



**MIDGARD**  
CONSULTING

# **Review of Nova Scotia Power Inc.'s Ruth Falls Main Dam Refurbishment Authorization to Overspend Application**

## **NSUARB Matter M11927**

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**SUBMITTED BY**

Midgard Consulting Inc.

**DATE**

December 16, 2024



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Midgard, established in 2009, provides consulting services across the electrical power and utility sector. Midgard's principals and staff have direct experience in project development, design, contract procurement, finance, construction, and operations. This combined experience has translated into mandates in project due diligence, lender's technical advisor, loan guarantee assessments, and Independent Engineer roles in Canada, the United States, and internationally. Midgard has worked for developers, utilities, government agencies, and both project lenders and equity providers.

Midgard's team has extensive experience modelling fuel sources, creating energy yield estimates, reviewing contracts, reviewing pro-formas, and assessing project risks from a construction, operations, and financial perspective.

## DOCUMENT CONTROL AND SIGN-OFF

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| 0        | Final report submission to the Nova Scotia Utilities and Review Board | December 16, 2024 |
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|          |                                                                       |                   |

### PERMIT TO PRACTICE

Midgard Consulting Inc. registered with Engineers and Geoscientists British Columbia under permit number 1000974.

### REPORT SIGN-OFF

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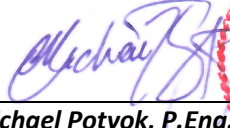
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16/Dec/2024  
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**NOTE: ORIGINAL HARD COPY IS SIGNED, SEALED, AND RETAINED ON FILE BY MIDGARD**

## TABLE OF CONTENTS

|                                                                      |    |
|----------------------------------------------------------------------|----|
| Document Control and Sign-off .....                                  | 3  |
| 1 Introduction .....                                                 | 5  |
| 1.1 Overview of the Ruth Falls Main Dam .....                        | 5  |
| 1.2 Application Context .....                                        | 7  |
| 1.3 Report Structure .....                                           | 7  |
| 1.4 Overview of Information Reviewed .....                           | 8  |
| 1.5 Site Visit .....                                                 | 8  |
| 1.6 Report Contributors.....                                         | 8  |
| 2 Reason For Variance: Environmental Permitting Requirements .....   | 9  |
| 2.1 Fisheries Act Authorization .....                                | 9  |
| 2.2 Watercourse Alteration Permit .....                              | 14 |
| 2.3 Navigable Waters Authorization .....                             | 16 |
| 3 Reason For Variance: Extended Construction Timeline .....          | 18 |
| 3.1 Material Cost Increases .....                                    | 18 |
| 3.2 Scope Increases .....                                            | 20 |
| 3.3 Labour Cost Increases.....                                       | 22 |
| 4 Reason For Variance: Archaeology and Mi'kmaq Engagement .....      | 25 |
| 4.1 Archaeology .....                                                | 25 |
| 4.2 Mi'kmaq Engagement.....                                          | 28 |
| 5 Economic Interest of Ratepayers.....                               | 30 |
| 5.1 Appropriate Alternatives Considered .....                        | 30 |
| 5.2 Potential Additional Cost Increases .....                        | 32 |
| 6 Summary and Conclusions .....                                      | 35 |
| 6.1 Reason for Variance: Environmental Permitting Requirements ..... | 35 |
| 6.2 Reason for Variance: Extended Construction Timeline .....        | 36 |
| 6.3 Reason for Variance: Archaeology and Mi'kmaq Engagement .....    | 36 |
| 6.4 Economic Interest of Ratepayers .....                            | 37 |
| Appendix A: Contributor Curriculum Vitae.....                        | 38 |

## LIST OF TABLES

|                                                                      |    |
|----------------------------------------------------------------------|----|
| Table 1: Relevant Proceeding Documentation Reviewed by Midgard ..... | 8  |
| Table 2: NS Power Correspondence with NSECC .....                    | 15 |
| Table 3: Material Cost Increase Breakdown.....                       | 18 |
| Table 4: Nova Scotia CPI Trend .....                                 | 18 |
| Table 5: Canada IPPI Trend .....                                     | 19 |
| Table 6: Cost Increase Due to Scope Increases Breakdown.....         | 21 |
| Table 7: Yearly Breakdown – Labour Variance.....                     | 23 |
| Table 8: Ruth Falls Archaeological Costs .....                       | 25 |
| Table 9: Comparison of Recent Project Archaeological Costs .....     | 27 |
| Table 10: Ruth Falls Mi'kmaq Engagement Costs .....                  | 28 |

## 1 INTRODUCTION

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Midgard Consulting Inc. (“**Midgard**”) has been retained by Counsel for the Nova Scotia Utility and Review Board (“**NSUARB**”) to carry out a review of Nova Scotia Power Inc.’s (“**NS Power**”) “*CI 50518 - HYD Ruth Falls Main Dam Refurbishment Authorization To Overspend*” Application (referred to in this report as “**the ATO Application**”), NSUARB Matter M11927. NS Power, a wholly owned subsidiary of Emera Incorporated, is a vertically integrated electric utility regulated by the NSUARB.

The ATO Application follows the initial application for NS Power’s “*2019 Annual Capital Expenditure (ACE)*” Application (referred to in this report as “**the Original Application**”), NSUARB Matter M08984, which was originally filed in November 2018 and approved by the NSUARB in May of 2019.

In the ATO Application, NS Power requests that the NSUARB approve an Authorization to Overspend (“**ATO**”) on its originally approved project budget by \$8,201,806. This would bring the total Project budget to \$15,445,508.<sup>1</sup>

While Midgard understands its mandate is to review NS Power’s ATO Application on behalf of NSUARB Counsel (with specific focus on NS Power’s actions since the close of the Original Application proceeding), the extended timeline of this project in general and extended regulatory schedule of NS Power’s filing necessitates some review of past evidence and decisions that reflect directly on this current application.

Note that throughout this report Midgard uses the term “**the Project**” to refer generally to the Ruth Falls Dam Refurbishment Project.

The findings stated within this report are the professional opinion of Midgard and are based on a review of the information described in Section 1.4.

### 1.1 Overview of the Ruth Falls Main Dam

The Ruth Falls Dam, located near Sheet Harbour in Nova Scotia, Canada, is part of the East River hydroelectric system, which has been generating power for the region since the late 19th century. Constructed in 1925, the facility has an installed capacity 7.2 MW. Its physical structure includes the main and wing dams, which are 32.8 feet high, as well as a spillway that spans 1,190 feet. The dam's power canal is 8,000 feet long, with an exposed canal area of 30,795 m<sup>2</sup>.<sup>2</sup>

NS Power’s proposed Ruth Falls Main Dam Refurbishment Project includes the following NSUARB-approved scope of work:<sup>3</sup>

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<sup>1</sup> M11927, Exhibit N-1, p. 1 of 10.

<sup>2</sup> NS Power, *Hydro Asset Study*, Appendix B, Section 2.15, Table 12, p. 39. [Link](#).

<sup>3</sup> M11927, Exhibit N-1, p. 1 of 10.

- Refurbish the Ruth Falls Main Dam embankments to address slope stability deficiencies and ensure compliance with Canadian Dam Association (“**CDA**”) Guidelines for all loading conditions.
- Replace the existing sluiceway gates with screw stem vertical lift gates to enhance operational functionality and structural stability under Inflow Design Flood (“**IDF**”) and earthquake conditions.
- Install rubber dams on the left portion of the dam (looking downstream) and construct an uncontrolled overflow spillway on the right portion to meet design flow requirements.
- Strengthen the spillway structure to address stability deficiencies and ensure its ability to pass the required design flood safely.
- Procure required materials in 2019, including rubber dams and vertical lift gates, with construction activities scheduled for 2020.

At the time of writing, NS Power has progressed with planning and preliminary activities for the refurbishment of the Ruth Falls Main Dam. However, beginning in 2019, the Project encountered challenges related to evolving regulations and interpretations of a 2019 amendment of the Fisheries Act. This change in the Fisheries Act resulted in additional and previously unforeseen environmental permitting requirements.

These included securing authorizations from Fisheries and Oceans Canada (“**DFO**”), the Nova Scotia Department of Environment and Climate Change (“**NSECC**”), and Transport Canada’s Navigation Protection Program.

After the Original Application, NS Power followed typical industry practice and submitted a Request for Review to DFO as a prudent step to establish adequate diligence and protect it from potential sanction under the federal Fisheries Act. Based on its interpretations of the 2019 Fisheries Act and evolving policies therefrom, DFO concluded that a Fisheries Act Authorization (“**FAA**”)<sup>4</sup> would be required. This determination resulted in a four-year ordeal to have its application for FAA accepted as complete and resulted in the introduction of new conditions for fish passage design and the implementation of an Environmental Offsetting Program. All of this necessitated additional studies, design efforts, and construction activities. These requirements were not anticipated in the original Project budget and contributed to delays in the construction schedule. At the time of this writing, DFO has yet to grant an FAA.

The extended timeline has resulted in increased Project costs due to shifts in market pricing for materials such as concrete and steel, as well as additional labour requirements to support ongoing project and environmental management efforts. Further, enhanced engagement with the Mi’kmaq of Nova Scotia and archaeological investigations were undertaken to address concerns about pre-contact archaeological sites and the environmental impacts associated with lowering the reservoir level.

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<sup>4</sup> DFO, *Project planning: Applying for a Fisheries Act authorization*, [Link](#). A FAA permits activities that may cause the death of fish or harm to fish habitat, as required under the Fisheries Act. It includes terms for mitigation, offsetting, and monitoring to manage impacts on aquatic environments.

- 1 The impacts of permitting challenges, construction delays, and additional engagement and mitigation  
2 measures form the basis for the variance reported as part of the ATO Application.<sup>5</sup>

## 1.2 Application Context

- 3 NS Power's ACE Plan process, guided by adherence to the Capital Expenditure Justification Criteria ("CEJC"),  
4 ensures that capital expenditures undergo scrutiny and justification within the regulatory framework.

- 5 The Original Application, submitted as NSUARB Matter M08984, was filed in November 2018 and approved  
6 by the NSUARB in May 2019. Its purpose was to provide customers, the NSUARB, and other stakeholders with  
7 an overview of NS Power's planned capital expenditures for the upcoming year.

- 8 The Original Application sought approval for \$190.4 million in capital projects, including the Ruth Falls Main  
9 Dam Refurbishment Project, which was the largest hydro capital project in the filing. NS Power estimated a  
10 total cost of \$7,244,422 for the Ruth Falls project, with \$1,561,074 allocated for expenditure in 2019. This  
11 allocation was subsequently approved in May 2019.<sup>6</sup>

- 12 In the ATO Application, NS Power is seeking approval from the NSUARB to exceed its initially approved  
13 project budget by \$8,201,806, raising the total project budget to \$15,445,508.<sup>7</sup>

## 1.3 Report Structure

- 14 To organize its report, Midgard reviewed a previously stated requirement for an ATO justification noted by  
15 NS Power in its 2012 General Rate Application proceeding:

- 16 *"In requesting an ATO, Nova Scotia Power must show that it acted prudently and with due diligence*  
17 *and that the project remains economically justified and in the best interests of customers."*<sup>8</sup>

- 18 Midgard has viewed NS Power's application through the lens of these requirements. This report is structured  
19 to address the following questions:

- 20 1. Are the cost increases being sought in the ATO the result of prudent actions by NS Power? To answer  
21 this question, Midgard analyzes the three "Reasons for Variance" that NS Power provided in the ATO  
22 Application:  
23 a. Environmental Permitting Requirements (Section 2)  
24 b. Extended Construction Timeline (Section 3)  
25 c. Archaeology and Mi'kmaq Engagement (Section 4)

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<sup>5</sup> M11927, Exhibit N-1, pp. 2-3 of 10.

<sup>6</sup> M08984, NSPI 2019 ACE Plan, Decision, Schedule A, p. 32.

<sup>7</sup> M11927, Exhibit N-1, p. 1 of 10.

<sup>8</sup> M04104, NSPI 2012 GRA, Exhibit N-8, Liberal RIR-19, p. 1 of 1.

2. Does the Project continue to be in the best economic interest of ratepayers after accounting for the overspending for which authorization is being sought? (Section 5)

As discussed in this report, Midgard views Section 2 as providing context on the Fisheries Act, including its historical evolution, compliance requirements, and penalties for violations. It also outlines recent guidance on applying modernized provisions to existing facilities, clarifying responsibilities for ongoing operations while exempting impacts predating the updated regulations. Finally, Section 6 summarizes Midgard's analyses and conclusions.

## 1.4 Overview of Information Reviewed

Table 1 contains a summary of documentation in this proceeding reviewed by Midgard during the preparation of this report.

**Table 1: Relevant Proceeding Documentation Reviewed by Midgard**

| Exhibit # | Document                  |
|-----------|---------------------------|
| N-1       | ATO Application           |
| N-2       | Letter of Comment         |
| N-3       | NSPI (CA) RIR-1 to 18     |
| N-4       | NSPI (IG) RIR-1 to 10     |
| N-5       | NSPI (Midgard) RIR-1 to 6 |
| N-6       | NSPI (NSUARB) RIR-1 to 13 |
| N-7       | NSPI (SBA) RIR-1 to 4     |

## 1.5 Site Visit

On September 8, 2021, Midgard staff member Michael Potyok attended the Ruth Falls Main Dam site for a site visit led by NS Power and attended by NSUARB staff. Midgard would like to thank NS Power and its on-site team for their courtesy and hospitality in arranging the site visit and for making themselves available for questions and discussion during the site visit.

