Matter No. M09920

In the Matter of an Application by Nova Scotia Power Incorporated for Approval of its Annual Capital Expenditure Plan for 2021

EVIDENCE OF

JOHN D. WILSON

ON BEHALF OF

THE CONSUMER ADVOCATE

Resource Insight, Inc.

FEBRUARY 18, 2021

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I. Identification

Q: Mr. Wilson, please state your name, occupation, and business address.

A: I am John D. Wilson. I am the research director of Resource Insight, Inc., 5 Water St., Arlington, Massachusetts.

Q: Summarize your professional education and experience.

A: I received a BA degree from Rice University in 1990, with majors in physics and history, and an MPP degree from the Harvard Kennedy School of Government with an emphasis in energy and environmental policy, and economic and analytic methods.

I was deputy director of regulatory policy at the Southern Alliance for Clean Energy for more than twelve years, where I was the senior staff member responsible for SACE's utility regulatory research and advocacy, as well as energy resource analysis. I engaged with southeastern utilities through regulatory proceedings, formal workgroups, informal consultations, and research-driven advocacy.

I have been in my current position since November of 2019. My clients have included a variety of consumer advocate, energy industry, and environmental advocacy organizations.

My work has considered, among other things, the cost-effectiveness of prospective new electric generation plants and transmission lines, retrospective review of generation-planning decisions, conservation program design, ratemaking and cost recovery for utility efficiency programs, allocation of costs of service between rate classes and jurisdictions, design of retail rates, and performance-based ratemaking for electric utilities.

My professional qualifications are further summarized in Exhibit JDW-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified more than two dozen times before utility regulators in California and the Southeast U.S. and appeared numerous additional times before various regulatory and legislative bodies.

Q: Have you previously testified in other proceedings before this Board?

A: Yes. I have filed testimony in six proceedings. I have also assisted the Consumer Advocate in preparing comments and developing positions in numerous proceedings and stakeholder processes.

II. Introduction and Summary

Q: On whose behalf are you testifying?

A: My testimony is sponsored by the Nova Scotia Consumer Advocate.

Q: What is the purpose of your testimony?

A: I review aspects of NS Power's application for approval its Annual Capital Expenditure Plan for 2020. My testimony is primarily focused on following up on the Board's concerns about cost overruns on capital projects, including the following topic areas:

- Cost minimization, considering whether NS Power has better demonstrated or improved its cost minimization practices;
- Project contingency, considering whether NS Power has improved its use and practice of selecting budget contingencies; and
- Economic analysis model (EAM), considering opportunities to update the EAM to align with new practices and more recent data.

I also raise concerns about several specific projects, which also serves to illustrate my concerns about cost overruns, as follows.

- Spare autotransformer project – a lack of alternatives analysis may demonstrate a failure to minimize costs during planning;
- Hydrogen degas panel phase 2 project – a failure to conduct risk review in the initial project may have led to imprudent spending, requiring remedial work; and
- Two information technology projects – opportunities to improve outcomes through up-front collaboration and planning.

Q: What steps has the Board taken to address cost overruns?

A: Cost overruns can and will occur because "unforeseen conditions and issues often arise in capital construction projects."[1] However, on average, cost overruns should be balanced by cost savings. The reasons that NS Power has much more frequent and larger cost overruns than projects under budget are either that NS Power has inadequate practices to minimize costs, or because its budgeting practices are inadequate.

To verify the adequacy of NS Power's cost minimization practices, the Board:

- Recognized the "importance of adequate information being made available to satisfy ratepayers and the Board that NS Power adheres to its mantra that cost minimization is at the forefront of its activities;"
- Welcomed "NS Power's willingness to do 'internal post project reviews;'" and
- Directed NS Power "to provide examples of cost minimization during execution and construction from the prior year's projects, with specific cost minimization being fully described."[2]

[1] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 31.

[2] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 25.

The Board also indicated its concerns that there may be "general issues with NS Power cost estimating practices, under-scoping of projects at the original approval submission stage and/or use of inadequate project contingencies," and that where an ATO is not required, "overspending amount does not require Board approval and goes to NS Power's rate base upon which the company earns a return."[3] To verify the adequacy of NS Power's budgeting practices, the Board directed NS Power to:

- "Develop non-binding guidelines describing how it determines when a capital cost estimate contingency amount is merited and at what level;"
- Track and file certain information regarding project budgets, costs, and contingencies; and
- Provide information to "review the relationship between various capital expenditures" related to thermal generation.[4]

Q: Does the new data in the 2021 ACE Plan demonstrate improvement in NS Power's underestimating of project costs?

A: No. NS Power has filed new data for 32 completed capital projects, in addition to the 122 projects previously listed; these additional projects also demonstrate that the original budgets substantially underestimated project costs.

Data filed by NS Power in Appendix E include 32 projects not included in Attachment 1 of its response to UARB IR-62 in the 2020 ACE Plan proceeding. It is worth noting that none of the newly listed projects were approved in the 2020 ACE Plan, and most were approved prior to the 2019 ACE Plan.

[3] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), pp. 31-32.

[4] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), pp. 33-37.

The following summary updates the Board's review of the 2020 ACE Plan proceeding, utilizing the 2021 ACE Plan data filed in Appendix E.[5]

- The average variance for listed projects amounts to approximately +10% of the original submission approved cost estimate, unchanged from 2020;
- The total variance of $15,935,203 for the listed projects is over and above the total contingency amount of $7,780,713 included in the total of the original submission approved cost estimates (for newly listed projects, these values are $4,067,651 and $2,352,551);
- The average contingency amount for the listed projects amounts to approximately 5% of the original submission approved cost estimate, with the newly listed projects having an average contingency of approximately 6%;
- Considering all 154 projects (the 32 newly listed projects):
    - 25% (22%) had a negative variance;
    - 75% (78%) had a positive variance; and
- Only one newly listed project required an ATO submission to the board; and
- For the three newly listed projects that have an original submission approved cost estimate less than $250,000, the total sum of the individual project variances as a percentage of the total sum of the individual project original submission approved cost estimates is 190 percent, compared to 210 percent for the under-$250,000 projects in the Board's 2020 analysis. Updated for their subsequently approved greater-than-$250,000 submissions, the total sum of the individual project variances as a percentage of the total sum of the individual project original submission approved cost estimates is 150 percent, compared to 9 percent in the Board's 2020 analysis.

[5] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), pp. 29-31. The calculations were performed as described in the evidence, but similar information is provided by NS Power in a response to an information request. NS Power, Exhibit N-4, response to NSUARB IR-55.

- For projects that have a negative variance, the total variance amount is approximately -$3.93 million, or 12.9% of the original approved cost estimates (for newly listed projects, these values are -$0.91 million and 14.9%);[6] and
- For projects that have a positive variance, the total variance amount is approximately $19.87 million, or 17.0% of the total of the original approved cost estimates; for newly listed projects, these values are $4.97 million and 14.7%.

In comparison to the contingency data provided by NS Power in the 2020 ACE Plan Proceeding, the new data continue to show that NS Power appears, on average, to underestimate project costs, inclusive of estimated contingency amounts. If anything, the newly listed projects underestimate project costs a bit more, on average, than the previously listed projects.

I would like to highlight specific information regarding Project CI 44716, filed in the 2015 ACE Plan, which I will discuss later in my testimony.

- Original submission: $191,007
- Subsequent approval in 2017: $274,951
- Actual spend: $784,759
- Variance to approved estimate: $593,752 (311%)

NS Power states that an "NSUARB letter dated November 8, 2019 advised NSUARB approval of ATO [was] not required due to PUA changes."[7] It is noteworthy that a project with such a large cost overrun does not require an ATO.

Q: Please summarize your recommendations.

A: My recommendations are:

[6] The Board Order mistakenly reported that the total variance for projects with a negative variance was 3.1% of the total of original approved cost estimates. The correct figure is 11.1%.

[7] NS Power, 2021 ACE Plan, Exhibit N-1, Appendix E, cell L3.

