

CI 49595

HYD Tusket 1 Overhaul

REDACTED

October 5, 2026





NSEB APPROVAL SHEET

Project Title: HYD Tusket Unit 1 Overhaul

CI Number: 49595

Date: October 5, 2026

Expenditure Profile			Type of Filing	
Year	Budget Amount	Project Estimate	☒	Capital Project Authorization
			☐	Unforeseen and Unbudgeted (U&U)
			☐	Planned & Advanced (P&A)
			☒	Subsequent Approval Item
			☐	Authorization to Overspend (ATO)
			☐	Scope Change
			☐	Final Cost (FIN)
2019	23,413	23,413		
2020	21,814	21,814		
2021	320	320		
2022	-	-		
2023	-	-		
2024	159,985	159,985		
2025	331,525	168,119		
2026	3,411,894	772,074		
2027	1,701,003	1,466,729		
2028	-	404,237		
Total	\$5,649,954	\$3,016,690		

COMMENTS

Submitted on behalf of NOVA SCOTIA POWER INCORPORATED

Approved on behalf of NOVA SCOTIA ENERGY BOARD

Authorized Signatory
Dave Pickles
Chief Operating Officer

DATE
October 5, 2026

DATE

CI Number: 49595

Title: HYD Tusket 1 Overhaul

Start Date: 2019/09
In-Service Date: 2027/12
Final Cost Date: 2028/12
Function: Hydro
Forecast Amount: \$3,016,690

DESCRIPTION:

This project is for the refurbishment of Tusket Unit 1 turbine. The work includes replacement of the Kaplan runner with a stainless steel, oil-free hub design, the replacement of the main shaft bearings, and conversion of greased bronze bushings to greaseless composite bushings. It will also include the refurbishment of the wicket gates, turbine shaft, headcover, operating ring, control arms and linkages, draft tube, wheel pit, scroll case, and governor. The overhaul will address age-related deterioration, corrosion, wear, cavitation damage, and reliability concerns and extend the operating life of Unit 1.

The Tusket Hydro Station is located on the Tusket River. It operates 3 units at 0.9 MW each and it has been in service since 1929. Tusket Unit 1 was last overhauled in 1981.

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.”

• 2024-2025	CI C0073168	HYD TUS PH Fish Passage	\$949,804
• 2024-2026	CI C0064966	HYD TUS Tidal Pool Fish Passage	\$1,763,971
• 2025-2026	CI C0080230	HYD TUS 3 Stator Refurbishment	\$632,975
• 2025-2026	CI C0019199	HYD TUS Crane Refurbishment	\$105,107
• 2026	CI C0083572	HYD TUS Powerhouse Refurbishment	\$582,538
• 2026-2027	CI C0040106	HYD TUS 1 Generator Refurb	\$2,331,683
• 2026-2028	CI C0084249	HYD TUS PH Fish Passage	\$15,216,454
• 2008-2030	CI 29807-H541	HYD Tusket Falls Main Dam	\$90,475,518
• 2016-2032	CI 48913-H765	HYD TUS Facility Repairs	\$32,496,885

Depreciation Class: Hydraulic Production Plant - Tusket

Retirement Information:

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 2.67%

Estimated Life of the Asset: 25 years

JUSTIFICATION:

Justification Criteria: Hydro, Wind and Biomass

Why do this project?

The Tusket Unit 1 overhaul is required to address significant deterioration of critical turbine components and restore the unit's safe and reliable operation. Previous inspections (Attachment 1, Attachment 2) identified excessive wear in wicket gate linkages, nose pins, eccentric pins, bushings, gate stems, push-pull arms, and operating ring wear surfaces, causing unacceptable linkage and gate movement, excessive operating ring clearances, and reduced gate control

precision which resulted in taking the unit offline. The deteriorated and cracked draft tube access hatch presents an additional reliability and maintenance concern. Extensive cavitation damage is also present throughout the hydraulic passage, including significant runner blade material loss and deterioration below the speed ring that has exposed concrete and reinforcing steel to water flow. If not addressed and the unit were returned to service, cavitation would continue to accelerate deterioration of both metallic and concrete components.

The project will also support environmental objectives and regulatory commitments. The Tusket Hydro System operation is strictly balanced to ensure water management supports generation requirements in conjunction with environmental regulatory requirements, which include seasonal ecological maintenance flows in accordance with NS Power's provincial water approval, and effective upstream and downstream fish passage in accordance with the *Fisheries Act*. The System is also balanced to ensure safe water management downstream in the Tusket River for residents and the commercial and Indigenous gaspereau fishery which takes place annually in the spring. Reduced powerhouse capacity results in a greater reliance on spill operations at the Tusket Main Dam to manage river flows and therefore reduces flexibility in water management to meet these environmental commitments, which has been a subject of ongoing concern from Fisheries and Oceans Canada (DFO) and local gaspereau harvesters. Concerns raised with respect to increased spill include less effective upstream fish passage during critical gaspereau migration periods, and safety related concerns when local harvesters are conducting fishery operations in high water levels and high spillway flows. NS Power has collaborated with DFO and harvesters to manage spill operations to reduce impacts to upstream fish passage and gaspereau fishery operations over the last 5 years. Increased generating capacity will support reduce spill requirements during many operating conditions, supporting consistent fish passage conditions and reducing operational interactions with DFO and the fishery community.

The project also improves employee safety on the Tusket system. To achieve the environmental requirements around elevation and flows from the Tusket Main Dam, employees must be available to manually operate tainter gates at any time of day, and during all weather conditions. Having Tusket Unit 1 available increases NS Power's ability to move water through the system by operating the Unit remotely.

Why do this project now?

Unit 1 has been offline since 2020 due to mechanical and electrical component conditions. This investment has been deferred to reprioritize other higher priority, higher generation, units requiring overhauls that are completed by the same resource pool of skilled trades. The priority of the project has increased as it will be relied upon for water control during the planned refurbishment of the Tusket Main Dam project. To ensure unit availability ahead of this work, refurbishment must commence at this time.

NS Power intends to complete construction of the Main Dam with the Lake Vaughan Reservoir remaining within its regulated operating range. This will require the support of the generating units and it is critical to have all three units in operation at the beginning of construction in the event of an unplanned outage on one of the three units during construction.

In addition, continued operation of the Tusket Powerhouse with only two generating units increases dependence on aging water control infrastructure, limits operational flexibility, and increases exposure to reliability, safety and environmental risks. Completion of the overhaul will restore the station's full water management capability, improve maintenance flexibility, and reduce long-term operational risk.

The project is being executed concurrently with the planned Unit 1 generator refurbishment to maximize the efficiency of the outage and minimize overall lifecycle costs. Completing both scopes of work during the same outage avoids future disassembly and reassembly costs, reduces generation impacts, and eliminates the need for a separate extended outage to remove major turbine components at a later date. Undertaking the work now, while the unit is already unavailable and access has been established, represents the most cost-effective and operationally efficient approach. It also reduces the risk of in-service mechanical failure, maximizes the use of outage resources, and enables repairs to be completed before component deterioration results in more extensive and costly corrective work. By completing the overhaul in a planned and coordinated manner, NS Power will reduce the risk of future unplanned outages and improve generation availability and operational flexibility within the Tusket system.

Why do this project this way?

Refurbishment of this unit through the replacement of identified worn components represents the lowest-cost approach for achieving the intended project scope, considering both the current condition of the components and the age of the unit. This approach satisfies all project requirements and operational constraints while offering a significantly lower cost solution than a full unit replacement. The overhaul will preserve the reliability and operational performance of Tuskett Hydro Unit 1, ensuring its continued availability to support ongoing water management and system operations on the Tuskett River.

The selected work replaces or refurbishes major turbine and governor components that have experienced significant wear, corrosion, cavitation damage, and age-related deterioration. The new stainless steel Kaplan runner with an oil-free hub design eliminates the risk of oil releases from the runner hub while reducing future corrosion and cavitation damage. Conversion from greased bronze bushings to greaseless composite bushings will further reduce environmental risk and maintenance requirements.

The overhaul restores the unit to modern reliability and maintainability standards while preserving the existing powerhouse and associated civil infrastructure. This approach maximizes asset life, improves operational performance, enhances environmental stewardship, and provides the safest and most practical solution for restoring the station's full water control capability. And when combined with the generator refurbishment, this approach provides the greatest lifecycle value by restoring both the mechanical and electrical components of Unit 1 as a complete generating unit, thereby maximizing reliability, extending asset life, and reducing the likelihood of future forced outages.

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 20 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 complete unit disassembly and inspection. The contingency will also cover potential unforeseen increases in material and contract costs.

Reason for Variance

CI 49595 HYD Tuskett 1 Overhaul was listed in the 2026 ACE Plan at \$5,649,954, which included the scope for this project and the generator refurbishment. Since that time, the generator scope was removed from CI 49595 and moved to CI C0040106 HYD Tuskett 1 Generator Refurbishment. Separating the project into two projects will better capture the investment in the two distinct assets during the same outage and is consistent with how NS Power has managed these projects in the past. The decrease of \$2,633,264 from the 2026 ACE Plan subsequent submittal estimate for CI 49595 of \$5,649,954 is due to this split. The overall cost for the two projects (\$5.4M) remains well aligned with the \$5.7M included in the 2026 ACE Plan, however reduced slightly following further scope definition and development of the Class 3 Estimates.

Capital Project Detailed Estimate

Location: Hydro Ci#: 49595 Title: HYD Tusket 1 Overhaul Execution Year: 2026-2027					
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference
Regular Labour					
Hydro River Staff - Construction	PD	915	\$ 417	\$ 381,733	
Engineering Staff	PD	91	\$ 472	\$ 43,043	
			Sub-Total	\$ 424,777	
Overtime Labour					
Hydro River Staff - Construction	PD	24	\$ 834	\$ 20,403	
			Sub-Total	\$ 20,403	
Term Labour					
Hydro River Staff - Construction	PD	135	\$ 417	\$ 56,502	
			Sub-Total	\$ 56,502	
Travel Expenses					
Site Visits	month	18	\$ 733	\$ 13,185	
Accommodations	month	12	\$ 7,000	\$ 84,000	
			Sub-Total	\$ 97,185	
Materials					
Runner Replacement	lot				Attachment 3, Items 2-3
Draft Tube Mechanical Plug	lot				Page C3
Turbine Parts Machining	lot				
Shaft/Piston/Coupling Bolts	lot				Attachment 4
Misc Material (items such as coupling bolts, scroll case ladder, and other consumables)	lot				
Wicket Gate Replacement	lot				
CIP Pads and Tubes	lot				
Unloader Valve	lot				
Combined Bearing	lot				
Collector Ring	lot				
Cooling Coil	lot				
			Sub-Total	\$ 863,824	
Contracts					
Draft Tube Refurbishment	lot	1			
Governor Refurbishment	lot	1			Attachment 5
Quadrant Shaft Concrete Refurbishment	lot	1			Attachment 6
Wheel Pit Refurbishment	lot	1			
Misc Contracts (items such as site inspections, and confined space support)	lot	1			
			Sub-Total	\$ 342,615	
Consulting					
Drawings, Eng Support	lot	1			Attachment 7
Misc Consulting (items such as monorail design, draft tube platform design)	lot	1			
Quadrant Shaft Refurb Design	lot	1			
Throat Ring Inspection	lot	1			
Turbine Shaft Assembly Condition Assessment	lot	1			Attachment 3, page C3 Item 1
			Sub-Total	\$ 174,535	
Meals					
Meals	month	18	\$ 1,110	\$ 19,988	
			Sub-Total	\$ 19,988	
Tools and Equipment					
Tooling and Personal Equipment	lot	1	\$ 2,959.62	\$ 2,960	
			Sub-Total	\$ 2,960	
Freight Postage Delivery					
Turbine Runner Freight	lot	1			Attachment 3, page C3, Item 4
Misc Freight	lot	1			
			Sub-Total	\$ 18,398	
Other Goods and Services					
Contingency	%	20%	\$ 2,021,187	\$ 404,237	
			Sub-Total	\$ 404,237	
Interest Capitalized					
AFUDC				\$ 133,407	
			Sub-Total	\$ 133,407	
Administrative Overhead					
Administrative Overhead				\$ 423,513	
Contractor Admin Overhead				\$ 34,345	
			Sub-Total	\$ 457,858	
Sub-Total (no AO, AFUDC)					
				\$ 2,425,425	
TOTAL (AO, AFUDC Included)				\$ 3,016,690	
Original Cost				\$ 1,180,143	
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 TUS 1 Overhaul		Started or Preliminary	Class 5	Class 4	Class 3	Class 2
Maturity Level of Project Definition Deliverables		Defined or Complete				Class 1
General Project Data						
A. Scope						
Project Scope of Work Description		Defined (D)	P	P	D	D
Site Infrastructure (Access, Construction Power, Camp, etc.)		Defined (D)	NR	P	D	D
B. Capacity						
Facility Output / Production Profile		Defined (D)	P	P	D	D
Electrical Power Requirements (when not the primary capacity driver)		Defined (D)	NR	P	D	D
C. Project Location						
Plant and Associated Facilities		Not Applicable (NA)				
D. Requirements						
Codes and/or Standards		Defined (D)	NR	P	D	D
Communication Systems		Not Applicable (NA)	NR			
Fire Protection and Life Safety		Not Applicable (NA)	NR			
Environmental Monitoring		Not Applicable (NA)	NR	NR		
E. Technology Selection						
Not Applicable						
F. Strategy						
Contracting/Sourcing		Defined (D)	NR	P	D	D
Escalation		Defined (D)	NR	P	D	D
G. Planning						
Regulatory Approval & Permitting		Defined (D)	P	P	D	D
Material Utilization (Borrow Sources)		Not Applicable (NA)				
Logistics Plan		Defined (D)	P	P	P	D
Work Breakdown Structure (WBS)		Preliminary (P)	P	P	P/D	
Decommissioning/Demolition Plan		Defined (D)	NR	P	D	D
Integrated Project Plan		Preliminary (P)	NR	P		
Project Code of Accounts		Defined (D)	NR	P	D	D
Project Schedule		Defined (D)	NR	P	D	D
Risk Register		Defined (D)	NR	P	D	D
Stakeholder Consultation/Engagement/Management Plan		Not Applicable (NA)	NR			
Start-up & Commissioning Plan		Preliminary (P)	NR	P	P/D	
H. Studies						
Hydraulics		Defined (D)	P	P	D	D
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		Not Applicable (NA)	NR/S			
Equipment Lists: Process/Utility/Mechanical		Preliminary (P)	NR/S	P		
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		Preliminary (P)	NR	S/P		
Construction Permits		Complete (C)	NR	S/P	P/C	C
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		Complete (C)	NR	P	P	P/C
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		Preliminary (P)	NR	P	P	P/C
Electrical Schedules		Not Applicable (NA)	NR	NR/S		
Instrument & Control Schedules		Complete (C)	NR	NR/S	P	P/C
Instrument Data Sheets		Complete (C)	NR	NR/S	P	P/C
Spare Parts Listings		Started (S)	NR	NR		C
Electrical Discipline Drawings		Not Applicable (NA)	NR	NR		
Facility Emergency Communication Plan & Drawings		Complete (C)	NR	NR	S/P	P/C
Information Systems/Telecommunication Drawings		Not Applicable (NA)	NR	NR		C
Instrumentation/Control System Discipline Drawings		Complete (C)	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		Not Applicable (NA)	NR	NR		
Protection & Controls System Design & Drawings		Not Applicable (NA)	NR	NR		
Total # Deliverables for Class Estimate			6	25	24	21
% Defined/Complete towards Class Estimate			100%	100%	77%	68%

Comments:

This project is being submitted as a Class 3 estimate. The deliverables of this project indicate that 77% of the Class 3 deliverables have been completed. A 20% contingency has been selected to account for specific risks, including water management risks associated with the isolation of the unit to ensure work space is dry, and 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.