## 1.6 Report Contributors

This report was contributed to by the following individuals, whose curricula vitae are attached as Appendix A.

- Michael Potyok, P.Eng., MBA
- Sam Mason, P.Eng.
- Matthew Matusiak, P.Eng.

## 2 REASON FOR VARIANCE: ENVIRONMENTAL PERMITTING REQUIREMENTS

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### 2.1 Fisheries Act Authorization

#### 2.1.1 NS Power Submission

In the ATO Application, NS Power states:

*“Subsequent to the approval of the original filing, NS Power was required to obtain a Fisheries Act Authorization (FAA) for the work from DFO, which was not required at the time of original filing. This FAA contained new conditions around fish passage requirements as well as requirements for NS Power to implement an Environmental Offsetting Program. The costs associated with the required studies, design, and construction of fish passage per the FAA were approximately \$3 million and the project costs associated with the Environmental Offsetting Program were approximately \$1.3 million.”<sup>9</sup>*

Between NS Power and the DFO, several key communications and milestones have taken place in relation to the Ruth Falls Project, with both parties engaging in a series of submissions, responses, and requests for additional information:<sup>10</sup>

1. In March 2020, DFO informed NS Power that Fisheries Act authorization was required for the Project. NS Power submitted its FAA application in June 2020, but DFO requested further details in August, including information on fish habitat, an offsetting plan, and operational procedures. NS Power responded by providing the requested materials, including a plan developed with the Confederacy of Mainland Mi'kmaq and a drawdown monitoring plan.
2. In 2021, DFO requested more information due to changes in the Project's scope, and NS Power submitted a watercourse alteration application to address a portion of the Project separately. This work was approved and completed in 2022, and NS Power clarified the broader Project scope and submitted updated supporting documents, including third-party monitoring plans. Further requests for supplemental information were made in 2022, to which NS Power responded with additional studies and plans, including those related to fish passage and hydraulic modeling.
3. By 2023, DFO had requested additional clarifications, particularly regarding the post-construction monitoring plan, fish habitat, and offsetting plans. NS Power made the necessary revisions and submitted the updated information. In December 2023, DFO asked for further revisions and more details on wetland and fish entrainment monitoring. NS Power responded with the required clarifications.

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<sup>9</sup> M11927, Exhibit N-1, p. 2 of 10.

<sup>10</sup> M11927, Exhibit N-1, pp. 1-3 of 10.

4. In early 2024, DFO identified remaining considerations that may require modifications to NS Power's proposal. Feedback from the Mi'kmaq of Nova Scotia was also received in June 2024, prompting additional requests for offsetting and monitoring clarifications.

### 2.1.2 Analysis – Amendments to the Fisheries Act

Significant changes to the federal Fisheries Act were enacted in 2012. These changes changed the previous focus of the Fisheries Act to protect the “sustainability and ongoing productivity of commercial, recreational or Aboriginal fisheries” as opposed to protecting all fish more broadly. Section 35 of that version of the Act, stated:

*“No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.”<sup>11</sup>*

“Serious harm to fish” was defined in Subsection 2(2) of the Fisheries Act as:

*“...the death of fish, or any permanent alteration to, or destruction of, fish habitat”.<sup>11</sup> [emphasis added]*

Two important considerations of this prohibition were:

1. The constraint of application to “commercial, recreational or Aboriginal fishery” as opposed to the previous application to all fish; and
2. The application to “permanent alteration”

The most significant impact expected from the Project results from the proposed drawdown of the reservoir to enable dam crest works to be carried out in the dry. While subject to debate, it can be argued that the drawdown of the reservoir would have resulted in non-permanent effects.

Midgard concludes that NS Power was acting reasonably in expecting that, at the time of its original ACE filing, an FAA would not have been required.

In June, 2019, the Fisheries Act was again amended, this time to largely reverse the previous 2012 amendments. A new Section 34.4 (1) states:

*“No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish.”<sup>12</sup>*

This definition results in a much broader application of the Fisheries Act. All reference to “permanent alteration” has been removed. It was under this new version of the Fisheries Act that NS Power submitted a Request for Review.

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<sup>11</sup> Government of Canada, Fisheries Act, R.S.C., 1985, c. F-14 (Previous Version 2013-11-25 to 2015-02-25), Section 35(1). [Link](#).

<sup>12</sup> Government of Canada, Fisheries Act, R.S.C., 1985, c. F-14, Section 78.2, p. 28. [Link](#).

In May, 2023, DFO published a new position statement “The Management of Existing Facilities and Structures under the Fisheries Act and the Species at Risk Act”. That document states:

*“The purpose of this statement is to outline the position and approach of Fisheries and Oceans Canada (the Department) with respect to the application of the fish and fish habitat protection provisions of the Fisheries Act, in combination with relevant provisions of the Species at Risk Act and the Aquatic Invasive Species Regulations, to an existing facility or structure, in or near water frequented by fish, **including a facility or structure that was constructed prior to the enactment of these provisions.**”*<sup>13</sup> [emphasis added]

The position further states that a person who carries on, owns, or has the charge, management or control of an existing facility or structure:

*“Is responsible for ensuring that the ongoing operation, modification, maintenance, decommissioning or any work, undertaking or activity associated with an existing facility or structure, is in compliance with the Fisheries Act and the Species at Risk Act. However, if the construction of the existing facility or structure precedes the enactment of the fish and fish habitat protection provisions of the Fisheries Act or relevant provisions of the Species at Risk Act, then impacts resulting from the construction (i.e., death of fish or harmful alternation, disruption or destruction of fish habitat from the construction of the facility or structure) are outside the scope of these provisions.”*<sup>14</sup>

It is presumed that under this policy DFO established expectation that the alteration of the Ruth Falls Dam constituted a “modification” and would therefore be subject to the new requirements under the act. This includes the requirement for a new fish ladder to allow for the migration of the previously excluded species of American Eel, which constituted a significant increase in scope over the originally filed project.

### **2.1.3 Analysis – DFO Correspondence**

In December 2019, NS Power submitted a Request for Review<sup>15</sup> for its Ruth Falls Main Dam Refurbishment Project. Section 78.6 of the Fisheries Act states:

*“No person shall be convicted of an offence under this Act if the person establishes that the person...  
...exercised all due diligence to prevent the commission of the offence; nor reasonably and honestly  
believed in the existence of facts that, if true, would render the person’s conduct innocent.”*

The Request for Review is generally considered a prudent approach to establish that diligence.

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<sup>13</sup> Government of Canada, *The Management of Existing Facilities and Structures under the Fisheries Act and the Species at Risk Act*, Position Statement, p. 3. [Link](#).

<sup>14</sup> Government of Canada, *The Management of Existing Facilities and Structures under the Fisheries Act and the Species at Risk Act*, Position Statement, p. 5. [Link](#).

<sup>15</sup> DFO, *Request For Review*, [Link](#). A Request for Review is submitted to DFO to assess potential impacts on fish and fish habitat under the Fisheries Act and determine if a Fisheries Act Authorization is required.

In a March 13, 2020, response, DFO identified several project components, including replacing stoplog bays with rubber dams, adding an uncontrolled overflow spillway, resurfacing concrete crests, and constructing cofferdams and temporary access roads. The works also involved fish migration measures and a 2.1–4.6 meter headpond drawdown, affecting up to 1.35 km<sup>2</sup> of the littoral zone.<sup>16</sup> Midgard confirmed the described scope aligned with the 2019 ACE Plan filing. DFO concluded the works were likely to harm fish and fish habitat, necessitating a FAA.

NS Power's mitigation and offsetting proposals, submitted in its June 24, 2020 FAA application, aimed to address impacts on fish and fish habitat under the new Fisheries Act and evolving interpretations and regulations. The application included measures such as fish passage systems, adherence to best practices, and a 5:1 offsetting ratio to account for risks associated with incomplete project designs.<sup>17</sup> This higher ratio exceeded typical prior standard practice, which in Midgard's experience, was closer to a 2:1 risk adjusted habitat offsetting ratio.

DFO's response on August 4, 2020, deemed the FAA application incomplete, citing the need for detailed offsetting plans and noting challenges due to limited project details and the drawdown's residual impacts:

*"We understand that NSPI would like to combine offsetting work for Sloane and Ruth Falls as they are within the same watershed. With both projects being delayed to 2021, sufficient time is available for NSPI to provide additional details related to planned offsetting."*<sup>18</sup>

In Midgard's experience, DFO has historically accepted conceptual offsetting plans and this case marked a shift toward requiring detailed designs, delaying approval and prompting NS Power to refine its plans further. While Midgard did not review NS Power's initial estimate of impacted habitat, subsequent data (a 2006 bathymetric map) suggested the estimate incorporated elements beyond subjective evaluation.<sup>19</sup>

Previously discussed amendments to the Fisheries Act introduced new requirements, forcing DFO to adapt without a clear policy framework, resulting in inconsistent, case-by-case project approvals. The evolving requirements underscored uncertainties arising from the transition away from the previous Act's "serious harm" language.<sup>20</sup>

*"The modernization of the Fisheries Act in 2019 included the addition of previously removed provisions on "death of fish" and the "Harmful Alteration, Disruption or Destruction (HADD) of fish habitat", and considerations for impacts to Indigenous Peoples of Canada. These provisions directly*

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<sup>16</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 1, pp. 1-3 of 3.

<sup>17</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 2, Section 16.0, p. 22 of 50.

<sup>18</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 3, p. 2 of 3.

<sup>19</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 4, pp. 55-57 of 57.

<sup>20</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 2, Section 10.0, Table 5, pp. 15-17 of 50.

1 *relate to the interpretation of impacts to fish and fish habitat as a result of the temporary drawdown*  
2 *and overall regulatory review process for the Ruth Project.”<sup>21</sup>*

3 On July 8, 2021, DFO acknowledged NS Power’s updated project scopes and timelines, requesting a new  
4 Request for Review:

5 *"As per communication from NS Power on July 6, 2021, the Program understands that the scope of*  
6 *work and timelines will change for the proposed project. Please provide a new Request for Review*  
7 *document to the Program that describes the revised scope of work and associated timelines.”<sup>22</sup>*

8 DFO declined to provide feedback on prior submissions due to these changes:

9 *"As changes to the scope of work and timelines are being proposed by the proponent, we are not*  
10 *providing comments [on] the previous Fisheries Act Authorization application or supporting*  
11 *documents (including proposed monitoring plan) at this time.”<sup>22</sup>*

12 Successive DFO communications demanded increasingly detailed submissions from NS Power, yet concerns  
13 persisted. While the application was deemed "complete" by January 2024,<sup>23</sup> subsequent communications,  
14 including a June 6 email, raised unresolved issues related to Mi’kmaq concerns and DFO’s technical  
15 comments on the monitoring plan.<sup>24</sup>

#### 16 **2.1.4 Conclusion**

17 While the Project was initially developed in accordance with earlier frameworks and included mitigation and  
18 offsetting proposals, the 2019 amendments to the Fisheries Act introduced new requirements that triggered  
19 the need for a FAA. Historically, habitat offsetting projects have been approved with conceptual plans,  
20 supported by letters of credit. However, in this instance, DFO’s evolving expectations necessitated more  
21 detailed submissions. As a result, DFO rejected the initial and supplemental proposals, delaying the approval  
22 process until further information on the Project's potential impacts could be submitted.

23 Midgard’s opinion is that despite its best efforts, NS Power had little choice but to invest significant time and  
24 effort in attempting to meet a series of changing and increasingly detailed requests for alterations and  
25 additional information from DFO – each of which imposed schedule and cost requirements on NS Power.

26 Ultimately, Midgard concludes that the changing context of the Fisheries Act and resulting consequences on  
27 NS Power’s Project execution process has imposed significant costs on NS Power, and ultimately on its

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<sup>21</sup> M11927, Exhibit N-3, CA RIR-4(c), p. 2 of 2.

<sup>22</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 5, p. 2 of 2.

<sup>23</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 13, p. 1 of 2.

<sup>24</sup> M11927, Exhibit N-6, NSUARB RIR-12, Attachment 14, p. 1 of 3.

ratepayers. Midgard views this as the primary driver for the majority of the costs associated with this ATO Application, and is of the opinion that NS Power generally acted prudently in its attempts to respond to DFO's requests in the face of an evolving regulatory environment.

## **2.2 Watercourse Alteration Permit**

### **2.2.1 NS Power Submission**

In the ATO Application, NS Power stated the following with respect to its application for a Watercourse Alteration Permit with the Nova Scotia Department of Environment and Climate Change ("**NSECC**"):

*"NS Power applied for the Watercourse Alteration Permit on December 17, 2019 and received the Permit Approval on June 30, 2024."<sup>25</sup>*

In response to IRs NS Power provided additional detail, including a table outlining its correspondence with NSECC (reproduced as Table 2 below), as well as copies of said correspondence.

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<sup>25</sup> M11927, Exhibit N-1, p. 2 of 10.

