

CI C0059783

HYD Upper Lake Falls 2 Overhaul

NON-CONFIDENTIAL

September 2, 2025





NSEB APPROVAL SHEET

Project Title: HYD Upper Lake Falls 2 Overhaul

CI Number: C0059783

Date: September 2, 2025

Expenditure Profile			Type of Filing	
Year	Budget Amount	Project Estimate	☒	Capital Project Authorization
2024	46,084	449	☐	Unforeseen and Unbudgeted (U&U)
2025	976,892	531,636	☐	Planned & Advanced (P&A)
2026	655,177	914,221	☒	Subsequent Approval Item
2027		135,708	☐	Authorization to Overspend (ATO)
			☐	Scope Change
			☐	Final Cost (FIN)
Total	\$1,678,153	\$1,582,014		

COMMENTS

Submitted on behalf of NOVA SCOTIA POWER INCORPORATED

Authorized Signatory
Dave Pickles
Chief Operating Officer

DATE
August 28, 2025

Approved on behalf of NOVA SCOTIA ENERGY BOARD

DATE

CI Number: C0059783**Title: HYD Upper Lake Falls 2 Overhaul**

Start Date: 2024/07
In-Service Date: 2026/11
Final Cost Date: 2027/05
Function: Hydro
Forecast Amount: \$1,582,014

DESCRIPTION:

This project is for the refurbishment of Upper Lake Falls Unit 2. The scope includes refurbishment of the turbine, headcover, turbine shaft, turbine bearings and housing, as well as all wear items. A re-alignment of the unit is required to ensure the unit will continue to operate reliably. This work represents the sustaining investment necessary to maintain safe and reliable water management on the Mersey River, consistent with NS Power's long-term strategy outlined in the Hydro Interval Plan (HIP) and Appendix G of the 2025 ACE Plan.

The Upper Lake Falls Hydro Station is located on the Mersey River. It operates 2 units at 3.0 MW each and it has been in operation since 1929. Upper Lake Falls Unit 2 was last overhauled in 1999 and is approaching 100 years of service life.

Summary of Related CIs +/- 2 years:

Pursuant to Section 11.2 of the CEJC, related CIs for Hydro projects include "work completed on the same generating unit and dam structures, but not necessarily the same asset."

- 2025 CI C0042526 HYD ULF2 Stator Refurbishment \$463,793

Depreciation Class: Hydro Generation Plant Mersey River Hydro 2400 Turbine

Estimated Life of the Asset: 25 Years

Retirement Information:

- Categorization of Retirement: Accounting Policy 6420 – Retirement and disposal of Capital Assets
- Percentage of Asset Pool: 1.31%

JUSTIFICATION:

Justification Criteria: Hydro, Wind and Biomass

Why do this project?

This project is consistent with the Mersey Hydro System sustaining capital strategy outlined in Appendix G of the 2025 ACE Plan. As part of NS Power's long-term planning under the HIP, targeted investments in aging generation assets—such as Upper Lake Falls Unit 2—are essential to maintaining safe and reliable operation of the Mersey system during the deferral period leading to either full redevelopment or partial decommissioning. The overhaul of Unit 2 ensures continued generation capacity and supports water management operations on the Mersey River, which are critical for downstream safety and system resilience. This investment reflects NS Power's commitment to proactively manage asset conditions and mitigate operational risks while preserving flexibility in future decision-making regarding the long-term path for the Mersey system.

Internal condition assessments were completed by NS Power in 2016 and 2023. Based on these assessments, the operating mechanisms (bushings, bearings, links and pins) were found to have excessive clearances. As a result, Unit 2 was prioritized for a full refurbishment. Additionally, the thrust block requires replacement due to an out of tolerance internal fit with the rotor shaft; this issue was initially addressed with a temporary solution in 2018 but now requires a permanent resolution. Many components within the unit are leaking oil. The turbine bearing is also now a critical issue for this unit as the unit is currently out of alignment. A complete refurbishment is necessary to ensure the unit's

long-term reliability. Additionally, this refurbished unit will continue to support water management on the Mersey River by minimizing the risk for uncontrolled releases of water, which could create flood damage downstream.

Why do this project now?

The last major overhaul was completed in 1999. A subsequent minor refurbishment was done in 2018 but only addressed components above the headcover without completely removing the unit. Based on condition assessments a complete refurbishment is necessary to address the major issues identified that would otherwise lead to unit failure. To mitigate the risk of an unplanned outage, this work must be completed in 2026.

Why do this project this way?