Condition Assessment

Tusket Hydro-electric Power Generating Station

Unit #1 – 1929

Inspection period: July-August, 2019

Final report: February, 2020

Fundy Hydro System- Tusket Powerhouse

NOVA SCOTIA POWER INC. - Hydro Maintenance Services

Prepared By Dylan Doucette

Crew: DD,BR,MH



TUSKET- UNIT ONE



Turbine – The original turbine Built by

S. Morgan Inglis Company LTD.

Toronto Canada. Serial number- 8498

Generator- Westinghouse AC Generator

Canadian Westinghouse Company Limited

Hamilton Canada.

Generator Information:

Horsepower - 1660

KVA - 900

Speed - RPM – 225

Volts - 6600

Head – 27'

Amps - 78.7

Excitation Volts - 125

Excitation Amps - 112

80% - PF

S.O. – 372484

60 Cycles

Serial Number - 236587

Built then Commissioned in 1929. Tusket is a three unit powerhouse. With a 4th scroll case for one more generator that was never installed. The 4th bay scroll case is used for water control at times. The units are valuable here because of location, extremely far from most the provinces generation. Tusket's Generators help supply voltage support to the grid. When the scope is planned to do major work within the Tusket system one must always state the importance of voltage support and water control as major factors on keeping Tusket alive for years to come. The outages for these units if done right will be extended to cover draft tube / throat ring and concrete repairs.

Manhole and Scrollcase entry point- The Scroll case ladders are in very poor condition; new ones need to be fabricated for all 3 units. During fabrication designs need to include scroll case drain brackets. Also, the concrete around the manholes show excessive erosion under flange. See pictures.



Scroll Case ladders need replacement.

Manhole cover Flange - undermined



1.5 - 2.5" deep



Scroll case- Is a typical water box design, for high flow units. At one point there have been repairs to the scroll cases in Tusket. You can find fittings in the walls in various places in the scroll case and throughout the powerhouse from hydraulic epoxy or cement being pumped into cracks. Also a heavy epoxy is applied to the entire scroll case for protection. This makes it difficult to inspect the concrete. This epoxy is

flaking off in various locations. The ladders are made of steel and almost completely falling off the wall, not safe for use and could potentially end up in the turbine causing damage. Measurements were taken to fabricate new ladders during July 2019. Scroll case floor is approx. 4 feet thick.

Draft tube/Throat ring - Throat ring and the draft tube on unit 1 is unbelievable. Severe Cavitation, the turbine had to of ripped stainless plates right off. There is exposed concrete embedded rebar and angle iron. Cracks found on throat ring to lower wicket gate ring. Need major repairs, chipping of concrete pedestal around draft tube, new forms and a repour. The old vacuum line 1"-1/2 pipe that use to suck the water off the head cover is now the exposed 6"x 6" square that's eroded, there are 7 locations on throat ring almost all identical. See video / pictures.

Unit 1- Turbine Throat ring - Running surface





Bottom Right hand corner of draft tube door is eroded from old vacuum pipe.
Inspection door is also cracked up the center.



Turbine side of door, very poor condition. Continuous erosion.



Blades appear to have made contact to stainless steel throat ring liner.



Lower wicket gate ring to throat has cracks 80% around. See chipped paint area above stainless steel.

Wheel pit Liner / head cover Flange- The wheel pit liner is in fair shape for age, has a heavy epoxy coating on the scroll case side. However on the turbine bearing side accessible with a ladder there is heavy corrosion/rust. It's highly likely the paint contains lead. The liner is approx. ½" where rivet sections meet so this would be original thickness, measured with a ruler. Blasting, thickness tests, repairs and paint are required. You can see where the liner was cut and repositioned back in 1964.

Wheel pit liner



Repositioned and welded to correct misalignment



Governor Linkage / Quadrant shaft - Governor shaft concrete pedestal on the left side floor of the scroll case looking upstream was inspected. There was excessive movement in the sole plate concrete block, it was deemed important to repair prior to releasing the unit for service. It was a quick fix because the unit needs an overhaul. A cage was built around the block and epoxy and anchors used to secure. This will need chipping, new anchor plan for block, grouting and realignment to gov, from main powerhouse floor. Push pull rods are in bad shape, there's no way to make adjustments on the rods as the threads are in poor condition. One pin was working itself out of the rods. This was hammered in and set screw re-tightened. Upper governor yoke bushing has excessive play, new bushing and pin needed.

After the cage install there was minor adjustments made to governor yoke for more Squeeze to try to close up the excessive clearance on wicket gates.



Draft Tube door- See pictures above, door has crack from erosion hole up through center of door. Door has not been removed in a very long

time. Recommendation: New door / inspection cover or remove completely, repair throat ring and not install new door.

Kaplan Turbine – Variable pitch 4 blades – Blades are severely cavitated on the bottom sides. One has a hole. Blades have had so many repairs in the past they are past fixing at this point. It appears that the blades are hitting the stainless at times as the throat ring deteriorates and rips chunks of it off. Possible cracks.

Kaplan - Turbine Blade

Severe cavitation





Frosting on stainless, cavitation and rust.



Runner blade - Very poor condition.

Lower wicket gate ring- Lower ring will need new threaded inserts for wicket gate shafts, lower wicket gate sealing surface is badly gouged/wore from gates rubbing it, during repairs to throat ring/ draft tube, if the repairs are extensive we may be able to chip out lower ring. Re-level / re-align or remove and do repairs it needs, machining bottom wicket gate sealing surface flat or proper belzona repairs could work. Also needs Blasting and paint.

Wicket Gates rubbing lower ring.

Deep grooves

Gate #2



Operating ring- Wicket gate actuation is underwater on the Tusket units. The operating ring has excessive amounts of wear on brass wear pads. Shim stock is behind wear pads indicated that wear plates have been there for extended amount of time with shimming to tighten it

up. Heavy pitting present. There is a ½" gap between castings. Wicket gate Links and bushings wore extremely bad. *All underwater parts never see grease. Unit should be scoped for water lubricated bushings prior to replacement.

Operating ring

Excessive wear .200"+ clearance in the left to right direction.



Operating ring, lower wear pads. Distorted and wore out.



Wicket Gates - Lots of cavitation on the wicket gates especially under the paint these pits cause turbulent flow which has degraded the runner blades. Gate # 3 has a steel plate bolted to the inside lower half. #5, 6, and 7 have a piece broken off the gate by toe pin/ gate link. See pictures.





Complete replacement recommended

Headcover- The head cover is fairly simple piece in Tusket, its big and heavy but it's basically one part. It will need to be removed from the powerhouse due to space restrictions upon disassembly. The head cover will need blasting, inspection / repairs and paint. Cavitation issues addressed, make the water path as linear as possible. Removing pits and divots with belzona smoothed out and painted. This would help with the cavitation issues on the runner blades. Headcover to runner hub clearance is between .202" and .205".

The turbine bearing housing bolt holes are very rough. The lower half of the machine needs fastener scoping and repairs. Head cover studs, nuts, etc.

Head cover Flange with studs/nuts
Rusted, needs replacement and refurbishment



Turbine Shaft – The turbine shaft, Line bore coupling bolts recommended. Inspection of shaft required.

Generator shaft: Bearing Journals, shaft fits, should be inspected and review the condition during the early stages of the overhaul. Assess repairs, cleaning. Shafts removed should be chucked and assessed in a lathe at the maintenance shop in Milton.

Coupling Bolts: Coupling holes would need to be lined bored and new ones fabricated. Time and materials should be added to overhaul as this is important to capture. There is 3 shafts and 2 couplings and a total of 20 bolts. Not including runner coupling.

Runner shaft to Jack shaft Coupling bolt bore
Hole # 2, rough finish.



Oil Pots and Covers for bearings: Unit 1 has a cascading oil system powered by a shaft driven oil pump with internal cooling coil. Almost every piece of pipe work in Tusket has a leak. The 90 year old fittings/pipes need replacement. Recommend replacement scoping of all pipework (internal and external) including cooling coil. Bearing covers are sealed poorly, adding felt seals around shaft and sealing any bad leaks would clearly help this issue. Kaplan Oil head Piping leaks on Exciter. There are areas where oil is under the paint. Indicates no gasket or very poor sealing methods. Leaks everywhere. See pictures.

Oil Leaks





* Important to identify locations of bad leaks during disassembly and or during piping scope work plan. Same goes for fasteners, all bolts have rounded heads, poor threads. New fasteners needed. Blind holes on lower machine end, may need extensive repairs.

Speed Switch: would need to ask operations the operating condition of it and if it's been tested.

Upper and lower brackets- upper brackets on Tusket units have a bridge style. Brackets need blasting and painting. During disassembly bridge deflection should be measured before removing thrust collar assembly. Bracket not built heavy enough for unit weight.

Lower bracket needs the same typical repairs, paint and cleaning, inspection.

The intermediate bearing bracket in Tusket is a very poor design almost like the upper bracket bridge it spans across from left to right. The bracket shimmies around while units in operation. Jack shaft should be chucked in a lathe and assessed/inspected by a machinist.



Oily surfaces - Insects stuck everywhere on unit.



Inside intermediate bearing housing



Cooling water intake- Needs modifications to the intake, there is no screen on the outer part of the plant, inside trash racks, outside headgates. These intakes (2) get plugged with minnows in the winter

months due to elevation, approx. 4 ft below the normal water level. This has tripped the units in Tusket a number of times. A manifold that plunges deeper with a screen would help eliminate this issue. This info was collected from the Fundy operations team. Low cooling water flows trips all 3 units. See pictures.



Basement upstream wall, pump intake line. 2-supply valves feed one line. Common for the 3 units.



Governor- Has some oil leakage, Kaplan Pitch mechanism should be cleaned, inspected, repaired if needed. Oil change, cleaning of oil sump, inspection of pump, gears should be carried out. Also, it may be time to look into replacing governor pressure tanks. See pictures

Kaplan Turbine - Pitch Operation mechanism * These pictures are unit 3

All units are the same from a visual standpoint.



Gov-Oil pressure tank needs inspection...replacement recommended.

All 3 units are alike.



TUSKET Unit#1 – Re-Evaluation

October 2020

An internal request from Hydro Operations was made for the Heavy Maintenance Shop to give a second opinion on the condition of some of the underwater mechanical components of TUS1 generator in October 2020.

The Operations crew was onsite performing an annual electrical-mechanical inspection and were concerned with the findings. One of the major concerns was the excessive amount of wear in the wicket gate mechanisms and possibly the operating ring.

There is excessive wear in the straight(nose pins) and eccentric pins and bushings. With the gates in the open position, the body of the gate can be grabbed with two hands and “rattled” in the linkages. Linear movement in the amount of ¼” or greater.

The gates can be pried up between the lower gate ring and the head cover 1/8”-1/4” with a small pry bar. The thrusts for the bottom gate stem, which would hold the gates in the vertical position are badly worn on about half of the gates.

There is an abundance of vertical gate clearance, which could be reduced by machining the top and bottom gate surfaces and adding a plate. This was performed on unit 2 during an overhaul in 2014 and is holding up well. There is not much head on these units, but leakage should be reduced if possible.

At some point the nose pins must have dropped as there are gouges in the lower gate ring. Not all of these gouges transfer from the operating ring to the lower ring, but the ones that do are painted over so it is not a new issue. The nose pins are probably supposed to be a shrink fit by design, but over the years, fits are most likely worn, they are secured with grub screws.

There is excessive clearance between the operating ring and the lower gate ring. The brass wear pads are badly worn, the operating ring shifts sideways probably about 1/8” before it starts to rotate.

There is also a lot of wear on the underside of the operating ring, mostly where the wear pads are. The brass is wearing into casting. This is putting undue stresses on the operating ring and gate linkages.

The pins and bushings on the push/pull arms are also worn, more on the ends that connect to the pawl of the quadrant shaft. There is a definitive “clunk” in this area when the gates are stroked through the governor.

The access hatch to the draft tube has a piece of metal missing and is cracked from top to bottom in a few places. The draft tube liner can be seen through this hole. During the annual inspection last year, it was noted that there was a small crack in this plate.

There is cavitation on the runner blades, on the bottom side, at the intersection of the stainless weld repairs to the original material. Also, some of the trunnions have cavitation where the stem fits into the runner hub.

About half of the stainless steel band that covers the nose cone bolts is missing. Not sure if this fell off or was cut off intentionally. This is the case on some other Kaplan runners in Hydro also.

There is a fair amount of metal or cladding missing below the speed ring, at the draft tube liner. This exposes the concrete and steel reinforcements which would normally be protected. The end result of this will be cavitation of the concrete.

The recommendation would be to remove the wicket gates, replace the nose pins, eccentric pins and all bushings. Repair the gate stem and replace the worn bushings. If the vertical clearance is to be reduced, plates would need to be added to take up the clearance. The operating ring could be refurbished to replace the wear pads and build up the running surfaces. The access plate to the draft tube should be repaired. The holes below the speed ring and the cavitation on the runner would require the runner to be removed.



NORCAN
HYDRAULIC TURBINE INC.

Norcan Hydraulic Turbine, Inc.
50 Bruce Crescent
Carleton Place, Ontario
Canada K7C3V6



Nova Scotia Power Inc.
1223 Lower Water Street
Halifax, Nova Scotia
Canada B3J 3S8

Ainslee Walker
Procurement Specialist
(902) 717-3202
ainslie.walker@nspower.ca

RE: Tusket Unit #1 Runner Replacement
REF: Q2891 R1

October 28, 2025

Dear Ms. Walker,

Norcan Hydraulic Turbine Inc. is pleased to provide, as a value-adding alternative, the following revised proposal to supply an upgraded Kaplan runner replacement to further improve reliability of the Tusket hydroelectric station's Unit #1 turbine. The associated headcover modification will still be required to complement the runner's new hydraulic design geometry. Expected turbine performances have been provided to serve as a target for the replacement runner. Coupled with upgraded materials, the upgraded Kaplan runner replacement will also aim to eliminate the risk of future cavitation erosion throughout its available range of operation.

