

# Nova Scotia Utility and Review Board

**IN THE MATTER OF** Section 35A of *The Public Utilities Act*, R.S.N.S. 1989,  
c.380, as amended

- and -

**IN THE MATTER OF** an Application by Nova Scotia Power Inc. for Approval of  
the **2021 Annual Capital Expenditure (ACE) Plan**

## 2021 ACE Plan

Date Filed: November 27, 2020

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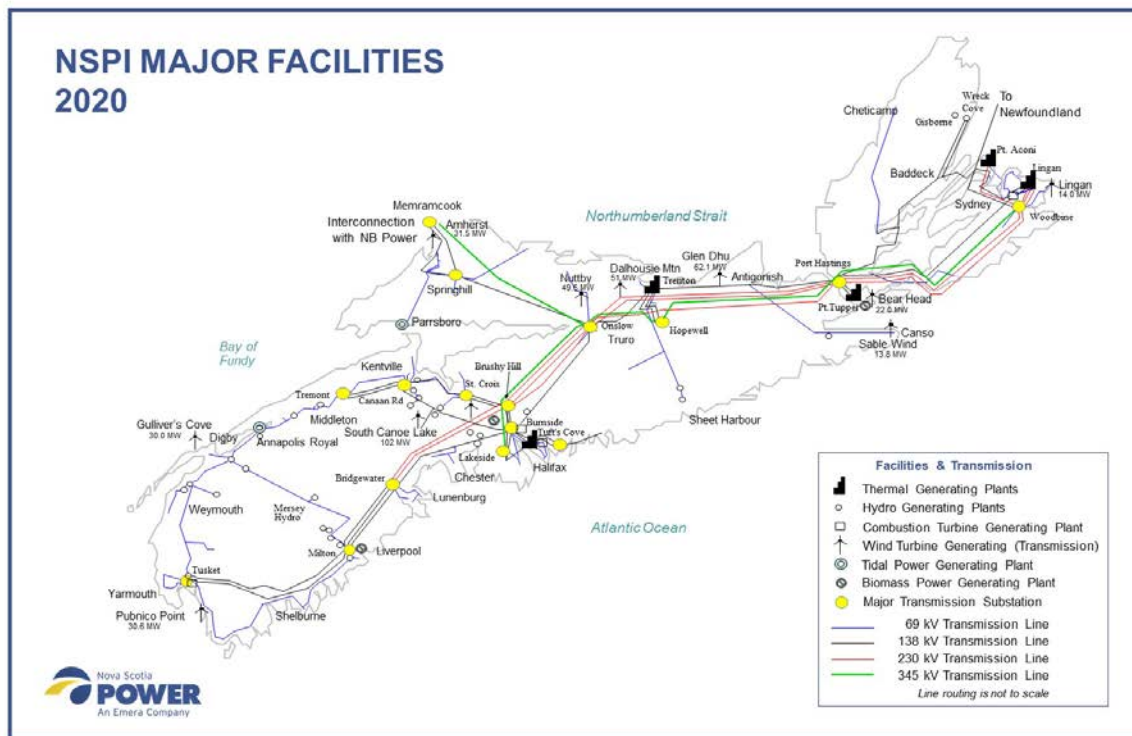
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## Nova Scotia Power

### 2021 Annual Capital Expenditure Plan



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1 **1.0 EXECUTIVE SUMMARY**

2  
3 The Nova Scotia Power Incorporated (NS Power, Company) Annual Capital Expenditure (ACE)  
4 Plan Application provides customers, the Nova Scotia Utility and Review Board (NSUARB,  
5 Board), and other stakeholders with a comprehensive and transparent overview of the Company's  
6 intended capital investments for the year ahead.

7  
8 NS Power is focused on its customers and providing them with safe, reliable, and innovative  
9 electrical service in a cost-effective manner. In alignment with these key objectives, the  
10 investments under the 2021 ACE Plan provide customers with an improved customer experience,  
11 while balancing affordability and rate stability. The investments are aligned with the Integrated  
12 Resource Plan (IRP) and the Company's focus on reducing carbon from its electricity generation  
13 while maintaining affordability. The capital investments proposed continue to be vetted and  
14 planned in compliance with the NSUARB-approved Capital Expenditure Justification Criteria  
15 (CEJC).

16  
17 NS Power's total capital budget for 2021 (inclusive of capital projects under \$1,000,000 and Point  
18 Aconi projects, as well as previously approved multi-year project profiles) is \$361.8 million. In  
19 this Application, within the overall 2021 capital budget, NS Power is requesting NSUARB  
20 approval of 16 capital work orders with total project investment of \$53.0 million and the 2021  
21 capital routine program of \$94.1 million for an aggregate total of \$147.1 million.

22  
23 With respect to NS Power's capital budget for 2020, as a result of COVID-19, NS Power's 2020  
24 capital investment forecast was reduced from \$375 million to approximately \$310 million.  
25 Approximately \$65 million of the 2020 capital investments have been either deferred to 2021 or  
26 2022 or have had a portion of their investment profiles shifted from 2020 to future periods. NS  
27 Power continues to evaluate workplans to balance capital investments in the context of the COVID  
28 pandemic. Details of those capital projects that have been deferred from the 2020 ACE Plan can  
29 be found in Section 4.4, and in the updated 2020 Q3 Reports (**Appendix C**).

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As NS Power has adapted to the circumstances presented by the COVID-19 pandemic, it has strived to minimize the impact on overall projects costs. The impacts of the pandemic are not isolated to NS Power as NS Power's suppliers and service providers have also been impacted. However, the Company will continue to adapt to the changing landscape and evaluate workplans to balance capital investments in the context of the COVID pandemic, while minimizing the impact on overall project costs going forward.

The investments in the 2021 ACE Plan:

- Ensure that the safe delivery of electricity service to customers is paramount in all aspects of NS Power's operations and capital project execution. Safety compliance projects contained in the 2021 ACE Plan include projects like upgrades to fire suppression systems and other asset specific initiatives.
- Continue investment in ongoing environmental compliance, such as the maintenance of its hydro and wind renewable energy resources, and the continued remediation of PCBs and asbestos through corresponding recurring capital programs aligned with regulation timelines.
- Provide benefits in communities throughout the province. NS Power's strategy related to reliability includes pursuing opportunities to manage reliability improvements on the T&D system and meeting reliability challenges from severe weather and climate change. Continued investments, such as NS Power's transmission and distribution rights-of-way widening program and T&D line and substation equipment replacements, and further incremental integration of new technologies and asset programs reduce the frequency and duration of unplanned outages for customers, and result in an improved customer reliability experience.

Traditional capital investments will be augmented by new types of projects focused on adapting to Nova Scotians' evolving expectations for more innovative energy solutions, with easier access,



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1 and increased digital control. Continuing to invest in innovation and customer experience justified  
2 projects will be a fundamental component of NS Power's future capital expenditures. This includes  
3 initiatives such as the Smart Grid Nova Scotia project, which was approved by the Board on May  
4 7, 2020, and will study the benefits related to the adoption of Distributed Energy Resources (DERs)  
5 and their centralized control through an Energy Systems Platform (ESP). It also includes  
6 initiatives to provide new digital experiences for customers which will allow easier access to NS  
7 Power's products and services, thereby providing more choice and control.