- NS Power should improve its cost minimization practices based on references or input from industry experts. NS Power should demonstrate implementation of those practices through documentation that is used for training, references in project planning, and future project evaluations. One specific practice that NS Power should implement is post project reviews. (Page 10)
- The Board should expand its Contingency Directive to request data on all projects with budgets or spending over $250,000, and extend the scope of the data request. (Page 14)
- The Board should direct NS Power to improve its Non-Binding Contingency Guidelines to identify specific budget and planning practices that improve accuracy and support cost minimization in capital projects by,
    - Fully implementing the AACE Recommended Practices, including creation of a checklist to classify project maturities; (Page 16)
    - Documenting use of expert judgement when setting contingencies by applying predetermined guidelines using a matrix, or some other approach that demonstrates the basis for the budget contingency; (Page 19) and
    - Applying contingencies to specific parts of the project budget, rather than routinely applying contingencies to the total project budget. (Page 22)
- NS Power should leverage the project contingency to help drive cost minimization, using a continuous process to increase the cost estimate accuracy throughout the planning process. (Page 24)
- The Board should direct NS Power to update the Economic Analysis Model (EAM) to align with new practices and more recent data that affect the replacement cost of energy and the design of sensitivities. (Page 27)
- NS Power should provide a full explanation of the current accounting treatment for all decommissioning-related costs. (Page 32)

- The Board should direct NS Power to analyze alternatives to the Spare Autotransformer Project (C0031050) and submit an updated proposal. (Page 34)
- The Board should require NS Power to provide additional information regarding the Hydrogen Degas Panel Phase 2 project (C0030887) and the 2019 Hydrogen Panel Replacement project (C0011085) to determine whether the projects have been planned and implemented in a prudent manner. (Page 36)
- The Board should encourage that AMI implementation IT projects not only support the time-varying pricing, but that NS Power ensures all customers are able to access details of their energy consumption. Further, NS Power should coordinate with E1 so that customers have immediate access to relevant information about saving energy and money when they access that information. (Page 38)
- The Board may wish to obtain a total cost of ownership estimate for the Privileged Access Management (PAM) IT project (49094), and consider directing NS Power to routinely provide such information for IT projects with capital budgets over $1 million. (Page 38)

III. Cost Minimization

Q: Has NS Power made adequate information available to demonstrate the effectiveness of its cost minimization practices?

A: No. While NS Power provided full descriptions of specific cost minimization examples, it did not demonstrate that its cost minimization practices are effective. While identifying where cost minimization has occurred is useful, it is perhaps more important to identify areas in which cost minimization opportunities may have been overlooked.

Q: Has NS Power provided full descriptions of specific cost minimization examples?

A. Yes. NS Power provided 58 examples of cost savings from 35 projects.[8] However, NS Power confirmed that these examples were not the result of internal post project reviews.

NS Power is not tracking older projects for cost minimization because they were approved prior to the 2020 cost minimization directive. As a result, out of a sample of ten projects I selected, NS Power was able to provide cost minimization examples for only two projects.[9] Going forward, tracking cost minimization practices from a subset of projects should provide an improved understanding of NS Power's process for learning from experience.

Q: Has NS Power taken any steps to improve its cost minimization practices?

A. NS Power provided a list of eight processes that it "follows in order to obtain best value for customers at the lowest cost."[10] There have been no meaningful changes to this list since the 2020 ACE Plan.[11] In evidence I co-authored for the 2020 ACE Plan, I noted that those processes may be prudent, but they are mostly fairly generic practices that do not necessarily lead to cost minimization.

For example, the cost minimization examples reported from the 35 projects are being used to improve "methods of *tracking* cost minimization" (emphasis added). NS Power stated that these results "will be reviewed with NS Power's employees," but NS Power did not describe any application of lessons it may have learned from collecting cost minimization data.

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[8] NS Power, Exhibit N-3, response to CA IR-1, Attachment 1.

[9] NS Power, Exhibit N-3, response to CA IR-1(d).

[10] NS Power, 2021 ACE Plan, Exhibit N-1, pp. 129-131.

[11] NS Power, 2020 ACE Plan, Exhibit N-1, Matter No. M09499, pp. 126-127.

Q: What further steps should NS Power take to improve its cost minimization practices?

A: Fundamentally, NS Power needs to adopt a meaningful "lessons learned" business practice. While NS Power does refer to "lessons learned exercises,"[12] it has not referred to any specific findings from those exercises in any of its evidence submitted in the 2020 or 2021 ACE Plan proceedings. I would be interested to learn more about the relevance of these exercises to cost minimization.

In evidence I co-authored for the 2020 ACE Plan, I suggested that NS Power improve its cost minimization practices based on references or input from industry experts.[13] For example, in a case study of capital project planning and execution, ScottMadden Management Consultants describe a number of best practices.[14] I continue to recommend that NS Power consider whether it is implementing these best practices, or others that it may be advised to consider. For instance, ScottMadden recommends that project managers should be included in capital project planning process.

The Board does not desire additional reporting that compromises regulatory efficiency, a position that I fully concur with.[15] An effective "lessons learned" business practice will result in documentation that is used for training, reference in project planning, and future project evaluations. Examples of this material and, as

[12] NS Power, Exhibit N-3, response to CA IR-4(e).

[13] Evidence of Chernick and Wilson, 2020 ACE Plan, Matter No. M09499, Exhibit N-7 (February 20, 2020), pp. 22-23.

[14] Cristin Lyons, "Improving Capital Project Planning and Execution," *ScottMadden Insights Library* (2013). Available at: https://www.scottmadden.com/insight/improving-capital-project-planning-and-execution/

[15] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p.25.

appropriate, business practices formally adopted by NS Power should provide the Board with sufficient evidence that effective cost minimization are in place.

Q: Has NS Power undertaken new or improved internal post project reviews?

A. No. In our 2020 ACE Plan evidence, we also recommended post-project reviews or audits as a strategy to learn from projects in order to minimize the costs of future projects.[16] It does not appear that NS Power has or plans to soon implement internal post project reviews unless directed by the Board. Even in the case of the two projects that required an Authorization to Overspend (ATO) submission (CI 16344 and CI 47787), NS Power did not conduct a post project review.[17]

Q: Has NS Power's behavior confirmed the Board's understanding of NS Power's intentions when it welcomed "NS Power's willingness to do 'internal post project reviews'?"[18]

A: No, I find no evidence that NS Power has initiated or updated internal post project reviews following the 2020 ACE Plan order. NS Power states,

> The Company does not believe that implementing formal internal post-project reviews or audits on all projects is necessary given the Company's internal processes and the robust capital approval process in place and the oversight exercised by the NSUARB through the ATO and FIN processes. However, if the NSUARB believes that additional information is required, NS Power confirms it would be prepared to implement post project reviews in the context of an ATO or FIN.[19]

[16] Evidence of Chernick and Wilson, 2020 ACE Plan, Matter No. M09499, Exhibit N-7 (February 20, 2020), p. 23.

[17] NS Power, Exhibit N-3, response to CA IR-1(a).

[18] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 25.

[19] NS Power, Exhibit N-3, response to CA IR-1(a).

IV. Project Contingency

Q: What is a project contingency?

A: NS Power defines a project contingency as "an amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs."[20] This definition indicates that when NS Power includes a contingency in a project budget, the Board should expect, on average, that the contingency will be expended. However, the application of cost minimization practices should lead to some projects having actual spends below the total project budget (including contingency).

Q: Why is it important for NS Power to improve its use of project contingencies?

A: In its 2021 ACE Plan Order, the Board commented that "NS Power appears, on average, to underestimate project costs, inclusive of estimated contingency amounts."[21] It reached the finding that, "NS Power does not adequately determine and apply contingencies in a consistent manner."[22]

Contingencies are important because they enable NS Power to accurately budget capital projects. When a pattern of capital project budget overspending emerges, the overspending may go to NS Power's rate base without a requirement for Board approval. The Board noted that, "This overspending that does not require Board approval presents another reason for the Board to question NS Power's capital cost minimization efforts."[23]

Thus, wider use of project contingencies should not inadvertently reduce the incentives for project managers to control costs. NS Power's use of project

[20] NS Power, 2021 ACE Plan, Exhibit N-1, p. 3.

[21] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 31.

[22] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 33.

[23] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), p. 32.

contingencies should be evaluated both for the effectiveness in providing accurate budgets in concert with effective cost minimization practices.

Q: Does the 2021 ACE Plan demonstrate any change to NS Power's use of contingencies?

A: That is difficult to say because projects less than $1 million do not require approval. Prior to the 2019 ACE Plan, about three-fifths of NS Power's projects lacked a contingency.[24] However, the majority of projects without contingencies have budgets of less than $1 million. NS Power has not provided data on contingencies for projects with budgets of less than $1 million, where any change in practice would be most evident.

For projects requiring approval (large projects with budgets more than $1 million), NS Power typically applies a contingency. There have been two large projects without contingencies approved in each of the 2017, 2018, 2020, and 2021 ACE Plans.

There does appear to have been a shift in the scope of the contingency. In the 2017 and 2018 ACE Plans, the majority of contingencies were applied to only a portion of the project budget (e.g., "Materials and Contracts"). But in the 2020 and 2021 ACE Plans, all but four contingencies were applied to the total before AO and AFUDC.[25] In only four cases was the contingency applied more narrowly, such as to "materials and contracts."