The condition assessment requirements to integrate the turbine shaft assembly into the scope of work have been included as a separate line item, and more information can be found herein. Additional costs have also been included for contingency planning purposes. Norcan's General Conditions of Contract have been included for reference but it is expected that the project would be executed under a modified NSPI contract agreement.

The equipment pickup would be anticipated to occur by the end of November (2025) in order to return the equipment to the project site location as soon as possible. An initial project schedule has been included to establish the expected production schedule and support Nova Scotia Power's internal project planning.

I hope that the following proposal relieves any outstanding concerns. We look forward to the opportunity to continue supporting Nova Scotia Power and satisfying the project requirements.

Respectfully,

Ian Shea
Technical Business Development Manager

(613) 257-4755 Ext. 18
ishea@norcanhydro.com



TUSKET UNIT #1 RUNNER REPLACEMENT

FIRM PROPOSAL



QUOTE: Q2891 R1
DATE: October 28, 2025

PREPARED FOR: Nova Scotia Power Inc.
[CUSTOMER]

ATTENTION TO: Ainslee Walker (902) 717-3202
[RECIPIENT] Procurement Specialist ainslie.walker@nspower.ca

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



PROPRIETARY AND CONFIDENTIAL

This document and all accompanied references have been submitted to the RECIPIENT in confidence solely for use in consideration of the merits of the offering. The contents included herein are proprietary to Norcan Hydraulic Turbine Inc. and its respective subcontractor(s) and no other direct or indirect use by the RECIPIENT is permitted without written authorization from the author(s). In taking receipt of this document, the RECIPIENT agrees not to reveal its contents except to those in its own organization who must evaluate it, to use this document and the information that it contains exclusively for the above-stated purpose, and to avoid disclosure of the information to any third party under any circumstance.

LIMITED LIABILITY

This document has been prepared by qualified persons who have, to the best of their abilities, represented the completeness and accuracy of the information contained herein. The author(s) reserve the right to modify this document at any time, or to rectify any misrepresentations upon discovery.

NOMENCLATURE

Norcan Hydraulic Turbine Inc. recognizes that the nomenclature specific to the hydropower industry continues to evolve and can be subjective based on individual naming conventions of the equipment, products, services, and/or procedures related to the purpose of this document. While every effort has been applied to avoid any confusion or misrepresentations, if at any time a discrepancy is encountered that requires clarification, the RECIPIENT is encouraged to request an immediate response from the PRIMARY CONTACT.

TERMS & ABBREVIATIONS - DEFINITIONS

Unless otherwise defined, the following definitions are to be used in association with this document.

TERM, ALTERNATIVE	DEFINITION
CFD / FEA	- Computational Fluid Dynamics / Finite Element Analysis, methods of engineering analyses
CONTRACT DOCUMENTS	- Documents included as part of the Contract Agreement and all identified associated references
CONTRACT AWARD DATE	- The date of receipt of purchase order from the CUSTOMER
CONTRACTOR	- Norcan Hydraulic Turbine Inc.
CUSTOMER, OWNER	- Nova Scotia Power Inc.
CW / CCW	- Clockwise / Counter-Clockwise
DE / NDE	- Drive End / Non-Drive End
DISCOVERABLE WORK	- Additional requirements to be integrated into the SCOPE OF WORK in order to satisfy the project
FINAL ACCEPTANCE	- Achieved once the SCOPE OF WORK has been fully satisfied and all project close-out documentation has been provided to the CUSTOMER
LE / TE	- Leading Edge / Trailing Edge
OEM	- Original Equipment Manufacturer
RECIPIENT	- Ainslee Walker, Procurement Specialist
PROJECT START DATE	- The date of receipt of the Purchase Order from the CUSTOMER
PROPOSAL DOCUMENTS	- Documents included as part of Norcan's proposal and all identified associated references
SCOPE OF WORK	- A definition of the work required for the project included as part of the CONTRACT DOCUMENTS
SUBSTANTIAL COMPLETION	- Achieved once the equipment has demonstrated its preparation for commercial operation and has been delivered to the CUSTOMER
US / DS	- Upstream / Downstream

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



EXECUTIVE SUMMARY

The Tusket hydroelectric station, operated by Nova Scotia Power, is a hydroelectric power plant located near Yarmouth, Nova Scotia. It's part of the Tusket Hydro System, which includes four storage reservoirs. The station is comprised of three vertical Kaplan turbine generating units, each with a rated capacity of 900 kW, for a total plant capacity of 2.7 MW. The turbines were originally supplied in 1929 and have undergone several repairs over the course of their service life. The turbines have historically struggled with cavitation erosion and following a condition assessment in 2020, excessive wear throughout the Unit #1 turbine and generator was identified and the was deemed unsafe to continue commercial operation.

The Customer is seeking innovative solutions to extend the Unit #1 turbine's service life and return the equipment to the project site as early as possible. Replacing the Kaplan runner blades using improved materials and refurbishing the hub, nose cone, and internal blade mechanism components was initially determined as the primary objective of the project. A secondary objective to redesign the runner blade seal and perform the necessary testing to verify its functionality was also determined. While the original intentions of the project requirements have been summarized above, existing constraints prevent the practical solutions that the Customer has requested and have been explained in greater detail:

The existing runner's service life is approaching 100 years old, which is generally considered long past the expected life cycle of the equipment. The existing components anticipated to be reused have an extremely high risk of fatigue failure without any real opportunity for prevention other than proactive replacement. [REDACTED]

[REDACTED]

[REDACTED]

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



1 COMMERCIAL PROPOSAL

1.1 CUSTOMER INFORMATION

CUSTOMER NAME: Nova Scotia Power Inc.

CUSTOMER ADDRESS: 1223 Lower Water Street
Halifax, Nova Scotia
Canada B3J 3S8

CUSTOMER CONTACT: Ainslee Walker (902) 717-3202
Procurement Specialist ainslie.walker@nspower.ca

1.2 CUSTOMER SUPPLIED COMMERCIAL DOCUMENTS & ADDENDA

The following commercial documents, amendments, and addenda issued to date by the CUSTOMER have been received and considered within this proposal.

FILENAME	FILETYPE	REVISION
Norcan Hydraulic Turbine Inc - Goods and Services Agreement (08-10-25v2)	DOCX	-
7-11. Attachment B Safety and Environmental Requirements	PDF	-
12. Addendum 1 - Questions and Answers 1	XLSX	-

1.3 CONTRACTOR SUPPLIED COMMERCIAL DOCUMENTS & ADDENDA

The following commercial documents, amendments, and addenda issued to date by the CONTRACTOR have been included as supplemental for consideration with this proposal.

FILENAME	FILETYPE	REVISION
Norcan Hydraulic Turbine Inc - Goods and Services Agreement (08-10-25v2)_2025-10-27	DOCX	-
NHT_NPSI Clarifications & Responses_2025-10-27	PDF	-
NOR103 - Diem Rates CAD (2025)	PDF	2025
NOR103 - Diem Rates CAD (2026)	PDF	2026

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



2 GENERAL

2.1 PROPOSAL REVISION HISTORY

DATE	DESCRIPTION	REVISION
May 15, 2025	Firm Proposal	R0
October 28, 2025	Updated Proposal - Increased Scope	R1

2.2 PROPOSAL INFORMATION

PROPOSAL TYPE: FIRM
PROPOSAL VALIDITY: 30 DAYS
EX-VALIDITY DATE: November 27, 2025

PROPOSAL CURRENCY: CANADIAN DOLLAR (CAD)
CAD/USD X-RATE: N/A
 BANK OF CANADA (2025-10-27)

PRIMARY CONTACT: Ian Shea +1 (613) 257-4755 (ext. 18)
 Technical Business Development Manager ishea@norcanhydro.com

SECONDARY CONTACT: Robert Kavanagh, P. Eng +1 (613) 257-4755 (ext. 15)
 Engineering / R&D Manager rkavanagh@norcanhydro.com

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



2.3 PRICING

Based on the firm pricing below, the initial Total Contract Value associated with Norcan's base scope of supply for the project has been calculated to reflect the following:

TOTAL CONTRACT VALUE: \$ [REDACTED] (CAD)

PRELIMINARY ENGINEERING					
ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
1	CONDITION ASSESSEMENT	1	LOT	\$ -	\$ [REDACTED]
	TURBINE SHAFT ASSEMBLY				

EQUIPMENT SUPPLY					
ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
2	UPGRADED KAPLAN RUNNER REPLACEMENT	1	LOT	\$ -	\$ [REDACTED]
3	HEADCOVER TRANSITION	1	LOT	\$ -	\$ [REDACTED]

FIELD SERVICES					
ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
4	EQUIPMENT TRANSPORTATION	1	LOT	\$ -	\$ [REDACTED]

2.4 ADDITIONAL PRICING (BUDGETARY)

The budgetary pricing below has been included for further consideration. Costs and associated schedule impacts are subject to adjustment upon evaluation at the time of request.

PRELIMINARY ENGINEERING (NOT INCLUDED IN TOTAL CONTRACT PRICE)					
ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
ALT2	SITE-SPECIFIC CFD CAM CURVE	1	LOT	\$ -	\$ [REDACTED]

EQUIPMENT SUPPLY (NOT INCLUDED IN TOTAL CONTRACT PRICE)					
ITEM	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL PRICE
ALT3	REPLACEMENT ACTUATOR ROD	1	LOT	\$ -	\$ [REDACTED]



3.0 PROJECT EXECUTION

3.1 PROJECT OBJECTIVES

The principal objective of this project is to support the customer in the replacement of the existing turbine equipment and expediting the unit's return to commercial service. Providing the highest quality products and services is rooted at the core of NORCAN's corporate values and can be supported by a consistent ability to provide the greatest level of customer satisfaction.

3.2 PROJECT MANAGEMENT

The project will be managed from NORCAN's head office, located in Carleton Place, Ontario (Canada). Key personnel information can be provided as an external document submittal and detailed supplemental information can be provided upon request. Norcan relies on a Product Data Management (PDM) system to reduce operational inefficiencies and streamline work orders from design to production to quality control. The service centralizes each component's workflow, tracks and automatically updates drawing revisions, manages design and engineering files, and ensures that every model, drawing, and document maintains its course along their defined processes. Each individual project process is created and monitored from a master resource scheduler and critical path tasks are prioritized to limit any controllable delays during the project. In the event the project schedule begins to slip, priorities are reorganized to best accommodate each project's anticipated delivery date to reduce schedule impacts.

3.3 PROJECT SCHEDULE

The Project Start Date begins from the latest date of receipt of the following:

- (i) Signed purchase order with reference to all applicable contract documentation; and
- (ii) Milestone Payment #1, as defined in Section 4.1.

A estimated schedule duration is described below. A working project schedule Gantt chart will be supplied within two (2) weeks of the Project Start Date and maintained throughout the course of the project. Schedule updates will be provided on a monthly progress basis, unless otherwise agreed upon. Schedule durations subject to change based on shop loading at the time of the Project Start Date.

Estimated Schedule Duration

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Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



4.0 COMMERCIAL TERMS AND CONDITIONS

4.1 PAYMENT SCHEDULE

Payment schedule subject to base scope of work, additional/optional scope items to be invoiced under separate schedule(s) if required, unless otherwise agreed upon.

			Anticipated Value	Anticipated Date

- Notes:
- 1. Major Component Materials (Runner Castings)

4.2 PAYMENT TERMS

[Redacted Payment Terms Content]

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



1 TECHNICAL PROPOSAL

1.1 CUSTOMER SUPPLIED TECHNICAL DOCUMENTS & ADDENDA

The following technical documents, amendments, and addenda made available to date by the CUSTOMER have been received and considered within this proposal.

FILENAME	FILETYPE	REVISION
1-5. H 009W1 9 411 00 030 runner hub	PDF	-
2-2. Attachment A - Tusket 1 Runner Refurb - Technical Spec	PDF	-
4-4. H 009W1 9 411 00 029 runner hub plan	PDF	-
5-3. H 009W1 9 411 00 019	PDF	-
6-10. Photo 5 - Unit 2 Runner Hub Interior After Some Refurbishment	PNG	-
8-9. Photo 4 - Unit 2 Crosshead, linkages, rocker arms	JPG	-
9-6. Photo 1 - Bottom side of unit 1 runner	JPG	-
10-7. Photo 2 - Missing bolt cover on unit 1 nose cone	JPG	-
11-8. Photo 3 - Top side of unit 1 runner	JPG	-
12. Addendum 1 - Questions and Answers 1	XLSX	-
13. Addendum 1.1 - PDF Attachments	PDF	-
14. Addendum 1.2 Photo 1 - Runner in current state (nose cone not shown)	JPG	-
15. Addendum 1.3 Photo 2 -TUS 1 Generator Nameplate	JPG	-
16. Addendum 1.4 Photo 3 - TUS 1 Turbine Nameplate	JPG	-

1.2 CONTRACTOR SUPPLIED TECHNICAL DOCUMENTS & ADDENDA

The following technical documents, amendments, and addenda issued to date by the CONTRACTOR have been included for reference and consideration with this proposal.

FILENAME	FILETYPE	REVISION
-	PDF	R0

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



2 GENERAL

2.1 SITE INFORMATION

SITE OWNER: Nova Scotia Power Inc.

