrow.

The panelists were selected to speak from various perspectives: BC Hydro ratepayers; environmental advocates; the power industry and investors; and landowners.

Each panelist will be provided with 15 minutes to lay out their perspectives. Panelists will then address points made by other panelists and will answer question from Cabinet members.




# **Backstory**

## **Chapter 1**

### **Electricity Terminology**

Cabinet Confidential

5



**Capacity** – the maximum sustainable amount of electricity that can be produced by a generator or carried over wires at any instant

**How capacity is measured**

- 1 kilowatt (kW) = 1,000 watts
- 1 megawatt (MW) = 1,000 kilowatts (or 1 million watts)
- 1 gigawatt (GW) = 1,000 megawatts (or 1 billion watts)

Cabinet Confidential 6

I'll briefly define some key electricity terms that will be used as we move through the presentation.

Capacity is the amount of energy that can be provided on demand. Capacity is measured in Watts and Megawatts, gigawatts

Firm Energy can be produced on demand, when needed.

Intermittent Energy is produced when its energy source, typically wind or the sun, is available. Since neither the wind or the sun can be controlled, intermittent energy cannot be provided on demand.




**Energy** - how much is consumed (or produced) over a period of time

**How energy is measured**

- 1 kilowatt hour (kWh) = 100 watt bulb for 10 hours (1,000 watt hours)
- 1 megawatt hour (MWh) = 1,000 kWh
- 1 gigawatt hour (GWh) = 1,000 MWh

Energy is the amount provided over time. We talk about, kilowatt hours megawatt-hours and gigawatt-hours.



**Firm Energy:** firm power is available on demand  
e.g. Hydro electric dams, gas, coal

**Intermittent Energy:** is not always available  
because its energy source cannot be controlled  
e.g. wind, solar, run-of-river

Cabinet Confidential 8

Two ways to understand that type of power we generate: Firm and Intermittet

Read slide



## Energy vs. Capacity



Cabinet Confidential

9

Energy and capacity are different ways to describe and measure electricity.

Using a pipe as an analogy, capacity is related to the size of the pipe and restricts the maximum amount of water that can flow through it.

Energy is analogous to the amount of water that flows through the pipe over time and it will vary.

While the amount of water (energy) can vary, the size of the pipe (capacity) does not.

At some point, if you want to increase the amount of water you are using, you need a bigger pipe.



The difference between  
energy and capacity  
is important in the context  
of Site C

Cabinet Confidential

10



# **Backstory**

## **Chapter 2**

### **Supply and Demand**

Cabinet Confidential

11



**Supply** is how much electricity is available

**Demand** is how much is needed

- Power generation plants create electricity supply
  - Examples of generation types: wind, solar, hydro, biomass
- If you reduce demand, not as much generation is needed.

Cabinet Confidential

12

Supply is how much electricity is available and demand is how much needed

Demand for electricity is created when a device is plugged in to the wall or a light switch is turned on.

On the other end there needs to be supply that is providing electricity in response.

Power generation such as wind, solar, hydro, and biomass provide the electricity supply to meet demand.

However , if demand is reduced, not as much supply is needed.



- Demand-side Management (DSM) programs are designed to encourage consumers to reduce their electricity use using incentives

**BChydro**   
**powerSmart**

Cabinet Confidential 13

Demand side management programs such as BC Hydro's Power Smart Program encourage less electricity use and that reduces the amount of electricity supply that is needed

BC Hydro's Power Smart program encourages residential, business and local governments to reduce electricity use

Financial incentives are used to encourage investment in more energy efficient technologies.



## Key Drivers of Electricity Demand

- **Population growth** (more people = more electricity use)
- **Economic growth** (more economic activity = more electricity use)
- **GHG policy** (less GHGs = more electricity use)
- **Industrial demand** (volatile based on commodity prices)
- **Pricing** (higher rates = less electricity use)
- **Disruptive Trends** (solar PV and batteries for home use = less grid electricity demand)