There also appears to have been a shift in the consistency of the contingency. In the 2017 and 2018 ACE Plans, approximately 52 percent of projects used a 10 percent

[24] NS Power, 2021 ACE Plan, Appendix E.

[25] NS Power, Exhibit N-3, response to CA IR-4, Attachment 1. AO and AFUDC refers to Administrative Overhead and Allowance for Funds Used During Construction.

contingency. But in the 2020 and 2021 ACE Plans, the 10 percent contingency became almost ubiquitous, being applied to approximately 86 percent of projects.

If one were to try to determine NS Power's Contingency Guidelines from the data, one might reasonably guess that they are very simple: "A contingency of 10 percent is applied to the total before AO and AFUDC, with just a few exceptions."

Q: What information would help clarify NS Power's budget contingency practices?

A: The Board's Contingency Directive (Appendix E) is a good start, but it could be enhanced in two ways. First, I recommend that the scope be expanded to include all projects with budgets (either as approved or as filed in an ACE Plan, if not required to be approved) or actual spend greater than $250,000. Projects with budgets between $250,000 and $1 million had substantial overspending.

Second, I recommend the Board expand its Contingency Directive to also require the scope of each contingency, the estimated cost within the scope of each contingency, and each contingency percentage.[26] Some projects will have more than one contingency, each should be listed individually.

Third, I recommend the Board extend the scope of its Contingency Directive to require similar reports on in-progress and proposed projects.[27]

Q: What is your opinion of NS Power's Non-Binding Contingency Guidelines?

A: The Guidelines require further improvement. Overall, the document provides an appropriate structure and the AACE Recommended Practices are an appropriate foundation. Yet improvement is needed because the Guidelines document is vague and has few references to the specific types of capital projects that NS Power typically conducts.

[26] See NS Power, response to CA IR-4, Attachment 2.

[27] See NS Power, response to CA IR-4, Attachment 1.

A good example of guidelines that are designed around NS Power's actual operations is the Fuel Manual. The Fuel Manual has, for example, extensive discussion about how fuel inventories will be managed to minimize cost in operations while maintaining reliability. The purpose of the Contingency Guidelines should be to identify specific budget and planning practices that improve accuracy and support cost minimization in capital projects.

Another way that the Guidelines are vague is the very broad range of contingencies that may be applied to projects (especially Class 3 or lower). The Guidelines provide no specific information about when expert judgement will be used to select a contingency value from that broad range, or when quantitative methods such as expected value will be considered.

The Guidelines are so vague that when asked to give examples of ways in which it might depart from the Guidelines, NS Power responded,

> NS Power expects that departures from the contingency guidelines would be infrequent. At this time, NS Power does not have actual examples of departures, nor has it considered hypothetical situations where departures might occur. Where departures from the guidelines are necessary, reasons will be determined at the time the budget for the future project is developed. While the contingency guidelines provide a framework to follow, contingency for each project and the reason for any variation from the guidelines will be provided and justified on the unique circumstances of the project at the time.[28]

In other words, the Guidelines provide such a broad range for contingency values that NS Power has not considered potential exceptions.

Q: Is NS Power following the AACE Recommended Practices (RPs)?

A: In three respects, NS Power is not following the AACE RPs. First, as NS Power acknowledges, AACE RP 17R-97 states that budget accuracy uncertainty is expressed "after application of the contingency," while NS Power considers the "probable

[28] NS Power, Exhibit N-3, response to CA IR-4(a).

accuracy range of this initial budget without any contingency included."[29] Budget accuracy uncertainty is the range within which the actual cost outcome is expected to fall 80 percent of the time. NS Power refers to this part of its method as a "modified view of the accuracy in the AACE RP."[30]

Second, since the "probable accuracy range" includes uncertainty both above and below budget, about half of all projects should have actual costs under the budget (including the contingency). Yet, as discussed above, about three-quarters of NS Power's capital projects have costs in excess of the original approved cost estimate.[31]

If NS Power were applying the AACE RPs as intended, it would not use the "modified view of the accuracy." Instead, it would determine the contingency without any reference to the expected accuracy range as described in the AACE RPs. Then, NS Power would evaluate the effectiveness of its budget and cost minimization practices by comparing its actual spend to the expected accuracy range. Once NS Power gains proficiency, one would expect to see projects budgeted with Class 1 estimates to show 3 – 15 percent overspending about half the time, and underspending of about 3 – 10 percent the other half of the time.[32]

Third, NS Power should use a checklist similar to AACE's "maturity level of project definition deliverables" to classify project maturities. In addition to establishing the maturity level of the project for contingency determination, the checklist will also provide the Board and stakeholders with a clearer description of the project's maturity level.

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[29] NS Power, Exhibit N-3, response to CA IR-4(h).

[30] NS Power, Exhibit N-3, response to CA IR-4(h).

[31] NSUARB Order, 2020 ACE Plan, Matter No. M09499 (June 25, 2020), pp. 29-30.

[32] More specifically, these ranges should occur about 40% of the time each, with greater overspending or underspending about 10% of the time.

Q: Please provide an example of NS Power's current approach to establishing project maturity.

A: The recent Gaspereau Dam proceeding provides several examples of how a clearer explanation would have informed parties and the Board regarding NS Power's assessment of the project maturity.

- NS Power was asked by Midgard Consulting for the "class of cost estimate" and to "justify the classification." NS Power responded that it "considers the current cost estimate to be Class III" but provided no justification other than a reference to another information request response that did not discuss the cost estimate classification.[33]
- In reply evidence, NS Power stated that its cost estimates were "based on market pricing provided by consultants with experience and expertise,"[34] a point which was not made in the original application or in numerous responses to relevant information requests.
- Later in the proceeding, the Board submitted an information request to RII that requested an explanation of "how the completion of a final dam design should significantly reduce the contingency for construction costs for the proposed project."[35]

The status of the dam design, contracts, etc. would have been clearer if NS Power had supplied a more structured and detailed project maturity level checklist. Intervenors would have provided more informed discovery questions and the Board would have

[33] NS Power, *NS Power Gaspereau Dam Safety Remedial Works,* Response to Midgard Consulting IR-20(b), Exhibit N-7(C) Matter No. M09579 (April 23, 2020), p. 1.

[34] NS Power, *NS Power Gaspereau Dam Safety Remedial Works Reply Evidence,* Exhibit N-16(C) Matter No. M09579 (July 9, 2020), p. 36.

[35] NSUARB, *NS Power Gaspereau Dam Safety Remedial Works,* Information Request to RII IR-6 Matter No. M09579 (May 27, 2020).

been assisted in understanding the reasons that that NS Power determined the project to have a Class 3 cost estimate and what that level of cost estimate implied for the selected contingency.

Q: Is NS Power utilizing expert judgement in a transparent manner?

A: No. When asked about the role of expert judgement, NS Power stated, "Information regarding the use of expert judgement will be consistent with the proposed contingency guidelines, and as is currently the case, can be made available upon request by the NSUARB or intervenors to a capital project application."

When asked to provide the basis for the contingency used in an autotransformer project (C0031050), NS Power stated only, "The contingency for this project was selected based upon expert judgement and historical experiences on previous similar projects based on the phase of the project, and also accounts for unforeseen costs."[36] Similarly, when asked for the basis for the contingency used in the Privileged Access Management IT project (49094, discussed further below), NS Power stated only, "Contingency for this project was selected based upon expert judgement and predetermined methods. At the time of filing, this project was at Decision Gate 3 which has a contingency range of 0-50 percent. Based on the uncertainty associated with level of effort to complete the project, the 10 percent contingency factor was deemed appropriate."[37]

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[36] NS Power, Exhibit N-3, response to CA IR-9(b)(vi).

[37] NS Power, Exhibit N-3, response to CA IR-8(n). The Consumer Advocate requested further clarification regarding the basis for this contingency from NS Power. The response was, "… the software component of the project was fairly firm, with the implementation costs carrying a higher level of uncertainty. Given those factors, and based on expert judgement, a contingency of 10% was selected." This response does not provide any explanation on how the expert judgement reached the 10% contingency on the total project costs.

In neither of these two responses did NS Power make available "information regarding the use of expert judgement." NS Power did not provide the "historical experiences on previous similar projects" for C0031050, nor did it explain how NS Power determined that the contingency for CI 49094 should be at the lower end of the Decision Gate 3 range.

NS Power has yet to demonstrate a framework for documenting that it used appropriate expert judgement in responses to intervenor requests.