SITE NAME: Tusket Hydroelectric Station

SITE ADDRESS: 51 Bennys Lane
Tusket, Nova Scotia
Canada B0W 3M0

SITE CONTACT: N/A (Unknown)

GEOLOCATION: 43°52'55" N 65°58'40" W



Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



2.2 EXISTING EQUIPMENT DATA - UNIT #1

TURBINE INFORMATION

MANUFACTURER: S. MORGAN SMITH CO. LTD

TURBINE TYPE:	KAPLAN	INTAKE:	OPEN FLUME	SERIAL NO:	8498
ORIENTATION:	VERTICAL	DISCHARGE:	CONICAL	ROTATION:	CW
RATED HEAD:	8.23 m 27.0 ft	RATED SPEED:	225.0 RPM 563 RPM	SYNCHRONOUS RUNAWAY (ESTIMATED)	
RATED FLOW:	20.00 m ³ /s 706 ft ³ /s	RATED POWER:	1660 HP 1238 kW		

GENERATOR INFORMATION

MANUFACTURER: CANADIAN WESTINGHOUSE CO. LTD

FORM:	SYNCHRONOUS	SERIAL NO:	236587	VOLTS:	6600 V
ORIENTATION:	VERTICAL	TYPE:		AMPERAGE:	78.7 A
RATED SPEED:	225 RPM	FREQUENCY:	60 Hz	GEARBOX:	Y ☐ N ☒ X
RATED OUTPUT:	900 kVA	POWER FACTOR:	0.8	RATIO:	N/A
RATED POWER:	720 kW				



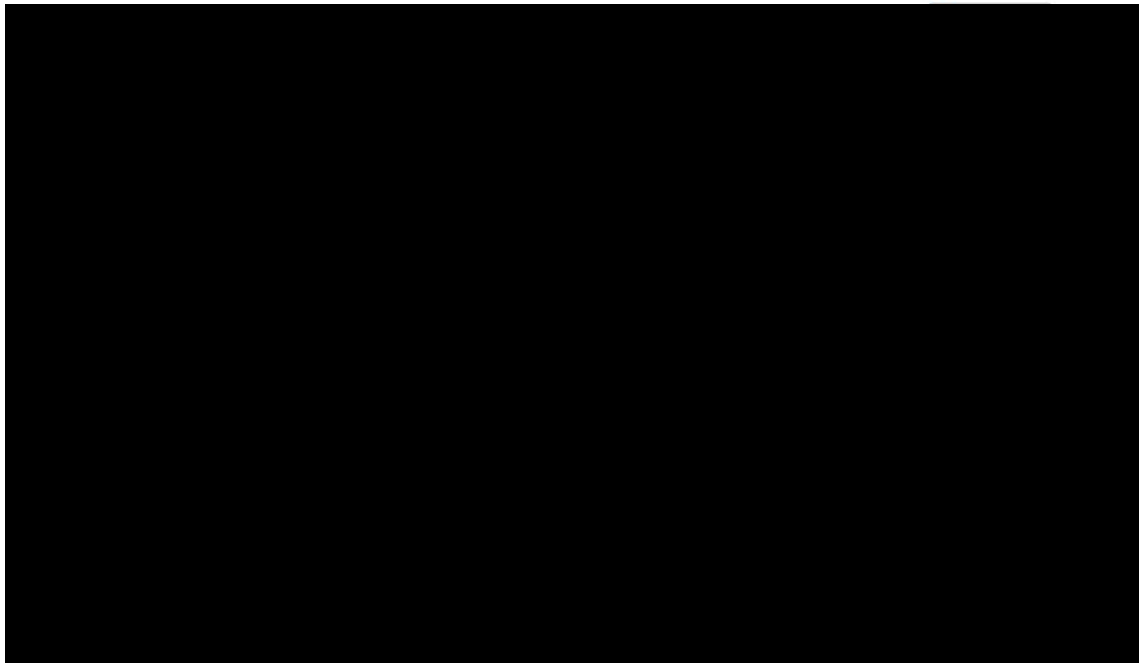
3 TECHNICAL DATA

3.1 TURBINE SPECIFICATIONS

[illegible]

3.2 TURBINE PERFORMANCE

This picture is
confidential



Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement

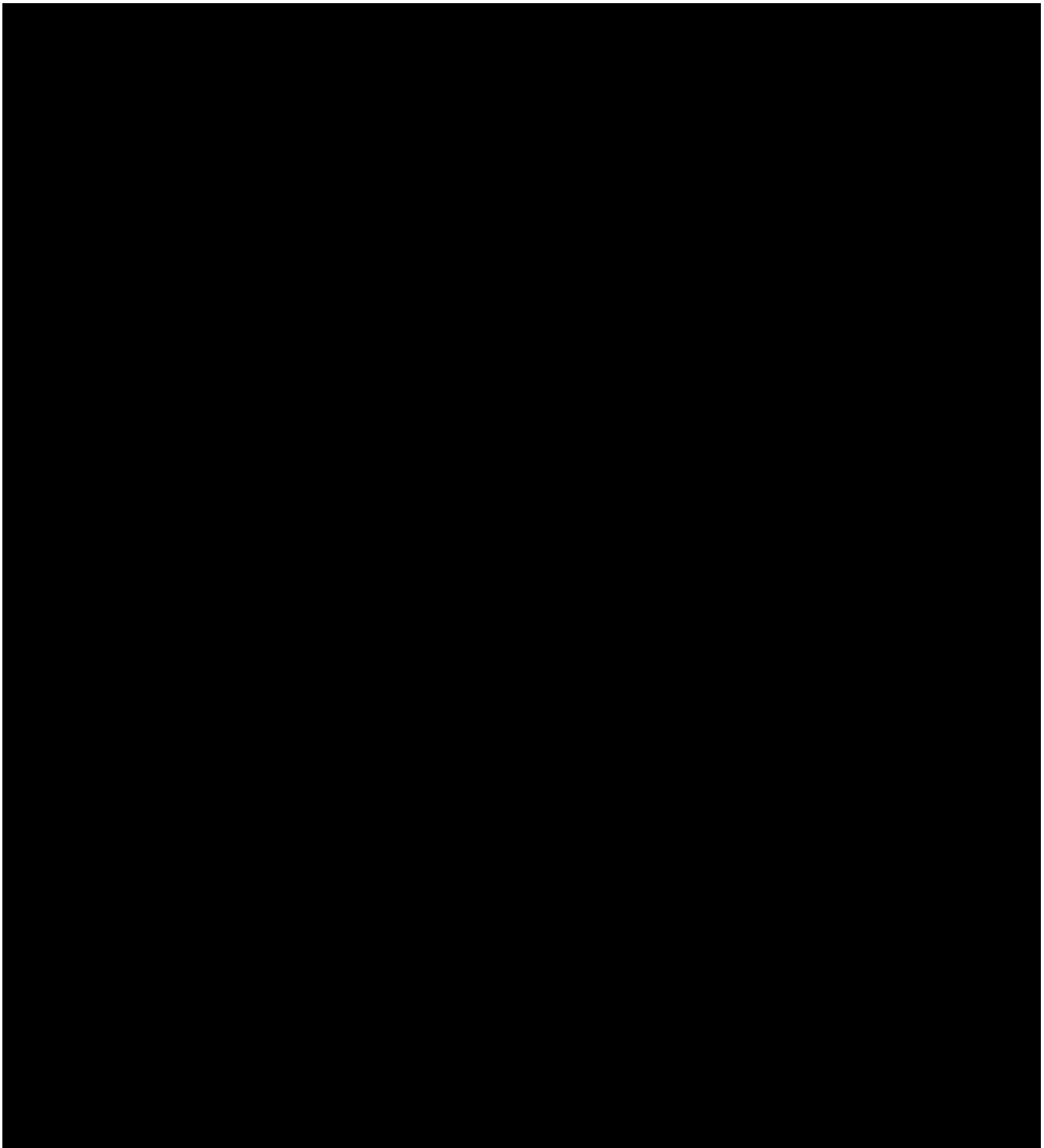


Figure 1 and 2: Expected Turbine Performance (Hill Chart and Performance/Cavitation Curve)

Final performances are subject to adjustment pending final engineering and design analysis results and/or notable observations and measurements during unit commissioning.

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



3.3 SCOPE OF WORK - SUMMARY

[REDACTED]

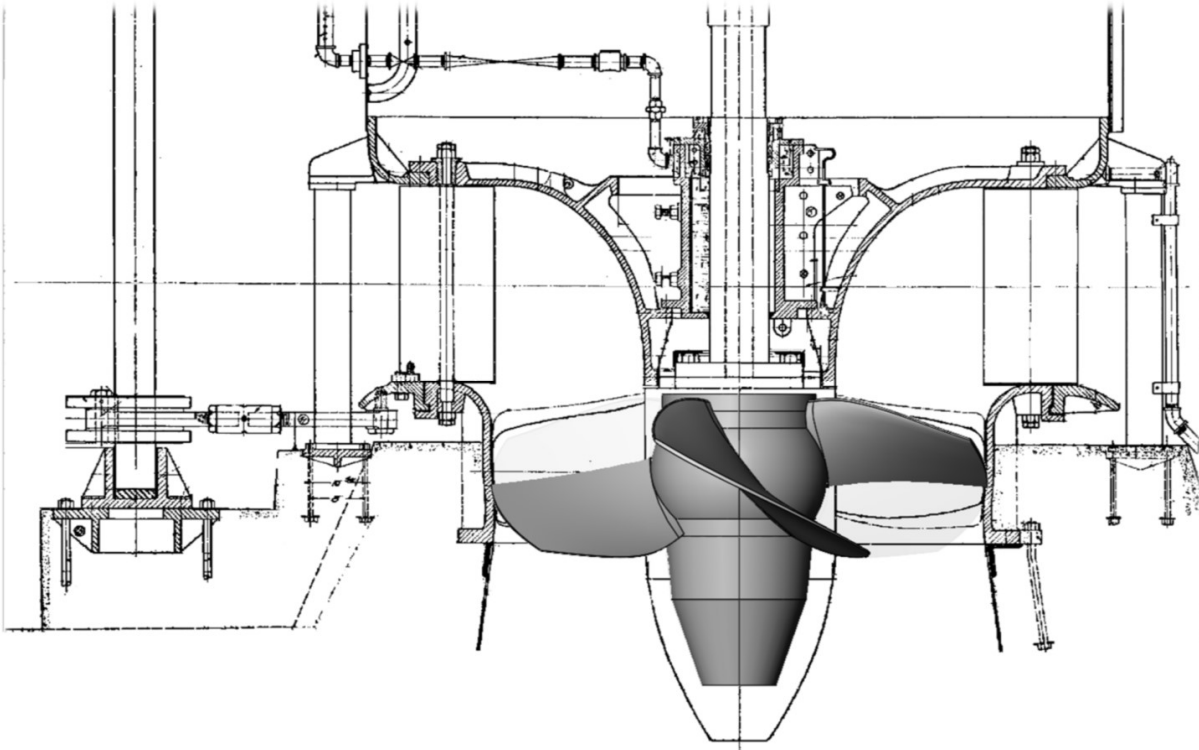


Figure 3: Scope of Work - Vertical Kaplan Turbine (Double Regulated)

<u>Component Name</u>	<u>Scope of Work</u>	<u>Notes</u>
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	[REDACTED]

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



3.4 KAPLAN RUNNER ASSEMBLY

DESIGN

[REDACTED]

MATERIALS

Component	Base Material	Condition	Reference	Grade
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

SURFACE FINISH, WAVINESS, PROFILE

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

ADDITIONAL NOTES

Materials: [REDACTED]

3.5 TURBINE SHAFT ASSEMBLY

[REDACTED]

MATERIALS

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



4 FACTORY ACCEPTANCE TESTING

Factory Acceptance Testing to be performed at Norcan's facility, unless otherwise identified during the project execution phase. All requirements to witness the testing shall be at the sole cost and effort of the Customer.

4.1 RUNNER BALANCING

[REDACTED]

4.2 PRESSURE/ACTUATION TESTING

[REDACTED]



5 FIELD SERVICES

5.1 EQUIPMENT TRANSPORTATION

Costs for each equipment shipment between Norcan's manufacturing facility and the Site Address has been included. Any changes to the equipment transportation resulting in cost adjustments to be identified through a Change Order form at applicable rates and reflected against the final milestone payment invoice. Costs to witness the equipment being loaded or unloaded at the Customer's facility have not been included, and all equipment handling requirements on site are to be the responsibility of others. Specialty lifting devices, rigging, or custom shipping frames outside of Norcan's scope of supply have not been included, unless specified otherwise.

5.2 TECHNICAL SUPPORT - EQUIPMENT DISASSEMBLY

Costs to provide technical support surrounding the equipment disassembly at the Site Address has not been included. Any changes to the scope of work resulting in cost adjustments to be identified through a Change Order form at applicable rates and reflected against the final milestone payment invoice.

5.3 TECHNICAL SUPPORT - EQUIPMENT INSTALLATION

Costs to provide technical support surrounding the equipment installation at the Site Address has not been included. Any changes to the scope of work resulting in cost adjustments to be identified through a Change Order form at applicable rates and reflected against the final milestone payment invoice. Norcan to provide applicable inspection forms for Customer to complete and return to Norcan engineering.

5.4 TECHNICAL SUPPORT - UNIT COMMISSIONING

Costs to provide technical support surrounding the unit commissioning at the Site Address has not been included. Any changes to the scope of work resulting in cost adjustments to be identified through a Change Order form at applicable rates and reflected against the final milestone payment invoice.

5.5 UNIT PERFORMANCE TESTING

[REDACTED]

6 TECHNICAL CLARIFICATIONS AND EXCEPTIONS

1. Civil engineering and design is not included.
2. Electrical connection/disconnection/interconnection is not included.
3. Field machining is not included.
4. All materials/equipment loading and unloading provisions on site to be provided by others.
5. Machine guarding is not included.
6. Net head calculated as per IEC 60041.
7. Unless otherwise explicitly defined, any omissions from the proposal have not been considered and will be billed at applicable rates or quoted at the time of discovery/request.

7 PROJECT REFERENCES

Norcan has a successful history of supplying the industry with hydroelectric turbines of all types, sizes, and arrangements. Detailed references can be made available upon request.

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The above is understood and agreed to by the following:

Signed and sealed this 28th day of October, 2025.

In the presence of:

(Seal)

(Seal)

A handwritten signature in blue ink, appearing to read "Joe Martin", is written over a horizontal line.

[PRINT NAME, POSITION]

Joe Martin, President

[PRINT NAME, POSITION]

Nova Scotia Power Inc.

Norcan Hydraulic Turbine Inc.

Nova Scotia Power Inc.
Tusket Unit #1 Runner Replacement





50 Bruce Crescent, Carleton Place ON K7C 3V6
Phone: 1-613-257-4755 Fax: 1-613-257-4215

CR #2891-CR-02

CONTRACT CHANGE REQUEST

Nova Scotia Power Inc. - OU

25 Beechville Park Drive,
Beechville Industrial Park
Beechville, NS B3T 1M9
Canada

Patrick Pellerin

Patrick.Pellerin@nspower.ca

Project Number	2891	Purchase Order Number	2163433
Project Name	Tusket U1	Date (yyyy/mm/dd)	2026-02-20

Detailed Description of the Change			
Pricing for Section 4 – Recommendations in 2891 TEC 002 - Condition Assessment Report REVA			
Project Cost Change	Y	Project Cost Change Amount	\$ REDACTED
Project Schedule Change	TBD	New Schedule Provided	N

Patrick Pellerin

Customer Representative Name (Print)

Customer Representative Signature

Date (yyyy/mm/dd) 2026/03/04

Please sign and return this form within 48 hours to avoid any project delays.