**Table 2: NS Power Correspondence with NSECC<sup>26</sup>**

| NSECC Communication                                                | Date Received     | NS Power Response                                                                                                                                       | NS Power Response Date | Attachment Reference |
|--------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------|
|                                                                    |                   | Watercourse Alteration Approval Application submitted to NSECC                                                                                          | December 16, 2019      | 1                    |
| Additional Information Requested                                   | January 7, 2020   | NS Power provided a letter response to NSECC                                                                                                            | February 27, 2020      | 2 & 3                |
| Additional Information Requested                                   | March 25, 2020    | NS Power provided a letter response to NSECC                                                                                                            | June 22, 2020          | 4 & 5                |
| Additional Information Requested                                   | March 31, 2021    | NS Power provided an updated project and environmental description and associated appendices to NSECC                                                   | April 9, 2021          | 6 & 7                |
| Additional Information Requested                                   | June 18, 2021     | NS Power provided an updated project and environmental description and associated appendices to NSECC                                                   | February 14, 2022      | 8, 11 & 12           |
|                                                                    |                   | NS Power submits standalone Watercourse Alteration Approval Application for the sluice gate and control building scope of work                          | July 17, 2021          | 9                    |
| Approval issued for sluice gate and control building scope of work | October 22, 2021  |                                                                                                                                                         |                        | 10                   |
| Additional Information Requested                                   | April 1, 2022     | NS Power provided and updated project and environmental description and associated appendices to NSECC                                                  | May 6, 2022            | 13 & 14              |
|                                                                    |                   | NS Power applied for an amendment to extend the expiry date of the Watercourse Alteration Approval for the sluice gate and control building scope       | July 8, 2022           | 15                   |
| Amended Approval issued for sluice gate and control building scope | September 7, 2022 | NS Power submitted a completion of work form to NSECC indicating the control building scope had been completed. The Sluice gate scope was not completed | September 22, 2022     | 16 & 17              |
| Additional Information Requested                                   | December 9, 2022  | NS Power submitted an updated project and environmental description and associated appendices                                                           | March 20, 2023         | 18 & 19              |
| Additional Information Requested                                   | May 25, 2023      | NS Power submitted an updated project and environmental description and associated appendices                                                           | August 21, 2023        | 20 & 21              |
| Watercourse Alteration Approval Received                           | July 31, 2024     |                                                                                                                                                         |                        | 22                   |

<sup>26</sup> M11927, Exhibit N-3, CA RIR-5(a), pp. 1-3 of 3.

## 2.2.2 Analysis

Midgard has conducted a high-level review of the extensive correspondence between NSECC and NS Power. Midgard does not have direct experience or background with NSECC processes and interactions, and is therefore not in a position to provide an opinion on whether or not the NSECC process as part of this Project should have been foreseeable by NS Power at the time of the Original Application.

Nevertheless, Midgard's review of the provided correspondence suggests that in general NS Power was responding appropriately and promptly to NSECC's requests. Moreover, it appears that the requests from NSECC were at times "piecemeal" (i.e., additional issues being raised only after unrelated answers provided by NS Power).

An issue that arose repeatedly in NS Power's correspondence with NSECC was NS Power's inability to provide finalized design drawings and contractor documentation to NSECC. Midgard notes that NS Power did not have these documents primarily due to the shifting Project design and schedule, which itself was caused by NS Power needing to adapt to changing request from DFO.

## 2.2.3 Conclusion

In Midgard's opinion NS Power was acting reasonably in its interactions with NSECC. The delays associated with the watercourse alteration permit issuance appear to stem from issues that originally initiated with the DFO FAA process (i.e., not having design or contractor documentation available to provide to NSECC).

NS Power has not detailed how much of its \$4.4 million in cost overages that it attributes to Environmental Permitting Requirements is due to its interactions with DFO vs NSECC. However, this question is likely immaterial – NSECC costs appear to stem primarily from delays associated with DFO, and therefore the "cause" of both cost centers appears to be the same (DFO requirements).

## 2.3 Navigable Waters Authorization

### 2.3.1 NS Power Submission

In response to IRs, NS Power stated:

*"NS Power applied for a Navigable Waters Authorization on April 30, 2021. This application is submitted through TC's online Navigation Protection portal. A copy of the email confirming submission of the application is provided in Attachment 23. Authorization has not yet been received and is expected to be issued at the same time as DFO authorization."*<sup>27</sup>

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<sup>27</sup> M11927, Exhibit N-3, CA RIR-5(b), p. 3 of 3.

### 2.3.2 Analysis

There is little information provided on this permit – the referenced attachment is an automated email response from 2021.

Review of the Transport Canada website shows two applications for the Ruth Falls dam (the second having been submitted in July 2021), both listed as “In Progress”. Furthermore, the East River is not listed as a “Scheduled” waterway by Transport Canada, meaning that the review requirements are decreased and in some cases are even voluntary.

### 2.3.3 Conclusion

Based on the limited information available, Midgard does not have any reason to doubt NS Power’s expectation that an authorization will be issued in due course, and considers this to be an area of low risk to the project. The navigable waters permit does not appear to have had a material contribution to the cost overruns for which approval is being sought in the ATO.

### 3 REASON FOR VARIANCE: EXTENDED CONSTRUCTION TIMELINE

#### 3.1 Material Cost Increases

##### 3.1.1 NS Power Submission

In its IR Responses, NS Power attributed attributes approximately \$710,000 of its cost increases to increases in material costs due to the extended construction timeframe. Table 3 provides a detailed breakdown of these costs as reported by NS Power.

**Table 3: Material Cost Increase Breakdown<sup>28</sup>**

| Description                                    | Increase in Costs (\$k) |
|------------------------------------------------|-------------------------|
| Increased Material Costs - concrete works      | \$689                   |
| Increased Material Costs - rebar dowels        | \$196                   |
| General contract - steel walkway               | \$176                   |
| Generator for the rubber dams control building | \$125                   |
| General contract - lighting system             | \$100                   |
| Rubber dams control building                   | -\$20                   |
| Gates and actuators                            | -\$256                  |
| Rubber dam supply                              | -\$300                  |
| <b>TOTAL</b>                                   | <b>\$710</b>            |

##### 3.1.2 Analysis

The Consumer Price Index (“CPI”) is a measure of the average change in prices over time for a basket of goods and services commonly purchased by households. It serves as a general indicator of inflation and helps track price trends across various sectors of the economy. Table 4 outlines the CPI trends for Nova Scotia, comparing May 2019 (approval of the Original Application) and October 2024 values:

**Table 4: Nova Scotia CPI Trend<sup>29</sup>**

| Description                 | May 2019 | October 2024 | Increase (%) |
|-----------------------------|----------|--------------|--------------|
| Nova Scotia CPI (All Items) | 137.8    | 164.6        | 19.4%        |

The CPI indicates a general increase in economic pressures, offering context for broader trends that may indirectly affect material costs. However, while the CPI provides a benchmark for inflation, it does not

<sup>28</sup> M11927, Exhibit N-3, CA RIR-9(a), p. 3 of 3.

<sup>29</sup> Statistics Canada, *CPI, Monthly, Not Seasonally Adjusted*. [Link](#). Index: 2002 = 100.0.

capture the unique price dynamics of materials like concrete and steel, which are influenced by global markets, supply chain issues, and local factors.

The Industrial Product Price Index (“**IPPI**”) measures the price changes of products sold by manufacturers in Canada, tracking fluctuations in the cost of goods at the factory gate before taxes and transportation costs. Unlike the CPI, the IPPI specifically includes categories such as fabricated metal products, construction materials, and cement, which are closely tied to the materials cost increases reported by NS Power. It serves as a more targeted indicator of inflationary trends in the production sector, reflecting economic pressures on these relevant material costs over time. Specifically, the material cost increases described by NS Power correspond most closely to the following IPPI categories:

1. Plastic and rubber products [P32]: Relevant for rubber dam supplies and related materials.
2. Fabricated metal products and construction materials [P63]: Covers rebar dowels, steel walkways, and other metal-based construction materials.
3. Machinery and equipment [P72]: Accounts for items like generators and other equipment.
4. Cement, glass, and other non-metallic mineral products [P81]: Relevant due to increased costs for concrete works.

Table 5 illustrates trends in the IPPI between May 2019 and October 2024, highlighting the price increases for categories directly associated with the materials used in NS Power’s project. Notable increases are seen in fabricated metal products and construction materials, as well as cement, glass, and other non-metallic mineral products—categories closely tied to construction activities:

**Table 5: Canada IPPI Trend<sup>30</sup>**

| Description                                                  | May 2019 | October 2024 | Increase (%) |
|--------------------------------------------------------------|----------|--------------|--------------|
| Total, IPPI                                                  | 101.4    | 127.2        | 25.4%        |
| Plastic and rubber products [P32]                            | 101.5    | 125.9        | 24.0%        |
| Fabricated metal products and construction materials [P63]   | 100.3    | 139.7        | 39.3%        |
| Machinery and equipment [P72]                                | 100.0    | 121.9        | 21.9%        |
| Cement, glass, and other non-metallic mineral products [P81] | 100.4    | 137.5        | 37.0%        |

<sup>30</sup> Statistics Canada, *IPPI, Monthly, Not Seasonally Adjusted*. [Link](#). Index: 2001 = 100.0.

The IPPI data suggests that an increase for inflationary reasons on the order of 25.4% across all sectors is in line with general economic trends. However, more specific categories, such as fabricated metal products and construction materials (up 39.3%) and cement, glass, and other non-metallic mineral products (up 37.0%).

The \$710,000 increase in material costs due to the extended construction timeframe represents a 47% increase over the original materials budget of \$1,520,000. However, this net increase in costs incorporates a savings of \$576,000 on the “Rubber dams control building”, “Gates and actuators”, and “Rubber dam supply” line items. Removing the effects of these savings, the remaining line items have increased by a total of \$1,286,000, or 85% of the original budget. Notably, \$689,000 of this increase is due to higher concrete material costs alone.

### **3.1.3 Conclusion**

In general Midgard concludes that NS Power did face an environment of dramatically increasing costs from the time of its original submission to the time of the ATO Application. Inflationary pressures, as seen in both CPI and IPPI data, explain part of the material cost increase, particularly in categories like concrete and fabricated metal products, with inflation data in these areas showing increases on the order of 35-40% from the time of the Original Application to the ATO Application.

On its face this would not appear to fully explain the 85% increase in those line items that did not see savings. However, Midgard notes that broad societal indices are not a substitute for project-specific information, and the inflation data available may not account for localized impacts related to specific regions, suppliers, contractors, etc. From the information provided it is unclear if there are other contributing factors to these line items, or if there are in fact also scope increases incorporated into these line items. More broadly, Midgard’s analysis supports the assertion that there was significant inflationary escalation that contributed to NS Power’s overspending.

## **3.2 Scope Increases**

### **3.2.1 NS Power Submission**

In response to IRs, NS Power indicated that \$698,000 of the cost increases being applied for in the ATO are the result of scope changes. Table 6 provides a detailed breakdown of the \$698,000 increase in costs attributed by NS Power to scope increases.

**Table 6: Cost Increase Due to Scope Increases Breakdown<sup>31</sup>**

| Description                                    | Increase in Costs (\$k) |
|------------------------------------------------|-------------------------|
| Fish passage upgrades                          | \$667                   |
| Insulated storage containers (for rubber dams) | \$16                    |
| Back-up generator (winter construction)        | \$15                    |
| <b>TOTAL</b>                                   | <b>\$698</b>            |

### 3.2.2 Analysis

Review of the correspondence between NS Power and DFO shows that DFO requirements drove the modification of several project components, including:

1. modifications to the upstream fishway and fish passage weirs;
2. upgrade of the existing fish diversion louvre system; and
3. installation of the new upstream eel ramp.

These changes account for the vast majority (\$667,000) of the scope change increase.

These changes arise directly from the expansion of protected species from the 2012 Fisheries Act protecting specific fisheries to the 2019 amendment, which protect all fish; as well as the 2023 position paper to expand application to owners of existing facilities making modifications.

The additional storage costs for the rubber dams were required because the rubber dams were procured early, and must be stored in appropriate conditions to ensure that the materials remain in good condition.

Regarding the additional back-up generator costs, NS Power stated the following:

*“The assumption in the estimate included with the original filing anticipated the General Contractor would include the costs for the rental of on-site trailers/generators/fuel for the NS Power site supervision/environmental services personnel as part of their bid. However, the selected General Contractor did not include an allowance for these rental costs in their bid submission and must be added to the overall cost to execute the project as planned.”<sup>32</sup>*

### 3.2.3 Conclusion

Overall Midgard concludes that the cost increases due to scope change are reasonable. Specific comment on each of the three scope increases is provided as follows:

<sup>31</sup> M11927, Exhibit N-3, CA RIR-9(a), p. 3 of 3.

<sup>32</sup> M11927, Exhibit N-6, NSUARB RIR 10(e), p. 7 of 7

- 1 1. Fish passage modifications and additions are the result of DFO requirements, and therefore out of NS  
2 Power control. This accounts for the vast majority of the scope change cost increases.
- 3 2. The insulated storage containers were required because the rubber dams were acquired early, and  
4 have had to be stored on site for the intervening years while NS Power. Not only is this \$16,000 cost  
5 therefore directly attributable to the project delays (which Midgard considers to be a direct  
6 consequence of DFO's requests), Midgard notes that because they were acquired early the rubber  
7 dams cost \$300,000 less than budgeted (see Table 3). As such, the cost of storage on-site is more  
8 than justified by the savings of early acquisition.
- 9 3. NS Power's stated reason for the additional generator costs suggest that there may have been  
10 miscommunication or misunderstanding in the cost estimation and/or procurement processes that  
11 led to generator costs not being included. However, the magnitude of this cost increase (\$15,000)  
12 makes this a relatively minor oversight that had a minimal impact on the overall overspending.