8  
9 The ACE Plan represents the Company's annual capital spending forecast with focused capital  
10 investments in the immediate to mid-term. Long-term strategic system considerations are  
11 considered separately through integrated planning exercises. In 2020, NS Power engaged with  
12 stakeholders in the development of its Integrated Resource Plan (IRP). The final IRP report is  
13 scheduled to be submitted to the NSUARB at the end of November. The IRP developed a long-  
14 term strategy for electricity supply in Nova Scotia, with a near-term Action Plan and Roadmap to  
15 implement the strategy. In order to accommodate the range of future uncertainties and  
16 opportunities, the 2020 IRP analyzed a broad range of scenarios for key input assumptions and  
17 policy drivers. This allowed for identification of resource strategy components that are common  
18 to many low-cost resource plans. The IRP established an Action Plan of near-term no regrets next  
19 steps, meaning actions and investments that are appropriate across a robust range of plans and  
20 potential futures, for NS Power. While the IRP does not prescribe individual capital items or  
21 establish annual capital planning agendas, future capital plans will be understood relative to the  
22 outputs of the 2020 IRP process in terms of ongoing system utilization projections and associated  
23 capital outlooks. In addition, as part of the IRP input assumption development process, NS Power  
24 developed long term sustaining capital forecasts associated with the costs of sustaining its existing  
25 generating assets. Annual sustaining investments consistent with those assumed as inputs to the  
26 IRP are to be appropriately undertaken to support the optimal long-term economic utilization of  
27 the power system through its transition to new and cleaner sources of electricity.

28  
29 In keeping with NS Power's commitment to transparency in the ACE Plan process, prior to filing  
30 the 2021 ACE Plan Application, NS Power met with customer representatives and Board staff to

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- 1 provide an overview of the 2021 ACE Plan. The 2021 ACE Plan also addresses the Directives
- 2 arising from the 2020 ACE Plan Decision.<sup>1</sup>

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<sup>1</sup> Please refer to Section 4.0.

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**2.0 2021 ACE PLAN STRUCTURE**

The following provides an overview of how the 2021 ACE Plan is organized.

- **Section 3.0 – Introduction** – This section provides a high-level summary of the overall expenditures in the 2021 ACE Plan, including a breakdown of expenditures into various categories such as sustaining and strategic capital, as well as a forecast of expenditures in those categories for the next five years.
- **Section 4.0 – 2020 ACE Plan Follow-Up** – This section addresses the status of items from the 2020 ACE Plan, including a list of capital items pending submission in 2020 from the 2020 ACE Plan, and the 2020 ACE Plan deferred and cancelled items.
- **Section 5.0 – 2021 ACE Plan** – This section provides a summary of all 2021 capital expenditures. These include the list of projects for which NS Power is seeking approval, the list of projects forecast for subsequent submission, the list of projects with a value of less than \$1,000,000, and the list of projects for the Point Aconi Generating station. NS Power is not seeking approval of those capital projects identified for subsequent submittal at this time. In addition, capital projects under \$1,000,000 undertaken by large-scale utilities and Point Aconi projects do not require NSUARB approval under the *Public Utilities Act*; however, the Company includes them in its ACE Plan for information purposes and to provide a complete picture of annual capital expenditures on NS Power's system.
- **Section 6.0 – Generation** – This section lists all generation capital projects submitted for approval, as well as related carry-over spending. Generation assets generate electricity through a variety of methods and fuel sources, including hydro, coal, oil and gas, biomass, and wind.

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- 1 • **Section 7.0 - Transmission** - This section lists all transmission capital projects submitted  
2 for approval, as well as related carry-over spending. Transmission assets transmit  
3 electricity from the generation plants to the distribution system throughout the province.  
4 Transmission includes assets and equipment operating at 69 kV level or higher, and also  
5 includes substation assets.  
6
  - 7 • **Section 8.0 - Distribution** - This section lists all distribution capital projects submitted for  
8 approval, as well as related carry-over spending. Distribution assets include equipment for  
9 delivering electric energy from points on the transmission system to customers served at  
10 voltages below 69 kV.  
11
  - 12 • **Section 9.0 - General Plant** - This section lists all general plant capital projects submitted  
13 for approval, as well as related carry-over spending. General plant assets include computer  
14 infrastructure and communication equipment, which comprise the majority of capital  
15 expenditures in this category. Other items such as office equipment, vehicles, telecom,  
16 construction equipment and buildings (except generating and substation facilities) are also  
17 included within this category.  
18
  - 19 • **Section 10.0 - Routine Capital Program** - This section lists all routine capital items  
20 submitted for approval, by generation, transmission, distribution, and general plant.  
21 Routine capital items are recurring annual expenditures for replacement of equipment (like-  
22 for-like replacement), additions to existing equipment base resulting from system growth,  
23 and addition of customers to the system.  
24
  - 25 • **Section 11.0 - Directives and Miscellaneous** – This section provides information in  
26 response to the various directives issued by the Board in respect to the Company's ACE  
27 Plan over the years as well as other miscellaneous information previously included in the  
28 Company's Application. The Board's directives include requests for information on  
29 revenue requirement impacts, transmission and distribution investment reliability impacts,  
30 and the ranking of projects submitted in the ACE Plan for approval.
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1 The 2021 ACE Plan also includes the following information provided as separate appendices:

- 2
  - 3 • **Confidentiality Matrix (Appendix A)** – The confidentiality matrix provides a listing of
  - 4 capital items submitted for approval, their attachments, and their confidentiality status so
  - 5 that the Board may evaluate the confidential portions of the ACE Plan. NS Power has
  - 6 minimized the information for which it seeks confidential treatment in this Application in
  - 7 order to facilitate transparency.
  - 8
  - 9 • **Listing of all 2021 ACE Plan projects in Excel format (Appendix B)** – This provides
  - 10 the Board and interested parties a convenient reference of all expenditures in 2021,
  - 11 regardless of whether they are submitted for approval in the ACE Plan. Details include
  - 12 Capital Item Numbers (CI #s), names, functional class, and investment details.
  - 13
  - 14 • **Updated Q3 Capital Reports (Appendix C)** – NS Power’s Q3 capital reports, submitted
  - 15 to the NSUARB on November 2, 2020, have been updated with 2021 ACE Plan projects
  - 16 submitted for approval and subsequent submittal, and provided in Excel format. The
  - 17 updated Q3 capital reports provide a comprehensive listing of the status of all “active”
  - 18 projects (i.e. those that have been submitted to the NSUARB or referenced on the ACE
  - 19 Plan subsequent submittal list and are currently underway).
  - 20
  - 21 • **The Excel version of NS Power’s Long-Term Capital Planning & Revenue**
  - 22 **Requirement table found in Section 11.1.1 (Appendix D)** – The table provides the Board
  - 23 and interested parties with the data required to examine the calculation and assumptions
  - 24 used to calculate the revenue requirement associated with NS Power’s ACE Plan
  - 25 expenditures.
  - 26
  - 27 • **2017-2020 Contingency Report (Appendix E)** – In accordance with the Board’s 2019
  - 28 and 2020 ACE Plan directives, a complete listing of projects submitted for approval in
  - 29 2017-2020 (either through or outside of the ACE Plan proceedings, including projects
  - 30 submitted for subsequent approval, but excluding U&U projects), that has been completed,
-

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1 including information as directed by the Board is provided in Excel format. Further detail  
2 relating to this directive can be found in Section 11.1.7.

- 3
- 4 • **Updated Guidebook for NS Power's Economic Analysis Model (EAM) (Appendix F)**  
5 – In accordance with the Board's 2020 ACE Plan directive, a copy of NS Power's updated  
6 EAM Guidebook is provided.

- 7
- 8 • **Non-Binding Contingency Guidelines (Appendix G)** – In accordance with the Board's  
9 2020 ACE Plan directive, a draft version of the guidelines was submitted to stakeholders  
10 on August 31, 2020. Further detail relating to this directive can be found in Section 4.1.

