EXHIBIT C: CONSTRUCTION HISTORY

1 Contents and Purpose of this Exhibit

Exhibit C presents a summary of the history and chronology of construction and commercial operation of the Boundary Hydroelectric Project (Project) and a history of additions or modifications that have been made to the Project since its initial construction, as well as a proposed schedule for proposed development.

2 Construction and Upgrade History

2.1. Chronology of Construction

The City of Seattle entered into a contract with Bechtel Corporation and Leed, Hill & Jewett, Inc., as a joint venture, to perform field investigations, explorations, and design engineering, and to provide consulting engineering services until completion of the Project. This contract was executed on January 17, 1962. Field investigations consisted mainly of exploratory core drilling and geologic reconnaissance. Diamond core drilling was mainly directed towards finding the most suitable site for the underground power plant. Concurrent with the field investigations, office-based studies were undertaken to develop the most efficient arrangement of the Project (SCL 1968).

Construction of the Project began in August 1963 with excavation of roughly a half-million cubic yards of limestone to create the underground machine hall, which studies had shown would be the most cost-effective and efficient location for the power plant. Another approximately 1 million cubic yards of rock was excavated to create the forebay (Sugiyama 1980). Figure C.2-1 shows a view of the dam and power plant during Project construction.

Construction milestones and other significant events relating to construction and operation of the Project are summarized in Table C.2-1.

Figure C.2-1. Boundary Project during construction; view looking upriver. Transformer bay and the top of the cofferdam (with machinery) used during draft tube construction are visible to the right.

Table C.2-1. Summary of construction milestones and other significant events relating to operation of the Boundary Project.

Event	Date
License Issued for Units 51 through 54	October 1, 1961
Construction Initiated	June 24, 1963
Dam Topped Out	June 1967
First Power Generated	September 1967
Reservoir Drawdown to El. 1,953 feet North American Vertical Datum (NAVD) 88 [1]	May 2-6, 1970
Sudden Drop of Unit 53 Head Gate	November 22, 1975
Reservoir Drawdown to El. 1,907 feet NAVD 88	August 23-26, 1979
Sluice Gate Put In Operating Position With Reservoir Drawdown to El. 1,964.6 NAVD 88	August 21-22, 1981
License Amendment Issued for Units 55 and 56	April 26, 1982
New Upstream Dam Triangulation Network Installed	1982

[1] Elevation values are in datum NAVD 88 unless otherwise noted.

Table C.2-1, continued…

Event	Date
Piezometers (DH 101, DH 102) Installed	December 1985
Units 55 and 56 On Line	April 5, 1986
Extensometers Installed (E-1 to E-6)	March 1990
Extensometer Installed (E-7)	March 1991
Piezometers (BL-1, BL-2) Installed	April 1991
Left Abutment Drains Completed (D-1 to D-9 and X-2 to X-7)	December 13, 1991
Tiltmeters Installed	December 8, 1992
Left Abutment Anchors Installed	April 1, 1993
Inverted Pendulums Installed in Foundation	June 1994
Epoxy Grouting of Dam Crack Completed	July 17, 1994
Left Abutment Drains Cleaned and Installation of Additional Drains (LA1-6)	December 20, 1996
Unit Overhaul and Turbine Runner Replacements (Units 51 through 56)	1996-2003
Replacement of Log Boom	April 1996
Strengthening of Elevator Tower Connections	July 1998
Installation of Test Dam Plumbline	October 15, 1999
Pavement of Lower Mucking Tunnel	June 2000
New Dam Deflection Survey System Installed	August 2000
Construction Of Station Service Center	December 2002
Completed Installation Of 4 Strong Motion Acceleromenters	2002-2004
Card Key Access To Key Areas And $1.2 Million Security Upgrade (New Cameras)	2002-2003
Completed Fiber-Optic At Plant, Ring Configuration	2002-2003
Installed New Roll-Up Door At Level 6 Entrance	2002-2003
Construction Of Instrumentation Houses And Installation Of Plumblines	2003
Installation Of Permanent Portal Cover To Visitor Center Tunnel Entrance	2003
Replaced All Unit Protective Relays	2003
Draft Tube Gate Rehab	2003-2004
Level 4 Rockfall Mitigation	2003-2004
Service Area Water Supply System	2003-2004
Tailrace Recreational Improvements	2003-2004
Vista House Recreation and Water Improvement	2003-2004
Sluice Gate Seal System Modifications	2003-2004
Generator Air Cooler Replacements	2003-2004
Fiber Optic Cable and Terminal Equipment Installation	2003-2004
Internal Fiber Optic Ring and Comm System	2003-2004
Generator Protective Relay Improvements	2003-2004
Generator Synchronization Improvements	2003-2004
Headgate Rehabilitation	2003-2004
Control Systems Fiber Backbone Installation	2003-2004
Station Service Switchyard Improvements	2003-2004
Unit 51 Runner Replacement	2003-2004
Unit 52 Runner Replacement	2003-2004