### 3.3 Labour Cost Increases

#### 3.3.1 NS Power Submission

13 In the ATO Application, NS Power attributed the labour cost increase to the extended construction timeline,  
14 required to secure environmental permits and meet their conditions. The increase was broken down as  
15 follows: \$444,441 for regular labour, \$94,851 for term labour, and \$6,186 for overtime. This reflects the  
16 additional project management and environmental services support needed due to project delays.<sup>33</sup>

17 The \$444,441 increase in regular labour costs was driven by additional support for securing environmental  
18 permits and addressing the expanded scope of work, with most costs incurred in 2025 for project execution  
19 and environmental studies. The \$94,851 increase in term labour costs is associated with monitoring support,  
20 post-construction activities, and compliance with environmental permit conditions.

21 Table 7 summarizes NS Power's detailed yearly breakdown of the labor cost variances resulting from the  
22 extended construction timeline:  
23

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<sup>33</sup> M11927, Exhibit N-1, p. 5 of 10.

**Table 7: Yearly Breakdown – Labour Variance<sup>34</sup>**

| Year         | Regular Labour (\$k) | Term Labour (\$k) |
|--------------|----------------------|-------------------|
| 2017-2020    | (\$19)               | \$3               |
| 2021         | \$85                 | \$0               |
| 2022         | \$124                | \$1               |
| 2023         | \$56                 | -                 |
| 2024         | \$47                 | \$1               |
| 2025         | \$104                | \$30              |
| 2026         | \$47                 | \$60              |
| <b>Total</b> | <b>\$446</b>         | <b>\$95</b>       |

The regular and term labour variances are primarily attributed to efforts associated with managing permitting and associated project activities:<sup>34</sup>

1. Regular Labour: driven by managing permitting activities with agencies (e.g., DFO), contract activities, and engineering work related to the controls building and fish passage upgrades. Costs also reflect ongoing management of project execution, environmental studies, and offsetting measures, with labour demands in the final months of the project to ensure completion and financial closure.
2. Term Labour: driven by managing site work associated with obtaining permits and executing permit conditions throughout the project. This includes support for environmental monitoring, post-construction activities, and ensuring compliance with the conditions outlined in the permits.

### 3.3.2 Analysis

Given the updated environmental permit requirements and the need for additional regulatory oversight, the increased labour and material costs reflect actions taken to address these challenges. The four staff types associated with regular labour costs—Hydro River Staff, Environmental Staff, Administrative Support, and Project Support Staff<sup>35</sup>—represent necessary resources for managing the project's complexity, regulatory compliance, and extended timeline. The allocation of costs across these staff categories aligns with the Project's evolving needs. Additionally, overtime labour, which constitutes a modest portion of the overall variance, represents a prudent strategy to control costs while maintaining project timelines.

<sup>34</sup> M11927, Exhibit N-3, CA RIR-9(a), pp. 1-2 of 3.

<sup>35</sup> M11927, Exhibit N-6, NSUARB RIR-11(c) p. 3 of 7.

NS Power was asked to elaborate on the cost minimization efforts made with respect to labour costs, to which NS Power responded:

*“Cost minimization will be realized by using internal labour rather than contracted labour at a marked-up rate during the upcoming monitoring during the nine months drawdown of Ruth Falls reservoir. NS Power also sought to minimize internal labour costs by incorporating lessons learned in preparing other FAA and Watercourse Alteration Approval applications to reduce the amount of questions asked by regulators and the additional work required to answer the questions. The Company also assigned internal labour resources to the Project that were already familiar with the Sheet Harbour Hydro System and the requirements of its operation, environmental considerations, and geographic constraints.”*<sup>36</sup>

NS Power’s cost minimization efforts, including the use of internal labour and efforts to reduce regulatory delays, reflect a commitment to due diligence. These measures align with NS Power’s responsibility to ensure economic efficiency while meeting the Project’s requirements.

### **3.3.3 Conclusion**

The increased labour and material costs reported by NS Power stem from updated environmental permitting requirements and an extended timeline to meet regulatory conditions. The allocation of costs across regular labour categories, including Hydro River, Environmental, Administrative, and Project Support Staff, reflects the necessary resources to manage the project's complexity and ensure compliance. While overtime labour is modest, it supports efforts to control costs and maintain progress. Additionally, NS Power’s use of internal labour and efforts to reduce regulatory delays demonstrate a responsible approach to managing expenses. Based on these factors, Midgard concludes that the reported increases in labour costs are reasonable.

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<sup>36</sup> M11927, Exhibit N-3, CA RIR-9(a), p. 3 of 3.

## 4 REASON FOR VARIANCE: ARCHAEOLOGY AND MI'KMAQ ENGAGEMENT

### 4.1 Archaeology

#### 1 4.1.1 NS Power Submission

- 2 In response to IRs, NS Power indicated that the ATO has increased the archaeological costs for the project  
3 from \$2,256 to \$250,361, as indicated in Table 8:

**Table 8: Ruth Falls Archaeological Costs<sup>37</sup>**

| Description                                                                                                                                                                                                                                                                                      | UARB<br>Approved<br>Original<br>Submission | ATO<br>Submission | Variance         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------|------------------|
| <b>Archaeological Reconnaissance and Mitigation for Dewatering of Ruth Falls Reservoir in 2025-2026:</b><br>To complete archaeological reconnaissance during the drawdown of the Ruth Falls headpond in 2025-2026 and complete preliminary historical background and predictive modeling report. | -                                          | \$106,302         | \$106,302        |
| <b>Archaeology Security costs:</b><br>Costs to provide security for the exposed pre-contact First Nations archaeological sites on the reservoir during the drawdown of Ruth Falls reservoir in 2025-2026.                                                                                        | -                                          | \$133,900         | \$133,900        |
| <b>Methodology and Costing for Archaeological Screening:</b><br>Additional costs related to methodology and costing for archaeological screening                                                                                                                                                 | \$2,256                                    | \$7,966           | \$5,710          |
| <b>Other historical costs</b>                                                                                                                                                                                                                                                                    | -                                          | \$2,193           | \$2,193          |
| <b>Total</b>                                                                                                                                                                                                                                                                                     | <b>\$2,256</b>                             | <b>\$250,361</b>  | <b>\$248,105</b> |

4

- 5 NSPI goes on to explain why these costs were not included in the original application:

- 6 *“NS Power was not aware the reservoir exhibited high potential for impacting archaeological*  
7 *resources prior to the original application. A desktop Archaeological Resource Impact Assessment*  
8 *(ARIA) was completed for the Ruth Falls headpond in 2023 to inform the development of an*  
9 *archaeological protection plan for the drawdown as referenced in CA IR-13, part (c), which*

<sup>37</sup> M11927, Exhibit N-3, CA RIR-13(c), pp. 2-3 of 3. Table reproduced from NSPI submission (totals calculated and added by Midgard).

determined the headpond was considered elevated potential to encounter archaeological resources.”

38

#### 4.1.2 Analysis

Though NS Power suggests that it was not aware that there was a high potential for archaeological resources in the headpond, it also goes on to admit that exclusion of these costs was an oversight:

*“Archaeological costs for the drawdown for the Ruth Falls Project were not included in the original application; this was an oversight by NS Power. ...”*<sup>39</sup>

However, in the same passage, NS Power suggests that even if the costs had been included, they would have been estimated at an immaterial level:

*“... However, the cost associated with an archaeological protection for a drawdown at the time of the original application would have been immaterial compared to the revised costs in the ATO application. As an example, an archaeological reconnaissance was conducted during the drawdown of Wright’s Reservoir, as part of the Wright’s Dam Refurbishment project in 2015, by a qualified archaeological consultant for approximately \$11,500. The area of Wright’s Reservoir is significantly larger than Ruth Headpond.*

*Revised archaeological costs in NS Power’s ATO application are a result of increased expectations and requirements for archaeological protection during extended drawdowns which have evolved since 2018.”*

Midgard has had direct experience with several projects that have involved shoreline archaeological reconnaissance and/or security – the archaeological costs associated with these projects (as well as the Wright’s Dam project referenced by NS Power) is summarized chronologically in Table 9, alongside the Ruth Falls project:

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<sup>38</sup> M11927, Exhibit N-4, IG RIR-9(a), p. 1 of 2.

<sup>39</sup> M11927, Exhibit N-4, IG RIR-9(c), p. 2 of 2.

**Table 9: Comparison of Recent Project Archaeological Costs**

| Application                                       | Date Filed        | Archaeological Cost       |
|---------------------------------------------------|-------------------|---------------------------|
| Gaspereau Dam Safety Remedial Works (Original)    | May 3, 2007       | \$150,000 <sup>40</sup>   |
| Wright's Dam Refurbishment                        | 2015              | \$11,500                  |
| Tusket Falls Main Dam Refurbishment (Original)    | July 5, 2017      | \$194,893 <sup>41</sup>   |
| Ruth Falls Main Dam Refurbishment (2019 ACE Plan) | November 29, 2018 | \$2,256                   |
| Gaspereau Dam Safety Remedial Works (ATO)         | February 3, 2020  | [REDACTED] <sup>40</sup>  |
| Tusket Falls Main Dam Refurbishment (ATO)         | July 23, 2021     | \$1,132,662 <sup>42</sup> |
| Ruth Falls Main Dam Refurbishment (ATO)           | November 29, 2024 | \$250,361                 |

Reviewing the timeline above suggests that at the time that the 2019 ACE Plan was being prepared, NSPI had the following experience with archaeological costs in addition to the Wright's Dam Refurbishment:

- Two submitted applications (the original Gaspereau and Tusket applications) in which refurbishment or remediation of a dam was associated with archaeological costs on the order of \$150,000 - \$200,000.
- Was likely well into its process of updating Gaspereau archaeological costs, which were ultimately significantly increased in its ATO application.
- May have been in the process of updating Tusket archaeological costs, which were ultimately significantly increased in its ATO application.

### 4.1.3 Conclusion

Midgard considers that the archaeological costs estimated in the Ruth Falls ATO are not overstated, and are in line with previously estimated amounts for Tusket and Gaspereau. Furthermore, in the context of this ATO application, Midgard suspects that a failure to account for \$248,105 in the original ACE application would not materially affect the outcome of a decision on this capital expenditure.

However, it is Midgard's opinion that at the time of the ACE submission, given its recent experience with similar dam refurbishment (i.e., Tusket, Gaspereau), NS Power should have been aware that archaeological costs for the Project would be several orders of magnitude higher than its estimated figure of \$2,256.

Midgard therefore concludes that NS Power was not appropriately estimating this portion of its original

<sup>40</sup> M09579, Exhibit N-1(C) (Application – Partially Confidential), p. 5 of 42.

<sup>41</sup> NSUARB M08162, Exhibit N-1, Section 4.3, Figure 12, p. 27 of 48.

<sup>42</sup> NSUARB M10197, Exhibit N-1, Section 3.4, Figure 7, p. 24 of 40. ATO states an increase of \$937,769; this amount has been added to the figure from the original application to arrive at the total stated archaeological cost.

1 costs. However, the magnitude of these costs is unlikely to have materially affected the outcome of the  
2 original decision.

## 4.2 Mi'kmaq Engagement

### 4.2.1 NS Power Submission

4 In response to IRs, NS Power indicated that the ATO has increased the Mi'Kmaq engagement costs for the  
5 Project from [REDACTED] to [REDACTED], as indicated in Table 10:

**Table 10: Ruth Falls Mi'kmaq Engagement Costs<sup>43</sup>**

| Description                                                                                                                                                                   | UARB<br>Approved<br>Original<br>Submission | ATO<br>Submission | Variance   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------------|------------|
| <b>Additional KMKNO Capacity Payments:</b><br>To provide the KMKNO with necessary resources to<br>meaningfully engage with NS Power.                                          | [REDACTED]                                 | [REDACTED]        | [REDACTED] |
| <b>Mi'kmaq observer:</b><br>Member of the Mi'Kmaq community observe the<br>drawdown and archaeological work in 2025 (per month:<br>\$20/hr x 40 hrs/wk. x 4 weeks + expenses) | [REDACTED]                                 | [REDACTED]        | [REDACTED] |
| <b>Total</b>                                                                                                                                                                  | [REDACTED]                                 | [REDACTED]        | [REDACTED] |

6 NS Power states that these costs are “required to cover additional monthly KMKNO capacity payments as a  
7 result of the project’s extended timeline and service of the Mi'kmaq observer as a result of evolving  
8 expectations.”<sup>44</sup>

### 4.2.2 Analysis

10 The timeline for execution of the Project increased dramatically in response to evolving DFO requirements.  
11 As a result of this extended timeline, as well as the changing project conditions, NS Power would have  
12 necessarily been required to consult with KMKNO as the Project changed and progressed over time.

### 4.2.3 Conclusion

14 Midgard concludes that the “Additional KMKNO Capacity Payments” increased costs are reasonable, as NS  
15 Power was required to continue consultation with KMKNO as the Project changed.