- 11
- 12 • **Thermal Generation Projects (Appendix H)** – In accordance with the Board's 2020 ACE  
13 Plan directive, a list of all projects in the 2021 ACE Plan for each of the thermal generating  
14 plants and units in a format similar to NS Power's response to 2020 ACE Plan NSUARB  
15 IR-17 is provided in Excel format.

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3.0 INTRODUCTION

3.1 2021 ACE Plan Summary

The Company's overall 2021 capital budget (inclusive of capital projects under \$1,000,000 and Point Aconi projects that do not require NSUARB approval, carryover spending, capital routines, and subsequent submittal items) is \$361.8 million. Within the overall 2021 ACE Plan budget, NS Power is requesting NSUARB approval of 16 capital work orders and the 2021 capital routine program, for a total approval amount of \$147.1 million.

Figure 1 and Figure 2 below illustrate NS Power's overall capital budget for 2021 and total forecast capital spending for 2022 through to 2025, as well as NS Power's total annual capital expenditures by function.

**Figure 1: NS Power Total Capital Spend: Historical, Budget and Forecast**  
(Millions of Dollars)



F = Forecast, B=Budget in above figure

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Figure 2: Total Annual Capital Expenditures by Function

(Millions of Dollars)

Year	Actuals						ACE Plan 2021	Forecast			
	2016	2017	2018	2019	2020 Q3 F*	2020 ACE Budget		2022	2023	2024	2025
Generation	\$115.8	\$129.6	\$100.2	\$129.7	\$84.2	\$140.1	\$149.6	\$188.2	\$177.2	\$146.2	\$124.8
Transmission	57.5	88.6	81.3	51.6	41.4	54.6	56.6	53.4	61.0	68.1	62.3
Distribution	68.8	79.1	114.6	166.8	141.4	122.8	97.5	70.1	70.6	71.1	71.6
General Plant	66.5	94.5	51.8	48.4	41.3	58.6	58.0	54.0	48.2	53.4	65.8
<b>Total</b>	<b>\$308.6</b>	<b>\$391.7</b>	<b>\$347.9</b>	<b>\$396.5</b>	<b>\$308.3</b>	<b>\$376.1</b>	<b>\$361.8</b>	<b>\$365.7</b>	<b>\$357.0</b>	<b>\$338.7</b>	<b>\$324.5</b>

\*The 2020 Q3 Forecast includes actuals up to July and forecast amounts for the remainder of the year.

Note: Totals may be off by \$0.1M due to rounding.

1  
2 NS Power's capital investments continue to focus on sustaining capital assets, representing cost-  
3 effective investments to maintain system performance for customers. The emphasis continues to  
4 be on making timely investments based on equipment condition and criticality and maintaining  
5 the performance of assets for customers.

6  
7 Generation, transmission, distribution and general plant (e.g. information technology) projects in  
8 the 2021 ACE Plan are subject to the Board-approved project selection and asset management  
9 methodologies pursuant to Section 6.2 of the CEJC. Only projects that provide value to customers  
10 are put forward for approval and completion.

11  
12 As shown in **Figure 3** and **Figure 4** below, projected costs associated with Sustaining Capital  
13 comprise the largest investment type for 2021, which is consistent over the next five years. NS  
14 Power's investments toward sustaining the Company's assets, customer driven investments  
15 required for load growth, and investments required by regulatory or environmental standards are  
16 forecast to be relatively stable over the next five years.

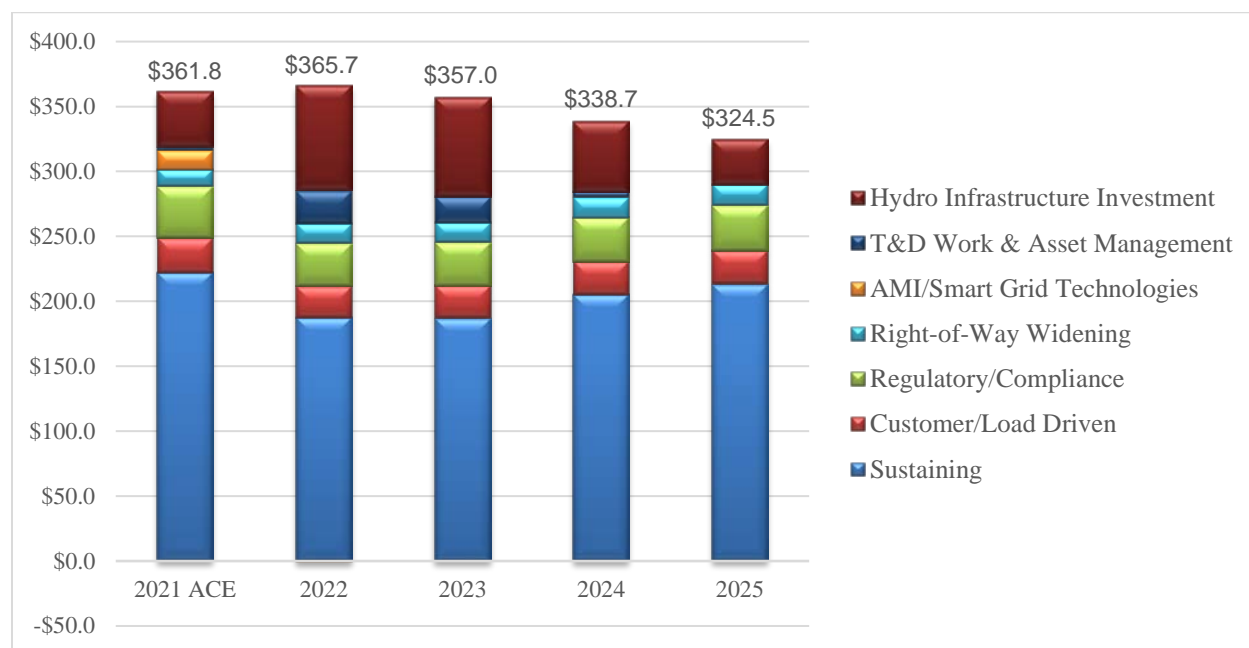
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**Figure 3: Breakdown of Capital Forecast by Investment Type**

(Millions of dollars)



**Figure 4: Breakdown of Capital Forecast by Investment Type**

(Millions of Dollars)

Investment Type	2021	2022	2023	2024	2025
Sustaining	\$222.4	\$187.5	\$187.2	\$205.1	\$213.3
Customer/Load Driven	26.7	24.3	24.8	25.3	25.8
Regulatory/Compliance	39.4	32.9	33.6	34.2	34.9
Right-of-Way Widening	13.1	15.1	15.4	15.7	16.0
AMI/Smart Grid Technologies	14.9	-0.5	0.0	0.0	0.0
T&D Work & Asset Management	2.4	25.9	19.5	4.5	0.0
Hydro Infrastructure Investment	42.8	80.5	76.6	53.9	34.5
	<b>\$361.8</b>	<b>\$365.7</b>	<b>\$357.0</b>	<b>\$338.7</b>	<b>\$324.5</b>

Note: Totals may be off by \$0.1M due to rounding.

Note: These figures are the Company's current forecast. The accuracy of these estimates will improve over time as new information informs the potential investments.

Section 11.1.1 of this Application (Impact of 2021 ACE Plan on Revenue Requirement and Affordability) shows that NS Power's capital expenditures for 2021-2025 reduce upward pressure on rates and revenue requirement cumulatively over the next five years. This takes into account

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1 the additional fixed cost recovery as a result of customer growth achieved through these capital  
2 investments made to serve new customers.