Refurbishing this unit through the replacement of specific worn components is the most economical way to achieve the intended project scope, considering both the current condition of its components and the unit's age. This approach meets all the requirements and constraints of the intended project scope and is significantly more economical than a full unit replacement. This overhaul will maintain the reliability of Upper Lake Falls 2 and ensure the unit remains available to support ongoing water management on the Mersey River. Running the unit to failure is not considered a technically feasible option due to the negative impacts its unavailability would have on ongoing water management operations. To maximize the unit's output, the refurbishment will be scheduled to minimize spill water and unit outage time.

Contingency Statement

Contingency for this project has been determined using a combination of internal subject matter expert (Professional Engineers) judgment, previous experience with hydro unit overhaul projects, as well as the non-binding contingency guidelines. Consistent with the maturity matrix, this project is being filed as a Class 3 estimate with a contingency of 15 percent. The contingency is intended to account for water management risks associated with the isolation of the unit to ensure the work area is dry, and additional component refurbishments that may be required based on the as-found condition following isolation and unit disassembly. Some of the unit components are not accessible for assessment prior to disassembly. The contingency will also cover potential unforeseen increases in material and contract costs.

Reason for Variance

The decrease of \$96,139 from the 2025 ACE Plan subsequent submittal estimate of \$1,678,153 is due to updating the project scope resulting in fewer contracts and less labour than previously estimated.

Capital Project Detailed Estimate

Location: Hydro
CI#: C0059783
Title: HYD Upper Lake Falls 2 Overhaul
Execution Year: 2025-2026

Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
Regular Labour						
Hydro River Staff - Construction	PD	783	\$ 417	\$ 326,327.40		
Engineering Staff	PD	163	\$ 480	\$ 78,158.00		
Hydro River Staff - Removal	PD	81	\$ 417	\$ 33,606		
			Sub-Total	\$ 438,091		
Overtime Labour						
Hydro River Staff - Construction	PD	30	\$ 834	\$ 25,205		
			Sub-Total	\$ 25,205		
Term Labour						
Hydro River Staff - Construction	PD	136	\$ 417	\$ 56,711		
			Sub-Total	\$ 56,711		
Travel Expenses						
Travel Expenses	lot	1	\$ 13,838	\$ 13,838		
			Sub-Total	\$ 13,838		
Materials						
Turbine parts refurbishment	lot	1	\$ 116,600	\$ 116,600		C0038126
Thrust block	lot	1	\$ 10,000	\$ 10,000		C0038126
Runner shaft	lot	1	\$ 10,000	\$ 10,000		
CIP for bushings etc	lot	1	\$ 15,000	\$ 15,000		
Babbitt bearing material	lot	1	\$ 5,000	\$ 5,000		
Misc Steel (turbine parts/platform)	lot	1	\$ 8,000	\$ 8,000		
Gate Links	lot	1	\$ 11,000	\$ 11,000		
Distributor Ring wear pads	lot	1	\$ 10,000	\$ 10,000		
Seals / Gaskets	lot	1	\$ 15,000	\$ 15,000		
Misc (Consumables, Paint, Oil, etc)	lot	1	\$ 19,000	\$ 19,000		
			Sub-Total	\$ 219,600		
Contracts						
Draft Tube refurbishment	lot	1	\$ 20,000	\$ 20,000		
NDT Inspections	lot	1	\$ 15,000	\$ 15,000		
Concrete Inspection	lot	1	\$ 10,000	\$ 10,000		
			Sub-Total	\$ 45,000		
Consulting						
Component Engineering/Drawings	lot	1	\$ 65,000	\$ 65,000		C0038126
Lifting device design	lot	1	\$ 8,000	\$ 8,000		
Structural Supports	lot	1	\$ 10,000	\$ 10,000		
Inspections/Testing (Rigging, Hazmat)	lot	1	\$ 3,000	\$ 3,000		
			Sub-Total	\$ 86,000		
Rental/Maint of Equipment						
Office Trailer	lot	1	\$ 13,250	\$ 13,250		
Washroom Rental	lot	1	\$ 7,000	\$ 7,000		
			Sub-Total	\$ 20,250		
Other Goods and Services						
Contingency	%	15%	\$ 904,695	\$ 135,704		
			Sub-Total	\$ 135,704		
Interest Capitalized						
AFUDC				\$ 59,665		
			Sub-Total	\$ 59,665		
Administrative Overhead						
Administrative Overhead				\$ 476,378		
Contractor Admin Overhead				\$ 5,571		
			Sub-Total	\$ 481,949		
Sub-Total (no AO, AFUDC)				\$ 1,040,399		
TOTAL (AO, AFUDC included)				\$ 1,582,014		
Original Cost						
				\$ 746,740		

Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes.
Note 2: Small differences in totals are attributable to rounding.