Q: Is NS Power taking any new steps to ensure that lessons learned from prior projects will be applied in setting future contingency levels?

A: No. NS Power indicated that its only mechanism is continuing to complete "lessons learned exercises," a process that "has been in place several years."[38]

In comments on the draft guidelines, Resource Insight recommended that NS Power develop a more detailed and evidence-based predetermined guidelines matrix based on historic experience. NS Power has neither rejected nor accepted this recommendation, stating that "further discussion would be required to ensure a common understanding of what is being proposed."[39] NS Power did not request any such discussion after receiving our comment, and I only learned that NS Power did not find our explanation sufficient in the response to our information request.

A combination of expert judgement and predetermined guidelines is the most reasonable approach for estimating contingency needs. However, the contingency ranges included in the draft are quite large—a Class 3 project could have a contingency of 10-30 percent—and thus the estimates will effectively depend on expert judgement, which is not easy to review.

[38] NS Power, Exhibit N-3, response to CA IR-4(e).

[39] NS Power, Exhibit N-3, response to CA IR-4(f).

Q: Please explain what you mean by a more detailed and evidence-based predetermined guidelines matrix.

A: The purpose of the predetermined guidelines matrix, or some other approach that NS Power might propose, is to systematically connect NS Power's historical experience with its capital project planning and budgeting process. A matrix would aid in determining contingences by applying NS Power's experience with instances of unexpected, but prudent, costs by class of estimate and project elements.[40]

I recognize that gathering, organizing and assessing this information might be a substantial amount of effort. In order to spread out the workload over time, and avoid unnecessary work, the predetermined guidelines matrix could be gathered and built on an ongoing basis. As NS Power develops contingency estimates for capital projects, the analysis of historical project data would be entered into the matrix (a database) for future use. As new projects are completed, already-completed entries in the matrix should be updated.

NS Power should take care to apply the AACE definition of contingency and exclude from this matrix costs resulting from major scope changes, extraordinary events, or currency effects.

For example, NS Power explained that the 28.8 percent overspending on the Lingan mill refurbishment (C0009096) was due to an unanticipated requirement to repair a concrete base for one of the mills. NS Power stated, "Use of the contingency guidelines and accounting for risks similar in nature to those that materialized over the course of this project would likely result in including contingency in Mill Refurbishment projects going forward."[41] Application of "lessons learned" such as

[40] By project elements, I am referring to budget groups such as materials for refurbishing hydro turbines.

[41] NS Power, Exhibit N-3, response to CA IR-4(b)(i).

this one to future projects is the key concept, whether it is called a predetermined guidelines matrix or anything else.

In contrast, NS Power did not provide any explanation for the 7.4 percent overspending on the Lingan coal reclaim feeder project (C0009082). NS Power simply stated that "application of the contingency guidelines would likely have resulted in a slightly higher (5% to 10%) contingency amount."[42] In this case, while NS Power acknowledged a need for a higher contingency in hindsight, it did not identify any specific lessons learned that would result in future contingencies being developed differently.

Q: Should the scope of the predetermined guidelines matrix be limited to projects that require Board approval?

A: No, the scope of the predetermined guidelines matrix should include projects with less than $1 million budget, because NS Power has often neglected to apply contingencies for those projects. My review of NS Power's capital project costs without contingencies for the 2020 ACE Plan found that the average cost overrun for projects without a contingency budget was 7.6%. This suggests that NS Power has a track record of misjudging cost risks associated with smaller projects.

Q: Should the contingency guidelines be applied at the project level, or at some more granular level?

A: As discussed above, NS Power is generally applying contingencies to the total budget. A better practice would be to apply contingencies to specific parts of the project budget. Thus, in the mill refurbishment example, rather than simply adding a 5 percent contingency to the entire project, the contingency should reflect the

[42] NS Power, Exhibit N-3, response to CA IR-4(b)(ii).

uncertainty regarding the condition of the concrete base by including a risk-adjusted allowance for repair costs.

For example, in the Wreck Cove project, NS Power used an Allowance for Scope Variation to account for potential refurbishment costs of components that could only be inspected during the rehabilitation.[43]

In contrast, for a hot section engine refurbishment on the LM6000, NS Power identified a similarly specific scope uncertainty, but applied the contingency to the entire amount of labor, materials, and contracts.[44]

> Additional work that could be required once the engine is accessible and fully inspected includes inspection and refurbishment of parts of the following: the compressor rear frame assembly and associated components, the high pressure compressor assembly rotor and stator assembly components, the low pressure compressor rotor and stator assembly components, the low pressure and high pressure shaft assemblies, the low pressure turbine assembly, and the components for the three gearbox assemblies. The estimated costs for these potential items are not factored into the base estimate for the project but are included in the 30 percent contingency.[45]

By applying the contingency to nearly all of the project scope, the contingency applied to costs such as scaffolding and testing.[46] While the magnitude of the contingency might be appropriate, the stated basis for the contingency may not relate to uncertainty in those costs. While NS Power provided a clear explanation as to why the project has uncertainty, its stated basis did not justify the 30 percent value – as opposed to 20 or 40 percent. Furthermore, the explanation did not explain why the contingency should be applied to the entire budget, rather than just to specific materials and contracts.

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[43] NS Power, reply evidence, Matter No. M09596 (August 6, 2020), p. 47.

[44] NS Power, Exhibit N-3, response to CA IR-4, Attachment 1, cell I32.

[45] NS Power, Exhibit N-5, response to SBA IR-9.

[46] NS Power, 2021 ACE Plan, Exhibit N-1, p. 189.

A contingency on total costs will continue to be appropriate for some projects. For example, NS Power applied a 15 percent contingency to the total budget for a control system upgrade at the Tusket combustion turbine. NS Power provided the following basis for the contingency:

> This project was determined to require a 15 percent contingency to address site specific unknowns during design, procurement, construction, and commissioning. Each combustion turbine control system has slightly different programing, field devices, electrical components, and control wiring which are not yet fully determined. As this project is currently in the final design/scoping phase – all major equipment has not been defined, and vendors have not yet been selected. The contingency was selected based on expert judgement and historical experiences on previous projects based on the phase of the project.[47]

In this case, the project unknowns evidently cover the entire scope of the project. If the "historical experience on previous projects" were documented for the entire project cost and reviewable, specifying all potential scope variations might not clarify the budget or improve project planning.

Q: What benefits might result from your recommended changes to the contingency guidelines?

A: The changes I recommend to the contingency guidelines are intended to improve the budgeting process so that the Board has more accurate information when considering the ACE Plans. As discussed above, NS Power should:

- Apply contingencies more granularly (where cost risks are specific to parts of the project), rather than simply to the entire project budget;
- Use a checklist similar to AACE's "maturity level of project definition deliverables" for classifying project maturity;
- Utilize expert judgement in a transparent manner; and

[47] NS Power, Exhibit N-5, response to SBA IR-10.

- Revise its contingency guidelines from being based on a "modified view of accuracy" to developing an evidence-based predetermined guidelines matrix.

In addition to generating more adequate project contingencies for budgeting purposes, these practices may also address the "general issues with NS Power cost estimating practices [and/or] under-scoping of projects at the original approval submission stage" that are of concern to the Board.

An example of the relationship between more granular contingencies and cost minimization can be seen in the mill refurbishment case. As discussed above, NS Power has learned that concrete bases may require repair during mill refurbishment. If the project needs to stop for several months while a concrete base is engineered and contractors are hired, the delay may drive up costs. NS Power should plan for that contingency in the budget, schedule, materials procurement, and labor provision for future mill refurbishment projects. A contingency plan could involve coordinating the construction with other concrete work at the same site, so that if a repair need is identified, then it can be addressed expeditiously, keeping the overall project closer to budget, and minimizing costs.

Leveraging the project contingency to help drive cost minimization should not stop once the budget is submitted to the Board for approval. As the project matures, NS Power should continue to update all aspects of the project budget, including the contingency. A continuous process to increase the cost estimate accuracy throughout the planning process is recommended by Midgard Consulting.[48] Midgard explains that the project's cost estimate should progress through each of the classification stages prior to project execution.

[48] Midgard Consulting, *A Review of Nova Scotia Power Inc.'s Wreck Cove Life Extension & Modernization – Unit Rehabilitation and Replacement (CI 0013838) Application*, Exhibit No. N-20 Matter No. M09596 (June 4, 2020), p. 38.

Q: Do you have any other recommendations related to project contingencies?