3  
4 **3.2 Relief Sought from the Board**

5  
6 NS Power respectfully requests Board approval of the following, in accordance with Section 35A  
7 of the *Public Utilities Act*:

- 8
- 9 • 16 Capital Items with 2021 budget investment of \$24.7 million and total project investment  
10 of \$53.0 million (please refer to Section 5.2); and
  - 11 • Capital routine programs with 2021 budget investment of \$94.1 million (please refer to  
12 Section 10.1).

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**4.0 2020 ANNUAL CAPITAL EXPENDITURE PLAN FOLLOW-UP**

This section addresses items arising from the 2020 ACE Plan. These items include a summary of the outcome of stakeholder engagement discussions, a list of subsequent submittal capital items from the 2020 ACE Plan that are planned to be submitted before year-end, as well as items from the 2020 ACE Plan that have been deferred or cancelled.

In addition to the items noted for stakeholder consultation, the Board provided the following additional directives in its 2020 ACE Plan Order, all of which NS Power has complied with in the 2021 ACE Plan:

- *To provide more detailed information in its quarterly reports on the timing and anticipated costs of any projects deferred as a result of the COVID-19 pandemic.<sup>2</sup> NS Power confirms it has complied with the Board's Directive; the Company has provided updates in its Q2 and Q3 capital reports, and will continue to provide this detail, as applicable, going forward.*
- *To fully consider all types of electric vehicles as an option for replacements to its fleet and report further in the 2021 ACE Plan application.<sup>3</sup> Please refer to Section 10.4.*
- *To provide the percentage of the estimated annual capital sustaining costs in the updated 2020 Hydro Interval Plan (HIP) that represent the expected archaeological and Mi'kmaq engagement costs associated with those capital sustaining costs, filed no later than August 31, 2020.<sup>4</sup> NS Power confirms it filed the revised HIP with the NSUARB on August 31, 2020.*
- *To file a copy of its updated Guidebook for its Economic Analysis Model (EAM), at the latest, with the filing of the 2021 ACE Plan.<sup>5</sup> Please refer to **Appendix F**.*

<sup>2</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 39.

<sup>3</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 40.

<sup>4</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 40.

<sup>5</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 40.

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- 1 • *In subsequent ACE Plan applications, to provide examples of cost minimization efforts*  
2 *during execution and construction from the prior year's projects, with project specific cost*  
3 *minimization examples being fully described.*<sup>6</sup> Please refer to Section 11.1.5 for further  
4 details on NS Power's cost minimization efforts.
  - 5 • *To develop non-binding guidelines describing how it determines when a capital cost*  
6 *estimate contingency amount is merited and at what level, and to submit the draft version*  
7 *of the guidelines to stakeholders by August 31, 2020.*<sup>7</sup> NS Power confirms the non-binding  
8 guidelines were circulated to stakeholders on August 31, 2020. Please refer to **Appendix**  
9 **G** for a copy of the guidelines.
  - 10 • *To continue to track the information related to contingency spending noted in Paragraph*  
11 *73 of the Board's 2019 ACE Plan Decision, with certain modifications.*<sup>8</sup> Please refer to  
12 **Appendix E.**
  - 13 • *To continue to track the information related to contingency spending, including*  
14 *information related to projects approved by the Board after 2020, and report it in*  
15 *subsequent ACE Plan applications.*<sup>9</sup> Please refer to **Appendix E.**
  - 16 • *To provide, for each of the thermal generating plants and units, a list of all projects that*  
17 *will be proposed in the 2021 ACE Plan. This information should be provided as part of the*  
18 *2021 ACE Plan, in a format similar to NS Power's response to 2020 ACE Plan NSUARB*  
19 *IR-17.*<sup>10</sup> Please refer to **Appendix H.**

21 **4.1 Stakeholder Engagement**

22  
23 The NSUARB provided the following directive in its Order approving the 2020 ACE Plan:

24  
25 NS Power is directed to engage with stakeholders on the issues identified in this  
26 Decision regarding the development of guidelines for contingency amounts, as well

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<sup>6</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 40.

<sup>7</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 40.

<sup>8</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, pages 40-41.

<sup>9</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 41.

<sup>10</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 41.

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1 as those which may contribute to regulatory efficiency, and to report on the  
2 outcome of the stakeholder engagement process in next ACE Plan application.<sup>11</sup>  
3

4 In relation to contingency guidelines, the Board provided the following in Directive 7:  
5

6 NS Power is directed to develop non-binding guidelines describing how it  
7 determines when a capital cost estimate contingency amount is merited and at what  
8 level, and to submit the draft version of the guidelines to stakeholders by August  
9 31, 2020.<sup>12</sup>  
10

11 In accordance with the NSUARB's directives, NS Power developed non-binding contingency  
12 guidelines and submitted a draft version of those guidelines to stakeholders on August 30, 2020.  
13 The Company held stakeholder engagement sessions with the Consumer Advocate (CA), Small  
14 Business Advocate (SBA), and counsel to the Industrial Group on September 10 and 23, 2020 and  
15 received written comments from both the CA and the SBA. In accordance with the Board's  
16 directives, the stakeholder engagement sessions focused on (1) the development of non-binding  
17 guidelines for contingency amounts; and (2) items which may contribute to regulatory efficiency  
18 (such as possible early filing of the ACE Plan, process efficiencies, and multi-year information).  
19 NS Power summarizes its position from those discussions as follows:  
20

21 (1) **Non-Binding Contingency Guidelines**  
22

23 NS Power incorporated comments received from stakeholders on its draft guidelines. A  
24 revised redline version of the contingency guidelines was provided to stakeholders on  
25 November 20, 2020.  
26

27 Please refer to **Appendix G** for NS Power's non-binding contingency guidelines, which  
28 incorporates feedback from stakeholders, and represents the codification of recommended  
29 practices from recognized industry sources. These guidelines supplement NS Power  
30 internal project management expertise, which considers uncertainty and risk inherent in the

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<sup>11</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Order, June 25, 2020, Directive 11.

<sup>12</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Order, June 25, 2020, Directive 7.

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1 scope of a project. These guidelines may be updated or revised as required to refine the  
2 Company's approach to applying project contingency.

3  
4 As outlined in the non-binding contingency guidelines, contingency is a line item within a  
5 capital project budget, which is based on the level of risk inherent in the scope at the time  
6 of estimation, and contributes to the accurate estimation of project budgets by taking into  
7 account unknowns at the time of capital project application submission. NS Power notes  
8 that the non-binding contingency guidelines are one additional tool that NS Power will  
9 consult prior to setting contingency amounts, if applicable. NS Power evaluates projects  
10 on a case by case basis, and the requirement for and level of contingency applied is  
11 dependent on the level of uncertainty within a project. When a project amount is approved  
12 by the NSUARB, which includes any applicable contingency, NS Power uses various cost  
13 minimization and asset management mechanisms, to ensure lowest costs and best value for  
14 customers.

15  
16 NS Power appreciates the stakeholder feedback, and commits to continued evaluation of  
17 the contingency guidelines. Further to stakeholder feedback, NS Power will:

- 18
- 19 • Review historical Company project data to inform the selection of contingency for  
20 projects within the ranges set out in the contingency guidelines.
  - 21
  - 22 • For the 2022 ACE Plan and beyond, develop checklists for larger capital projects  
23 (either on the approval or subsequent submittal list).
  - 24
  - 25 • Provide supplemental information with the detailed cost estimates for projects with  
26 higher contingency amounts.
  - 27
-

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(2) **Regulatory Efficiencies**

- **ACE Plan Filing Date**

NS Power also discussed with stakeholders issues relating to the timing of the ACE Plan filing.