Instructions: Select option in Column B.
Columns C through G will auto-populate.

Document No: XXX-XX-XXXX-XXXX

Project Cost Estimate Input Checklist and Maturity Matrix						
Hydropower	Required fields:	Estimate Classification				
Project Name: HYD Upper Lake Falls 2 Overhaul	Started or Preliminary	Class 5	Class 4	Class 3	Class 2	Class 1
Maturity Level of Project Definition Deliverables	Defined or Complete					
General Project Data						
A. Scope						
Project Scope of Work Description	Defined (D)	P	P	D	D	D
Site Infrastructure (Access, Construction Power, Camp, etc.)	Defined (D)	NR	P	D	D	D
B. Capacity						
Facility Output / Production Profile	Defined (D)	P	P	D	D	D
Electrical Power Requirements (when not the primary capacity driver)	Defined (D)	NR	P	D	D	D
C. Project Location						
Plant and Associated Facilities	Defined (D)	P	P	D	D	D
D. Requirements						
Codes and/or Standards	Defined (D)	NR	P	D	D	D
Communication Systems	Defined (D)	NR	P	D	D	D
Fire Protection and Life Safety	Defined (D)	NR	P	D	D	D
Environmental Monitoring	Not Applicable (NA)	NR	NR			
E. Technology Selection						
Not Applicable						
F. Strategy						
Contracting/Sourcing	Preliminary (P)	NR	P			
Escalation	Defined (D)	NR	P	D	D	D
G. Planning						
Regulatory Approval & Permitting	Preliminary (P)	P	P			
Material Utilization (Borrow Sources)	Preliminary (P)	P	P	P/D		
Logistics Plan	Defined (D)	P	P	P	D	D
Work Breakdown Structure (WBS)	Preliminary (P)	P	P	P/D		
Decommissioning/Demolition Plan	Not Applicable (NA)	NR				
Integrated Project Plan	Defined (D)	NR	P	D	D	D
Project Code of Accounts	Defined (D)	NR	P	D	D	D
Project Schedule	Preliminary (P)	NR	P			
Risk Register	Preliminary (P)	NR	P			
Stakeholder Consultation/Engagement/Management Plan	Defined (D)	NR	P	D	D	D
Start-up & Commissioning Plan	Preliminary (P)	NR	P	P/D		
H. Studies						
Hydraulics	Not Applicable (NA)					
Topography & Bathymetry	Not Applicable (NA)					
Environmental Impact/Sustainability Assessment	Not Applicable (NA)	NR				
Environment/Existing Conditions	Not Applicable (NA)	NR				
Soils & Hydrology	Not Applicable (NA)	NR				
Geotechnical Investigation	Not Applicable (NA)	NR				
Technical Deliverables (Specifications and/or Drawings)						
Block Flow Diagrams	Not Applicable (NA)					
Hydraulic Design & Probable Maximum Flood (PMF)	Not Applicable (NA)					
Equipment Data Sheets	Preliminary (P)	NR/S	P			
Equipment Lists: Electrical	Preliminary (P)	NR/S	P			
Equipment Lists: Process/Utility/Mechanical	Complete (C)	NR/S	P	C	C	C
Design Specifications	Preliminary (P)	NR	S/P			
Electrical One-Line Drawings	Not Applicable (NA)	NR				
General Equipment Arrangement Drawings	Preliminary (P)	NR	S/P			
Instrument List	Not Applicable (NA)	NR				
Construction Permits	Not Applicable (NA)	NR				
Civil/Site/Structural/Architectural Discipline Drawings	Not Applicable (NA)	NR				
Demolition Plans and Drawings	Not Applicable (NA)	NR				
Erosion Control Plan & Drawings	Not Applicable (NA)	NR				
Fire Protection & Life Safety Drawings & Details	Not Applicable (NA)	NR				
Mitigation Measures (Aquatic, Terrestrial, Heritage, etc.)	Not Applicable (NA)	NR				
Dam Design & Drawings	Not Applicable (NA)	NR				
De-silting Basins	Not Applicable (NA)	NR				
Gates & Cranes Design & Drawings	Not Applicable (NA)	NR				
Intake Design & Drawings	Not Applicable (NA)	NR				
Penstock Design & Drawings	Not Applicable (NA)	NR				
Powerhouse Design & Drawings	Not Applicable (NA)	NR				
Spillway Design & Drawings	Not Applicable (NA)	NR				
Turbine and Generator Design & Drawings	Started (S)	NR	P			
Electrical Schedules	Not Applicable (NA)	NR	NR/S			
Instrument & Control Schedules	Not Applicable (NA)	NR	NR/S			
Instrument Data Sheets	Preliminary (P)	NR	NR/S	P	P/C	
Spare Parts Listings	Complete (C)	NR	NR	P	P/C	C
Electrical Discipline Drawings	Not Applicable (NA)	NR	NR			
Facility Emergency Communication Plan & Drawings	Complete (C)	NR	NR	S/P	P/C	C
Information Systems/Telecommunication Drawings	Not Applicable (NA)	NR	NR			
Instrumentation/Control System Discipline Drawings	Preliminary (P)	NR	NR	S/P	P/C	
Mechanical Discipline Drawings	Started (S)	NR	NR	S/P		
Auxiliary Electrical Design & Drawings	Not Applicable (NA)	NR	NR			
Auxiliary Mechanical Design & Drawings	Started (S)	NR	NR	S		
Protection & Controls System Design & Drawings	Preliminary (P)	NR	NR	S	P	
Total # Deliverables for Class Estimate		7	26	24	19	16
% Defined/Complete towards Class Estimate		100%	100%	73%	58%	48%