Table C.2-1, continued…

Event	Date
Security System	2003-2004
Draft Tube Gate Slot Safety Modification	2005
Dam Safety Instrumentation	2005
Units 55 and 56 Linkage Bushing Replacement	2006
36” Fill Line Bulkhead Installation	2006
Units 51 and 56 Governor Controls Replacement	2006
Units 55 and 56 Intake Gate Rock Guard Installation	2006
Lightning Arrestors	2006
Level 4 & 6 Tunnel Doors	2007
Rehab As-builts and Closeout	2007
Dam East Access Road Culvert-Drainage Provisions	2007
Fall Protection & Ladder Upgrades	2007
Units 51 through 54 Spare Turbine Bearing	2007
Units 51 through 56 Governor Controls Replacement	2007
Security Systems Upgrades	2007
Transformer Bay Fall Protection	2007
Unit 51 Current Transformer Replacement	2008
Air Compressor Replacement	2008

2.2. Commencement of Commercial Operation

The first turbine-generator unit, Unit 51, was completed in July 1967, and the plant began commercial operation on September 1, 1967. By December 1967, all four turbines (Units 51 through 54) were capable of producing a total of 650 MW. The forebay and machine hall were constructed with room for two additional units (the future Units 55 and 56) for expansion at a later date.

2.3. Additions or Modifications to Project

Seattle City Light (SCL) filed an application for a license amendment in October 1981 to install two additional turbine-generator units (Units 55 and 56) in the previously excavated bays. FERC approved addition of the units and issued its Order Amending License in April 1982. Construction activity on the upgrade began in July 1983, and Units 55 and 56 came on line in 1986.

Other modifications and enhancements under the existing license are summarized in Table C.2-1 and include SCL’s responses to seismic activity and slope stability concerns as noted in the table.

3 Planned and Proposed New Development

Table C.3-1 lists the new development planned for the new license term and the intervals following issuance of a license when the work will commence and be completed.

Table C.3-1. Summary of new development planned and proposed for the new license term. [1]

Event	Start Date (year from license issuance)	End Date (year from license issuance)
Major Capital Improvement Projects (CIP)		
Unit 55 Generator Rebuild (including runner replacement) (every 30 years)	Year 1 and Year 28	Year 3 and Year 32
Unit 56 Generator Rebuild (including runner replacement) (every 30 years)	Year 1 and Year 29	Year 4 and Year 33
Forebay Wall Hardening	Year 1	Year 7
Transformer Banks 151-156 Rock Damage Mitigation (every 25 years)	Year 1 [2], 23 and Year 48	Year 3, 24 and Year 49
Replace Step-up Transformer, Bk 240-153/4/1/2 (every 40 years)	Year 1 and Year 41	Year 5 and Year 45
Unit 54 Generator Rebuild (every 30 years)	Year 4 and Year 34	Year 6 and Year 36
Unit 53 Generator Rebuild (every 30 years)	Year 5 and Year 35	Year 7 and Year 37
Unit 51 Generator Rebuild (every 30 years)	Year 6 and Year 36	Year 8 and Year 38
Unit 52 Generator Rebuild (every 30 years)	Year 7 and Year 37	Year 9 and Year 39
Replace Isophase Bus	Year 7	Year 11
Ozone Abatement	Year 10	Year 11
Unit 54 Runner Replacement (every 30 years)	Year 17 and Year 47	Year 21 and Year 49
Unit 52 Runner Replacement (every 30 years)	Year 18 and Year 48	Year 20 and Year 50
Unit 53 Runner Replacement (every 30 years)	Year 19 and Year 49	Year 21 and Year 51
Unit 51 Runner Replacement (every 30 years)	Year 20 and Year 50	Year 22 and Year 52
Minor Improvement Projects	Year 1	Year 50
Environmental Measures		
Geology and Soils		
Erosion Control Measures at Three (3) Designated Sites (as part of the Erosion Program, a component of the Terrestrial Resources Management Plan [TRMP])	Year 1	Year 7 [3]
Water Resources		
Design, Testing and Evaluation of Structural TDG Abatement Measures	Year 1	Year 10
Fish and Aquatics Resources		
Upstream Fish Passage Trap-and-Haul Facility: • Temporary • Permanent	 Year 6 Year 16	 Year 7 Year 17
Mainstem Gravel Augmentation	Year 1	Year 5
Channel Modifications for Mainstem Trapping Pools at Project River Mile (PRM) 30.3	Year 1	Year 5
Placement of Mainstem Engineered Large Woody Debris (LWD) Jams at Tributary Deltas	Year 1	Year 5
Habitat Protection in Sullivan Creek River Mile (RM) 0.00 to RM 0.54	Year 1	Year 5