The CA provided comments related to gradually moving the filing of the ACE Plan earlier in the calendar year, with the goal of ultimately having an ACE Plan hearing before the end of the calendar year. Although NS Power sees the value of continuing to work towards this goal, the Company's historical filing timeline is to ensure the Company can include as many projects as possible for the following year, which provides the Board, stakeholders and customers with a more complete view of the capital plan for the year ahead. As such, NS Power tries to balance (1) the requirement to complete its asset condition assessments to identify necessary capital projects for the following year; while (2) filing the ACE Plan to enable timely review and assessment by stakeholders and the NSUARB. Further to the CA's comments, NS Power also welcomes the opportunity to work with the NSUARB to assist in development of an ACE Plan schedule that balances the need for a transparent capital process with regulatory efficiencies.

In relation to the ACE Plan filing date, the Board provided the following in its Decision:

The Board notes that the 2020 ACE Plan was filed on November 27, 2020, later than the date indicated. There was no explanation for this, and therefore, the Board directs this matter to further stakeholder engagement, with a report on the engagement to be filed with the Board in its next ACE Plan application. The Board expects that if NS Power is unable to file its application in the time

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1 determined to be feasible, an explanation will appear in the  
2 application.<sup>13</sup>  
3

4 The COVID-19 pandemic has presented a number of challenges for NS Power, and  
5 this has made it more difficult than expected to advance the filing date of this plan  
6 to mid-November. For example, some inspection work that occurs early in the year  
7 and informs the ACE plan could not be completed until later in the year than is  
8 typical.  
9

10 • **Multi-Year Information**  
11

12 During stakeholder engagement, the CA suggested inclusion of additional  
13 information regarding capital expenditures for multiple years to better understand  
14 how the current capital year fits into the Company's broader overall strategy.  
15

16 The Company provides multi-year information in various sections of the ACE Plan.  
17 For example, Figures 1, 2, 3 and 4 of the 2020 ACE Plan provide historical and  
18 future spending forecasts out to year 2024, broken out into various asset and capital  
19 categories. Corresponding commentary is provided regarding this multi-year  
20 information.  
21

22 In NS Power's view, the presentation of multi-year information is sufficient within  
23 the Company's ACE Plans, but the Company welcomed comments on this item.  
24 No additional feedback was provided by stakeholders regarding inclusion of  
25 additional multi-year information within the Company's ACE Plans.  
26

27 **4.2 2020 Capital Items Pending Submission**  
28

29 The NSUARB provided the following directive in its 2017 ACE Plan Order:

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<sup>13</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Decision, June 25, 2020, page 37.

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1  
2 9. The Board directs NSPI to include, as part of their annual ACE Plan submissions,  
3 a list of projects which appear as items for subsequent submission in a prior years'  
4 ACE Plan filing, which have not been submitted for approval at the time of an ACE  
5 Plan filing, but which NSPI intends to submit by the end of the calendar year.<sup>14</sup>  
6

7 **Figure 5** sets out projects included in the 2020 ACE Plan as items for subsequent approval, but  
8 not yet submitted to the Board. NS Power has identified 2 subsequent submittal items that it  
9 anticipates will be filed with the NSUARB for approval by the end of 2020. These projects will  
10 carry over into 2021 and total \$14.5 million of 2021 forecast spending. These budget numbers  
11 were estimated at the time the 2021 ACE Plan was prepared and are subject to change as the scope  
12 and details of the projects are refined.

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<sup>14</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Order, April 4, 2017.

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**Figure 5: Pending 2020 Subsequent Submittal Items**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)
<b>Hydro</b>			
C0014218	HYD - WRC LEM Balance of Plant	13,927,993	21,186,378
	<i>This is the second project of the Wreck Cove Life Extension &amp; Modernization (LEM). This project incorporates the balance of system upgrades associated with the Wreck Cove Generating Station. These systems will include; Cooling Water, Air and Hydraulic Systems, Switchgear and other support systems for the generating units.</i>		
<b>Total New Hydro Generation Spending for Subsequent Approval</b>		<b>13,927,993</b>	<b>21,186,378</b>
<b>General Plant</b>			
C0021826	IT - Enterprise Data Lake	543,983	1,260,147
	<i>This project will implement a modern, cloud-based, enterprise data infrastructure, commonly referred to as a “data lake”, which is a large-scale repository of data and a set of processes that extract data from production systems and integrate data needed for reporting and analytics in a single source, allowing safe, secure access to data without jeopardizing the performance of production systems. (Note: This CI was originally titled IT - Enterprise BIA Phase 1. The scope of this CI has now been reduced to just the Enterprise Data Lake and the project title has been updated accordingly. Other initiatives have been separated into other CIs and will be filed separately.)</i>		
<b>Total New General Plant Spending for Subsequent Approval</b>		<b>543,983</b>	<b>1,260,147</b>
<b>Total Capital Items for Subsequent Approval</b>		<b>14,471,976</b>	<b>22,446,525</b>

**4.3 2020 ACE Plan Subsequent Submittal List Status Update**

**Figure 6** below provides an update to the list of projects that were identified by NS Power in the 2020 ACE Plan for later submission for NSUARB approval.

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**Figure 6: Subsequent Submittal Project Status Update**

CI#	Project Title	ACE 2020		Updated		Status
		2020 Budget (\$)	Project Total (\$)	2020 Budget (\$)	Project Total (\$)	
Generation						
C0014218	HYD WRC LEM Balance of Plant	473,687	22,700,620	2,002,827	21,186,378	2020 ACE Plan Pending Submission
C0020385	LIN Heavy Oil Tank Refurbishment	1,148,417	1,162,325	74,967	3,268,105	To be refiled
Transmission						
C0021140	New 138KV-25KV Substation - Stellarton	1,136,018	5,057,118	-	-	Deferred to 2022
C0022247	1N-Onslow 138 kV Add Second 42 MVA Power Transformer	501,941	4,506,388	-	-	Deferred to 2022
C0010956	78W Substation Relocation and New Power Transformer	405,071	2,542,645	-	-	Deferred to 2022
Distribution						
C0010778	Smart Grid Nova Scotia Project	4,647,015	6,740,589	4,829,834	7,053,622	Approved
C0008638	Cogswell HRM Redevelopment Program	595,593	5,628,280	70,826	2,904,326	Deferred to 2021
C0019379	50N-410 - 4C-430 Highway 104 Twinning	1,253,815	1,361,237	1,057,570	1,137,223	Approved
General Plant						
46075	IT - T&D WAM Phase 2 – Work Management and Scheduling & Dispatch	9,928,272	45,566,358	506,503	55,899,483	2021 ACE Plan Subsequent Submission
C0010019	IT - ADMS Upgrade	4,992,828	8,962,442	7,454,976	9,626,891	Approved
C0021826*	IT - Enterprise BIA Phase 1	3,133,303	5,248,884	716,164	1,260,147	2020 ACE Plan Pending Submission
C0021108	2020/2021 LIIR Deployment Project	453,930	5,092,708	-	-	Deferred to 2022
C0021805	IT - Microsoft EA Renewal 2020	2,584,139	2,584,139	3,139,727	3,139,727	Approved
C0023622	AMO Substation and Transmission APM Program	572,832	2,087,848	907,391	2,217,589	Approved
C0023623	AMO Distribution APM Program	468,681	1,708,240	634,359	1,721,484	Approved
49859	IT - Windows Server 2008 Upgrade	164,466	1,183,310	164,466	1,183,310	Approved

\*Note: This CI was originally titled IT - Enterprise BIA Phase 1. The scope of this CI has now been reduced to just the Enterprise Data Lake and the project title has been updated accordingly. Other initiatives have been separated into other CIs and will be filed separately.