50 Bruce Crescent, Carleton Place ON K7C 3V6
Phone: 1-613-257-4755 Fax: 1-613-257-4215

CR #2891-CR-02

Please find below adjustments to contract pricing to reflect the revised project direction.

Norcan Hydraulic Turbine Inc. to supply the following:

Item	Description	Cost
1.	Recommendation: Section 4.1, 4.2, 4.3 (Shafts & Actuator Rods)	
2.	Recommendation: Section 4.4 (Piston)	
3.	Recommendation: Section 4.5 (Coupling Hardware)	
	TOTAL COST	

Notes:

PROPOSAL TYPE:	Firm
PROPOSAL CURRENCY:	CAD
VALIDITY PERIOD:	30 Days
EX-VALIDITY DATE:	March 22, 2026
PAYMENT TERMS	



**Emerson Process Management
Power & Water Solutions, Inc.**
Eastern Regional Office – Knoxville, TN
512 Township Line Rd, 3 Valley Square, Suite 220,
Blue Bell, PA 19422
T: 1 (865) 672-1220 / C: 1 (865) 684-5279
www.emerson.com/hydro

QUOTATION

Quote #	TT-FS260420-50	From:	Tandi Trent, Sales Support
Request #:	Email	Email:	tandi.trent@emerson.com>
Date:	April 20, 2026	Phone:	(865) 672-1220
Company:	Nova Scotia Power	Cell:	(865) 684-5279
Attn:	Patrick Pellerin	Ship Via:	Best Way
Phone:	(902)266-9107	Validity:	Estimate valid for 30 Days
Email:	Patrick.Pellerin@nspower.ca	Payment	PO: Net 30 OAC, VISA/MC: add 2.5% FCA
Ship To:	TBD – Tusket Falls	Terms:	
		Delivery Terms:	FCA (Incoterms 2010)
		Other Terms:	Document# TQS-GIS/USA-2023 Document# Emerson Hydro - Legacy FS 4-2025-01

Hello Patrick,

As requested, we are pleased to provide the following estimate to perform the minor overhauls of three Woodward Gateshaft Governors (circa 1929) at the Tusket hydroelectric generating station located in the Tusket, NS, Canada. **Note:** Customer has S. Morgan Smith Kaplan Blade controls there that they'd like looked at.

Item	Qty	Description	Schedule	Price (USD)
1	Lot	Field Service – Three Woodward Gateshaft Governors - Estimate Including: - One Weekend Day Travel to Site - Five Weekdays on Site - One Weekend Day on Site - One Weekend Day Travel from Site - Trip Preparation, Administration Fees and Field Service Report - Air & Ground Transportation, Lodging, Meals and Expenses	TBD	
2	Lot	Parts Kit – Support Three Woodward Gateshaft Governor Overhauls - Estimate Including: - Typical consumable parts required to overhaul equipment. The actual parts required are dependent on the condition of each governor and this price is our best estimate. Final cost/governor could range from a low of around \$1,500.00, for a governor in very good condition, to over \$5,000.00 for one in poor shape. - Roundtrip shipping of WGC GS Service Parts Kit to/from Customer site not included. Note: Only parts-used and round-trip shipping will be billed		
3	Lot	Labor Market Impact Assessment and/or Work Permit - Estimate As required by Canadian Government Note: This is an estimate and can be reduced with involvement by the Customer to complete Letters of Invitation, etc. Contact Sales at the time of order for clarification and requirements.		
		This estimate is for budgetary purposes only. Actual billing for the travel and work outlined will be on a Time and Materials basis. Please reference the included Field Service Rate Sheet for the associated hourly rate for the tasks provided.		
Total Estimated Price (USD):				

Exchange Rate 5.4.2026: \$ USD = \$

Field Service Notes:

- Pricing shown is ESTIMATED. Actual invoices will be prepared on a T&M basis supported by the signed Daily Timesheets.
- No proposed schedule dates shall be considered Firm until a PO or credit card authorization has been received.

3. Please allow a minimum of two weeks' advance notice prior to any anticipated outage date to allow for coordination of Field Service Engineer (FSE) schedules. Emergency FSE Dispatching (within 24 hours) is available for an additional charge.
4. Any COVID19 related time (testing, quarantine, extra travel) will be an additional charge.

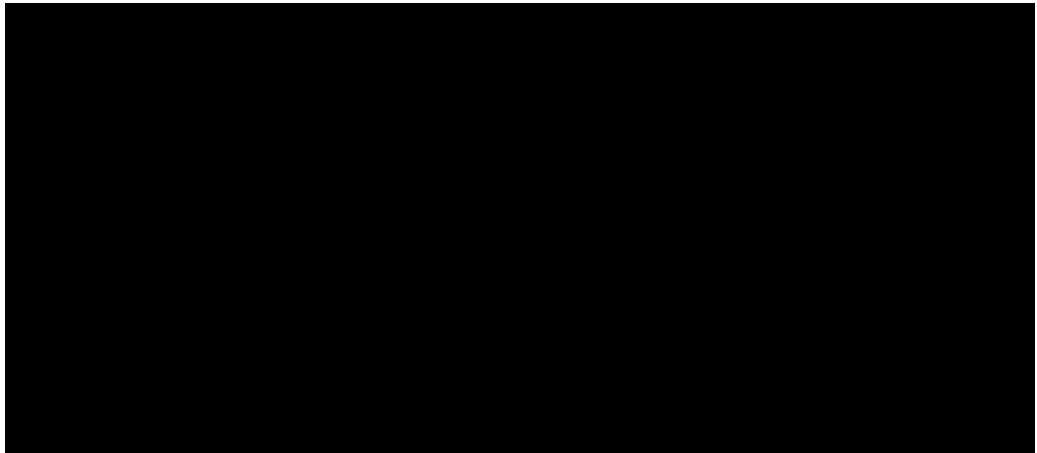
Emerson continues our mission to support the hydro governor needs of every hydro utility in North America, providing legacy spare parts, factory repair services, on-site overhauls, professional training, and advanced digital governor conversion systems. We remain committed to keeping your governors – whether new or old – running reliably and efficiently for as long as you wish to keep them in service.

We look forward to working with you and would be happy to discuss this proposal at your earliest convenience. We appreciate the opportunity. Please let me know if you have any questions.

Thank you,



Tandi Trent
Aftermarket Sales
Eastern Region





Terms of Quotation and Sale - Goods & Services

These Terms govern Emerson's quotation and any resulting Contract for Emerson to supply Goods, Documentation, Software and Services. Emerson's acceptance of Customer's PO is exclusively subject to these Terms.

1. **Quotation & Contract**
 - 1.1 Emerson's quotation is valid for acceptance for 30 Days after its date unless Emerson has stated a different period or withdraws it earlier.
 - 1.2 The PO must be in writing and has no effect until Acknowledgement. Emerson is not obliged to accept any PO.
 - 1.3 If there are any conflicts, discrepancies or ambiguities, the following order of priority applies: (1) the Acknowledgment, (2) these Terms, (3) the PO and (4) Emerson's quotation. Clauses 5 and 16 of these Terms take priority over the rest of these Terms.
 - 1.4 All communications about the Contract must be in English and state the Customer PO number and Emerson order number.
2. **Customer Responsibilities**
 - 2.1 Customer must in a timely manner supply the information, documents and instructions Emerson reasonably needs to proceed with its Contract duties.
 - 2.2 Customer is responsible for the accuracy and completeness of all information it supplies.
 - 2.3 If Emerson performs Services at Site, Customer will not ask Emerson or Emerson Personnel to enter any agreement which imposes, waives, releases, indemnifies or otherwise limits or expands any rights or obligations in respect of Emerson or Emerson Personnel. Any such agreement is void.
 - 2.4 If the acts or omissions of Customer, Customer Personnel or Customer's other contractors delay or prevent Emerson from performing a Contract duty or increase Emerson's costs, time will be extended and Customer will compensate Emerson accordingly.
 - 2.5 Unless otherwise agreed, Customer is solely responsible for use of the Goods and Services in accordance with all applicable local, state and federal laws pertaining to data privacy, security and transfer including but not limited to the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA). As such, Customer is solely responsible for maintaining the integrity of its own network and internal security.
 - 2.6 Emerson will perform Services but only to the extent they do not violate any Laws and only to the extent Services can be performed safely and would not present a risk of harm to any Personnel. Emerson reserves the right to remove its Personnel if it deems Site unsafe.
3. **Delivery**
 - 3.1 **Delivery and Performance Periods.**
Delivery and performance periods begin on Acknowledgment. All delivery periods and dates stated are approximate. Emerson will not be liable for any damages caused by its failure to deliver or perform on time.
 - 3.2 **Delivery Terms.**
Unless the Contract says otherwise, Emerson will deliver the Goods, Documentation and Software from its, its Affiliate's or third party's factory or warehouse (the point of delivery), Carriage Paid To (CPT) the place of destination named in the Contract (Incoterms® latest version). Customer will pay for freight, packing and handling at Emerson's then current rates.
 - 3.3 **Partial Shipments.**
Emerson may make partial shipments. Emerson may ship batteries separately from the rest of the Goods. Hard copies of Documentation may be shipped separately from the Goods.
 - 3.4 **Storage.**
Emerson may place Goods, Documentation and Software into storage at a third-party warehouse chosen by Emerson, at Customer's expense if Customer, by its acts or omissions, delays their shipment. On placing Goods, Documentation and Software in the warehouse, delivery is complete and risk and title in Goods and Documentation passes to Customer. This Clause 3.4 does not apply to Goods, Documentation and Software which Emerson or its Affiliate exports from the United States.
4. **Title & Risk**

Even if the Contract says otherwise and except as stated in Clauses 3.4 and 5:

 - a) for any Goods and Documentation which Emerson or its Affiliate exports from the United States, title and risk of loss will pass to Customer when they pass the territorial limits of the United States.
 - b) for all other Goods and Documentation, title will pass to the Customer on delivery and risk of loss will pass to Customer under the Incoterms® rule stated in the Contract.
5. **Documentation, Software, Firmware and Intellectual Property**
 - 5.1 Emerson and other owners will each keep all rights, interest and title in their respective Documentation, Software, and Firmware and all copies thereof.
 - 5.2 Customer's use of Software and Firmware is governed exclusively by the Software License Agreement with Emerson (or its Affiliate) if there is one or, in any other case, by the license terms of the owner.
 - 5.3 If Software or Firmware is not governed by a separate Software License Agreement, Customer is granted a non-exclusive, royalty-free license to use that:
 - a) Software only in conjunction with the Goods; and
 - b) Firmware in the Goods, only as incorporated in the Goods.In both cases, the license applies only at the Site where the Goods are first used.
 - 5.4 Customer may only copy Documentation (with its copyright notices unchanged) as needed to install, operate, re-calibrate, de-install, maintain and repair the Goods for its reasonable internal business purposes.
 - 5.5 Unless the Contract says otherwise, Documentation will consist of one copy only of Emerson's, its Affiliates', or the manufacturer's standard documents in English. Emerson is only required to supply third party documents if authorized to do so by the third party. Emerson may choose to supply Documentation by hard copy, by CD-ROM or other suitable media, or by download from a website.
6. **Compensation**
 - 6.1 **Prices/Rates.**
Unless the Contract says otherwise, the prices, Software license fees and rates:
 - a) are fixed for Goods, Documentation and Software licenses delivered and for Services performed within the period(s) stated in the Contract;
 - b) exclude all taxes (such as sales, use, value added and similar taxes), duties, levies and similar charges. Emerson will invoice all these taxes, duties, levies and charges as a separate line item on the invoice unless it has received an appropriate exemption from Customer;
 - c) exclude freight, packing and handling; and
 - d) exclude the storage, installation, start-up and maintenance of the Goods and Software.
 - 6.2 **Payment Terms.**
 - a) Unless the Contract says otherwise, Customer will pay Emerson:
 - (i) in full without set-off, counterclaim or withholding (except deductions required by Law);
 - (ii) in the currency of Emerson's quotation; and
 - (iii) full payment, or milestone payments in advance of shipment or within 30 days of the invoice date, subject to the approval of Emerson's credit department.
 - b) Unless the Contract says otherwise, Emerson will invoice:
 - (i) Goods (including part shipments), Documentation and Software license fees: on delivery.
 - (ii) Services upon completion.
 - (iii) Storage costs under Clause 3.4: monthly in arrears.
 - c) Customer will pay Emerson by check or direct bank transfer to the Emerson bank account stated in the Contract or invoice, paid in either case from Customer's account with a bank in Customer's country. Emerson may reject payment by any other method.
7. **Warranties**
 - 7.1 Emerson warrants that:
 - a) Emerson will transfer title to the Goods (excluding Software and Firmware) to Customer under Clause 4;
 - b) Goods, Documentation and Services will conform with the Specification;
 - c) Goods made by Emerson or its Affiliates will, under normal use and care, be free from defects in materials or workmanship; and
 - d) Emerson and its Affiliates' Personnel delivering Services are trained and will use reasonable skill and care.
 - 7.2 **Warranty Periods.** Unless otherwise specified by Emerson, the warranties in Clause 7.1 apply as follows:
 - a) **Goods:** until the earlier of 12 months from the first installation or 18 months from delivery (90 days from delivery in the case of consumables and PolyOil® products).
 - b) **Services:** for 90 days from completion of the Services.
 - c) **Goods repaired, replacement items and Services re-performed:** from delivery of the replacement or completion of the repair or re-performance, for 90 days or until the end of the original warranty period (if later).
 - 7.3 **Warranty Procedure.** Clause 7.3 applies if, within the warranty period, Customer discovers any non-conformity with a warranty in Clause 7.1, tells Emerson in writing and, in the case of Goods, returns the non-conforming items at Customer's cost, freight and insurance pre-paid, to the repair facility chosen by Emerson. Where this Clause applies, Emerson will, at its sole option, either:
 - a) correct any non-conforming Documents and Services; or
 - b) repair or replace non-conforming Goods FCA (Incoterms® latest version) at the repair location; or
 - c) instead refund the price of the non-conforming item.
 - 7.4 **Exclusions from Warranty.**
 - a) The warranties in Clause 7.1(b), (c) and (d) exclude and Customer will pay the cost of all repairs and replacements caused by any of the following: normal wear and use; inadequate maintenance; unsuitable power sources or environmental conditions; improper handling, storage, installation, or operation; misuse or accident caused by anybody except Emerson; a modification or repair not approved by Emerson in writing; materials or workmanship made, provided or specified by Customer; contamination; the use of unapproved parts, firmware or software; Cyber Attack; any other cause not the fault of Emerson.
 - b) Emerson will not pay any costs relating to non-compliance with a warranty in Clause 7.1, except when agreed in writing in advance. Unless accepted in writing by Emerson, Customer will pay:
 - (i) all costs of dismantling, freight, reinstallation and the time and expenses of Emerson Personnel for travel under Clause 7; and
 - (ii) all costs incurred by Emerson in correcting nonconformities for which Emerson is not responsible under Clause 7 and in examining items that comply with the warranties in Clause 7.1.
 - c) If Emerson relies on wrong or incomplete information supplied by Customer, all warranties are void unless Emerson agrees otherwise in writing.
 - d) Customer alone is responsible for the selection, maintenance and use of the Goods.
 - e) Resale Products carry only the warranty given by the original manufacturer. Emerson has no liability for Resale Products beyond making a reasonable commercial effort to arrange procurement and shipping of the Resale Products.
 - 7.5 **Disclaimer.** The limited warranties set out in this Clause 7 are the only warranties made by Emerson and can be changed only with Emerson's signed written agreement. THE WARRANTIES AND REMEDIES IN CLAUSE 7 ARE EXCLUSIVE. THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, ABOUT MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANYTHING ELSE FOR ANY OF THE GOODS, DOCUMENTATION OR SERVICES.
8. **Changes**

