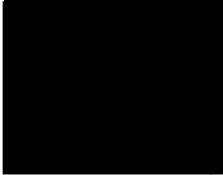


**Project Title:** Site C Clean Energy Project**SAP Project #:** YM-80004**Project Manager:** 

## 1. Project data

### 1.1 Standard References

Project Phase: Implementation  
Originating Organization: Site C  
Project Initiator:   
Project Sponsor:   
Project Manager:   
Vice President & Project Director, Site C: 

### 1.2 Statement of Objectives Revision History

Phase/Stage	Revision No	Date
Implementation Phase	0	December 11, 2015
Implementation Phase	1	May 31, 2016
Implementation Phase	2	July 5, 2016

### 1.3 Project Background

BC Hydro will develop a dam and hydroelectric generating station on the Peace River in northeast British Columbia; referred to as the Site C Clean Energy Project (Site C or the Project). Site C will be the third hydroelectric generating station on the Peace River and would be located downstream of existing generating facilities at G.M. Shrum and Peace Canyon and their respective Williston and Dinosaur reservoirs.

Given the long lead time and the scope of evaluation and development work required for a major hydroelectric facility, BC Hydro adopted a multi-stage approach for the planning and evaluation of Site C. This approach provides multiple decision-making points during project development, and focuses on specific deliverables and objectives at each stage.

- Stage 1: Review of Project Feasibility (2004 to 2007). The review of project feasibility concluded that it would be prudent to continue to investigate Site C as a potential resource option to address the growing electricity supply gap within the province.
- Stage 2: Consultation and Technical Review (2007 to 2009). Stage 2 included comprehensive consultations with Aboriginal groups, the public and stakeholders, as well as advancing environmental studies, field studies, engineering design and technical work.
- Stage 3: Environmental and Regulatory Review (2010 to 2014). Stage 3 included a cooperative federal-provincial environmental assessment, including an independent Joint Review Panel process.

- Stage 4: Stage 4 included obtaining approval to proceed to construction from the provincial government as well as other regulatory permits and approvals.
- Stage 5: Construction. The final stage includes construction, project commissioning, site reclamation, and demobilization.

The Site C project received federal and provincial environmental approvals in October 2014. These approvals followed a rigorous three-year review that concluded the effects of the project are justified by the long-term benefits it would provide.

The final investment decision by BC Hydro's Board of Directors and the Shareholder was issued in December 2014. Site preparation activities started in June 2015, with full project construction beginning in spring 2016.

## **2 Project Initiator's Statement of Summary Requirements**

### ***2.1 Statement(s) of the business problem or opportunity and the required response***

#### ***Opportunity***

The opportunity for Site C has been described and evaluated multiple times over Stages 1 through 4 of the project. The opportunity at the time of the decision to proceed to the implementation phase of the project was based on analysis completed as part of three processes:

- The 2013 Integrated Resource Plan (2013 IRP)
- The Site C Environmental Impact Statement (EIS) and the associated Joint Review Panel (JRP) process
- The review process to support the Government Final Investment Decision (FID) on the Site C project.

Both the 2013 IRP and the EIS/JRP process were performed on a common underlying basis, which included:

- The 2012 Load Forecast
- The 2013 IRP assessment of existing and committed resources
- The 2013 Resource Options Update
- Site C ratepayer costs prior to the 10-year Rates Plan.

The 2013 IRP and EIS/JRP concluded that Site C offered the best combination of financial, technical, environmental and economic development attributes as compared to portfolios of comparable resource options, and is the preferred option to meet the need for energy and dependable capacity within the planning horizon.

The FID analysis used the same underlying basis as the 2013 IRP and EIS/JRP but reflected updated information developed as part of the FID process, including:

- Review of the impacts of the 2014 Load Forecast on the economic case for Site C
- Extending portfolio modelling for the full 70-year economic planning life of the Site C project from the 30-year basis in the 2013 IRP
- Updated project schedule and capital cost reflecting changes made by Government during the Site C FID process
- Potential lower costs of IPP resources

- Reflection of the impact to ratepayer cost of Site C from the 10-year Rates Plan.

The FID analysis resulted in the same conclusion as the 2013 IRP and EIS/JRP – that Site C was the preferred option to meet the need for energy and dependable capacity within the planning horizon.

The results of these analyses are consolidated and described in the Business Case to support the Financial Investment Decision of December 2014. As per this business case, electricity demand in B.C. is expected to increase by approximately 40 per cent over the next 20 years, excluding any load from liquefied natural gas (LNG) facilities and before accounting for Demand Side Management (DSM) energy and associated capacity savings. Load from new LNG facilities that may request service from BC Hydro would further increase this load. BC Hydro looks to DSM as its first resource to meet customer demand, and the approved 2013 IRP sets an aggressive DSM target of 7,800 gigawatt hours per year (GWh/year) of energy savings and 1,400 megawatts (MW) of associated capacity savings by Fiscal (F) 2021:

- With DSM, it is projected that there will be a shortfall in BC Hydro's ability to meet peak capacity demand commencing in 2019, and a shortfall in total supply of energy commencing in 2022, using a mid-range load forecast and an expected LNG demand of 3,000 GWh/year.
- With DSM and without LNG the capacity shortfall remains the same (2019) and the energy shortfall begins in 2028.