- 1
- 2 **4.4 2020 ACE Capital Items Deferred / Cancelled**
- 3
- 4 NS Power's list of deferred and cancelled capital work orders relative to the 2020 ACE Plan is
- 5 contained in **Figure 7**. Given the timing of the filing of this Application, **Figure 7** does not include

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2020 ACE Plan Subsequent Submittal items that are planned to be submitted after this Application has been filed and prior to 2020 year-end and does not include additional 2021 expenditures.

These 62 projects were originally included in the 2020 ACE Plan with a forecast investment of \$5.5 million in 2020. Five of these projects have been cancelled, while 57 have been deferred to future years.

The COVID-19 pandemic was a factor in the deferral of 31 projects in the 2020 ACE Plan to future years, with approximately \$5.3 million of 2020 capital investments deferred to 2021 and 2022. As previously noted, NS Power will continue to evaluate workplans to balance capital investments in the context of the COVID pandemic, while minimizing the impact on overall project costs going forward.

Of the 62 projects listed, no projects were included in the 2020 ACE Plan for approval. Five of these projects were listed in the 2020 ACE Plan subsequent submittal list, to be filed separately as individual capital items, and 57 projects were listed in the 2020 ACE Plan as projects under \$1,000,000.

**Figure 7: 2020 ACE Items – Deferred or Cancelled**

CI	Project Title	2020 ACE Project Total	Cancelled/ Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
<b>Generation</b>							
C0019904	HYD - Safety Boom Deployment Vessel <i>Deferred due to a delay in RFP responses from vendors in 2020.</i>	191,692	Deferred	2022		Less than \$1M	
C0020644	AMO TUC3 Turbine Supervisory System Upgrade <i>Delays in the execution of CI C0020685, AMO TUC2 Turbine Supervisory System Upgrade, has resulted in the deferral of this project.</i>	126,441	Deferred	2021		Less than \$1M	Less than \$1M
C0020842	POT Turbine Generator Fire Protection <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	454,769	Deferred	2021		Less than \$1M	Less than \$1M



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Figure 7: 2020 ACE Items – Deferred or Cancelled

CI	Project Title	2020 ACE Project Total	Cancelled/Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
C0011116	POT - Acid Skid for WWTP <i>Higher priority work limiting available resources in 2020.</i>	138,183	Deferred	2022		Less than \$1M	
C0020362	TRE5 5-2 BFP Refurbishment <i>Higher priority work limiting available resources in 2020.</i>	197,263	Deferred	2022		Less than \$1M	
C0020363	TRE5 5-1 Pulverizer Refurbishment <i>Higher priority work limiting available resources in 2020.</i>	173,625	Deferred	2022		Less than \$1M	
C0010331	TRE6 Precipitator Controls Upgrade <i>Higher priority work limiting available resources in 2020.</i>	166,711	Deferred	2022		Less than \$1M	
C0020364	TRE5 Stack Access <i>Higher priority work limiting available resources in 2020.</i>	155,128	Deferred	2021		Less than \$1M	Less than \$1M
C0020310	TRE Roofing Anchor Points <i>Higher priority work limiting available resources in 2020.</i>	152,181	Deferred	2022		Less than \$1M	
C0020366	TRE5 Precipitator Refurbishments <i>Higher priority work limiting available resources in 2020.</i>	146,770	Deferred	2022		Less than \$1M	
C0020367	TRE5 Main Oil Pump & Gearbox Refurbishment <i>Higher priority work limiting available resources in 2020.</i>	101,461	Deferred	2022		Less than \$1M	
52152	TRE5 Relay Room and Cable Spreading Area - Fire Protection <i>Higher priority work limiting available resources in 2020.</i>	96,945	Deferred	2022		Less than \$1M	
C0020797	TRE5 4160V Switchgear Room Fire Sealant <i>Higher priority work limiting available resources in 2020.</i>	47,633	Deferred	2022		Less than \$1M	
C0010321	TRE5 Parallel Slide Valve Replacement <i>Higher priority work limiting available resources in 2020.</i>	649,217	Deferred	2021		Less than \$1M	Less than \$1M
C0020325	TRE5 Pulverizer Fuel Line Refurbishment Phase 2 <i>Higher priority work limiting available resources in 2020.</i>	265,618	Deferred	2022		Less than \$1M	

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**Figure 7: 2020 ACE Items – Deferred or Cancelled**

CI	Project Title	2020 ACE Project Total	Cancelled/ Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
C0020332	TRE5 ACW Piping to Coolers Replacement <i>Higher priority work limiting available resources in 2020.</i>	148,148	Deferred	2022		Less than \$1M	
C0020337	TRE5 Low Load Valve Refurbishment <i>Higher priority work limiting available resources in 2020.</i>	147,155	Deferred	2022		Less than \$1M	
C0020336	TRE5 Wire Cable Sprinkler Protection <i>Higher priority work limiting available resources in 2020.</i>	122,260	Deferred	2022		Less than \$1M	
C0020305	TRE Common Water Replacement 2020 <i>Higher priority work limiting available resources in 2020.</i>	107,540	Deferred	2022		Less than \$1M	
C0021468	TUC Waste Water Treatment Plant Roof Replacement <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	295,465	Deferred	2022		Less than \$1M	
C0021723	TUC Parking Lot Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	245,305	Deferred	2022		Less than \$1M	
C0021469	TUC Facilities Upgrade Phase3 <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	219,439	Deferred	2022		Less than \$1M	
C0021423	TUC Auxiliary Boiler PLC/DCS Upgrades <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	120,398	Deferred	2021		Less than \$1M	Less than \$1M
C0021464	TUC Turbine Air Dehumidifier Units <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	120,225	Deferred	2022		Less than \$1M	
C0021607	TUC1 Boiler Flue Gas Containment <i>Deferred due to the forecasted unit utilization of Tufts Cove Unit 1.</i>	107,591	Deferred	2022		Less than \$1M	
C0021463	TUC Turbine Bay Louvers Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	99,167	Deferred	2022		Less than \$1M	

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Figure 7: 2020 ACE Items – Deferred or Cancelled

CI	Project Title	2020 ACE Project Total	Cancelled/Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
C0021602	TUC Telehandler Forklift <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	75,790	Deferred	2021		Less than \$1M	Less than \$1M
C0021402	TUC Oil Tanks Levels and Pump House Controls Upgrade <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	73,594	Deferred	2021		Less than \$1M	Less than \$1M
C0021605	TUC Electrical Rooms Underground Upgrade <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	50,772	Deferred	2021		Less than \$1M	Less than \$1M
C0021606	TUC Cation Chromatograph Replacement <i>NS Power has utilized other alternative technical solutions to mitigate risk and avoid replacement at this time.</i>	39,861	Cancelled			Less than \$1M	
C0021562	TUC1 CW Intake Canal Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	146,103	Deferred	2022		Less than \$1M	
52276	TUC1 Obsolete Valve Replacement <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	99,635	Deferred	2022		Less than \$1M	
C0020842	POT Turbine Generator Fire Protection <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	454,769	Deferred	2021		Less than \$1M	Less than \$1M
C0021502	TUC1 FD Fan VIV Actuator Replacement <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	72,411	Deferred	2022		Less than \$1M	
C0021470	TUC1 Natural Gas Valves Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	43,810	Deferred	2021		Less than \$1M	Less than \$1M
C0020664	TUC3 Online Generator Monitoring <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	126,723	Deferred	2022		Less than \$1M	
49670	TUC1 4kV/600V Breaker Replacement	97,431	Deferred	2021			