A: Yes, as discussed earlier in my testimony, NS Power sometimes includes an allowance for scope variation to account for potential refurbishment costs of components that can only be inspected during the rehabilitation. But NS Power views allowance for scope variation in two different ways. On one hand, NS Power considers allowances for scope variation to be a type of contingency, stating that "Contingency includes allowances for scope variation."[49] Under this view, an allowance for scope variation is simply a more precisely targeted form of a project contingency.

However, in the Wreck Cove LEM application budget, allowances for scope variation were listed as line items under materials and contracts.[50] The budget also included an overall project contingency as an entirely separate line item. The Wreck Cove LEM application is the only budget where I have seen NS Power call out allowances for scope variation.

In some other cases, NS Power has precisely targeted contingencies to specific areas of the budget. For example, in the ADMS Upgrade project, NS Power identified five separate contingencies covering 41 percent of the total project budget excluding AO and AFUDC.[51]

Whether it is called an allowance for scope variation or a contingency, more precisely targeted contingencies would facilitate better planning and budgeting, supporting greater accountability. As discussed above, NS Power's most recent practice is to apply project contingencies to the total project budget (or at least a very

[49] NS Power, Exhibit N-3, response to CA IR-4(j).

[50] NS Power, Wreck Cove Life Extension and Modernization, Matter No. M09596, Exhibit N-2 (February 28, 2020), Appendix D01, p. 5.

[51] NS Power, ADMS Upgrade (CI C0010019), Matter No. M09609, Exhibit N-1 (March 2, 2020), p.

large portion of the budget). Increased use of contingencies on the total budget may eventually close the gap between budget and actual spend (if the average contingency increases). However, resolving the overspending problem is only a step towards advancing cost minimization. The role of contingencies in identifying opportunities for cost minimization is more significant if the contingencies themselves are more precisely targeted.

It is reasonable to use both allowance for scope variation and contingency in the same project budget. For example, a project budget might include a 10% allowance for scope variation to account for potential refurbishment costs of components that can only be inspected during a rehabilitation. The project budget might also include a 10% contingency for all contracts.

The Board should encourage NS Power to make greater use of allowances for scope variation, since the specificity provides more accountability than a project-wide contingency. Furthermore, for budget presentation and reporting purposes, I recommend that the Board direct NS Power to also present a total contingency including any allowance for scope variation budget items.

V. Economic Analysis Model

Q: What is your opinion of the Economic Analysis Model (EAM)?

A: The EAM is a fundamentally sound tool for comparing alternatives when developing sustaining capital projects. While it should not be used for evaluating major new investments, such as new generation facilities or transmission lines, it is otherwise well suited to providing the Commission with an economic comparison among alternatives that serve similar purposes.

Nevertheless, the Board should direct NS Power to update the EAM to align with new practices and more recent data that affect the replacement cost of energy and the design of sensitivities. As discussed below, the EAM should be updated to:

- Use results from the Integrated Resource Plan to determine the replacement cost of energy;
- Include the value of greenhouse gas emissions in the replacement cost of energy;
- Align the Increased Capital sensitivity analysis with the Non-Binding Contingency Guidelines; and
- Align the Avoided Costs and Timing of the Project sensitivities with recent data.

I also have further questions regarding accounting liabilities maintained by NS Power for future retirement obligations.

Q: Why should the replacement cost of energy be updated?

A: The EAM requires NS Power to input a replacement cost of energy. Currently, the Board's direction is to utilize "both a Port Hawkesbury biomass only calculation, and one with a mix of generation sources … when submitting hydro projects."[52] For the generation mix replacement cost of energy, NS Power uses "the weighted average replacement energy cost of all non-base loaded generation units and imports, consistent with the replacement energy value used for coal units."[53] This latter replacement cost is generally used for non-hydro projects.

The Board should update this direction for several reasons. First, the Integrated Resource Plan (IRP) indicates that future generation needs are likely to be met with a mix of resources. The IRP did not suggest acquiring a significant amount of

[52] NSUARB, Decision in M08984, 2019 ACE Plan (May 1, 2019), pp. 20-21.

[53] NS Power, Gaspereau Dam ATO, Exhibit N-1, Matter No. M09579, p. 19.

biomass,[54] so it will be inappropriate to continue using a Port Hawkesbury biomass calculation for hydro projects. Instead, and IRP-supported mix of future resources should be used, superseding past assumptions regarding the replacement energy value used for coal units.

Second, replacement energy for the renewable energy units, at least in the near term, need not be renewable energy. Once the NS Block is fully available, NS Power's renewable supply should exceed RES requirements for the foreseeable future; even more renewable energy should be available over the Maritime Link, if needed. Further increases in the renewable energy surplus are likely because NS Power's IRP indicates that additional wind resources are likely to be procured.[55] IRP models can provide an indication of the renewable energy contribution required of replacement energy.

Third, the use of an average cost of energy may not reflect the actual energy dispatch to be replaced. In the Gaspereau Dam ATO proceeding, I provided evidence that the marginal generation at issue primarily occurred during off-peak hours.[56] This would tend to be the case for other options that reduce energy output from hydro plants that can vary hourly output. As an average cost of energy would include on-peak costs, it would likely overstate the replacement energy value of such projects.

Q: How should the replacement cost of energy be determined?

A: NS Power should rely primarily on the IRP to obtain the replacement cost of energy. However, NS Power should adjust the replacement cost based on which services (on-

[54] The Board has previously expressed concern that energy from Port Hawkesbury Biomass overstates the cost of replacement energy. NSUARB, Decision in M08984 (May 1, 2019), p. 19.

[55] NS Power, *2020 Integrated Resource Plan* (November 27, 2020), Matter No. M08929, Exhibit N-9, p. 113.

[56] Paul Chernick and John D. Wilson, Evidence in Gaspereau ATO proceeding (May 7, 2020), Matter No. M09579, N-12, p. 13.

peak or off-peak energy, operating reserves, inertia, etc.) are relevant to the proposed capital project. NS Power should also consider renewable energy requirements and greenhouse gas emissions.

Regarding renewable energy requirements, NS Power should only limit replacement energy to renewable resources if RES compliance is likely to be at issue.

Regarding greenhouse gas emissions, NS Power should utilize a forecast of the shadow carbon price that it currently uses for system dispatch. This should be applied to the net impact of the generation mix on greenhouse gas emissions relative to the energy being replaced.

If NS Power uses its IRP models to determine the replacement energy cost, that would fully address dispatch, operating reserves, and renewable energy standards, but would not address the impact of the carbon shadow price. The IRP model currently only considers compliance with an emissions target and gives no value to emission reductions below the compliance level. Those emissions have value in the carbon allowance market and that value should be recognized in the EAM, for similar reasons as my firm indicated in final comments on the IRP.[57]

Q: What sensitivity analyses does NS Power implement in the EAM?

A: The EAM analysis includes three sensitivity analyses, as follows.

- Capital Investment – 10 percent increase from budget
- Avoided Costs – 10 percent decrease from budget
- Timing of the project – Project delays of one, two or three years

Results from the sensitivity analyses may affect NS Power's choice among project alternatives or it may determine not to pursue the project.

[57] John D. Wilson and Paul Chernick, *Review of Nova Scotia Power's 2020 Integrated Resource Plan* (January 20, 2021), Matter No. M08929, Exhibit N-14, p. 13.

Q: Should the capital investment sensitivity be updated?

A: Yes. The 10 percent capital investment sensitivity does not reflect the uncertainty in cost estimates. As the Non-Binding Contingency Guidelines indicate, even a Class 1 cost estimate has an expected accuracy range that includes cost increases of up to 15 percent. AACE defines the accuracy range as an "indication of the degree to which the final cost outcome for a given project will vary from the estimated cost … after application of contingency …" at an 80 percent confidence interval.[58] Relying on several AACE Recommended Practices, NS Power has identified the expected accuracy ranges for capital projects as follows.

- Class 5: -50% to 100%
- Class 4: -30% to 50%
- Class 3: -20% to 30%
- Class 2: -15% to 20%
- Class 1: -10% to 15%[59]

By uniformly applying a capital investment sensitivity of a 10 percent increase, the EAM neglects to consider the project maturity (class of cost estimate).[60] I recommend that the EAM be revised to require the use of the upper limit of the expected accuracy range, considering the project maturity. For example, for a Class 3 cost estimate, the EAM would utilize a 30 percent cost increase in the capital investment sensitivity.

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[58] AACE International, *Cost Estimate Classification System*, Recommended Practice 17R-97 (August 7, 2020), pp. 3, 5.

[59] NS Power, 2021 ACE Plan, Exhibit N-1, Appendix G, pp. 12-16.