<sup>43</sup> M11927, Exhibit N-3(C), CA RIR-13(c), pp. 2-3 of 3. Table reproduced from NSPI submission (totals calculated and added by Midgard).

<sup>44</sup> M11927, Exhibit N-3, CA RIR-13(b), pp. 2-3 of 3.

- 1 With respect to the Mi'kmaq observer costs, as noted in Section 4.1 above Midgard considers that NS Power
- 2 could have known at the time of its ACE submission that its archaeological costs were underestimated, which
- 3 could be considered to include the need for a Mi'kmaq observer of that archaeological work. However, the
- 4 magnitude of these costs is unlikely to have materially affected the outcome of the original decision.

## 5 ECONOMIC INTEREST OF RATEPAYERS

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### 5.1 Appropriate Alternatives Considered

#### 5.1.1 NS Power Submission

The Project involves the refurbishment of the Ruth Falls Main Dam's water-retaining structures, with five alternatives reviewed during the conceptual design phase:<sup>45</sup>

1. Option 1: Replace the existing stoplogs with screw stem vertical lift gates.
2. Option 2: Replace approximately half of the existing stoplog bays, add an uncontrolled overflow section, and replace the remaining stoplog bays with screw stem vertical lift gates.
3. Option 3: Replace approximately half of the existing stoplog bays, construct an uncontrolled labyrinth spillway, and replace the remaining stoplog bays with screw stem vertical lift gates.
4. Option 4: Remove the stoplog bays, install rubber dams on the left portion of the dam (looking downstream), and install an uncontrolled overflow spillway and rubber dams on the right portion of the dam. The existing sluiceway gates would also be replaced with screw stem vertical lift gates.
5. Option 5: Construct a new dam immediately downstream of the existing dam, like Option 4, with an uncontrolled overflow section, deep sluice gates, and a rubber dam section.

Option 4 was ultimately chosen due to its cost-effectiveness, meeting operational requirements while being approximately \$500,000 cheaper than the next closest option.

NS Power asserts that it did not need to re-evaluate the options it considered as part of the ATO Application, since all of the options would be equally negatively affected by the FAA delays:

*"Re-evaluation was not necessary as all five options considered would have the same cost increases as a result of increases in costs associated with environmental permitting. A Fisheries Act Authorization with the same conditions would be required regardless of the option selected. All five options would also see increases in costs as a result of the deferral of construction and the construction cost differences between the five options remains the same."*<sup>46</sup>

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<sup>45</sup> M11927, Exhibit N-1, p. 5 of 10.

<sup>46</sup> M11927, Exhibit N-6, NSUARB RIR-7(a), p. 2 of 2.

### 5.1.2 Analysis

All of the alternatives considered by NS Power require the drawdown of the headpond, which is the primary driver of environmental permitting requirements and costs. When asked whether alternatives were considered which would not require drawdown, NS Power stated:

*“NS Power considered the use of a cofferdam or bulkhead system to isolate the dam and provide a dry work area, both of which were considered infeasible due to the required size of a cofferdam structure to allow a dry work area and concerns around the safety of workers under significant head differential. NS Power also had concerns around the ability to safely manage water during construction as. an ROV survey of the existing sluiceway stop log checks confirmed the presence of several waterlogged and deteriorated stop logs making a dry seal for isolation difficult to achieve.”<sup>47</sup>*

Additionally, NS Power did not consider (either in the Original Application or the ATO Application) an option to decommission the Project entirely. NS Power has justified this as follows:

*“The Company has not considered selling or decommissioning the Ruth Falls Generating Station. Ruth Falls is included in small hydro capacity and is a part of the path to achieve 2030 legislated requirements.”<sup>48</sup>*

And:

*“The estimated remaining life on the Ruth Fall’s major components (e.g. turbines and generators), is estimated to be at least 14 years. Major replacement or refurbishment on two of the turbines planned for 2038 and generating units will be overhauled as necessary based on asset health assessments. As per the 2020 IRP conclusions, the long-term outlook supports continued sustaining investment in these small hydro assets over the 25-year planning horizon.”<sup>49</sup>*

### 5.1.3 Midgard Conclusion

NS Power’s justification for not considering an alternative that did not require drawdown of the headpond appears reasonable. Therefore, the “repair or replace” alternatives considered by NS Power are appropriate.

However, despite Project costs increasing by 113% and \$8.2M, NS Power has not re-evaluated its decision to not consider a decommissioning option. Midgard understands the stated justifications for this (that the Project is a part of NS Power’s plans to meet its legislated requirements and its IRP), however presumably this assertion is not true at any cost. As such, Midgard would suggest that the NSUARB should have been

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<sup>47</sup> M11927, Exhibit N-5, Midgard RIR 6(b), pp. 1-2 of 2

<sup>48</sup> M11927, Exhibit N-4, IG RIR-4(b), p. 1 of 1.

<sup>49</sup> M11927, Exhibit N-4, IG RIR-8(a), p. 1 of 1.

afforded the ability as part of this proceeding to evaluate whether or not a decommission option would be in the best interest of NS Power's ratepayers. Given the extreme decommissioning cost options that have been presented in other recent proceedings it is likely that such an option would not be considered economic by NS Power. Again, Midgard suggests that this is a decision and outcome that should be put before the NSUARB for review and approval.

## 5.2 Potential Additional Cost Increases

### 5.2.1 NS Power Submission

In the ATO Application and in response to IRs, NS Power has asserted that its currently estimated cost estimate is a Class 1 estimate (as per AACE Standard 69R-12), with an expected accuracy range of -10% and +15%. Of note, the majority of the project costs are based on quotes from the general contractor, suppliers, or consultants.

NS Power is implying, therefore, that the currently estimated cost of \$15.4 M is reliable and unlikely to increase further. NS Power confirms this, stating:

*"NS Power does not expect further delays to the project which would affect the revised costs. The General Contractor was awarded the work, and the NSECC and Transport Canada permits were obtained in June 2024. NS Power continues to work towards receiving FAA from DFO as the Project cannot proceed until the FAA has been granted. This is contingent on satisfying additional information requests directed to NS Power through DFO's email on June 6, 2024."*<sup>50</sup>

### 5.2.2 Analysis – Environmental Offsetting Costs

In response to DFO's regulatory review of NS Power's FAA application and the associated Crown consultation, NS Power was directed to evaluate additional offsetting for the project. As outlined in a follow-up email from DFO dated June 6, 2024:

*"In response to DFO's regulatory review of NS Power's Fisheries Act Authorization (FAA) application and Crown consultation, DFO directed NS Power to evaluate additional offsetting for the Project in a follow up email dated June 6, 2024. Please refer to NSUARB IR-12 Attachment 14 for a copy of this correspondence. In its original offsetting plan submitted to DFO as part of the FAA application, NS Power proposed 2,700 m of offsetting. DFO has not specifically requested NS Power provide a set amount but has referenced the required offset could be up to 57,500 m<sup>2</sup>."*<sup>51</sup>

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<sup>50</sup> M11927, Exhibit N-6, NSUARB RIR-1(b), p. 1 of 1.

<sup>51</sup> M11927, Exhibit N-3, CA RIR-14(a), p. 1 of 2.

1 In relation to the potential financial impact of additional offsetting, NS Power has provided an estimated cost  
2 variance for the Project:

3 *“The potential variance ranges from \$320,000 to up to \$1.45 million. This range includes a low-end*  
4 *estimate based on the budget for NS Power’s original offsetting plan for 2,700 m<sup>2</sup>, and a high-end*  
5 *estimate based on the 57,000 m<sup>2</sup> referenced in DFO’s June 6th 2024 email. The high-end was derived*  
6 *from DFO as guidance to offset the Harmful Alteration, Disruption and Destruction (HADD) of fish*  
7 *habitat using the total area of the Ruth Headpond to be dewatered during the temporary drawdown,*  
8 *the duration of the drawdown, and an average cost of \$25/m<sup>2</sup> of offsetting to impact area using*  
9 *other NS Power projects which have undergone offsetting. However, NS Power does not expect this*  
10 *high end estimate to be required by DFO and, as such, the Company estimated a reasonable variance*  
11 *of the cost of offsetting for the Project to be 20,000 m<sup>2</sup> based on feedback provided by DFO. NS*  
12 *Power used the average cost of 25/m<sup>2</sup> to determine a budget of \$500,000 for offsetting. The*  
13 *Company also included an additional \$500,000 in contingency to account for possible additional*  
14 *offsetting, should it be required by DFO through the regulatory review and Crown consultation*  
15 *process.”*<sup>52</sup>

16 However, NS Power does not expect this high end estimate to be required by DFO and, as such, the Company  
17 estimated a reasonable variance of the cost of offsetting for the Project to be 20,000 m<sup>2</sup> based on feedback  
18 provided by DFO. NS Power used the average cost of 25/m<sup>2</sup> to determine a budget of \$500,000 for offsetting.  
19 It is not clear how NS Power arrived at an estimated offsetting amount of 20,000 m<sup>2</sup>.

20 Furthermore, Midgard notes that NS Power’s own estimate of the cost of offset works had a unit cost of  
21 [REDACTED]<sup>53</sup>, and that the unit rate of \$25/m<sup>2</sup> was in fact suggested by DFO since this rate was used by NS  
22 Power on a previous project. It is not clear why NS Power now believes that the unit rate suggested by DFO is  
23 more appropriate than its original estimate.

### 24 **5.2.3 Analysis – Archaeological Costs**

25 Midgard notes the examples of the Tusket and Gaspereau projects identified in Table 9. For these projects  
26 archaeological costs were originally estimated at amounts that are comparable to the revised estimate in this  
27 ATO Application. However, the costs ultimately applied for in the ATO applications for each of those projects,  
28 respectively, were many times greater than the original estimate – 5.8x for the Tusket project, and [REDACTED] for  
29 the Gaspereau project.

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<sup>52</sup> M11927, Exhibit N-3, CA RIR-14(b), p. 1 of 2.

<sup>53</sup> M11927, Exhibit N-6(i)(C), NSUARB RIR 12 Attachment 14b (Confidential)

While NS Power has already corrected the archaeological costs upwards significantly as part of this ATO Application, past experience suggests that there remains a risk of future significant increases.

#### **5.2.4 Analysis – Geotechnical Issues**

Geotechnical issues have only been explored in limited fashion thus far on the project. NS Power has not yet completed a detailed geotechnical investigation at the Project site:

*“NS Power has not completed a detailed geotechnical investigation at the project site. Potential technical issues were reviewed during the conceptual design phase of the project, and the Company’s external engineering consultant was able to proceed with the detailed design phase and issuance of the IFC drawing package based on that review.”<sup>54</sup>*

Midgard notes that geotechnical issues (in the form of water ingress to dry work areas through bedrock cracks) have been a primary driver of millions of dollars of cost overruns on the Tuskett Falls project. As such, this remains a risk area to the Project.

#### **5.2.5 Conclusion**

Midgard is concerned that the Project remains exposed to several risk areas (environmental compensation costs, archaeological costs, and geotechnical risks) that have the potential to cause additional overages to Project costs above and beyond the contingency allowances and Class 1 error bounds currently forming NS Power’s estimate. Had NS Power completed an analysis of a decommissioning option, it may be clearer to what extent Project costs could exceed the ATO estimate and not change the conclusion of an economic analysis (i.e., that reinvestment in the Project is in ratepayers’ best interests).

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<sup>54</sup> M11927, Exhibit N-6, NSUARB RIR-6(b)(i), pp. 1-2 of 2.

## 6 SUMMARY AND CONCLUSIONS

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Midgard has structured this review report to address the following questions:

1. Are the cost increases being sought in the ATO the result of prudent actions by NS Power? To answer this question, Midgard analyzes the three "Reasons for Variance" that NS Power provided in the ATO Application:
  - a. Environmental Permitting Requirements (Section 2)
  - b. Extended Construction Timeline (Section 3)
  - c. Archaeology and Mi'kmaq Engagement (Section 4)
2. Does the Project continue to be in the best economic interest of ratepayers after accounting for the overspending for which authorization is being sought? (Section 5)

Midgard's conclusions in addressing each of these questions are summarized as follows.

### 6.1 Reason for Variance: Environmental Permitting Requirements

#### 6.1.1 Fisheries Act Authorization

Midgard's opinion is that despite its best efforts, NS Power had little choice but to invest significant time and effort in attempting to meet a series of changing and increasingly detailed requests for alterations and additional information from DFO – each of which imposed schedule and cost requirements on NS Power. Midgard views this as the primary driver for the majority of the costs associated with this ATO Application, and is of the opinion that NS Power generally acted prudently in its attempts to respond to DFO's requests in the face of an evolving regulatory environment.

#### 6.1.2 Watercourse Alteration Permit

In Midgard's opinion NS Power was acting reasonably in its interactions with NSECC. The delays associated with the watercourse alteration permit issuance appear to stem from issues that originally initiated with the DFO FAA process (i.e., not having design or contractor documentation available to provide to NSECC).

#### 6.1.3 Navigable Waters Authorization

Based on the limited information available, Midgard does not have any reason to doubt NS Power's expectation that an authorization will be issued in due course, and considers this to be an area of low risk to the project.