No change to the Contract applies unless agreed in writing by Emerson and the Customer.
9. **Termination**
 - 9.1 **Termination for Default and Insolvency.**
 - a) Either party (Injured Party) may end the Contract wholly or partly by written notice to the other (Defaulting Party) if an Insolvency Event or Default Event affects the Defaulting Party. Termination under Clause 9.1 will not affect other rights of the Injured Party.
 - b) A **Default Event** occurs if all the following conditions are met:
 - (i) Defaulting Party breaches a material duty under the Contract;
 - (ii) Injured Party sends Defaulting Party a notice identifying the breach in sufficient detail;
 - (iii) 10 Days after receiving the notice, Defaulting Party has not corrected the breach; and
 - (iv) if the breach cannot reasonably be corrected in 10 Days, Defaulting Party has not acted diligently to fix the breach.
 - c) An **Insolvency Event** means any of the following:
 - (i) a meeting of creditors of Defaulting Party.
 - (ii) a proposal for an arrangement or composition with or for the benefit of creditors of Defaulting Party.
 - (iii) a chargeholder, receiver, administrative receiver or similar person is appointed over or takes possession of material assets of Defaulting Party.
 - (iv) a legal enforcement process is taken (and not discharged within 5 Days) against material assets of Defaulting Party.
 - (v) Defaulting Party stops trading or cannot pay its debts.
 - (vi) anyone gives notice of intention to appoint an administrator, or applies to court to appoint an administrator, in relation to Defaulting Party.
 - (vii) a petition is presented (and not discharged within 20 Days) or a resolution is passed or an order made for winding-up, bankruptcy or dissolution of Defaulting Party.
 - (viii) an event similar to any of (i) to (vii) in a jurisdiction where Defaulting Party is incorporated or resides or carries on business or has assets.
 - d) On termination under Clause 9.1(a), Customer will pay Emerson the price of Goods, Software, Documentation and Services already delivered. If Emerson was the Injured Party, Customer will also pay Emerson for work in progress under Emerson's then current policies and cancellation charges.
 - 9.2 **Termination for Customer Convenience.** Customer may end the Contract in whole or in part for its own convenience only with Emerson's written agreement and following Emerson's then current policies and cancellation charges.



EMERSON

Terms of Quotation and Sale - Goods & Services

- 9.3 **Termination after 90 Days' Force Majeure.** Either party may end the Contract without liability by written notice to the other if performance of the Contract is delayed or prevented by a cause listed in Clause 12 for 90 Days. Unless prevented by a cause listed in Clause 12, Customer will pay Emerson for all Goods, Documentation, Software licenses and Services delivered before the notice was given and for work in progress.
10. **Customer Information**
Emerson may use and share Customer Information in accordance with data protection Law, as necessary to fulfill the Contract and to communicate with Customer for marketing purposes, including sharing:
a) Customer Information to its suppliers, for use in product registration and support and to comply with import and export control Law;
b) Customer Information and copies of the Contract to its agents and sales representatives, as necessary to fulfill the Contract.
Customer has sole responsibility for obtaining all consents and permissions (including providing notices to Customer Data Subjects or third parties) and satisfying all requirements necessary to permit Emerson and its affiliates' use of Customer Information in connection with this Agreement. Customer is solely responsible for compliance with all applicable local, state, federal, and foreign data privacy and sovereignty laws, regulations, rules and restrictions as the same relate to the collection, movement, and use of data provided by Customer or generated by the Goods and to Customer's use of the Goods. With regard to the collection processing and use of personal data (if any) by Emerson, please refer to Emerson's Privacy Notice, which is available at <https://www.emerson.com/en-us/privacy-notice>.
11. **Intellectual Property Claims**
11.1 In Clause 11, an **Intellectual Property Claim** is a claim that Goods made or Documentation produced by Emerson infringe a valid intellectual property right (including patent, copyright, design right and trademark) of the United States or of a country where the Contract states the Goods will be used.
11.2 Clause 11 applies only while Customer does all the following:
a) promptly tells Emerson in writing that an Intellectual Property Claim has been threatened or filed;
b) allows Emerson complete control of the defense and settlement of the claim; and
c) gives all reasonable help and cooperation requested by Emerson for the defense.
11.3 Subject to the provisions herein, Emerson will indemnify and defend Customer against any Intellectual Property Claim brought by legal action.
11.4 Emerson will only pay any final judgment or settlement resulting from the action. If the action results in an injunction against the use of any Goods or Documentation, Emerson will, at its sole option and expense, provide a commercially reasonable alternative. This may include procuring for Customer the right to continue using the Goods or Documentation or replacing them with a non-infringing item or changing them to become non-infringing or refunding their price.
11.5 Emerson will not be liable for infringement, and Customer will indemnify Emerson, in each of these cases:
a) the infringement relates to goods not made by Emerson.
b) Emerson did not design the Goods or Documentation, or Emerson did not design them for use in the way or for the purpose that infringed intellectual property rights.
c) the Customer caused the Goods or Documentation to become infringing.
12. **Force Majeure**
Neither party is liable for non-performance or delay due to circumstances or causes beyond its reasonable control, including but not limited to acts of God; war; armed conflict; terrorism; fire; flood; accident; weather; failure or interruption of public and private computer or telecommunication systems, networks, and infrastructure; Cyber Attacks; sabotage; strikes or labor disputes; civil disturbances or riots; epidemics or pandemics; governmental decisions, requests, restrictions, Law (including the denial, failure to issue or loss of export or re-export licenses); unavailability of or delays in transport; or shortage of materials or parts.
13. **Export Controls and Compliance**
13.1 Customer and Emerson will comply with all:
a) export, import and other trade compliance Laws of the territories in which Customer and Emerson are established, from which the Goods, Firmware, Software, Services and any technical data are supplied or shipped, and to which the Goods, Firmware, Software, Services and any technical data will be taken or eventually used; and
b) Laws against bribery, corruption and money-laundering.
13.2 Customer agrees not to use, transfer, release, export or re-export any Goods, Firmware, Software, Services or Emerson-supplied technical data contrary to trade compliance Law or to any license or required government authorization.
13.3 Customer will give Emerson:
a) details of financial institutions and other parties involved in the transaction;
b) details of the end-destination, end-user and end-use of the Goods, Firmware, Software, Documentation and Services;
c) all information needed by Emerson to:
(i) apply for necessary export and import licenses and government authorizations and
(ii) comply with Laws against bribery, corruption and money-laundering and Emerson's policies on them; and
d) any trade compliance certification or letter of assurance requested by Emerson in relation to trade compliance Law.
13.4 Neither Emerson nor Customer will engage in any activity that exposes the other party or an Affiliate to a risk of penalties under Laws forbidding corruption, bribery and improper payments. Emerson strictly adheres to its environmental social governance standards and code of ethics found at <https://www.emerson.com>.
14. **Laws and Regulations**
14.1 Both parties will comply with all Laws, except to the extent a party is prohibited from doing so based upon a conflict of Laws.
14.2 The Contract does not require Emerson to collect, treat, recover or dispose of anything Law treats as 'waste'. If the Law on waste requires Emerson to dispose of something it supplied, Customer will, if allowed by Law, pay Emerson to dispose of it at Emerson's standard charge. If Emerson has no standard charge, and if allowed by Law, Customer will pay Emerson's costs incurred in the disposal (including handling, transport and a reasonable mark-up for overhead).
14.3 Each party must ensure that its Personnel will, while on the premises of the other party, comply with the other party's reasonable site rules on HSSE that are communicated in writing to the visitor before its arrival, and with the other party's reasonable instructions relating to HSSE.
14.5 Emerson objects and does not agree to the application of any governmental procurement provision to the Contract.
15. **Nuclear and Medical End-use**
GOODS, FIRMWARE, SOFTWARE, DOCUMENTATION, SERVICES AND THE PRODUCTS OF SERVICES SUPPLIED UNDER THE CONTRACT MUST NOT BE USED IN CONNECTION WITH ANY MEDICAL, LIFE-SUPPORT OR RELATED APPLICATIONS UNLESS OTHERWISE AGREED IN WRITING BY BOTH PARTIES. ALL NUCLEAR OR NUCLEAR-RELATED APPLICATIONS MUST BE SUPPORTED BY A NUCLEAR DEFENSE & INDEMNIFICATION AGREEMENT EXECUTED BY THE END-USER. Regardless of whether Customer is the owner/operator of the nuclear, medical or other facility, Customer:
a) accepts all Goods, Software, Documentation, Services and products of Services with these restrictions;
b) agrees to communicate these restrictions in writing to all later buyers or users; and
c) agrees to defend and indemnify Emerson and Emerson Affiliates from all claims arising from such use of Goods, Firmware, Software, Documentation, Services and products of Services. This indemnity covers every sort of claim, including allegations of negligence, strict liability or product liability.
16. **Limitation of Liability**
16.1 EMERSON AND ITS AFFILIATES WILL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE REMEDIES OF CUSTOMER STATED IN THIS CONTRACT ARE EXCLUSIVE. REGARDLESS OF THE TYPE OF THE CLAIM (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), EMERSON'S AND ITS AFFILIATES' LIABILITY TO CUSTOMER AND ITS AFFILIATES WILL NEVER EXCEED THE CONTRACT PRICE.
16.2 NEITHER PARTY WILL EVER BE LIABLE FOR(A) DAMAGES FOR LOSS OR CORRUPTION OF DATA OR CYBER ATTACKS, OR (B) INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. "CONSEQUENTIAL DAMAGES" INCLUDE BUT ARE NOT LIMITED TO LOSS OF ANTICIPATED PROFITS, REVENUE, PRODUCTION OR USE AND COSTS INCURRED INCLUDING WITHOUT LIMITATION FOR CAPITAL, FUEL AND POWER, REPLACEMENT PRODUCT AND CLAIMS OF EACH PARTY'S AFFILIATES.
16.3 No action, regardless of form, relating to this Contract, may be brought more than 2 years after the claim arose.
17. **Applicable Law, Disputes, Notices**
17.1 Ontario law governs the Contract and its interpretation. The parties agree to exclude any effect on that law of the 1980 United Nations' Convention on Contracts for the International Sale of Goods and, so far as legally possible, any rules which might apply the laws of another jurisdiction.
17.2 The Ontario courts or the U.S. federal district courts in Missouri have exclusive jurisdiction over all disputes arising out of the Contract.
17.3 All notices and claims connected with the Contract must be in writing.
17.4 If any provision of the Contract is invalid under any Law, such provision, to that extent only, shall be deemed omitted without affecting the validity of the remainder of the Contract.
18. **Entire Agreement**
The Contract is the exclusive and entire agreement between the parties on its subject matter. At Acknowledgment, the Contract supersedes all previous or existing agreements, negotiations, representations and proposals, whether written, oral, express or implied, on that subject matter. Except where the Contract expressly states otherwise, the parties intend that nobody except Customer and Emerson will benefit from or enforce any term of the Contract. The parties have requested that the Contract and all ancillary documents be drafted in English. *Les parties ont exigé que le Contrat et tous les documents y afférant soient rédigés en langue anglaise.*
19. **Definitions**
In these Terms:
Acknowledgement is Emerson's written acceptance of the PO by means of Emerson's standard order acknowledgement form, including all text on the form and its attachments.
Affiliate of an entity is any body that entity controls, is controlled by or is under common control with. 'Control' of an entity means the direct or indirect beneficial ownership of more than half the shares, or other participating interest with the right to vote or to receive profits of that entity.
Contract is the agreement between Customer and Emerson for the supply of the Goods and any Documentation, Software and Services. The Contract consists of: Emerson's quotation, the PO, the Acknowledgement, these Terms, and all other documents contained or referred to in the agreement. (See Clause 1.3 for the order of priority of these documents.)
Contract Price is the total price the Customer must pay Emerson for the Goods, Documentation, Services and Software licenses.
Customer is the buyer of the Goods, Documentation, Services and Software licenses.
Customer Information is:
a) Customer's name, address, phone number, ship-to recipient and address;
b) similar details for the end-user (if that is not the Customer); and
c) Customer's primary contact's name, address, phone number, and email address.
Cyber Attack means cyber attack, intrusion attempt, unauthorized third-party access, and other malicious activity.
Day is any day except Saturdays, Sundays and public holidays at Emerson's office named in the Contract.
Documentation means any manuals, drawings and other documents Emerson must supply with the Goods, Software and Services.
Emerson is the Emerson company which issues the Acknowledgement.
Firmware is any firmware incorporated into Goods Emerson must supply under the Contract.
Goods are the goods Emerson must supply under the Contract.
HSSE is health, safety, security and the environment.
Law is applicable law, including statutory rules and regulations, decrees, directives, orders, by-laws and ordinances having the force of law.
Personnel is anyone who works for a party (or for an Affiliate or subcontractor of that party). It includes both employees and contract staff.
PO is Customer's purchase order or acceptance of Emerson's quotation, for the supply of the Goods, Software, Documentation and Services.
Resale Products are Goods Emerson buys from anyone except an Emerson Affiliate for resale to Customer.
Services are any services Emerson must perform under the Contract.
Site means the places not belonging to Emerson or to an Emerson Affiliate, which are identified in the Contract as where the Goods are to be installed, and the Services performed.
Software is any software Emerson must supply under the Contract.
Specification is the agreed specification of the Goods, Documentation and Services identified in the Contract or, if none is identified, Emerson's standard published specification.