[60] In the IRP, NS Power used a 50 percent increase in the sustaining capital cost forecast as a sensitivity. Although the sustaining capital cost forecast is not representative of Class 4 project maturity, the forecast reflects multiple projects. I consider the IRP sensitivity reasonable since some projects could have costs that are consistent with the forecast, even if other types of projects have costs that are twice as high as forecast. NS Power, Exhibit N-3, response to CA IR-5(a).

Q: Should the avoided cost sensitivity be updated?

A: Quite likely. This sensitivity was determined in 2013, and there have been significant changes to NS Power's avoided costs since then. Furthermore, the costs of clean energy technologies such as wind, solar and battery storage are declining rapidly and could fall well below NS Power's forecasts.

To update the avoided cost sensitivity, I recommend that the Board direct NS Power to review its past avoided cost forecasts, compare them with actual values, and update the avoided cost sensitivity accordingly. For example, NS Power could:

- Obtain the avoided cost forecasts used in the EAM for each ACE Plan since 2013;
- Obtain the avoided cost approved in the Annually Approved Rates proceedings;
- Calculate the difference between the forecasts and the actual approved avoided costs; and
- Statistically determine the 80 percent confidence interval for the accuracy of the avoided cost forecasts.

This, or some similar method, should be used to update the avoided cost sensitivity.

Q: Should the timing-of-the-project sensitivity be updated?

A: Quite likely. This sensitivity was determined in 2013, and NS Power has significant experience with project completion since that time.

To update the timing-of-the-project sensitivity, I recommend that the Board direct NS Power to review its past project in-service forecasts, compare them with actual in-service dates, and update the timing-of-the-project sensitivity appropriately. For example, NS Power could:

- Obtain the forecast in-service dates used in the EAM for each capital project completed since 2013;

- Obtain the actual in-service date for each project;
- Calculate the delay; and
- Update the timing-of-the-project sensitivity to use the worst project delay. If the worst project delay was due to a later decision that an alternative project should be pursued to the advantage of customers, then the Board may wish to utilize the second worst project delay.

This, or some similar method, should be used to update the timing-of-the-project sensitivity.

Q: What questions do you have regarding retirement-related liabilities?

A: In the 2020 ACE Plan proceeding, I learned that NS Power recognizes a "cost of removal liability." It was my understanding that this was the sole decommissioning-related account in NS Power's financial statements. In its response to further questions on this topic, NS Power indicated that there is also an asset retirement obligation (ARO) liability and accumulated depreciation.[61] NS Power should provide a full explanation of the current accounting treatment for all decommissioning-related costs, including the cost-of removal liability, the ARO liability, and accumulated depreciation, and how they interrelate.

With respect to the EAM, it is important that the accounting treatment of decommissioning-related costs be correctly considered in the analysis.

I do not have a recommendation related to this issue for the Board since I do not have sufficient information to form an opinion. NS Power should provide a comprehensive explanation on this point in its reply evidence, including an update on the balance of all decommissioning-related regulatory liability accounts for each hydro system.

[61] NS Power, Exhibit N-3, response to CA IR-2(e). Further clarified by NS Power via counsel.

VI. Spare Autotransformer Project (C0031050)

Q: Please describe the Spare Autotransformer project.

A: NS Power has ten autotransformers built "between 1959 and 1987 [having] an average age of approximately 46 years."[62] Since many of these units have exceeded their estimated useful lives, and one similar unit failed in 2019, NS Power proposes to procure and commission a spare unit at a cost of $2.4 million. NS Power states that having the spare available will significantly reduce a 12-15 week delay in replacing the unit, and the possibility that no such unit will be available from a vendor. While a single autotransformer is out of service, NS Power risks loss of transmission flexibility or forced derating of an economic generation source. NS Power explains that its "grid is robust enough to withstand many single contingency scenarios brought about by a failure of one of these units, it comes at a cost to the flexibility of the transmission system and reduced ability to withstand additional contingencies."[63]

Q: What will be the total cost to purchase and install the spare autotransformer?

A: The spare autotransformer will be stored at a storage site in Onslow. When it is needed, the spare will need to be disassembled, transported, and installed at the site of the failed unit. This will be a capital cost of approximately $1.4 million.[64] Including the $2.4 million cost to purchase, commission, and store the autotransformer, the total cost to purchase and install the spare autotransformer is about $3.8 million.

Q: Did NS Power conduct an Economic Analysis Model (EAM) analysis?

A: No. NS Power should have conducted such an analysis because there are several viable options. Often, NS Power only conducts an EAM analysis if the status quo is

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[62] NS Power, 2021 ACE Plan, Exhibit N-1, p. 221.

[63] NS Power, 2021 ACE Plan, Exhibit N-1, p. 221.

[64] NS Power, Exhibit N-3, response to CA IR-9(c).

a sustainable and viable option. NS Power seems comfortable with having just one spare; once that spare is deployed, NS Power would be back at the spare-less status quo for a substantial period of time. It thus appears that the status quo is viable, if perhaps undesirable.

Q: What alternatives should NS Power have included in the EAM analysis?

A: NS Power should have considered the following alternatives:

- Purchase of a spare autotransformer (the proposed project), including costs to purchase, commission and store and install the spare of $3.8 million;
- Status quo, assuming that a replacement unit would cost $2.6 million based on the 2019 replacement of a failed transformer (CI C0024486);[65]
- Replacement of one aging autotransformer, at a cost of about $2.6 million, making the retired autotransformer the system spare, incurring additional costs for storage, etc.;
- Replacement of several autotransformers whose age exceeds the "estimated useful life of the asset of 40 years"[66] at an estimated cost of $3 million per site[67]; and
- Replacement of all ten autotransformers at an estimated cost of $3 million per site.

Each alternative should include a risk-adjusted consideration of the system costs related to loss of transmission flexibility or forced derating of an economic generation source based on the duration of the outages. In the case of the proposed project, once

[65] NS Power, Exhibit N-3, response to CA IR-9(a).

[66] NS Power, 2021 ACE Plan, Exhibit N-1, p. 221.

[67] NS Power, Exhibit N-3, response to CA IR-9(d). NS Power did not explain why a bulk order of ten autotransformers would cost $3 million per site, when a single autotransformer replacement in 2019 cost only $2.6 million.

the spare is used, NS Power indicates that it will be without a spare for 16-18 months.[68]

Because the proposed project results in a higher cost per unit than the alternatives, it is not obvious that it is in the best interests of customers to proceed with the spare autotransformer project over one of the other alternatives. The Board should direct NS Power to analyze alternatives to the Spare Autotransformer Project (C0031050) and submit an updated proposal.

VII. Hydrogen Degas Panel Phase 2 Project (C0030887)

Q: Please describe the Hydrogen Degas Panel Phase 2 project (C0030887).

A: NS Power explains that after completion of the Point Tupper Unit 2 Hydrogen Panel Replacement project (C0011085, included in the 2019 ACE Plan), an insurance risk review process was conducted.[69] The review identified a risk that two field operators would be near the generator that is being degassed and potentially "in the line of fire" for 6-8 hours during a degas event. The new control panel will be located in the control room, providing greater safety for the operators. The project will also upgrade the CO_2 delivery system, enabling a degas time of less than one hour, reducing risk of equipment damage and downtime, with a budget of $272,830.

Q: Please describe the 2019 Hydrogen Panel Replacement project (C0011085).

A: The Hydrogen Panel Replacement project was included in the 2019 ACE Plan with a budget of $464,252,[70] including a contingency of 10 percent on total costs excluding AFUDC and AO. The project was not included in the response to the Contingency

[68] NS Power, Exhibit N-3, response to CA IR-9(f).

[69] NS Power, Exhibit N-3, response to CA IR-10(a).

[70] NS Power, 2019 ACE Plan, Exhibit N-1, Matter No. M09499, p. 639.

Directive (Appendix E), but in the 2020 ACE Plan NS Power reported an actual spend of $708,660, representing overspending of 53 percent.[71] The aging control panel had reached a point where the repair or replacement of individual components was "less effective, resulting in a greater probability of significant failure."[72] The only alternative to replacement of the control panel considered was continued replacement of individual components.

Q: What concerns and questions do you have about these projects?

A: These two projects illustrate potential issues related to both cost minimization and the contingency budget. With respect to cost minimization, if NS Power had conducted a risk review prior to proposing the panel replacement project, then it might have identified the concern with the location of the hydrogen and the capacity of the CO_2 delivery system. With respect to the contingency budget, unless the original budget was considered a Class 4 (or lower) budget estimate,[73] it appears that either the contingency budget was not properly established (presumably using expert judgement) or that the project was imprudently managed, resulting in the need for remedial work in the proposed "Phase 2" project.[74]

After reviewing NS Power's response to CA IR-10(a), I have the following questions:

- Was a risk review conducted during the planning for the Hydrogen Panel Replacement project?