## **6.2 Reason for Variance: Extended Construction Timeline**

### **6.2.1 Material Cost Increases**

In general Midgard concludes that NS Power did face an environment of dramatically increasing costs from the time of its original submission to the time of the ATO Application. On its face the available inflation data would not appear to fully explain the material cost increases. However, Midgard notes that broad societal indices are not a substitute for project-specific information, and the inflation data available may not account for localized impacts related to specific regions, suppliers, contractors, etc. From the information provided it is unclear if there are other contributing factors to these line items, or if there are in fact also scope increases incorporated into these line items. More broadly, Midgard's analysis supports the assertion that there was significant inflationary escalation that contributed to NS Power's overspending.

### **6.2.2 Scope Increases**

Overall Midgard concludes that the cost increases due to scope change are reasonable. Fish passage modifications and additions are the result of DFO requirements, and therefore out of NS Power control. This accounts for the vast majority of the scope change cost increases.

### **6.2.3 Labour Cost Increases**

The increased labour and material costs reported by NS Power stem from updated environmental permitting requirements and an extended timeline to meet regulatory conditions. Midgard concludes that the reported increases in labour costs are reasonable.

## **6.3 Reason for Variance: Archaeology and Mi'kmaq Engagement**

### **6.3.1 Archaeology**

It is Midgard's opinion that at the time of the ACE submission, given its recent experience with similar dam refurbishment (i.e., Tusket, Gaspereau), NS Power should have been aware that archaeological costs for the Project would be several orders of magnitude higher than its estimated figure of \$2,256. Midgard therefore concludes that NS Power was not appropriately estimating this portion of its original costs. However, the magnitude of these costs is unlikely to have materially affected the outcome of the original decision.

### **6.3.2 Mi'kmaq Engagement**

Midgard concludes that the "Additional KMKNO Capacity Payments" increased costs are reasonable, as NS Power was required to continue consultation with KMKNO as the Project changed.

With respect to the Mi'kmaq observer costs, as noted in Section 4.1 Midgard considers that NS Power could have known at the time of its ACE submission that its archaeological costs were underestimated, which could

be considered to include the need for a Mi'kmaq observer of that archaeological work. However, the magnitude of these costs is unlikely to have materially affected the outcome of the original decision.

## **6.4 Economic Interest of Ratepayers**

### **6.4.1 Considered Alternatives**

Despite Project costs increasing by 113% and \$8.2M, NS Power has not re-evaluated its decision to not consider a decommissioning option. Midgard understands the stated justifications for this (that the Project is a part of NS Power's plans to meet its legislated requirements and its IRP), however presumably this assertion is not true at any cost. As such, Midgard would suggest that the NSUARB should have been afforded the ability as part of this proceeding to evaluate whether or not a decommission option would be in the best interest of NS Power's ratepayers.

### **6.4.2 Potential Additional Cost Increases**

Midgard is concerned that the Project remains exposed to several risk areas (environmental compensation costs, archaeological costs, and geotechnical risks) that have the potential to cause additional overages to Project costs above and beyond the contingency allowances and Class 1 error bounds currently forming NS Power's estimate. Had NS Power completed an analysis of a decommissioning option, it may be clearer to what extent Project costs could exceed the ATO estimate and not change the conclusion of an economic analysis (i.e., that reinvestment in the Project is in ratepayers' best interests).

## **APPENDIX A: CONTRIBUTOR CIRRICULUM VITAE**

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- 1 This appendix contains curricula vitae for the following report contributors:
- 2     • Michael Potyok, P.Eng., MBA
- 3     • Sam Mason, P.Eng.
- 4     • Matthew Matusiak, P.Eng.

## PROFILE

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Mr. Potyok has over 25 years of commercial and technical experience in project permitting, design, construction and operation of hydroelectric project or dams. He has been a project developer, consultant, Independent Engineer, Owner's Engineer, project owner and operator while serving the hydropower industry in Canada and internationally. Additionally, Mr. Potyok has appeared as witness, expert in the design, permitting, financing, construction, and operation of small hydroelectric projects in front of an arbitration tribunal.

Over the past 23 years, he has worked on or evaluated over 50 hydroelectric projects that are either operational or in construction (ranging from as small as 250 kW to 2,000 MW), and over 100 additional projects that either remain in development or have been placed into abeyance. The broad exposure to so many projects, in different jurisdictions, has provided a deep understanding of the mechanics of hydro project design, construction, finance and operation.

A professional engineer, with a finance focused MBA he has combined a technical and financial background to successfully assume a strategic due diligence role on multiple assignments, providing comprehensive project review and evaluation on behalf of project lenders and other capital providers. These roles require not only an understanding of project design considerations and engineering properties, but also regulatory permits, construction contracts, Power Purchase Agreements, Interconnection Agreements, and operating and maintenance plans, that all combine to constitute a successful project and ensure long term safe and reliable operations.

Beyond a successful consulting career, Mr. Potyok incorporated a company with two partners to purchase and, for 3 years, own and operate a 10 MW run-of-river project in BC. That experience, in balancing the requirements of equity backers, lenders, provincial regulators and the power purchaser, while operating and maintaining the plant has provided hands on practical knowledge of operations and maintenance of small non-utility generating stations.

## EDUCATION

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|                                                                                  |      |
|----------------------------------------------------------------------------------|------|
| <b>MASTER OF BUSINESS ADMINISTRATION</b> , University of Western Ontario, London | 2001 |
| <b>BACHELOR OF SCIENCE, ENGINEERING</b> , Queen's University, Kingston           | 1995 |

## PROFESSIONAL REGISTRATIONS

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**PROFESSIONAL ENGINEER, BRITISH COLUMBIA**

**PROFESSIONAL ENGINEER, ONTARIO**

**PROFESSIONAL ENGINEER, NEWFOUNDLAND AND LABRADOR**

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## SUMMARY OF EXPERTISE

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### OWNER'S ENGINEER / INDEPENDENT ENGINEER / LENDER'S ENGINEER

- Independent Engineer for regulatory agencies reviewing design and monitoring construction.
- Lender's Engineer for senior lenders evaluating project viability and certifying construction draws.
- Owner's Engineer providing strategic technical and financial advice to project owners and developers.

### PRELIMINARY ENGINEERING & PROJECT DEVELOPMENT

- Design of preliminary project layouts evaluating for energy potential, capital cost, permitability, & constructability.
- Financial feasibility analysis.
- Project permitting and environmental certificates
- Preparation of tender documents and specifications

### M&A DUE DILIGENCE

- Technical due diligence of hydroelectric project portfolios in Canada, US and Internationally
- Risk profiling and asset valuation

### DETAILED ENGINEERING & CONSTRUCTION MANAGEMENT

- Detailed design, drawings, and specification for construction packages for earth dams.
- Resident Engineer managing multidisciplinary teams for construction supervision.

## EMPLOYMENT

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|                                                                                                                             |                |
|-----------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>MIDGARD CONSULTING INC.</b><br><i>Principal, Vancouver BC</i>                                                            | 2009 -Present  |
| <b>SKOOKUM POWER CORP.</b><br><i>Principal, Vancouver BC</i>                                                                | 2009 – 2012    |
| <b>ELEMENTAL POWER DEVELOPMENT LTD.</b><br><i>Principal, Vancouver BC</i>                                                   | 2001 – Present |
| <b>GOLDER ASSOCIATES</b><br><i>Project Engineer and Construction Resident Engineer, Toronto/Vancouver/Santiago de Chile</i> | 1995 – 2001    |

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## PROFESSIONAL EXPERIENCE – HYDROELECTRIC

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**CRANBERRY CREEK HYDROELECTRIC PROJECT** (2023 to present) – A run-of river project in British Columbia's interior. Asset condition assessment and capital investment prioritization advisory

**BETMAI II STORAGE HYDRO PROJECT** (2023-2024) – A 60 MW storage project with a 65 m high dam and 4-months of storage on the Pampana River in Sierra Leone. Project optimization and pre-feasibility as well as development advisory

**LOWER MAMQUAM HYDRO ELECTRIC PROJECT** (2023) – A 50 MW run-of-river project near Squamish, BC. Acquisition due diligence and valuation advisory

**EAR FALLS GENERATING STATION** (2022 to 2023) – A 24 MW storage hydro project in north-west Ontario. Technical advisor to the IESO regarding operations and flood hydrology.

**BRIDGE RIVER GENERATING STATIONS** (2021 to 2022) – A 480 MW complex of two generating stations in south-central BC. Engaged as expert by the Residential Consumers Intervener Association in a regulatory proceeding in front of the British Columbia Utilities Commission for a 4-unit capital replacement program proposed by BC Hydro.

**WRECK COVE GENERATING STATION** (2020) – A 216 MW storage hydro project on Cape Breton, Nova Scotia. Technical advisor to Nova Scotia Utility and Review Board counsel during a rate review hearing for project refurbishment application.

**GASPEREAU LAKE** (2020) - Technical advisor to Nova Scotia Utility and Review Board counsel during a rate review hearing for dam refurbishment application.

**BREMNER CREEK** (2019 to 2021) - A 25 MW hydro project with intra-day storage north of Harrison Hot Springs, BC, with a 12 m high dam, multiple intakes, a 4.5 km penstock and a single vertical-axis Penton turbine. Independent Engineer for regulatory agencies of the Province of BC. Independent Engineer for acquisition and senior lenders. Evaluating project design, hydrology, energy yield, construction contracts, capital costs, major maintenance budgets and reserve account in support of credit agreement. Monitoring detailed designs and construction progress in support of both periodic draw certification and authorization of construction.

**LONG LAKE HYDROELECTRIC PROJECT** (2018) - A 31 MW storage project operating in north west British Columbia. Conducted project due diligence in support of project acquisition.

**UPPER AND LOWER BEAR HYDROELECTIC PROJECTS** (2018) - A 32 MW run-of-river-hydro cascading project operating in southwest British Columbia. Conducted project due diligence in support of project acquisition.

**KERN & TULE HYDROELECTRIC PROJECTS** (2018) – An historic pair of run-of-river-hydro projects - 12 MW (Kern) and 6 MW (Tule) - in the Sierra Mountain foothills of southern California. Conducted technical due diligence and condition assessment in support of project acquisition.

**TUSKET DAM HYDROELECTRIC PROJECT** (2018 to 2021) – An historic 2 MW storage-hydro project operating at Yarmouth, Nova Scotia. Acted on behalf of the Nova Scotia Utility and Review Board during a rate review hearing for project refurbishment application.

**BIG CHINO VALLEY PUMPED STORAGE PROJECT** (2017 to 2020) - A 2,000 MW pumped storage-hydro project under development in northern-Arizona, USA with two proposed rock-fill gravity dams, two shaft / tunnel conveyances, and an underground powerhouse with 8 x 250 MW pump-turbine generators. Owner's Engineer and Project Manager, carrying out senior advisory services of project planning and development.

**UPPER AND LOWER CLOWHOM HYDROELECTRIC PROJECT** (2017) - A 22 MW cascade run-of-river-hydro hydro project operating in the southern Coast Mountains of British Columbia. Conducted project due diligence in support of project acquisition, then acted as Lender's Engineer on behalf of project lenders in support of project acquisition finance.

**FURRY CREEK HYDROELECTRIC PROJECT** (2017) - A 10 MW run-of-river-hydro project operating on the south coast of British Columbia. Conducted project due diligence in support of project acquisition.

**DASQUE MIDDLE HYDROELECTRIC PROJECTS** (2017) - A 20 MW cluster of run-of-river-hydro projects operating on the north-coast of British Columbia. Conducted project due diligence in support of project acquisition, then acted as Lender's Engineer on behalf of project lenders in support of project acquisition finance.

**OCEAN FALLS** (2016 to 2019) - A 15 MW storage-hydro project with a concrete gravity dam, short penstock and three horizontal-axis Francis turbines. Carried out project condition assessment and prepared asset depreciation schedules and cost-of-service model in support of re-contracting negotiations between IPP project owner and provincial electric utility.

**NARROWS INLET PROJECTS** (2015 to 2017) - A 30 MW cluster of 3 projects (2 run-of-river and 1 lake drawdown storage), north of Sechelt, BC. Acting with Lender's Engineer, evaluating project design, hydrology, energy yield, contracting structures, capital costs, operating costs and major maintenance allowances in support of senior debt credit agreement.

**WEDGEMOUNT CREEK** (2014 to 2019) - A 5 MW run-of-river project north of Whistler, BC with a 3 km buried and surface penstock and a single horizontal-axis Penton turbine. Acting Independent Engineer for both regulatory agencies of the Province of BC as well as senior lenders. Evaluating project design, hydrology, energy yield, construction contracts, capital costs, major maintenance budgets and reserve accounts and project pro forma in support of credit agreement. Monitoring construction progress in support of periodic draw certification.

**TRIO CREEK** (2014 to present) - A 29 MW hydro project with intra-day storage north of Harrison Hot Springs, BC, with a 30 m high dam, multiple intakes, a 5 km penstock and a single vertical-axis Penton turbine. Independent Engineer for regulatory agencies of the Province of BC. Independent Engineer for acquisition and senior lenders. Evaluating project design, hydrology, energy yield, construction contracts, capital costs, major maintenance budgets and reserve account in support of credit agreement. Monitoring detailed designs and construction progress in support of both periodic draw certification and authorization of construction.