219 Waverley Road, Suite 200
Dartmouth, NS, Canada, B2X 2C3
T: +1 902 405 4696

MEMO

Date:	2025-Oct-10	File No.:	251166
To:	Patrick Pellerin, P.Eng.	From:	Carson MacKay, E.I.T. Thomas McNutt, P.Eng.
Address:	Nova Scotia Power Incorporated 1223 Lower Water Street Halifax, NS, B3J 3S8		
Subject:	Tusket Powerhouse Scroll Case Concrete Repair; Phase 1 (Conceptual Design)		

1. BACKGROUND

Harbourside Engineering Consultants (Harbourside) were retained by Nova Scotia Power Incorporated (NSPI) to prepare a conceptual design and opinion of probable constructions costs for a repair in the scroll case of the unit 1 turbine at Tusket Powerhouse. NSPI indicates they are looking to overhaul the Tusket unit 1 turbine starting in 2026 and are looking to get a head start on some of the design work, particularly around the scroll case. NSPI provided Harbourside with the following relevant background information: Located in the scroll case is a large quadrant shaft, which is used to control the wicket gates. It is driven by the governor, located on the turbine floor, and is connected to the wicket gates via push pull rods and an operating ring. The bottom of the shaft is anchored to a concrete block, which is connected to the main concrete pedestal that holds the draft tube. The concrete anchor block has separated from the main pedestal. Some temporary repairs were made to attempt to re-anchor the block to the pedestal, however it is unknown if the unit ever ran in this condition, and the capacity of this repair is unknown. As part of the overhaul NSPI would like to repair this concrete block to regain a rigid anchor point for the bottom of the quadrant shaft.

2. SITE VISIT AND EXISTING CONDITIONS

Harbourside completed a site visit on August 7, 2025, to observe the interior of the scroll case at the unit 1 turbine. This site visit record is appended to the end of this memo (Appendix C). Harbourside observed and collected measurements of the concrete block supporting the quadrant shaft and the main concrete pedestal supporting the draft tube. Harbourside observed

a construction joint between the concrete block supporting the quadrant shaft and the main concrete pedestal. This construction joint has separated/opened in some locations suggesting the concrete block has separated from the main concrete pedestal. The main concrete pedestal was observed to be in good condition at the location surrounding the concrete block. Some voids and cracks in the concrete were observed in the concrete block. On the right-hand side of the concrete block (looking towards the main concrete pedestal) a void was observed near the construction joint between the concrete block and the main concrete pedestal approximately 1/3 of the way down from the top of the concrete block. This void extends at least 200 mm into the face of the concrete block and is approximately 200 mm wide and 50 mm tall. On the left-hand side of the concrete block (looking towards the main concrete pedestal) a section of concrete (approximately 300 mm wide x 500 mm tall) appears to be cracked and delaminated from the concrete block, with a crack surrounding the perimeter of this delaminated section. This delaminated section was observed beside the construction joint between the concrete block and the main concrete pedestal. Harbourside observed up to approximately 50 mm of water on the floor of the dewatered scroll case. In particular, standing water was observed around the concrete block supporting the quadrant shaft. Water is leaking into the scroll case at the stop logs and through cracks in the scroll case walls.

3. LOAD DEVELOPMENT

Harbourside understands that the concrete block houses a bearing which supports the quadrant shaft and prevents lateral movement. Torque is applied to the quadrant shaft by a governor located on the turbine floor with a labeled torque output of 10500 ft·lbs. Push/pull rods are connected to the quadrant shaft just above the concrete block and when torque is applied, the shaft rotates which pulls on one rod, inducing a tension force, and pushes on the other, inducing a compression force. This push/pull motion rotates an operating ring and controls the angle of the wicket gates. Theoretically, if the bearing housed within the concrete block is free spinning with zero friction, when torque is applied to the quadrant shaft causing rotation the compression/tension force applied to the push/pull rods should be equal and opposite, with no load being applied to the concrete block other than from vertical self weight of the quadrant shaft.

Through observations by NSPI this is not the case and translational load is being applied to the concrete block during operation. This could be from friction in the bearing, vibration in the system, or wear of the operating ring and wicket gate linkages which is introducing resistance into the system and not rotating freely as intended. The exact cause of how load is being applied to the concrete block, which ultimately caused it to separate from the main concrete pedestal, is unknown. To develop a conservative yet reasonable design load to re-anchor the concrete block Harbourside has considered the following:

- The load put into the system comes from the governor with a labeled torque output of 10500 ft·lbs
- If it is assumed that no rotation takes place when this torque is applied to the quadrant shaft (due to combined resistance of the bearing, operating ring, and wicket gate linkages) then this torque would need to be resolved through a compression/tension force in one of the push/pull rods, with an equal and opposite force applied at the base of the quadrant shaft.

- The distance between the centerline of quadrant shaft and centerline of a push/pull rod connection was conservatively estimated to be 200mm based on measurements collected of the surrounding area.
- If the output torque of 14.2kN·m (10500 ft·lbs) is resolved over this distance, it results in a shear load of 71.2kN applied at the centerline of quadrant shaft at the top of the concrete block. As the exact cause as to how load is being applied to this concrete block, and due to uncertainties in the gearing of the governor and quadrant shaft assembly, this load has been multiplied by 3 to get a design load of 214kN. For analysis this 214kN design load has been applied at the centerline of the quadrant shaft at the top of the concrete block.

4. PROPOSED CONCRETE BLOCK REPAIR

4.1. Repairs of Existing Concrete

The existing steel frame should be removed from the concrete block. Harbourside has identified multiple locations where the existing concrete must be repaired due to voids or large cracks observed in the concrete block. These locations, shown on sketches in Appendix A, should be removed using chipping hammers to expose the full extent of the voids and remove any unsound or delaminated concrete. These locations will be repaired by hammer drilling holes into the face of the concrete block and inserting adhesive anchored rebar. The rebar will anchor the new concrete repairs to the existing concrete surface. Concrete will then be placed to fill the voids/repair areas.

NSPI indicated that they wanted two options for repair. At the time of site visit Harbourside had proposed a concrete repair option, and a steel repair option. As concrete repairs are required on the existing concrete block even if a steel option is selected, Harbourside believes it is more feasible to move forward with a concrete repair option only as a steel design could become impractical with concrete repairs already required.

4.2. Encasement of The Existing Concrete Block

Harbourside proposes encasing the existing concrete block supporting the quadrant shaft with new reinforced concrete around the entire perimeter. This concrete encasement would be approximately 300mm thick and would encase the full height and perimeter of the concrete block. Rebar dowels would be hammer drilled and adhesive anchored into the face of the existing concrete block to permit load transfer between the existing concrete block and the new concrete encasement. Rebar dowels would also be hammer drilled and adhesive anchored into the face of existing concrete pedestal, and into the concrete floor below to transfer the load from the new reinforced concrete encasement into the surrounding area. Encasing the existing concrete block in reinforced concrete would reinstate a rigid anchor point for the bottom of the quadrant shaft.

4.3. Water Control

Before commencing any repairs, water control must first be established. Harbourside carried out a site visit when the scroll case was dewatered, and it was observed that some water was still present on the scroll case floor. This water was observed to be leaking into the scroll case through cracks in bottom of the wall of adjacent scroll cases. A horizontal crack with water leakage was observed in the bottom of the scroll case wall at the corner closest to the quadrant shaft. Two cracks/holes with water leakage were observed in the bottom of the scroll case wall at the corner with the access ladder. Water leakage was also observed through the stop logs. Most of this water is flowing to a drain placed just beneath the entrance ladder however due to the uneven floor standing water is present in some locations, particularly around the area of proposed repair. Harbourside proposes sandbagging the work area surrounding the concrete block that supports the quadrant shaft and using a submersible pump to remove water and drain it using the existing drain near the bottom of the entrance ladder. Care should be taken to seal all gaps in the sandbags to prevent as much water infiltration as possible. Water control will be particularly important during concrete placement and curing.

5. OPINION OF PROBABLE CONSTRUCTION COSTS

Harbourside has developed an opinion of probable construction costs (Appendix B) assuming a 4 person crew completing the work. Harbourside has assumed the selected contractor has confined space rescue training and can provide a designated person to serve as a monitor throughout the entire duration of construction. This person would bring the total crew up to 5 personnel. If a specialized confined access crew is necessary, this would be an additional project cost.

Harbourside have considered the following tasks in the development of the opinion of probable construction costs:

1. Site access/confined space equipment installation
2. Water control (sandbag, pump installation, sealing gaps)
3. Demolition of existing steel brace and concrete removals
4. Hammer drilling and adhesive placement for new reinforcing/anchors
5. Rebar Installation
6. Formwork Installation
7. Concrete placement
8. Formwork removals and site cleanup

Based on the conceptual design Harbourside estimates the following material quantities:

1. Cast-in-place Concrete - New (includes reinforcing steel): 2 m³ at a cost of \$■■■■ per cubic meter. Harbourside has estimated a high unit rate cost of concrete due to the relatively small quantity of concrete required, the site access restrictions, and the remoteness of this site.
2. Hilti Injectable Epoxy RE 500-V3: 25 tubes (330ml) at a cost of \$■■■■ per tube. Tube quantity estimate is based on the preliminary quantity of hammer drilled holes for adhesive anchored rebar.
3. Miscellaneous disposables (drill bits, formwork ties, etc.): A lumpsum cost of \$■■■■.
4. Formwork: A lumpsum cost of \$■■■■.

File No: 251166

Harbourside has completed this opinion of probable construction costs using preliminary quantities and schedule and has therefore considered this a class C estimate with a 20% contingency. The total opinion of probable construction costs, including a 20% contingency, for this scope of work is \$ [REDACTED], excluding taxes. See Appendix B for the full cost breakdown.

Please contact the undersigned with any questions or comments you may have regarding this memorandum.

Sincerely,



Carson MacKay, E.I.T.
Structural Engineer-in-Training
O 902 405 4696
E cmackay@harboursideengineering.ca

Harbourside Engineering Consultants
A Division of the Harbourside Engineering Group



Thomas McNutt, P. Eng., P.E., M.A.Sc.
Senior Structural Engineer | Partner
O 902 405 4696
E tmcnutt@harboursideengineering.ca

Harbourside Engineering Consultants
A Division of the Harbourside Engineering Group

ENCLOSED:

APPENDIX A: Conceptual Design Sketches

APPENDIX B: Opinion of Probable Construction Costs

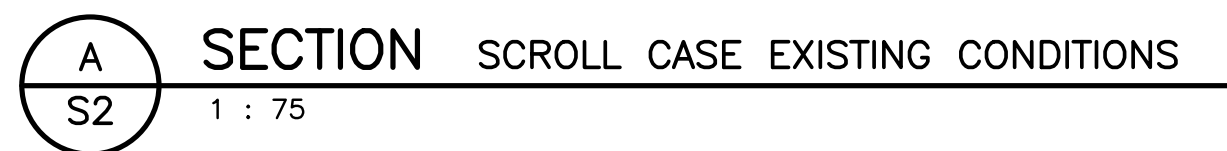
APPENDIX C: Site Visit Report

APPENDIX A: Conceptual Design Sketches



PRELIMINARY
Not For Construction

[illegible]



PRELIMINARY
Not For Construction

[illegible]

Remove existing metal frame in its entirety. Concrete repairs may be required if unsound concrete currently hidden by the metal frame is exposed, or if removal of anchors damages existing concrete



PRELIMINARY
Not For Construction

[illegible]

Crack/Delaminated
concrete to be
repaired; See E2

EXISTING MAIN
CONCRETE PEDESTAL

Void in concrete
to be repaired;
See E1

- EXISTING CONCRETE BLOCK
- EXISTING QUADRANT SHAFT

Remove concrete down to sound material (Assumed depth of removal of 100mm). If existing reinforcing is encountered, remove concrete to at least 25mm beyond reinforcing bar

A SECTION
S4 1:10

Void approx. 200mm deep. Remove exterior concrete surrounding void to expose full extents of void and remove any delaminated/unsound concrete

E1 **ELEVATION**
S4 1 : 5

Delaminated concrete to be removed using chipping hammers until sound concrete is found

E2
S4 **ELEVATION**
1 : 5
(mirrored)

CONCEPT

Drawing

PRELIMINARY
Not For Construction

[illegible]

X REV	DATE:
	BY:
_____ _____ _____ _____	
APPROVAL: _____ WO: _____	

SEAL	DEPARTMENTAL APPROVALS	
	APPROVED	
	DATE	
		

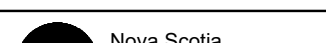
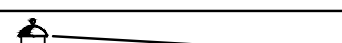
SCALE	AS NOTED
UNITS	METRIC
DESIGNED	CAM
DRAWN	AAO
DATE	2025-10-10
	W.O.

 Nova Scotia POWER An Emera Company										 HARBOURSIDE <u>Engineering Consultants</u>									
TUSKET POWERHOUSE																			
TUSKET																			
SCROLL CASE																			
EXISTING CONDITIONS																			
X	X	X	X	X	X	X	X	X	X	X	X	S 4				REV.			



PRELIMINARY
Not For Construction

X REV	DATE:
	BY:
_____ _____ _____ _____	
APPROVAL: _____ WO: _____	

SEAL	DEPARTMENTAL APPROVALS		SCALE AS NOTED	 Nova Scotia POWER An Emera Company	 HARBOURSIDE <i>Engineering Consultants</i>													
			UNITS															
			METRIC	TUSKET POWERHOUSE														
			DESIGNED															
			CAM	TUSKET														
	APPROVED		DRAWN	SCROLL CASE EXISTING CONDITIONS														
			AAO															
			DATE															
	DATE		2025—10—10															
			W.O.															
				X	X	X	X	X	X	X	X	X	X	X	X	S	5	REV.

APPENDIX B: Opinion of Probable Construction Costs



HARBOURSIDE
Engineering Consultants

Responsibility	Percentage
Current administration	85%
Previous administration	15%

1. Taxes not included.
2. Opinion of probable construction costs is based on Harbourside historical cost information. Current market conditions are volatile and costs may vary from those provided.
3. Class C Opinion of Probable Construction Cost accuracy $\pm 20\%$
4. Repair of cracks/leaks observed in adjacent concrete walls (between turbines) is not included in the quantities/timeline of this opinion of probable construction costs

80 Hrs 4 personnel

10 Days

APPENDIX C: Site Visit Report

251166_SVR_2025-08-07.docx		PREPARED BY: Carson MacKay		
Weather & Temperature	Location	Site Visit Date (yyyy-mm-dd)		
Sunny, 25°C.	Tusket Powerhouse	2025-08-07		
		Start Time	Finish Time	
		10:00 AM	1:30 PM	

Tusket Powerhouse Scroll Case Concrete Repair

Site Visit Report

Purpose: To observe the interior of the scroll case at the unit 1 turbine and collect measurements of the concrete block supporting the quadrant shaft and the main concrete pedestal supporting the draft tube.