Comments:

This project is being submitted as an AACE Class 3 estimate. The defined deliverables of this project indicate that 73% of the Class 3 deliverables have been completed. AACE recommends applying between 10% to 30% contingency to estimates in this class. A contingency value of 15% was selected to account for specific risks such as water management risks associated with the isolation of the unit to ensure work space is dry. The contingency will also provide coverage for additional component refurbishments that may be required based on the as-found condition following unit isolation and disassembly, as there are components that are not accessible for assessment/inspection until after unit disassembly.

Legend:

The maturity level is an approximation of the completion status of the deliverable. The completion is indicated by the following descriptors:

General Project Data:

- Not Required (NR): May not be required for all estimates of the specified class, but specific project estimates may require at least preliminary development.
- Preliminary (P): Project definition has begun and progressed to at least an intermediate level of completion. Review and approvals for its current status has occurred.
- Defined (D): Project definition is advanced, and reviews have been conducted. Development may be near completion with the exception of final approvals.

Technical Deliverables:

- Not Required (NR): Deliverable may not be required for all estimates of the specified class, but specific project estimates may require at least preliminary development.
- Started (S): Work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
- Preliminary (P): Work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- Complete (C): The deliverable has been reviewed and approved as appropriate.

Inclusions

For the purposes of this document, the term *hydropower industries* is assumed to include private and public utilities involved with the production of electrical power, exclusive of transmission and distribution, using natural gravitational force of falling or flowing water, excluding tidal forces, to drive a turbine that powers a generator.

The common thread among private and public utilities (for the purpose of estimate classification) is their reliance on user requirements, statement of objectives, design reports (i.e. geotechnical investigations, sourcing borrow materials and hydraulic design/modeling) and/or environmental data collection and studies as primary scope defining documents. These documents are key deliverables in determining the degree of project definition, and thus the extent and maturity of estimate input information.

Cost estimates for hydropower facilities are typically composed of key features such as:

- Reservoir area preparation (e.g., clearing, removal of structures and earthmoving).
- River management (e.g., cofferdams, diversion channels or tunnels, sediment management plans, environmental monitoring programs).
- Principal structures (e.g., dams, dykes, intakes, penstocks, powerhouse(s), low level outlet(s), power tunnel(s), de-silting basin(s), and spillway structure(s)).
- Permanent infrastructure (e.g., access roads, railroads, bridges, offices, warehouse and housing).
- Temporary infrastructure (e.g., construction camp, site access roads, airport, workshops, construction power etc).
- Environmental mitigation features (e.g. fish ladder(s), water bypass and creation of new fish or wildlife habitat).
- Owner's costs (e.g., stakeholder involvement, licensing, studies and investigations, administration and overhead, catering.).

Some, but not all, of these features are unique to the hydropower industries.

Typical hydropower facilities may include: turbines, generators, exciters, governors, transformers, gates for intake, spillway and draft tubes, and supporting electrical, mechanical, telecom, protection, and control systems. The water storage reservoir is typically required to support the operations of the hydropower facility.