[71] NS Power, 2020 ACE Plan, Exhibit N-1, Matter No. M08984, p. 1531.

[72] NS Power, 2019 ACE Plan, Exhibit N-1, Matter No. M09499, p. 639.

[73] A Class 4 budget estimate is considered to have an accuracy range that allows for cost overruns of up to 50% within an 80% confidence interval. See page 25 for further discussion.

[74] The AACE recommended practices also allow for major scope change, extraordinary event, or currency effect as justification for overspending. However, there is no indication of any such issues within the scope of the Hydrogen Panel Replacement project.

- Under what circumstances are capital project planning managers required to conduct a risk review during project planning? And under what circumstances do they have discretion to conduct such a review?
- What were the causes of the overspending in the Hydrogen Panel Replacement project?
- Will the new equipment installed during the Hydrogen Panel Replacement become redundant when the new panel is installed in the control room? If not, under what circumstances will it be used?
- What "lessons learned" from these projects have been documented, and how will they be applied to improve cost minimization in future projects, improve the selection of contingency levels for future projects, and reduce safety and property risks in future projects?

Answers to those questions would enable me to form an opinion regarding the prudency of NS Power's management of these projects.

Q: What action should the Board take?

A: NS Power is not required to obtain Board approval for the proposed Hydrogen Degas Panel Phase 2 project (C0030887), since the budget is less than $1 million. Even though the information NS Power has provided appears to provide a reasonable justification for the additional work, the information provided so far is not sufficient to demonstrate the prudency of the overall management of these projects. The Board should inquire further into these projects to determine whether the projects have been planned and implemented in a prudent manner. Considering both the original project's actual spend to date and the proposed project's budget, the total cost is currently estimated at $965,005.

VIII. Comments on Information Technology Projects

Q: Do you have any comments on the subsequent submittal Customer Energy Insights Management (C0021839) IT project?

A: Yes. It is my understanding that this project was intended to provide customers with details of their energy consumption as a result of AMI implementation. In a response to an information request, NS Power indicates that it will be combined with CI C0032502, which will implement time-varying pricing, and the combined projects will be submitted to the Board for review and approval.[75]

I agree it makes sense to pursue these two projects in a coordinated fashion. However, since NS Power has proposed a "soft launch" of its time-varying pricing program, the benefits of that work will initially be available to a limited number of customers. The Board should encourage NS Power to ensure that all customers are able to access details of their energy consumption as a result of AMI implementation, and that it should coordinate with E1 on the scope and design of this project so that customers have immediate access to relevant information about saving energy and money when they access that information.

Q: Have you identified any more general concerns about IT project budgets?

A: Yes. I am concerned that NS Power's budget for the Privileged Access Management (PAM) IT project (49094) may not quantify all related, near-term costs. The total cost of ownership for this project is not included in the submission. There will be on-going operational costs, renewal of licenses after the initial three-year period, potential warranty extensions, and annual costs for maintenance, support and subscriptions.

If the Board wishes to have a more complete view of costs associated with PAM, it could request a cost projection for the full 10-year life of the asset. As a more

[75] NS Power, Exhibit N-3, response to CA IR-7(a).

general matter, the Board could request that NS Power provide a total cost of ownership for IT projects with capital budgets of over $1 million as part of its submission.

Q: Does this complete your testimony?

A: Yes.

Exhibit JDW-1

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SUMMARY OF PROFESSIONAL EXPERIENCE

2019–Present **Research Director, Resource Insight, Inc.** Provides research, technical assistance, and expert testimony on electric- and gas-utility planning, economics, and regulation. Reviews electric-utility rate design. Designs and evaluates conservation programs for electric utilities, including conservation cost recovery mechanisms and performance incentives. Evaluates performance of renewable resources and designs performance evaluation systems for procurement. Designs and assesses resource planning and procurement strategies for regulated and competitive markets.

2007-19 **Deputy Director for Regulatory Policy, Southern Alliance for Clean Energy.** Managed regulatory policy, including supervision of experts in areas of energy efficiency, renewable energy, and market data. Provided expert witness testimony on topics of resource planning, renewable energy, energy efficiency to utility regulators. Directed litigation activities, including support of expert witnesses in the areas of rate design, resource planning, renewable energy, energy efficiency, and resource procurement. Conducted supporting research and policy development. Represented SACE on numerous legislative, utility, and private committees across a wide range of climate and energy related topics.

2001–06 **Executive Director, Galveston-Houston Association for Smog Prevention.** Directed advocacy and regulatory policy related to air pollution reduction, including ozone, air toxics, and other related pollutants in the industrial, utility, and transportation sectors. Served on the Regional Air Quality Planning Committee, Transportation Policy Technical Advisory Committee, and Steering Committee of the TCEQ Interim Science Committee.

2000–01 **Senior Associate, The Goodman Corporation.** Provided transportation and urban planning consultant services to cities and business districts across Texas.

1997–99 **Senior Legislative Analyst and Technology Projects Coordinator, Office of Program Policy Analysis and Government Accountability, Florida Legislature.** Author or team member for reports on water supply policy, environmental permitting, community development corporations, school district financial management and other issues – most recommendations implemented by the 1998 and 1999 Florida Legislatures. Edited statewide government accountability newsletter and coordinated online and internal technical projects.

1997 **Environmental Management Consultant, Florida State University.** Project staff for Florida Assessment of Coastal Trends.

1992-96 **Research Associate, Center for Global Studies, Houston Advanced Research Center.** Coordinated and led research for projects assessing environmental and resource issues in the Rio Grande / Rio Bravo river basin and across the Greater Houston region. Coordinated task force and edited book on climate change in Texas.

EDUCATION

BA, Physics (with honors) and history, Rice University, 1990.

MPP, John F. Kennedy School of Government, Harvard University, 1992. Concentration areas: Environment, negotiation, economic and analytic methods.

PUBLICATIONS

"Urban Areas," with Judith Clarkson and Wolfgang Roeseler, in Gerald R. North, Jurgen Schmandt and Judith Clarkson, *The Impact of Global Warming on Texas: A Report of the Task Force on Climate Change in Texas*, 1995.

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"Green in the Grid: Renewable Electricity Opportunities in the Southeast United States," with Dennis Creech, Eliot Metzger, and Samantha Putt Del Pino, World Resources Institute Issue Briefs, April 2009.

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"Analysis of Solar Capacity Equivalent Values for Duke Energy Carolinas and Duke Energy Progress Systems," prepared for and filed by Southern Alliance for Clean Energy, Natural Resources Defense Council, and Sierra Club in North Carolina NCUC Docket No. E-100, Sub 147, February 17, 2017.

"Seasonal Electric Demand in the Southeastern United States," Southern Alliance for Clean Energy, March 2017.

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"Tracking Decarbonization in the Southeast, 2019 Generation and CO_2 Emissions Report," with Heather Pohnan and Maggie Shober, Southern Alliance for Clean Energy, August 2019.

"Seasonal Electric Demand in the Southeastern United States," with Maggie Shober, Southern Alliance for Clean Energy, April 2020.

"Making the Most of the Power Plant Market: Best Practices for All-Source Electric Generation Procurement," with Mike O'Boyle, Ron Lehr, and Mark Detsky, Energy Innovation Policy & Technology LLC and Southern Alliance for Clean Energy, April 2020.

PRESENTATIONS

"Clean Energy Solutions for Western North Carolina," presentation to Progress Energy Carolinas WNC Community Energy Advisory Council, February 7, 2008.

"Energy Efficiency: Regulating Cost-Effectiveness," Florida Public Service Commission undocketed workshop, April 25, 2008.

"Utility-Scale Renewable Energy," presentation on behalf of Southern Alliance for Clean Energy to the Board of the Tennessee Valley Authority, March 5, 2008.

"An Advocates Perspective on the Duke Save-a-Watt Approach," ACEEE 5th National Conference on Energy Efficiency as a Resource, September 2009.

"Building the Energy Efficiency Resource for the TVA Region," presentation on behalf of Southern Alliance for Clean Energy to the Tennessee Valley Authority Integrated Resource Planning Stakeholder Review Group, December 10, 2009.

"Florida Energy Policy Discussion," testimony before Energy & Utilities Policy Committee, Florida House of Representatives, January 2010.

"The Changing Face of Energy Supply in Florida (and the Southeast)," 37th Annual PURC Conference, February 2010.

"Bringing Energy Efficiency to Southerners," Environmental and Energy Study Institute panel on "Energy Efficiency in the South," April 10, 2010.