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Figure 7: 2020 ACE Items – Deferred or Cancelled

CI	Project Title	2020 ACE Project Total	Cancelled/ Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
	<i>This project has been deferred due to restrictions related to the COVID pandemic.</i>					Less than \$1M	Less than \$1M
C0020744	LIN1 - Boiler Erosion Reduction System Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	403,089	Deferred	2021		Less than \$1M	Less than \$1M
C0019499	LIN1 RH Tube Replacement 2020 <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	311,584	Deferred	2021		Less than \$1M	Less than \$1M
49447	LIN Steam Drum Level Controls Upgrade <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	122,348	Deferred	2021		Less than \$1M	Less than \$1M
C0020263	LIN Coal Stacker MCC Upgrade <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	190,057	Deferred	2021		Less than \$1M	Less than \$1M
52038	LIN Precipitator Pressurizing Fan Replacement <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	173,707	Deferred	2022		Less than \$1M	
C0020604	ICP Street Crossing Light Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	222,515	Deferred	2021		Less than \$1M	Less than \$1M
C0020622	ICP Main Coal Storage Liner Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	199,439	Deferred	2021		Less than \$1M	Less than \$1M
C0020602	ICP Silo Liner Replacement <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	133,269	Deferred	2021		Less than \$1M	Less than \$1M
C0020570	ICP Conveyor Hydraulics Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	75,176	Deferred	2021		Less than \$1M	Less than \$1M
C0020603	ICP Locomotive Traction Motor Refurbishment <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	71,341	Deferred	2022		Less than \$1M	

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**Figure 7: 2020 ACE Items – Deferred or Cancelled**

CI	Project Title	2020 ACE Project Total	Cancelled/Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
C0020567	ICP Ventilation Upgrades <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	72,907	Deferred	2021		Less than \$1M	Less than \$1M
<b>Transmission</b>							
C0022743	Retire 9H-Yale Street Substation <i>The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.</i>	188,681	Cancelled			Less than \$1M	
C0022742	Retire 6S-Terrace Street <i>The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.</i>	158,264	Cancelled			Less than \$1M	
C0021149	Retire 4H-Marginal Rd Substation <i>The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.</i>	45,033	Cancelled			Less than \$1M	
C0021140	New 138KV-25KV Substation - Stellarton <i>Deferred due to delays in land acquisition and design planning.</i>	1,136,018	Deferred	2022		Subsequent Submittal	
C0022783	2020/2021 Generation Related Power Transformer Refurbishments <i>Higher priority work limiting available resources in 2020.</i>	469,001	Deferred	2021		Less than \$1M	Less than \$1M
C0022247	1N-Onslow 138 kV Add Second 42 MVA Power Transformer <i>Forecast additional load that determined the need for this project did not materialize and the project has now been deferred.</i>	501,941	Deferred	2022		Subsequent Submittal	
C0010956	78W Substation Relocation and New Power Transformer <i>Deferred due to delays in land acquisition and design planning.</i>	405,071	Deferred	2022		Subsequent Submittal	

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Figure 7: 2020 ACE Items – Deferred or Cancelled

CI	Project Title	2020 ACE Project Total	Cancelled/ Deferred	Deferred To	Prior Approval	Prior ACE Plan Reference	2021 ACE Plan Reference
<b>Distribution</b>							
C0020830	85S-401 Cape Smokey Build to Roadside <i>Build to roadside work was contingent on the completion of Transportation Infrastructure Renewal work in the area which will not be completed until late 2020.</i>	255,732	Deferred	2021		Less than \$1M	Less than \$1M
C0008638	Cogswell HRM Redevelopment Program <i>Deferred due to ongoing discussions with HRM.</i>	595,593	Deferred	2021		Subsequent Submittal	Subsequent Submittal
<b>General Plant</b>							
C0021838	IT - Customer Billing Enhancements <i>This project's identified scope will now be completed along with CI C0031002 - IT - Customer Billing &amp; Payment Solution.</i>	211,012	Cancelled			Less than \$1M	
C0022002	IT - Storm Centre Upgrade <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	193,269	Deferred	2021		Less than \$1M	Less than \$1M
C0021108	2020/2021 LIIR Deployment Project <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	453,930	Deferred	2022		Subsequent Submittal	
C0021133	SCADA Mobile Application <i>This project has been deferred due to restrictions related to the COVID pandemic.</i>	258,001	Deferred	2021		Less than \$1M	Less than \$1M
49094	IT - Privilege Access Management <i>Higher priority work limiting available resources in 2020.</i>	334,338	Deferred	2021		Less than \$1M	Request Approval

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**5.0 2021 ANNUAL CAPITAL EXPENDITURE PLAN**

**5.1 Summary of Expenditures**

**Figure 8** below provides the proposed capital investment by category for NS Power's 2021 ACE Plan. This Application seeks NSUARB approval of the 2021 routine capital and other 2021 projects, which total approximately \$118.8 million of forecast investment in 2021. Certain items do not require NSUARB approval but are included in NS Power's annual capital plan for transparency and informational purposes. The 2021 ACE Plan budget also includes investment on multi-year projects that were previously approved by the NSUARB (Carryover Projects).

**Figure 8: 2021 Capital Investments by Category**

(Millions of dollars)

2021 ACE Spend	2021 NSUARB Approval Request	NSUARB Approval Not Required	Capital Items Forecast for Later Filing & Approval in 2020/2021	Previously Approved Capital Projects with 2021 Carryover	2021 ACE Plan
Capital Item Approval Sought through the 2021 ACE Process (Including Routine Capital Projects)	118.8				<b>118.8</b>
2020 ACE Plan Items Pending Submission in 2020			14.5		<b>14.5</b>
Capital Items Submitted for Later Approval in 2021			20.9		<b>20.9</b>
2021 Carryover Projects				139.7	<b>139.7</b>
Capital Items Less Than \$1M		51.8			<b>51.8</b>
Point Aconi Capital Spend		16.1			<b>16.1</b>
<b>2021 ACE Plan</b>	<b>\$118.8</b>	<b>\$67.8</b>	<b>\$35.4</b>	<b>\$139.7</b>	<b>\$361.8</b>

Note: NS Power is seeking approval of \$94.1 million of routine investment in 2021.

Note: Figures presented in the ACE Plan document reflect rounding differences on some line items.

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**5.2 2021 ACE Plan Capital Items Submitted for Approval**

**Figure 9** below provides the list of 16 new Capital Items for which NS Power seeks NSUARB approval in the 2021 ACE Plan, totaling approximately \$24.7 million of spending in 2021, with a total forecast investment of approximately \$53.0 million.