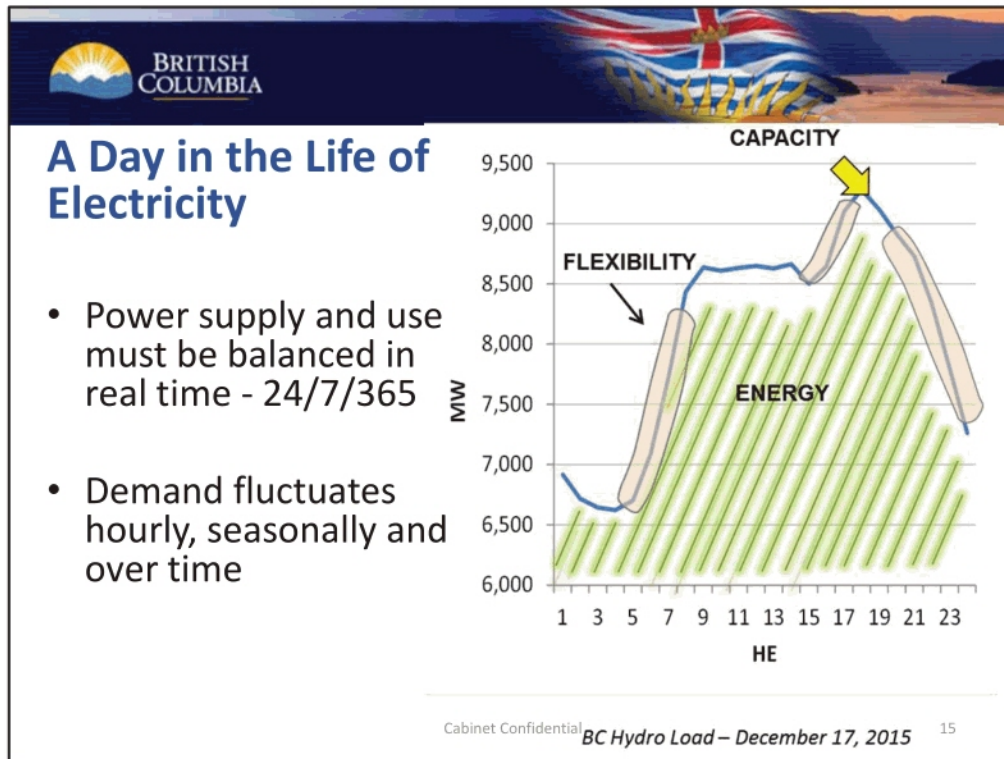
Cabinet Confidential

14

BC Hydro's forecasts account for population growth, economic growth, known GHG policy, industrial demand, and pricing.

BC Hydro maintains flexibility in its plans to respond to changes in GHG policy and "disruptive trends," like a major drop in battery prices and increased availability.





Electricity use, aka demand, fluctuates during the day as shown here. Notices when electricity demand is at the highest –after work, and when it jumps – like when we all wake up in the morning.

It also fluctuates seasonally. Anyone want to guess the time of year where energy is in greatest demand? So imagine what would happen if we didn't have enough energy supply to meet the demand.

Tell story of Lwangua village. Electricity came on between 8am and 11pm and that's it. Sweating with no AC, no fan and no light in the bathroom. The hospital used a diesel generator to power one light in the ER during the night.

To ensure reliable electricity service to customers, an electric utility must ensure that supply equals demand in real-time and at all times, it's a balance that must be maintained 24 hours a day, 7 days a week, 365 days of the year.

This balance needs to be maintained on the coldest day, through the driest seasons, when it is windy and when it is not.

If this balance is not maintained it can result in safety issues and can damage equipment.

With demand fluctuating constantly, utilities need enough electricity generation and transmission capacity to meet peak demand and sufficient fuel or energy to meet daily and annual needs.

The consequences of not having enough electricity to meet demand is much greater than the consequences of having too much electricity. A shortage leads to brownouts, an excess leads to trade.

If electricity demand is forecast to increase, the question for utilities is when and how to invest to meet it.

Utilities need enough generation and transmission to meet peak demand, sufficient fuel (energy) to meet daily and annual needs, and flexibility to respond to changes





## Demand Comparisons

- Average BC Hydro residential customer – 11,000 kWh/yr
- Large industrial (pulp mill) – 400 GW.h/yr = 40,000 homes
- Large office (20-25 floors) – 5 GW.h/yr = 500 homes
- Big box store – 3.5 GW.h/yr = 350 homes

Cabinet Confidential

16

To illustrate the relative demand of different customers some average energy uses are listed here.

In short large industrial facilities use 40,000 the amount of energy than residential customers, a large office 500 times and a large commercial store 350 times.

Additional information on conversions if needed:

- 400 GWh/yr = 400 million kWh/yr
- 5 GWh/yr = 5 million kWh/yr
- 3.5 GWh/yr = 3.5 million kWh/yr



## **BC Hydro planning process to meet demand**

- Done every 5 years
- Look 20 to 30 years out
- Forecast annual future capacity and energy needs – high, mid, and low cases
- Look at ways to reduce demand (Power Smart)
- Assess any remaining gaps in capacity and energy, and the most cost effective resources to fill any gaps, including need for new transmission

Cabinet Confidential

17

Utilities need to plan in order to keep their systems reliable and in order to ensure that they are well position to meet future electricity demand.

BC Hydro's plan is known as the Integrated Resource Plan or IRP.