**BIG SILVER** (2003 to 2017) - A 30 MW run-of River project north of Harrison Hot Springs, BC with a 1 km tunnel, 1 km penstock and 4 horizontal-axis Francis turbines. As Owner's Engineer, prepared preliminary project layout and design. Then, in another role during construction, acting as Independent Engineer for provincial agencies, which comprised review and approval of detailed IFC designs and monitoring of construction progress and QA/QC.

**ANUDOL CREEK** (2013 to 2018) - An 8 MW proposed run-of-river project in Northern BC with a 1 km penstock and two horizontal-axis Francis turbines. Acting as Owner's Engineer, carrying out feasibility engineering, financial analysis and preparation of strategic development strategy.

**BETMAI FALLS (SIERRA LEONE)** (2013 to present) - A proposed 25 MW run-of-river project in Sierra Leone with a 1.2 km power canal, multiple 500 m penstocks and four horizontal-axis Francis turbines. Acting as Owner's Engineer from preliminary project assessment through tender package preparation and contractor selection. Includes tender level design, hydrological and energy yield analysis, geotechnical assessment, site characterization and financial analysis.

**KAFUE GORGE – LOWER** (2014 to 2018) - Proposed 750 MW large storage project on the Kafue River in Zambia with a 140 m high dam, a 4 km tunnel and multiple 500 m penstock leading to a surface powerhouse with 5 vertical-axis Francis turbines. Acting with project Transaction Advisor, evaluating project design, hydrology, energy yield, environmental impacts and permitting status in preparation or project review report in support of project equity and debt placements.

**FITZSIMMONS CREEK** (2016) - An 8 MW run-of-river project in Whistler, BC with a 4 km penstock and a single vertical-axis Pelton turbine. Acted with Lender's Engineer, evaluating project condition in support of project lenders during project re-financing.

**BOSTON BAR** (2016) - A 6 MW run-of-river project north of Hope, BC with a 4 km penstock and two horizontal-axis Turgo turbines. Conducted project condition assessment and prepared asset depreciation valuation and cost-of-service model in support of re-contracting negotiations between IPP project owner and provincial electric utility.

**NORLAND HYDRO PROJECT** (2015 to 2016) - A 2 MW run-of-river project built into an existing dam north of Peterborough, ON with 4 inline propeller turbines, gear boxes and vertical axis generators. Acted as Lender's Engineer, reviewing project design, hydrology, energy yield, construction contracts, major maintenance budgets, operating cost budgets and project financial model in support of project credit agreement.

**MICA 5 & 6** (2010 to 2016) - The 1000 MW expansion of the BC Hydro Mica Dam Generating Station. Acted as Independent Engineering on behalf of provincial regulatory agencies during expansion project installed two new 500 MW vertical axis Francis turbines into existing powerhouse gallery. Reviewed detailed designs and construction plans for consistency with project permits, protection of environment, worker safety and good industry practice.

**TRETHEWAY CREEK** (2006 to 2016) - A 21 MW Run-of River project north of Harrison Hot Springs, BC with a 4 km penstock and two vertical-axis Pelton turbines. Initial capacity as Owner's Engineer involved preliminary project layout, design and project evaluation. Subsequently, during construction acted as Independent Engineer for both provincial government and senior lenders, which comprised review of detailed IFC designs, monitoring of construction progress and QA/QC, and preparation of IE certification of progress draws.

**KINSKUCH LAKE** (2016) - A proposed 30 MW lake draw-down storage project in northern BC with a 3 km tunnel, 3 km penstock and two vertical-axis Pelton turbines. Reviewed proposed project layouts from developer and prepared a detailed storage, energy and revenue model to allow developer to perform scenario analyses during contract negotiations with provincial utility. Analysis included penstock cost and loss optimization, environmental flows assessment and energy vs. capacity valuation.

**MOON LAKE PUMPED STORAGE PROJECT** (2015 to 2016 and 2019 to Present) - A proposed 20 MW pumped storage project in northern BC near the Yukon border. Prepared feasibility level layout and design as well as preparing capital and operating cost estimates and undertaking financial analysis for this proposed capacity project for territory utility. Initiated early stage permitting and developed strategic road map for project permitting and development.

**SASKATOON WEIR** (2010 to 2016) - A proposed 3 MW redevelopment of the existing Saskatoon Weir with multiple very low head, fixed magnet propeller turbines. Acted as Owner's Engineer evaluating designs and project economical for municipal government

**YUKON LARGE HYDRO INVENTORY** (2015) - A review of large hydro potential in the Territory of Yukon yielded a final inventory of 6 large hydro storage projects. Proposed feasibility level designs, hydrological analysis, cost estimates and financial modelling.

**LONDON STREET GS** (2015) - An 8 MW run-of-river project in Peterborough, ON with two S-type Kaplan turbines. Acted as Lender's Engineer, reviewing project design, energy yield estimates, construction contracts, capital costs and major maintenance and operating budgets in support of project credit agreement.

**CYPRESS CREEK** (2015) - A proposed 2 MW run-of-river project in West Vancouver. Prepared a pre-feasibility assessment of project including hydrological analysis, energy yield estimate, conceptual layouts, cost estimates and financial model.

**STAVE RIVER (NORTHWEST STAVE)** (2004 to 2015) - An 18 MW run-of-river project north of Stave Lake, BC with a 1.8 km penstock and 3 horizontal axis Francis turbines. Carried out preliminary project layout and engineering. Was project manager during project permitting, and EPA bid process. A subsequent and separated role during construction, acted with Independent Engineer for both provincial government and for project lenders, which comprised review of detailed IFC designs, project permits, capital costs, construction contracts, PPA, major maintenance and operating budgets and financial pro forma in support of project credit agreement. Monitored construction progress and QA/QC in support of periodic draw certification.

**SMITH CREEK** (2014 to 2015) - A 38 MW run-of-river project with an 8 km buried penstock and three horizontal shaft Pelton turbines. Carried out asset condition assessment and due diligence in support of equity buyer during project auction process.

**FRANKLIN RIVER** (2014 to 2015) - A proposed 4 MW run-of-river project with a 3.5 km buried penstock and a horizontal axis Pelton turbine. Reviewed project design, cost estimates, permitting status and financial analysis on behalf of land owner in support of project Lease negotiations.

**ROMANIAN SMALL HYDRO DUE DILIGENCE** (2013 to 2015) - A series of 14 run-of-river projects across Romania with a range of turbines including Francis, Pelton and Crossflow. Provided project due diligence including project condition assessment, hydrological evaluation and energy yield assessment in support of asset purchase.

**McNAIR CREEK** (2009 to 2015) - A 9 MW run-of-river project west of Vancouver, BC with a 4 km penstock and a single, vertical-axis Pelton turbine. Part of an ownership team that competitively purchased the project after due diligence and negotiations. As an owner/operator of the project, managed day to day operations and annual maintenance programs.

**GOOD HOPE LAKE** (2014) - On behalf of BC Hydro, review of design and financial analysis for this 250 kW off grid hydroelectric project being studied as part of BC Hydro remote communities electrification program.

**WASDELL FALLS** (2014) - Prepared a fairness opinion for the valuation of this 1.65 MW project near Gravenhurst, ON. Reviewed project hydrology, predicted energy and project pro forma to develop a DCF valuation on behalf of the Board of Directors.

**CASTLE MOUNTAIN HYDRO PROJECT** (2014) - An 8 MW run-of-river project near McBride, BC with a 4.6 km buried penstock and two horizontal-axis Pelton turbines. Prepared a valuation and fairness opinion in support of project lenders for the purpose of establishing project security requirements.

**JOHN HART GS REPLACEMENT** (2013) - Rebuild of BC Hydro's 237 MW John Hart Generating Station (GS). Reviewed project design, technical requirements and contractual obligations with Lender's Technical Advisor to one of three EPCM consortiums undertaking bid preparation.

**SASKATCHEWAN LOWER HEAD HYDRO INVENTORY** (2013) - Developed an inventory of low-head hydroelectric potential in the province of Saskatchewan on behalf of the Provincial utility which resulted in the identification of 7 preferred development projects ranging from 1 MW to 2.7 MW. Analysis included conceptual level design and cost estimates, assessment of energy yield and financial analysis.

**SPRINGER CREEK** (2012 to 2013) - A 2 MW run-of-river project Slocan City, BC. Acted as Owner's Engineer, reviewing proposed design, permitting processes and financial viability for municipal client.

**HARTLEY BAY GS** (2012 to 2013) - On behalf of BC Hydro, review of design and financial analysis for this 2 MW off-grid hydroelectric project being studied as part of BC Hydro remote communities electrification program.

**KENNY DAM HYDROELECTRIC RETROFIT** (2012 to 2013) - A proposed 44 MW installation on the existing Kenney Dam near Vanderhoof, BC. Reviewed project designs, energy yield and cost estimates then developed a financial pro forma in support of project developer.

**LASSEN LODGE** (2012) - A proposed 6 MW run-of-river development near Mineral, California. A project review of hydrology, permitting and design was done on behalf of a potential project equity investor.

**GREASE RAPIDS (2012)** - A proposed 21.5 MW run-of-river project near Fond du Lac, Saskatchewan that includes a 3 km penstock and four horizontal-axis Francis turbines. Prepared feasibility level design, hydrologic analysis, cost estimates and financial analysis in support of project Feasibility Study.

**PENTICTON (2012)** - Prepared a feasibility study for a proposed power generation installation in line with existing municipal irrigation waterworks.

**NARROWS INTLET PROJECTS (2011 to 2012)** - A cluster of 5 hydroelectric projects (2 run-of-river and 3 lake-drawdown storage). Project Manager for the development and permitting of the projects.

**SASKATCHEWAN HYDROELECTRIC INVENTORY (2011 to 2012)** - Developed an inventory of province wide hydroelectric potential, project identification, and financial ranking for projects larger than 10 MW on behalf of provincial utility. Study resulted 20 identified projects. Analysis included site identification, hydrologic, geotechnical, conceptual layouts, cost estimates and financial analysis.

**BRANDYWINE CREEK (2011)** - A 8 MW run-of-river project near Whistler BC with a 4.5 km buried penstock and two horizontal-axis Pelton turbine. Carried out project due diligence and analysis as a precursor to a potential project purchase.

**SKOOKUM CREEK (2011)** - A 25 MW run-of-river project near Squamish, BC with a 6.3 km buried penstock and two vertical-axis Pelton turbines. Carried out project due diligence and analysis as a precursor to a potential project purchase.

**SIMILKAMEEN RIVER (2010 to 2014)** - A proposed 65 MW storage hydro project near Princeton, BC. Owner's engineer conducting financial analysis, design review, developing a strategic permitting plan and preparing tender packages and tender review for selection of project permitting team.

**WANETA EXPANSION (2010)** - The 335 MW expansion of the Waneta project in Trail, BC. As consultant to utility owner, carried out an assessment of project performance and assisted with preparation of utility's regulatory filing in support of Capacity Purchase Agreement.

**HAUER CREEK (2009 to 2011)** - A 2 MW run-of-river project near McBride, BC with a 3.3 km buried penstock and a single horizontal-axis Pelton turbine. Carried out project due diligence and analysis as a precursor to a potential project purchase.

**ELDORADO RESERVOIR (2009)** - This is a 1 MW storage project connected to a municipal work works. It draws water from the existing municipal water works through a 30 m specific conduit to a horizontal axis Pelton turbine. Acted as Independent Engineer for provincial government, reviewing detailed IFC designs and preparing authorization for works to proceed. Assisted municipal owner with preparation of operating parameters and procedures.

**NICOLA LAKE PUMPED STORAGE (2009)** - A proposed 770 MW pumped storage proposal in Merritt, BC. Developed conceptual project layouts and hydrological assessment then prepared early stage project permitting documentation.

**TYSON CREEK (2008 to 2009)** - This is a 9 MW lake-drawdown storage project with a 500m lake-tap tunnel and 4 km penstock with a single horizontal-axis Pelton turbine. Acted with Independent Engineer for provincial government and senior lenders during construction. Mandate comprised review of detailed IFC designs and monitoring of construction progress and QA/QC. Assisted owners with preparation of operating parameters and procedures. Subsequent involvement, in separate roles included a project due diligence for potential equity investors in 2011 and again a review of project interconnection amendments in 2016 for project lenders.

**BUTE INLET PROJECTS (2007)** - Carried out project due diligence for 18 proposed run-of-River projects with a combined installed capacity of 700 MW. Areas of study included proposed project layout, environmental constraints and capital cost estimates.

**NASS AREA HYDRO PROJECTS (2007)** - Early stage development of six proposed run-of-river projects in northern BC with a combined installed capacity of 40 MW. Managed early stage project permitting and collection of baseline hydrometric data. Managed preliminary engineering design and financial analysis. Projects were placed into abeyance due to a change in focus by project developer.

**FIRE CREEK (UPPER FIRE) (2003 to 2005)** - This was a proposed 6 MW lake-drawdown storage project that achieved project permits but was withdrawn from EPA bidding process. Project manager during project conceptual design and permitting.