Harbourside Project Number: 251166

NSPI Project Number: C0011018

Participants:

- Carson MacKay (CM), Harbourside Engineering Consultants (Harbourside).
- Thomas McNutt (TM), Harbourside Engineering Consultants (Harbourside).
- Patrick Pellerin (PP), Nova Scotia Power Incorporated (NSPI).
- Confined space rescue team (3 personnel).

Safety Notes:

- Standard PPE and confined space PPE (harness) worn by all parties on site. No incidents to report.

General Notes:

- Background provided by NSPI: NSPI are looking to overhaul the Tusket unit 1 turbine starting in 2026 and are looking to get a head start on some of the design work, particularly around the scroll case. Located in the scroll case is a large quadrant shaft, which is used to control the wicket gates. It is driven by the governor, located on the turbine floor, and is connected to the wicket gates via push pull rods and an operating ring. The bottom of the shaft is anchored to a concrete block, which is connected to the main concrete pedestal that holds the draft tube. The concrete anchor block has separated from the main pedestal, however the cause for the cracking and separation could not be confirmed. Some temporary repairs were made to attempt to re-anchor the block to the pedestal (see photos), however it is unknown if the unit ever ran in this condition. As part of the overhaul NSPI would like to repair this concrete block to regain a rigid anchor point for the bottom of the quadrant shaft.
- NSPI informed Harbourside they would like options for repairing the concrete block supporting the quadrant shaft to reestablish a rigid anchor point with an opinion of probable construction costs to account for this project cost in the 2026 construction budget.

Observations:

- Harbourside completed a site visit on August 7, 2025, to observe the interior of the scroll case at the unit 1 turbine. Harbourside observed and collected measurements of the concrete block supporting the quadrant shaft and the main concrete pedestal supporting the draft tube.
- The scroll case was dewatered with stop logs installed and a confined space rescue crew was in place to permit entry into the scroll case. Harbourside observed the rescue crew test the air quality of the scroll case using a handheld gas monitor.

- Harbourside observed the interior walls and floor of the scroll case, the main concrete pedestal supporting the draft tube, and the concrete block that anchors the bottom of the quadrant shaft.
- Harbourside observed a construction joint between the concrete block supporting the quadrant shaft and the main concrete pedestal. This construction joint has separated/opened in some locations suggesting the concrete block has separated from the main concrete pedestal. NSPI has installed a metal frame in an attempt to re-anchor this concrete block to the main pedestal, however NSPI indicates they do not wish to run the unit using this repair and would like a more robust solution.
- The main concrete pedestal was observed to be in good condition at the location adjacent to the concrete block
- Some voids and cracks in the concrete were observed in the concrete block. On the right-hand side of the concrete block (looking towards the main concrete pedestal) a void was observed near the construction joint between the concrete block and the main concrete pedestal approximately 1/3 of the way down from the top of the concrete block (Figure 6). This void extends at least 200 mm into the face of the concrete block and is approximately 200 mm wide and 50 mm tall. On the left-hand side of the concrete block (looking towards the main concrete pedestal) a section of concrete (approximately 300 mm wide x 500 mm tall) appears to be cracked and delaminated from the concrete block, with a crack surrounding the perimeter of this delaminated section (Figure 5). This delaminated section was observed beside the construction joint between the concrete block and the main concrete pedestal.
- Harbourside observed up to approximately 50 mm of water on the floor of the dewatered scroll case. In particular, standing water was observed around the concrete block supporting the quadrant shaft. Water is leaking into the scroll case at the stop logs and through cracks in the scroll case walls.
- Harbourside observed water leakage from adjacent scroll cases through cracks in bottom of the wall. A horizontal crack with water leakage was observed in the bottom of the scroll case wall at the corner closest to the quadrant shaft. 2 cracks/holes with water leakage were observed in the bottom of the scroll case wall at the corner near the access ladder. Water is leaking through the wall and flowing to a drain placed just beneath the entrance ladder.

Photos:



Figure 1: Concrete block supporting quadrant shaft



Figure 2: Concrete block supporting quadrant shaft



Figure 3: Main concrete pedestal supporting draft tube; Concrete block supporting quadrant shaft on right



Figure 4: Standing water surrounding concrete block



Figure 5: Delaminated/cracked concrete on left side of concrete block



Figure 6: Void in concrete observed on right side of concrete block



Figure 7: Crack in scroll case wall with water leakage (Corner nearest concrete block supporting quadrant shaft)



Figure 8: Crack/hole in scroll case wall with water leakage (Corner nearest entrance ladder)



Figure 9: Drain located at corner with entrance ladder



Figure 10: Water leakage at stop logs



Figure 11: Governor label with torque output



65 Industrial Court B., Sault Ste. Marie, ON P6B 5Z9
Phone 705-946-3182 Fax 705-946-8492
info@hydrotech-inc.ca

QUOTATION

TO Nova Scotia Power
Patrick Pellerin
1223 Lower Water Street
Halifax, NS B3J 3S8

BUDGETARY QUOTE

Date: 17-Apr-26

PROJECT TITLE		QUOTE #	EXPIRATION DATE	
Tusket GS Engineering Design Scope of Work		26025	17-May-26	
LINE #	DESCRIPTION	QTY	UNIT PRICE (CAD)	LINE TOTAL (CAD)
1	Engineering Design Scope of Work per Tusket 1 Overhaul Total Estimate for Senior Engineering (P Eng) Total Estimate for Junior Engineering (P. Eng) (See Spread Sheet Provided for Breakdown of Hours)	1 1	\$ \$	\$ \$
2	OPTIONAL Onsite Measurement Services (Scanner etc.) Estimated based on current flight, car rental and hotel costs for a 4 day turnaround, including equipment and one HT Personnel based on 16 hours of measurements Hourly Rates and Services can be provided under the Current NS Power Master Services Agreement that is in Place with Hydro Tech	1	\$	\$
Payment Terms: Per MSA or to be Established upon award Ref. Only Attachments: MSA with NSP NSP Statement of Work Hourly Breakdown based on Scope of Engineering Work General Clarifications: This is a budgetary estimate based on information provided Completion of Engineering Package before end of June 2026				

Taxes not included in quote at this time

SUBTOTAL (CAD)	\$
Applicable Taxes	
TOTAL (CAD)	\$

Quotation prepared by: Bruno Cestra
Cell #:



To accept this quotation, sign here and fax to 705-946-8492: _____

VISIT US ON THE WEB AT WWW.HYDROTECH-INC.CA
THANK YOU FOR YOUR BUSINESS

Item	Drawings	Dwg & QA Review	As found QA	As built QA	Technical support	Column1	SR Eng	Jr Eng	total	Third party	comments
Stuffing Box	16	4	4	4			4	24	28		
Turbine Bearing LV Staves	8	2	2	2			2	12	14		
Headcover WG Bushings	4	2	4	2			2	10	12		
Gate Link Bushings	4	2	2	4			2	10	12		
Gate Link Pins (concentric & eccentric)	8	2	4	4			2	16	18		
Wicket Gates refurbishment	16	4	4	4			4	24	28		
WG bushings	2	2	2	2			2	6	8		
WG Stems (gate spindle)	4	2	2	2			2	8	10		
Push pull rod bushings	2	2	2	2			2	6	8		
Push pull rod pins (both ends)	4	1	2	2			1	8	9		
Gateshaft	20	2	2	2			2	24	26		
Throat Ring			4		16		16	4	20		
Operating Ring Slider pads	8	2	4	2			2	14	16		
							0	0	0		
							0	0	0		
							0	0	0		
							0	0	0		
Total	96	27	38	32	16		43	166	209		



2026 Project Rates

DESCRIPTION	HOURLY RATES	
	Time	Overtime
TECHNICAL STAFF		
Senior Engineer		
Senior Specialist		
Alignment Specialist		
Project Manager		
Engineer/Site Supervisor		
TRADES STAFF		
CAD Draftsman		
Foreman		
Tradesperson		
Administrative Clerk		
OTHER CHARGES		
Night Shift premium	Rates as above	
Ground Transportation		
Expenses and Equipment shipping (including air travel, meals and accommodations; ground or air shipping if required)	Cost	

Notes:

1. "Time" (straight time) shall be the rate charged for "Regular Working Hours" defined as the first 8 hours of work on all regular working days (excluding Saturdays, Sundays and Statutory Holidays).
2. "Overtime" shall apply to all work conducted on Saturdays & Sundays, Statutory Holidays, and beyond the initial 8 hours on any given day.
3. Any taxes will be in addition to the fees quoted in the table above.
4. Rates for Standby Time are equal to rates posted above
5. Rates for Travel Charges will be reviewed quarterly and adjustments may apply.

"Rental Rates" will apply for any tools worth a new cost greater than \$1,000 CAD with the exception of: Standard Office Equipment.

Approved By:

Date:



FARO Rates 2026

DESCRIPTION	HOURLY RATES	
	Time	Overtime
MEASUREMENTS		
Laser tracker and one operator		
Laser tracker, one operator and a helper		
Report writing/CAD		
Threaded/epoxy or weld-on stainless steel monuments		
OTHER CHARGES		
Employee travel time		
Night Shift premium	Rates as above	
Ground transportation (pick up or SUV)		
Expenses and Equipment shipping (including air travel, meals and accommodations; ground or air shipping if required)	Cost	

Notes:

1. "Time" (straight time) shall be the rate charged for "Regular Working Hours" defined as the first 8 hours of work on all regular working days (excluding Saturdays, Sundays and Statutory Holidays).
2. Overtime" shall apply to all work conducted on Saturdays & Sundays, Statutory Holidays, and beyond the initial 8 hours of work on any given day.
3. Any taxes will be in addition to the fees quoted in the table above.
4. Rates for Standby Time are equal to rates posted above for Operator.
5. Minimum of 8 hours per day will be charged.

Environmental conditions may affect the accuracy and operation of the FARO laser tracker. Please consult with Hydro Tech personnel regarding application.

Approved By:

Date:



Romer Arm Rates 2026

DESCRIPTION	HOURLY RATES		
	Time	Overtime	
MEASUREMENTS			
Romer arm and one operator			
Romer arm, one operator and a helper			
Report writing/CAD			
OTHER CHARGES			
Employee Travel Time			
Night Shift premium	Rates as above		
Ground transportation (pick up or SUV)			
Expenses and Equipment shipping (including air travel, meals and accommodations; ground or air shipping if required)	Cost		

Notes:

1. "Time" (straight time) shall be the rate charged for "Regular Working Hours" defined as the first 8 hours of work on all regular working days (excluding Saturdays, Sundays and Statutory Holidays).
2. "Overtime" shall apply to all work conducted on Saturdays & Sundays, Statutory Holidays, and beyond the initial 8 hours of work on any given day.
3. Any taxes will be in addition to the fees quoted in the table above.
4. Rates for Standby Time are equal to rates posted above for Operator.
5. Minimum of 8 hours per day will be charged.

Environmental conditions may affect the accuracy and operation of the Romer arm. Please consult with Hydro Tech personnel regarding application.

Approved By:

Date:

	Mechanical Design – Scope of Work	Tusket 1 Overhaul
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Tusket 1 Turbine Overhaul – Engineering Design Scope of Work

1. Background

This Scope of Work defines the engineering design services, drawings, material specifications, and quality documentation required to support the overhaul of the Tusket 1 hydro turbine. The engineering package will provide fully detailed construction, repair, and fabrication drawings, along with bills of materials, quality assurance documents, and as-built documentation.

The Tusket powerhouse is located near Yarmouth, NS. The powerhouse consists of 3 identical 900 kW units. They are vertical Kaplan turbines manufactured by S. Morgan Smith. They were commissioned in 1929. In advance of the overhaul, a new Kaplan runner is being fabricated for unit 1. Disassembly of the turbine and generator will begin in the summer of 2026.

2. General Requirements

The scope of work shall include the following:

- Design drawings. Drawings must include NSPI drawing numbers.
- Complete Bill of Materials (BOM) for each assembly.
- Virtual meetings between the consultant and NSPI. At minimum: Kickoff, plus one meeting after each drawing revision.
- Three formal revisions: Preliminary, Issued for Construction (IFC), As-Built.
- Inspection and Test Plan (ITP) sheets for all critical components.
- Compliance with applicable engineering standards and safety requirements.

3. Detailed Scope of Engineering Work

3.1 Stuffing Box

- Design of a new stuffing box or modifications to the existing one to accommodate a new seal water intake.

3.3 Turbine Bearing – Lignum Vitae Staves

- Design new lignum vitae staves with end-grain orientation. Must be compatible with the existing bearing housing.

3.4 Headcover Wicket Gate Bushings

- Provide design to support the conversion of greased bronze bushings to greaseless CIP bushings with integrated seals to prevent water ingress.

 Nova Scotia POWER An Emera Company	Mechanical Design – Scope of Work	Tusket 1 Overhaul
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- Drawing should include bushing housing bore size, based on as-found conditions.

3.6 Gate Link Bushings and Pins

- Provide design to support the conversion of greased bronze bushings to greaseless CIP bushings.
- Drawing should include bushing housing bore size, based on as-found conditions.
- Design of new stainless steel straight and eccentric pins.

3.7 Wicket Gate Repairs

- Provide design for new wicket gate stems.
- Provide design for repairs to the top/bottom and heel/toe seal surfaces on the gate bodies.
- Provide design to support the conversion of greased bronze bushings to greaseless CIP bushings.

3.8 Push-Pull Rod Bushings and Pins

- Provide design to support the conversion of greased bronze bushings to greaseless CIP bushings.
- Drawing should include bushing housing bore size, based on as-found conditions.
- Design of new stainless-steel pins at gateshaft and operating ring ends.

3.9 Operating Ring

- Provide design to support conversion of bronze wear pads to greaseless CIP. This must include the addition of a stainless-steel mating surface.
- Provide design to support the conversion of greased bronze bushings to greaseless CIP bushings for the eccentric pin connections.

3.10 Gateshaft

- Provide design to support the conversion from a greased bronze bushing to a greaseless CIP bushing with an integrated seal to prevent water ingress.

3.11 Throat Ring

- Review inspection data, propose repair options, and prepare final design.
- NSPI will provide inspection data including, but not limited to the following:
 - o General condition of throat ring and dimensions
 - o Material identification
 - o Remaining steel thickness
 - o Condition of concrete behind steel throat ring

4. Deliverables

The final deliverables should include the following:

- Preliminary Engineering Package
- IFC Package
- As-Built Package

 Nova Scotia POWER An Emera Company	Mechanical Design – Scope of Work	Tusket 1 Overhaul
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- Technical Support
- Bill of Materials
- ITP Sheets (as deemed necessary)

5. Schedule

- Preliminary Design: June 2026
- IFC Issue: July 2026
- As-Built Submission: TBD

6. Assumptions

- NSPI provides measurements, OEM drawings, and historical data.

7. Exclusions:

- Field services.
- Supply of materials or fabrication.