Go to slide



# **Backstory**

## **Chapter 3**

### **How we got here**

Cabinet Confidential

18



## 2001 Liberal Government Elected

- Begin breakup of BC Hydro
- New Transmission Corp to allow easier connection of private sector renewable generation

## 2002 Energy Plan:

- IPP's to supply new power, BC Hydro upgrades existing assets only
- First wave of run-of-river and wind project get long term Energy Purchase Agreements (EPA's)
  - EPA's provide risk-free returns to developers while burdening hydro rate payers with the cost
- High-priced contracts for IPPs leads to \$56B in future EPA commitments
- Primarily intermittent energy costing over \$100 MWh
- Bioenergy provides some capacity, but is even more expensive

## Result:


- We don't have enough capacity to firm up all this intermittent energy

Cabinet Confidential

19

I would like to talk about the policy decisions since 2000 and how they affect the situation now.

s.13



### Clean Energy Act (2010)

- Put 2007 Energy Plan and 2008 Climate Action Plan into Legislation
- Exempted projects and procurements from BCUC review:
  - Site C
  - Northwest Transmission Line
  - Mica and Revelstoke expansions
  - Clean Power Call
  - Bioenergy Call for Power
  - Standing Offer Program
  - Smart Meters
- BC Hydro states they need firm capacity by 2022-2024
- Planning for Site C begins in earnest.

Cabinet Confidential 20

In 2009, the BCUC rejected BC Hydro's 2008 Long Term Acquisition Plan, requiring more reliance on the Burrard Plant.

In response, Government drafted the 2010 Clean Energy Act, putting portions of the Climate Action Plan and Energy Plan into legislation and exempting a number of projects, including Site C, Smart Meters, and calls for IPP power from BCUC oversight.

s.13

Site C was planned as a resource to meet BC Hydro's needs for capacity in the 2020s, and was approved in 2014.



## Why was Site C chosen?

- s.12,s.13

- 

- 

Cabinet Confidential

21

s.12,s.13




## Site C Environmental Review Process

- Over 7 years of consultation with First Nations, communities, and the public
- 2013/14 - federal-provincial joint review panel (JRP) held public hearings
- May 2014 - JRP report to Canada and BC
- December 2014 - decision to proceed with Site C

Site C underwent a comprehensive environmental review with years of consultation, studies, and engineering work leading a joint Federal-Provincial Review Panel that held hearings and received almost 30,000 pages of evidence.





## Key Findings of the Joint Review Panel in 2014

### Upsides

- Least expensive of the alternatives
- Small burden of GHGs compared to alternatives
- Provides local and regional economic benefits

### Downsides

- Unmitigated losses to wildlife, plants, and fish/fish habitat
- Archaeological, historical and paleontological losses
- Social costs to farmers, ranchers, hunters, and other users
- Changes to use of lands and waters by Treaty 8, other First Nations, and Métis

Cabinet Confidential 23

The JRP found that Site C was the least expensive of the generation options that BC Hydro was considering with the smallest amount of GHG emissions. In addition the construction and operation of the project would provide local and regional economic benefits.

The JRP also pointed out the potential negative impacts of the project.

The JRP stated that the Project would result in significant cumulative effects on fish, vegetation and ecological communities, wildlife, current use of lands and resources for traditional purposes, and heritage.

The project would end agriculture on the Peace Valley bottom lands, and while that would not be significant in the context of B.C. or western Canadian agricultural production, it would highly impact the farmers who would bear the loss.