In order to meet these energy and capacity Load-Resource Balance gaps, additional resources are required to meet both the energy and capacity needs of BC Hydro's customers.

As previously stated, based on the analysis of alternative resource options in the 2013 IRP and confirmed through due diligence completed at the FID, Site C provides the best combination of financial, technical, environmental and economic development attributes and is therefore the preferred option to meet the need for energy and dependable capacity within BC Hydro's planning horizon. Site C was identified as having the lowest levelized Unit Energy Cost at \$82 per megawatt hour (MWh) (\$62 per MWh on a cost of service basis), the lowest present value cost under expected conditions, the lowest projected impact on ratepayers, and the lowest level of greenhouse gas emissions from all of the portfolios of alternatives considered. Site C would also optimize the use of the Williston Reservoir, enabling Site C to deliver approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area.

Refer to the Site C Business Case for further details. (<http://ppm/projects/YM-80004/ProjectDocuments/YM-80004.4.Z/YM-80004.4.Z.01/YM-80004.4.Z.01.001/Project Plan/E Business Case/1016.Z.15.001.FIN.00001.BUS Appx E - Business Case.pdf>)

### ***Required Response***

Build Site C for the earliest in service date of F2024 in order to add an earthfill dam and generating facility to the BC Hydro system, with the following characteristics:

- ♦ Six Francis turbines capable of providing the following:
  - An average of approximately 5,100 GWh/year of annual energy to the BC Hydro system



- Approximately 1,100 MW of dependable capacity
- ◆ An operating life of more than 100 years
- ◆ Spillway capacity of 16,500 m<sup>3</sup>/s at Maximum Flood Level 466.3 m
- ◆ An earthfill dam that will impound a reservoir with the following characteristics:
  - Maximum normal operating level of 461.8m
  - Minimum normal operating level of 460.0m
- ◆ Substation and transmission infrastructure to connect the Site C generating station to the Peace Canyon switchgear building

Site C shall be constructed in accordance with the detailed User Requirements developed for the project which can be found in [Appendix K](#) of the Project Plan.

The construction of Site C is subject to obtaining all appropriate permits required to undertake the work and fulfilling the Crown's duty to consult, and where appropriate, accommodate Aboriginal groups.

## **2.2 Safety, Security (Critical Infrastructure Protection) and Confidentiality Requirements**

- ◆ Comply with NERC protection standards during construction of all critical infrastructure
- ◆ Incorporate Safety by Design principles into the dam, powerhouse, station and transmission design and construction
- ◆ Provide perimeter security during the construction of critical infrastructure

## **2.3 Maintenance and Operational Requirements**

The Maintenance and Operational Requirements for the Project are embedded in the User Requirements which can be found in [Appendix K](#) of the Project Plan.

## **2.4 Aboriginal Relations Business Strategy Requirements**

The Aboriginal Relations Business Strategy Requirements for the Project can be found in [Appendix U](#) of the Project Plan.

## **2.5 Project Initiator's Interim Decision Requirements**

No interim decisions are expected.

# **3 Project Manager's Proposed Summary Objectives to Achieve Requirements**

## **3.1 Scope Objectives**

### **Site Preparation Activities:**

- ◆ Clearing of the Dam site area
- ◆ Construction of access roads and a temporary construction bridge across the Peace River near the dam site

- ◆ Upgrades to Ministry of Transportation & Infrastructure roads (OFR, 240, 269 and 271 Roads)
- ◆ Construction, operation and decommissioning of a worker accommodation camp
- ◆ Installation of construction power and telecommunications

***Construct and Commission:***

- ◆ An earthfill dam, approximately 1,050 metres long and 60 metres high;
- ◆ A buttress of roller-compacted concrete to support the valley wall, provide the foundation for the concrete structures and form the south abutment of the earthfill dam;
- ◆ Two 10.8 metre diameter diversion tunnels and associated intake and outlet structures;
- ◆ Slope stabilization of the north bank above the dam site;
- ◆ A 1,100-megawatt hydroelectric generating station with six Francis turbine generating units and associated intake structures, penstocks and spillways;
  - Spillway capacity of 16,500 m<sup>3</sup>/s at Maximum Flood Level 466.3 m
- ◆ An 83-kilometre-long reservoir with a maximum surface area of 9,330 ha;
  - Maximum normal operating level of 461.8m
  - Minimum normal operating level of 460.0m
- ◆ Erosion protection at Hudson's Hope and locations adjacent to Highway 29 as required;
- ◆ Realignment of six sections of Highway 29 over a total distance of approximately 30 kilometres;
- ◆ Construct the Site C South Bank Substation;
- ◆ Two 75-kilometre 500kV transmission lines to connect the new Site C substation to BC Hydro's existing Peace Canyon switchgear building including clearing and access;
- ◆ Three 1-kilometre 500kV transmission lines to connect Site C Substation to Site C Powerhouse;
- ◆ Expansion of the Peace Canyon Gas Insulated Switchgear;
- ◆ Upgrades at various stations; and
- ◆ Reservoir utilities relocation including transmission and distribution lines.