"Energy Efficiency: The Southeast Considers its Options," NAESCO Southeast Regional Workshop, September 2010.

"Energy Efficiency Delivers Growth and Savings for Florida," testimony before Energy & Utilities Subcommittee, Florida House of Representatives, February 2011.

"Rates vs. Energy Efficiency," 2013 ACEEE National Conference on Energy Efficiency as a Resource, September 2013.

"TVA IRP Update," TenneSEIA Annual Meeting, November 19, 2014.

"Views on TVA EE Modeling Approach," presentation with Natalie Mims to Tennessee Valley Authority's Evaluating Energy Efficiency in Utility Resource Planning Meeting, February 10, 2015.

"The Clean Power Plan Can Be Implemented While Maintaining Reliable Electric Service in the Southeast," FERC Eastern Region Technical Conference on EPA's Clean Power Plan Proposed Rule, March 11, 2015.

"Renewable Energy & Reliability," 5th Annual Southeast Clean Power Summit, EUCI, March 2016.

"Challenges to a Southeast Carbon Market," 5th Annual Southeast Clean Power Summit, EUCI, March 2016.

"Solar Capacity Value: Preview of Analysis to Date," Florida Alliance for Accelerating Solar and Storage Technology Readiness (FAASSTeR) meeting, Orlando, FL, November 2017.

"Making the Most of the Power Plant Market: Best Practices for All-Source Electric Generation Procurement," Southeast Energy and Environmental Leadership Forum, Nicholas Institute for Environmental Policy Solutions, August 2020.

EXPERT TESTIMONY

2008 **South Carolina PSC** Docket No. 2007-358-E, surrebuttal testimony on behalf of Environmental Defense, the South Carolina Coastal Conservation League, Southern Alliance for Clean Energy and the Southern Environmental Law Center. Cost recovery mechanism for energy efficiency, including shareholder incentive and lost revenue adjustment mechanism.

2009 **North Carolina NCUC** Docket No. E-7, Sub 831, direct testimony on behalf of Environmental Defense Fund, Natural Resources Defense Council, Southern Alliance for Clean Energy, and Southern Environmental Law Center. Cost recovery mechanism for energy efficiency, including shareholder incentive and lost revenue adjustment mechanism.

Florida PSC Docket Nos. 080407-EG through 080413-EG, direct testimony on behalf of Southern Alliance for Clean Energy and the Natural Resources Defense Council. Energy efficiency potential and utility program goals.

South Carolina PSC Docket No. 2009-226-E, direct testimony in general rate case on behalf of Environmental Defense, the Natural Resources Defense Council, the South Carolina Coastal Conservation League, Southern Alliance for Clean Energy and the Southern Environmental Law Center. Cost recovery mechanism for energy efficiency, including shareholder incentive and lost revenue adjustment mechanism.

2010 **North Carolina NCUC** Docket No. E-100, Sub 124, direct testimony on behalf of Environmental Defense Fund, the Sierra Club, Southern Alliance for Clean Energy, and Southern Environmental Law Center. Adequacy of consideration of energy efficiency in Duke Energy Carolinas and Progress Energy Carolinas' 2009 integrated resource plans.

Georgia PSC Docket No. 31081, direct testimony on behalf of Southern Alliance for Clean Energy. Adequacy of consideration of energy efficiency in Georgia Power's 2010 integrated resource plan, including cost effectiveness, rate and bill impacts, and lost revenues.

Georgia PSC Docket No. 31082, direct testimony on behalf of Southern Alliance for Clean Energy. Adequacy of consideration of energy efficiency in Georgia Power's 2010 demand side management plan, including program revisions, planning process, stakeholder engagement, and shareholder incentive mechanism.

2011 **South Carolina PSC** Docket No. 2011-09-E, allowable ex parte briefing on behalf of Southern Alliance for Clean Energy, South Carolina Coastal Conservation League, and Upstate Forever. Adequacy of South Carolina Electric & Gas's 2011 integrated resource plan, including resource mix, sensitivity analysis, alternative supply and demand side options, and load growth scenarios.

South Carolina PSC Docket Nos. 2011-08-E and 2011-10-E, allowable ex parte briefing on behalf of Southern Alliance for Clean Energy, South Carolina Coastal Conservation League, and Upstate Forever. Adequacy of Progress Energy Carolinas and Duke Energy Carolinas' 2011 integrated resource plans, including resource mix, sensitivity analysis, alternative supply and demand side options, cost escalation, uncertainty of nuclear and economic impact modeling.

2013 **Georgia PSC** Docket No. 36498, direct testimony on behalf of Southern Alliance for Clean Energy. Adequacy of consideration of energy efficiency in Georgia Power's 2013 integrated resource plan, including cost effectiveness, rate and bill impacts, and lost revenues, economics of fuel switching and renewable resources.

South Carolina PSC Docket No. 2013-392-E, direct testimony with Hamilton Davis in Duke Energy Carolinas need certification case on behalf of the South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. Need for capacity, adequacy of energy efficiency and renewable energy alternatives, and use of solar power as an energy resource.

2014 **South Carolina PSC** Docket No. 2014-246-E, direct testimony generic proceeding on behalf of the South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. Methods for calculating dependable capacity credit for renewable resources and application to determination of avoided cost.

2015 **Florida PSC** Docket No. 150196-EI, direct testimony in Florida Power & Light need certification case on behalf of Southern Alliance for Clean Energy. Appropriate reserve margin and system reliability need.

2016 **Georgia PSC** Docket No. 40161, direct testimony on behalf of Southern Alliance for Clean Energy. Adequacy of consideration of renewable energy in Georgia Power's 2016 integrated resource plan, including portfolio diversity, operational and implementation risk, analysis of project-specific costs and benefits (including location and technology considerations), and methods for calculating dependable capacity credit for renewable resources.

2019 **Georgia PSC** Docket Nos. 42310 and 42311, direct testimony with Bryan A. Jacob in Georgia Power's 2019 integrated resource plan and demand side management plan on behalf of Southern Alliance for Clean Energy. Adequacy of consideration of renewable energy in IRP, retirement of uneconomic plants, and use of all-source procurement process. Shareholder incentive mechanism for both renewable energy and DSM plan.

2020 **Nova Scotia UARB** Matter No. M09519, direct testimony with Paul Chernick in Nova Scotia Power's application for approval of the Smart Grid Nova Scotia Project on behalf of the Nova Scotia Consumer Advocate. Cost classification, decommissioning costs, justification for software vendor selection, and suggested changes to project scope.

Nova Scotia UARB Matter No. M09499, direct testimony with Paul Chernick in Nova Scotia Power's 2020 annual capital expenditure plan on behalf of the Nova Scotia Consumer Advocate. Potential to decommission hydroelectric systems, review of annually recurring capital projects, use of project contingencies, and cost minimization practices.

Nova Scotia UARB Matter No. M09579, direct testimony with Paul Chernick in Nova Scotia Power's application for the Gaspereau Dam Safety Remedial Works on behalf of the Nova Scotia Consumer Advocate. Alternatives to proposed project, project contingency factor, estimation of archaeological costs, and replacement energy cost calculation.

Nova Scotia UARB Matter No. M09609, direct testimony with Paul Chernick in Nova Scotia Power's application for the Advanced Distribution Management System Upgrade on behalf of the Nova Scotia Consumer Advocate. Need for the ADMS and integration with the Distributed Energy Resources Management System.

Nova Scotia UARB Matter No. M09707, direct testimony with Paul Chernick on Nova Scotia Power's 2020 Load Forecast on behalf of the Nova Scotia Consumer Advocate. Impacts of recession, application of end-use studies, improvements to forecast components, and impact of time-varying pricing.

California PUC Docket A.19-10-012, direct and rebuttal testimony with Paul Chernick in San Diego Gas & Electric's application for the Power Your Drive Electric Vehicle Charging Program on behalf of the Small Business Utility Advocates. Ensuring that utility-installed chargers advance California goal for electric vehicles. Budget controls. Reporting requirements. Evaluation, monitoring and verification processes. Outreach to small business customers.

California PUC Docket A.19-08-012, direct testimony in Southern California Edison's 2021 general rate case (track 2) on behalf of the Small Business Utility Advocates. Reasonableness of remedial software costs to be included in authorized revenue requirement.

Georgia PSC Docket Nos. 4822, 16573 and 19279, direct, rebuttal and surrebuttal testimony in Georgia Power Company's PURPA avoided cost review on behalf of the Georgia Large Scale Solar Association. Reviewing compliance with prior Commission orders. Application of capacity need forecast in projection of avoided capacity cost. Calculation of cost of new capacity. Proposal of standard offer contract.