**The JRP also recommended that Site C be  
referred to the BCUC**



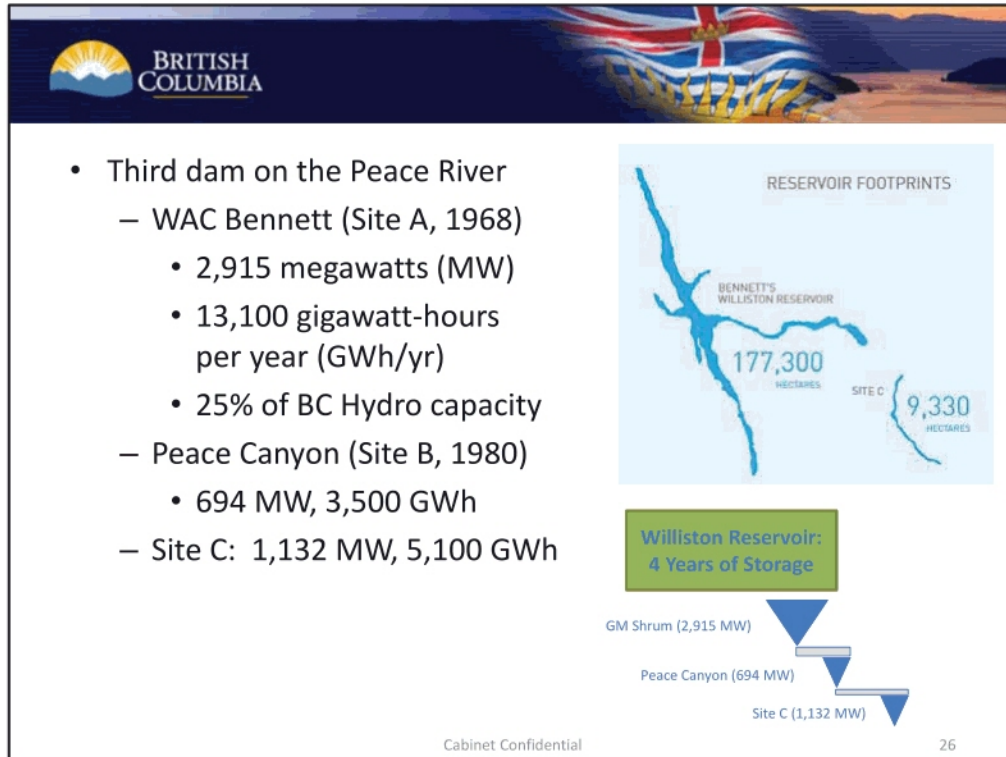
# **Backstory**

## **Chapter 4**

### **BTWs. What is Site C?**

Cabinet Confidential

25



Site C will be the 3<sup>rd</sup> dam on an already regulated river system

Williston Reservoir, created by the WAC Bennett Dam, is the largest in the BC Hydro system,

It is 250 km long and 74 km<sup>3</sup> storage (60 million acre feet) – or approximately 4 years of storage

Even though Site C reservoir is small it will provide firm power

The availability of fuel, or water, is from the upstream reservoir – just like for Peace Canyon below the Bennett Dam or Revelstoke below Mica, or all of the US dams on the main-stem of the Columbia River below the storage built in BC under the Columbia River Treaty



## Current Status of the Project

- Started July 2015, approximately 20% complete, \$2.1 billion spent by Dec. 31
- As of September, Site C directly employed 2,357 workers:
  - 1,917 from B.C., 593 workers from PRRD, 49 apprentices, 172 Indigenous people, and 354 women

Site C Employment Statistics – September 2017				
	# of Total Workers	# of B.C. Primary Residents	% of B.C. Workers	# (and %) of Peace River Regional District Primary Residents
<b>Construction and Non-Construction Contractors<sup>2</sup></b> <i>Excludes work performed outside of B.C. (e.g., Manufacturing)</i>	1,914	1,489	78%	593 (31%)
<b>Engineers and Project Team<sup>3</sup></b>	461	428	93%	---
<b>Total Workforce</b>	2,375	1,917	81%	---

Cabinet Confidential



27

Construction of Site C started over two years ago, and sunk costs are project to be \$2.1B by the end of next month

Current employment on the project is over 2,300, and you can see the breakdown on this slide. 81 per cent of Site C workers are from BC and 31 percent are from the Peace River Regional District.

These job numbers fluctuate depending on what work is being done, and by season

Consistently BC workers represent over 80% of the work force





## Status of Construction and Procurement

### Contracts Awarded

- Site preparation
- Construction bridges
- Worker Accommodation
- Road Upgrades
- Main Civil Works
- Turbines and Generators

*\$170M in committed contracts to First Nations businesses and partnerships*




Worker Accommodation

### Procurements Underway

- Generating Station and Spillways
- Transmission lines and substations

### Upcoming Procurements

- Highway 29 Realignment



Peace River construction bridge

Cabinet Confidential

28

In terms of procurement, Site C was designed with contracts sequenced throughout the project

The site preparation, bridges, worker accommodations and road upgrades were all early works

The Main Civil Works contract is the largest for the project and runs through the entire construction period

The turbines and generators contract needed to be completed before the powerhouse can be designed

Two large contracts are in procurement – Generating Station and Spillways and Transmission lines and substations - but no contracts will be awarded until a decision is made on the future of Site C



## Where we are today – Continue or Cancel Site C?

- Cabinet referred Site C to BCUC

s.12,s.13

Cabinet Confidential

29

Four months ago, this Cabinet referred Site C to the BCUC.

s.12,s.13



# Decision-Making

## Chapter 5

### Criteria

Cabinet Confidential

30

Page 32

Withheld pursuant to/removed as

s.12;s.13





# Decision-Making

## Chapter 6

### Evaluation

Cabinet Confidential

32

Page 34 to/à Page 49

Withheld pursuant to/removed as

s.12;s.13

Page 50 to/à Page 53

Withheld pursuant to/removed as

s.12;s.16;s.13

Page 54 to/à Page 66

Withheld pursuant to/removed as

s.12;s.13



## QUESTIONS?

Cabinet Confidential

65