Table C.3-1, continued…

Event	Start Date (year from license issuance)	End Date (year from license issuance)
LWD and Riparian Planting in Sullivan Creek RM 0.00 to RM 0.54	Year 1	Year 5
Riparian Buffer Protection in Sullivan Creek RM 0.00 to RM 0.54	Year 1	Year 5
Riparian, Streambank, and Channel Improvements in Sullivan Creek RM 2.30 to RM 3.93	Year 1	Year 5
Culvert Replacements in Slate Creek Tributaries Slumber Creek at RM 0.20 and Styx Creek at RM 0.10	Year 1	Year 5
Riparian Planting in Linton Creek RM 0.00 to RM 0.20	Year 1	Year 5
Channel Improvements in Sweet Creek RM 0.40 to RM 0.50	Year 1	Year 5
Riparian Planting in Sweet Creek RM 0.00 to RM 0.50	Year 1	Year 5
Riparian Buffer Protection in Sweet Creek RM 0.00 to RM 0.50	Year 1	Year 5
Native Trout Supplementation Facility	Year 1	Year 7
Botanical Resources		
No new development proposed that involves design and construction	NA	NA
Wildlife Resources		
No new development proposed that involves design and construction	NA	NA
Threatened and Endangered Species		
No new development proposed that involves design and construction	NA	NA
Aesthetic/Visual Resources		
Addressed by Recreation Resources measures	NA	NA
Cultural Resources		
No new development proposed that involves design and construction	NA	NA
Recreation Resources and Land Use		
Improvements at Forebay Recreation Area	Year 3	Year 5
Improvements at Boundary Vista House Recreation Area	Year 8	Year 10
Improvements at Boundary Tailrace Recreation Area/Machine Hall Visitors' Gallery	Year 8	Year 10
Improvements at Metaline Waterfront Park Boat Launch	Year 3	Year 5
Development of Peewee Falls Viewpoint and Trail	Year 6	Year 7
Development of Metaline Falls Portage Trail	Year 6	Year 7
Enhancements to Designated Dispersed Shoreline Recreation Sites	Year 6	Year 7

Table C.3-1, continued…

Event	Start Date (year from license issuance)	End Date (year from license issuance)
Installation of Gates on Road Near the Vista House Recreation Area that Leads Downslope to the Tailrace East Parcel and Potentially on the Road Leading from the Ridge Downslope to the BWP (as part of the Travel and Public Access Program, a component of the TRMP)	Year 1	Year 5
Installation of Interpretation and Education (I&E) Signs (as part of the I&E Program, a component of the Recreation Resources Management Plan [RRMP])	Year 1	Year 13
Decommissioning of Well Heads and Associated Roads	Year 1	Year 2
Socioeconomics		
Addressed by measures of other resource areas	NA	NA
Tribal Resources		
Addressed by measures of other resource areas	NA	NA

Notes:
1 Includes design, planning, permitting and construction.
2 Effort commenced in 2009, under current license term.
3 To be implemented concurrent w/ schedules for respective recreation sites.

4 References

SCL (Seattle City Light). 1968. Boundary Project Design Report. Prepared by Bechtel-Leedshill for City of Seattle, Department of Lighting. January 1968.

Sugiyama, K. 1980. History of the Boundary Project. City of Seattle, Office of Community Relations. September 1980.

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