**DOUGLAS CREEK (2002 to 2010)** - This is a 27 MW run-of-river project near Tipella, BC with a 3 km penstock and two vertical-axis Pelton turbines. Carried out preliminary project layout and engineering was project manager during project permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**FIRE CREEK (2002 to 2010)** - This is a 23 MW run-of-river project near Tipella, BC with a 4.5 km penstock and two vertical-axis Pelton turbines. Carried out preliminary project layout and engineering was project manager during project permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**STOKKE CREEK (2002 to 2010)** - This is a 22 MW run-of-river project near Tipella, BC with a 2.5 km penstock and two vertical-axis Pelton turbines. Carried out preliminary project layout and engineering was project manager during project permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**LAMONT CREEK** (2002 to 2010) - This is a 27 MW run-of-river project near Tipella, BC with a 3.5 km penstock and two vertical-axis Pelton turbines. Carried out preliminary project layout and engineering was project manager during project permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**TIPELLA CREEK** (2002 to 2010) - This is a 22 MW run-of-river project near Tipella, BC with a 3.5 km penstock and two vertical-axis Pelton turbines. Carried out preliminary project layout and engineering was project manager during project permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**STAVE RIVER (UPPER STAVE)** (2002 to 2010) - This is a 33 MW run-of-river project north of Stave Lake, BC with a 2 km penstock and four horizontal-axis Francis turbines. Initial involvement comprised carrying out preliminary project layout and engineering and project management during project permitting, and EPA bid process. In a subsequent and separate role, during construction, acted with Independent Engineer for both provincial government and for project lenders including review of detailed IFC designs and project permits and monitoring of construction progress and QA/QC in support of periodic draw certification for project lenders.

**KOKISH RIVER** (2008) - A 45 MW Run-of-river project with a 9 km penstock and four horizontal-axis Francis turbines. As Owner's Engineer, assignments included hydrology review, review of cost estimates, EPC contractor negotiations and financial analysis.

**EAST TWIN CREEK** (2008) - A 3 MW run-of-river project near McBride, BC with a 500 m tunnel, 500 m penstock and three crossflow turbines. Reviewed project re-development alternatives as a pre-cursor to PPA renewal negotiations.

**KENYON LAKE AND ISABELLE LAKE PUMPED STORAGE PROJECTS** (2008) – Two proposed 1000 MW pumped storage projects in south-west BC. Carried out preliminary project assessment and successfully initiated project permitting processes. Projects were placed into abeyance as there was no commercial avenue to follow a strictly capacity project in British Columbia

**CENTRAL COAST PROJECTS** (2007 to 2008) - A cluster of 27 run-of-river projects proposed for the Central Coast of BC. Early stage project development included preliminary project layouts, preparation of early stage permitting documentation and installation of hydrometric stream gauging. Acted for project developer as PM, providing oversight and management of disparate consultants in achieving successful acceptance into Provincial permitting processes. Projects were paced into abeyance due to changing power purchase markets in BC.

**CLINT CREEK (2007)** - This was a proposed 6 MW lake-drawdown storage project. Involvement comprised project due diligence as a precursor to its purchase by a senior equity developer. Issues included geotechnical risks, penstock routing and interconnection considerations. Project was acquired but did not proceed to construction.

**MKW'ALTS (URE) CREEK (2002 to 2006)** - This was a proposed 50 MW run-of-River project south of Mt. Currie, BC that achieved and EPA with BC Hydro, a draft construction contract with the EPC builder but was placed into abeyance when local First Nation withdrew support. Was Project Manager during project conceptual design, permitting, and EPA bid process. Installed and maintained project hydrometric gauges and managed hydrology data collection.

**JAMIE CREEK (2002 to 2004)** - This is an 18 MW run-of-river project near Gold Bridge, BC with a 3 km penstock and two vertical-axis Pelton turbines. Project manager during early stage project conceptual designs and baseline data collection. Subsequent involvement, in a separate role, included project due diligence for equity investors looking to purchase project.

**RUTHERFORD CREEK (2001 to 2005)** - This is a 50 MW run-of-River project north of Whistler, BC with a 9 km penstock and two vertical-axis Pelton turbines. Developed project hydrology and energy modelling, including installation of hydrometric gauging and collection of flow measurements. Was Project Manager during late-stage project permitting, tender level design, contractor tendering and contractor selection. Subsequent EPC Contractor negotiations and construction monitoring.

## PROFILE

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Graduate of the University of British Columbia's Mechanical Engineering program and recipient of the Leston Prize as his program's top graduating student. A detail-oriented and organized individual with a strong background in mechanical engineering fundamentals, project management, and the electric utility industry. Has strong written and verbal communication skills with a good understanding of audience needs. Experience with technical project design, project development, due diligence analysis, the regulation of utilities, and project management.

## INDUSTRY EXPERIENCE

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### REGULATION OF UTILITIES

- Extensive experience in the regulated utility environment, having worked on regulatory and quasi-regulatory matters in British Columbia, Alberta, Ontario, Nova Scotia, and Newfoundland & Labrador.
- Author of numerous expert reports submitted as evidence in regulatory proceedings – both on behalf of intervenor organizations, and as a consultant to board counsel.
- Previously empaneled to give expert evidence in regulatory proceedings before the Nova Scotia Utility and Review Board and the Alberta Utilities Commission.
- Project lead in 25+ interventions on BCUC proceedings on behalf of the Residential Consumer Intervenor Association.
- Application and Cost of Service modelling in support of the creation of a new regulated utility in British Columbia.

### PROJECT DEVELOPMENT

- Author and participant in multiple screening, pre-feasibility, and feasibility level project development studies.
- Involvement in the hydrological, energy, and financial modeling of projects, both to assess project feasibility and to optimize project configuration.
- Contributor to multiple final reports communicating the findings of technical work.
- Carried out a pre-feasibility study on the potential Anudol Creek hydroelectric project (8+ MW), located in northern British Columbia. Estimated costs and modeled hydrology, energy production, and economic performance.
- Carried out a feasibility study on the potential Betmai Falls hydroelectric project (25+ MW), located in Sierra Leone. Estimated costs and modeled hydrology, energy production, and economic performance.
- Carried out a feasibility study on the potential Grease Rapids hydroelectric project (20+ MW), located in northern Saskatchewan. Estimated costs and modeled hydrology, energy production, and economic performance.

### DUE DILIGENCE

- Experience with the due diligence analysis of a variety of renewable resource projects, including the evaluation and modeling of the revenues and costs associated with mid-life energy projects.
- Evaluation of site visit materials and subsequent technical modeling for a variety of hydroelectric projects being considered for purchase by a Canadian client.
- Participant in owner's engineer work on behalf of the Zambia Electricity Supply Corp. Ltd. with respect to a proposed hydroelectric development.
- Detailed energy modeling (including hydrological modeling) of a hydroelectric asset in Idaho, USA, being considered for purchase by an American client.
- Participant in the evaluation of multiple renewable energy projects on behalf of the Ontario Finance Authority. Review and reporting on materials including technical, economic, and contractual aspects.

## PROVINCIAL RESOURCE PLANNING & REGULATORY FILINGS

- Technical and economic modeling and reporting for Yukon Development Corp.'s Next Generation Hydro and Transmission Viability Study.
- Northwest Territories Long Term Power System Plan.
- Long-term resource plan for a FortisBC (including load forecasts, rate forecasts, load/resource balance, portfolio analysis).
- Multiple papers and reports on electricity markets, price forecasting, planning reserve margin, and various generation technologies.
- Province-wide hydroelectric inventory for Saskatchewan.
- Co-authored a report on pumped storage hydro technologies for very low head hydro applications.

## TECHNICAL DESIGN

- Experience with technical design software, including AutoCAD, Solidworks, and PLS-CADD.
- Involvement in feasibility-level technical design of several hydroelectric generation and electrical transmission projects, including the use of design software and the preparation of drawings.
- Produced feasibility-level drawings in AutoCAD while also carrying out design work and quantity estimation using AutoCAD's Civil3D features.
- Performed clearance checks on a proposed fiber optic line in northwestern BC using PLS CADD, testing for extreme environmental conditions.
- Detailed design using AutoCAD Civil3D and Solidworks of several British Columbia run-of-river hydroelectric projects while on secondment to Kawa Engineering Ltd.

## OPERATIONS

- 3 years of operating experience for a 10 MW run-of-river hydroelectric plant in southwest BC.
- Daily check-ins and monitoring through HMI interface and monthly site inspections.
- On-call for managing plant trips and getting the plant back on-line (after an outage).
- Project manager and on-site engineer for annual shutdown maintenance programs, including multiple pelton nozzle replacements, coanda screen replacements, intake sluice gate clearing, intake box de-sedimentation, headpond draining operations, exhaust fan maintenance, dye penetrant testing, transformer clean out, and general inspections.

## EMPLOYMENT HISTORY

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### MIDGARD CONSULTING INC.

2011 - Present

*Consultant, Vancouver BC*

- Integral part of a small consulting firm with exposure to many aspects of the electricity industry.
- Provide consulting services to electric utilities, governments, First Nations, and developers.
- Focus on electrical transmission and generation design, resource planning, project feasibility analysis, project development, and project management.

## EDUCATION & TRAINING

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### DESIGN OF OVERHEAD TRANSMISSION LINES USING PLS CADD

2013

- Power Line Systems, Inc.

### BACHELOR OF APPLIED SCIENCE IN MECHANICAL ENGINEERING

2010

- University of British Columbia
- Recipient of the Leston Prize as top graduating student in "General" option.

## PROFILE

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A dependable and driven professional engineer with a Bachelor of Science in Electrical Engineering and work experience in technical analysis and project planning, project management, due diligence analysis, and business development activities in the energy industry. Emphasizes completing work in a safe and responsible manner and can convey results to multi-disciplinary personnel and clients through strong verbal and written proficiencies.

## INDUSTRY EXPERIENCE

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### MIDGARD CONSULTING INC.

2021 - Present

*Consultant, Vancouver BC*

- Conducted comprehensive analyses of solar photovoltaic systems using PSS/E, assessing integration, performance, and grid impact, including power output, voltage stability, and response to transient conditions like voltage fluctuations, frequency variations, and disturbances.
- Conducted feasibility studies, developed conceptual designs, and estimated costs to support the early stages of project development.
- Managed project operations, including technical consultants, budget tracking, status reporting, regular discussions with other project managers, and overseeing construction plans, procurement, vendor selection, and commissioning activities.
- Managed an interdisciplinary team of engineers and specialists to engage in regulatory filings and preparation of expert reports for submission to the BC Utilities Commission.
- Provided audits of Pre-Construction Development Costs ("PCDC") of previously terminated Feed-in Tariff ("FIT") contracts from over 150 suppliers in Ontario.
- Conducted screening and on-site audits as Vendor of Record of Feed-in Tariff Contract facilities comprised of solar photovoltaic infrastructure.
- Authored and contributed to technical reports for consulting services and technical analysis.
- Integral part of a multidisciplinary consulting firm, providing services to electric utilities, municipalities, First Nations, and renewable energy developers across various aspects of the electricity industry.

### CANADIAN NUCLEAR LABORATORIES

2021

*Electrical Engineering Intern, Chalk River ON*

- Designed retrofits and modifications to existing electrical engineering systems.
- Performed electrical power studies (e.g., load flow, short circuit, coordination, and arc flash) using power studies ETAP software.
- Prepared specifications of technical components for electrical systems.
- Prepared design documentation including design plans, concept reports, design requirements, design descriptions, design manuals, design guides, technical specifications, and technical notes.
- Engineering support during the construction, installation, and commissioning project phases.
- Customer liaison.
- Develop engineering specifications and standards facilitating a consistent design approach.

### CANADIAN NUCLEAR LABORATORIES

2019 - 2021

#### *Project Engineering Representative, Chalk River ON*

- Interacted with design participants, operations engineering, technical staff, and nuclear operators to obtain technical input as required to meet project and client requirements in an Integrated Project Delivery (IPD) method.
- Provided technical support during the design, procurement, construction, and commissioning phases of assigned projects.
- Prepared technical documents, work scopes and specifications.
- Aided in surveillance of design, construction, and commissioning activities.
- Assessed equipment selection options and make recommendations.
- Supported and implemented the project quality assurance plan.
- Assisted in developing project work packages, deliverables, budgets, and schedules.
- Ensured that deliverables meet the quality objectives of the project and are completed on schedule and within budget.
- Identified, assessed, and initiated changes to approved design, work scope, budgets and schedules following applicable change control processes.

#### **CANADIAN NUCLEAR LABORATORIES**

2018 - 2019

##### *Co-op Student Designer, Chalk River ON*

- Updated multi-disciplinary technical drawings using AutoCAD software.
- Examined technical documentation to extract information on equipment specifications and contractual obligations relating to the construction project and its clients.

#### **CANADIAN NUCLEAR LABORATORIES**

2018

##### *Laboratory Renewal Projects Co-op Student, Chalk River ON*

- Interpreted engineering drawings by comparing specifications to installed systems on the construction site, checking for errors and overall quality control.
- Maintained a Master Equipment List of all components installed to date in construction.
- Participated in client meetings with the project team to interpret needs and requirements and represent them in the field.

## **EDUCATION & TRAINING**

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#### **BACHELOR OF SCIENCE, ELECTRICAL AND COMPUTER ENGINEERING**

2019

- University of Victoria, Victoria BC

#### **BUSINESS ADMINISTRATION DIPLOMA**

2013

- University of the Fraser Valley, Abbotsford BC

## **PROFESSIONAL REGISTRATIONS**

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#### **PROFESSIONAL ENGINEER, BRITISH COLUMBIA**

#### **PROFESSIONAL ENGINEER, YUKON**

#### **PROFESSIONAL ENGINEER, ONTARIO**



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