***General Management:***

- ◆ Implement all engineering, design, procurement, environmental, regulatory and permitting and construction activities as detailed in the general management work packages.

***Mitigation and Compensation:***

Address Environmental Assessment Certificate and Canadian Environmental Assessment Act conditions, and as applicable permits and authorisations, and includes the following work packages:

- ◆ Implement all of the authorized regulatory conditions including all the agreed mitigation and compensation requirements and benefits agreements
- ◆ Fish and Fish Habitat, including construction of temporary and permanent fish passage facilities, habitat mitigation programs and follow-up monitoring
- ◆ Vegetation and Wildlife, including habitat mitigation and compensation, retention of conservation lands, and follow-up monitoring
- ◆ Community Benefits and Community Issues, including measures to address community issues and create lasting benefits
- ◆ Social and Land Programs, including measures to address transportation and community infrastructure, recreation and reservoir boat launches, and agriculture
- ◆ Physical Environment Monitoring, including water quality, groundwater quality, air quality, noise, climate, and greenhouse gas emissions reporting during construction
- ◆ Heritage, including mitigation of paleontological, archaeological and historical sites, and provision of compensation funds to support local museums

***General Rights, Taxes and Grants:***

- ◆ Acquire the properties and rights necessary for construction and operation of all Site C assets

***Aboriginal Relations:***

- ◆ Consult with Aboriginal groups consistent with the honour of the Crown; and
- ◆ Negotiate and conclude agreements with Aboriginal groups that meet goals and interests of the parties, and which fulfill Environmental Assessment process requirements

***Site Reclamation, Demobilization and Project Closure***

- ◆ In accordance with the Construction Environmental Management Plan, restore and revegetate disturbed construction areas to a safe and environmentally acceptable condition as appropriate to the Project's temporary and permanent land use objectives
- ◆ Prepare project deliverables for acceptance by Generation and Transmission, Distribution & Customer Service in accordance with Generation Operating Order 1G-30 (Plant) and System Operating Order 1T-35 (Switchyard)
- ◆ Testing and commissioning
- ◆ Verify deficiencies are completed
- ◆ Perform Completion
- ◆ Prepare and issue Project Completion Report
- ◆ Perform project documentation closeout filing
- ◆ Complete all financial account transfers and closeout of project accounts

### 3.2 Schedule Objectives

The approved Final Investment Decision (FID) schedule is described below. The Project has advanced implementation phase activities to mitigate schedule risk.

FID Date	Description	Milestone Code
October 2020	5L5 500kV Transmission Line In-Service	1.01
November 2020	Site C Substation In-Service	1.01
July 2023	5L6 500kV Transmission Line In-Service	1.01
December 2023	Unit #1 In-Service	1.01
February 2024	Unit #2 In-Service	1.01
May 2024	Unit #3 In-Service	1.01
July 2024	Unit #4 In-Service	1.01
September 2024	Unit #5 In-Service	1.01
November 2024	Unit #6 In-Service	1.01

### 3.3 Cost Objectives

- ♦ BC Hydro is committed to delivering the Site C Clean Energy project within the expected project cost and Authorized Amount of \$8.335 billion in loaded, nominal dollars.
- ♦ There is an additional reserve held by Treasury Board of \$440 million.



## 4 Approvals

██████████ is appointed Project Director with authority and responsibility in accordance with the Project Management Policies and Procedures of BC Hydro, Capital Infrastructure Project Delivery and Engineering.

<b>Accepted by:</b>	██████████ Project Manager and Director Operations, Site C	<u>5 July 2016</u> Date
<b>Accepted by:</b>	██████████ VP and Project Director, Site C	<u>July 11 2016</u> Date
<b>Reviewed by:</b>	██████████ Finance Director, Site C	<u>July 5, 2016</u> Date
<b>Reviewed<sup>1</sup> by:</b>	██████████ Principal Engineer for Project Management	<u>JULY 11, 2016</u> Date
<b>Initiator:</b>	██████████ Sr. VP, Generation	<u>July 12, 2016</u> Date
<b>Sponsor:</b>	██████████ Deputy CEO	<u>July 7, 2016</u> Date

<sup>1</sup> For compliance with PPM Practices.