**Figure 9: 2021 Capital Items Submitted for Approval**

Tab #	CI#	Project Title	2021 Budget (\$)	Project Total (\$)
<b>Generation</b>				
<b>Steam Turbine</b>				
G01	C0030528	TUC3 HP Turbine Refurbishment	2,085,088	2,085,094
<b>Total New Steam Spending</b>			<b>\$2,085,088</b>	<b>\$2,085,094</b>
<b>Gas Turbine</b>				
G02	C0020944	LM6000 - 191-443 Hot Section Engine Refurbishment	473,200	5,749,282
G03	46483	CT - TUS Control System Upgrade	1,046,322	1,046,322
<b>Total New Gas Turbine Spending</b>			<b>\$1,519,522</b>	<b>\$6,795,604</b>
<b>Total New Generation Spending</b>			<b>\$3,604,610</b>	<b>\$8,880,698</b>
<b>Transmission</b>				
T01	C0031263	2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	3,082,728	7,512,226
T02	C0031089	2021/2022 Transmission Right-of-Way Widening 69kV	2,015,923	5,288,520
T03	C0031122	L6539 Replacements and Upgrades	1,410,921	2,821,842
T04	C0031085	L6516 Line Replacement and Upgrades	1,384,963	2,730,592
T05	C0031050	New Spare Large Autotransformer	976,198	2,398,564
T06	C0033644	2021/2022 Steel Tower Life Extension	793,248	2,332,746
T07	C0033645	2021/2022 Steel Tower Refurbishment	1,190,655	1,944,005
T08	C0031069	L6020 Replacements and Upgrades	926,286	1,825,300
T09	C0031262	2020/2021 Transmission Switch and Breaker Replacement	814,495	1,483,048
T10	C0031064	L5054 Replacements and Upgrades	1,045,362	1,134,737
<b>Total New Transmission Spending</b>			<b>\$13,640,779</b>	<b>\$29,471,580</b>
<b>Distribution</b>				



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**Figure 9: 2021 Capital Items Submitted for Approval**

Tab #	CI#	Project Title	2021 Budget (\$)	Project Total (\$)
D01	C0031083	New Distribution Rights-of-Way Phase 6	4,160,074	9,762,735
D02	C0031145	2021 Padmount Replacement Program	1,379,040	1,636,153
<b>Total New Distribution Spending</b>			<b>\$5,539,114</b>	<b>\$11,398,887</b>
<b>General Plant</b>				
GP01	49094	IT - Privilege Access Management (PAM)	1,962,056	3,211,166
<b>Total New General Plant Spending</b>			<b>\$1,962,056</b>	<b>\$3,211,166</b>
<b>Total New Capital Spending</b>			<b>\$24,746,559</b>	<b>\$52,962,331</b>
<b>Total Routine Capital Spending</b>			<b>\$94,090,144</b>	<b>\$94,090,144</b>
<b>Total Capital Items for which Approval is Sought</b>			<b>\$118,836,702</b>	<b>\$147,052,475</b>

**5.3 2021 ACE Plan Capital Items Forecast for Subsequent Approval**

**Figure 10** below identifies 2021 projects forecast in excess of \$1 million that are not yet ready for submission to the NSUARB but which NS Power anticipates will be filed for review and approval in 2021. NS Power estimates approximately \$20.9 million of investment in 2021 on these projects, which are currently estimated for total investment of approximately \$230.1 million. The budget numbers indicated below are estimates as NS Power needs additional time to refine the specific project budget proposals. This section of the application is designed to provide an indication of these anticipated 2021 projects.

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Figure 10: 2021 Capital Items Forecast for Subsequent Submittal

CI#	Project Title	2021 Budget (\$)	Project Total (\$)
<b>Generation</b>			
<b>Hydro</b>			
39472	HYD - Mersey Redevelopment Phase 1  <i>This project is the first phase of the re-development of the Mersey Hydro System and includes the replacement of the Big Falls Powerhouse, the Big Falls Control Structure and the redevelopment of the Big Falls Substation</i>	9,441,871	159,822,112
48913	HYD - Tusket Facility Refurbishment  <i>This project is for the structural stabilization and general refurbishment of the Tusket Powerhouse that has exceeded its expected useful life and now poses safety and security risks.</i>	1,061,936	2,544,240
49634	HYD - Trout River Diversion Screen Replacements  <i>This project for replacement of the current fish diversion screen structure to mitigate a leak in the Trout River Diversion dam.</i>	600,149	1,013,722
<b>Total New Hydro Spending for Subsequent Approval</b>		<b>\$11,103,955</b>	<b>\$163,380,074</b>
<b>Steam</b>			
C0026285	TRE Heavy Fuel Oil Tank Refurbishment  <i>This project is for the refurbishment of the Heavy Fuel Oil Tank at the Trenton Generating Station.</i>	1,644,255	1,732,921
<b>Total New Steam Spending for Subsequent Approval</b>		<b>\$1,644,255</b>	<b>\$1,732,921</b>
<b>Total New Generation Spending for Subsequent Approval</b>		<b>\$12,748,210</b>	<b>\$165,112,995</b>
<b>Distribution</b>			
C0008638	Cogswell HRM Redevelopment Program  <i>This project includes the costs associated with the proposed redevelopment of the Cogswell Interchange site by Halifax Regional Municipality. This project will require relocation of existing underground infrastructure and the addition and routing of new electrical feeds for additional load growth.</i>	300,967	2,904,326
47794	Heckman Island Underwater Cable Replacement  <i>This project provides for the replacement of the underwater cable to Heckman's Island near Lunenburg. The targeted underwater cable has reached its end of life and must be replaced due to age, condition and risk. In addition, the load on this cable has increased since its original installation and the cable can no longer support cold-load pick up.</i>	1,129,537	1,296,112

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**Figure 10: 2021 Capital Items Forecast for Subsequent Submittal**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)
<b>Total New Distribution Spending for Subsequent Approval</b>		<b>\$1,430,504</b>	<b>\$4,200,438</b>
<b>General Plant</b>			
46075	IT – T&D WAM Phase 2 – Work Management and Scheduling & Dispatch  <i>This project will upgrade and replace NS Power's T&amp;D Work &amp; Asset Management (WAM) and Scheduling &amp; Dispatch systems, respectively.</i>	2,403,362	55,899,483
C0021839	IT - Customer Energy Insights Management  <i>This project will implement a solution to provide residential customers details of their energy consumption.</i>	2,351,875	2,560,958
C0030987*	IT - NERC CIP Environment Refresh  <i>This project is to refresh required NERC CIP infrastructure in the Control Centre and substations.</i>	1,318,786	1,318,786
C0011167	IT - Backup Infrastructure Upgrade  <i>This project will upgrade NS Power's backup infrastructure</i>	652,768	1,015,253
<b>Total New General Plant Spending for Subsequent Approval</b>		<b>\$6,726,791</b>	<b>\$60,794,480</b>
<b>Total Capital Items for Subsequent Approval</b>		<b>\$20,905,505</b>	<b>\$230,107,912</b>

\*Capital Item Related to NERC and/or NPCC Standards

**5.4 2021 ACE Plan Capital Items with Estimated Total Project Cost of Less Than \$1,000,000**

**Figure 13** below sets out capital items with a total project cost of less than \$1,000,000. These projects do not require NSUARB approval but are provided for transparency and informational purposes.

Similar to 2020, the information in this section has been expanded in the 2021 ACE Plan in accordance with the agreement reached with stakeholders pursuant to NS Power's report provided to the NSUARB on September 5, 2017. Historical dollar values and numbers of projects are provided in **Figure 11** and **Figure 12** below, respectively. The table of projects under \$1,000,000 includes brief descriptions of all projects and rankings of those projects in accordance with NS Power's asset management methodology as described in Section 6.2 of the CEJC.

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**Figure 11: Historical Value of Projects Less Than \$1M**

(Millions of dollars)

Value of Projects Less than \$1M (\$)				
Function	2018	2019	2020	2021
Gas Turbine	2.1	2.4	2.4	2.2
Steam	29.6	33.3	34.4	28.5
Hydro	7.5	2.6	2.9	1.9
Wind	0.0	0.3	0.0	0.9
Transmission	6.6	1.6	2.8	2.7
Distribution	9.2	4.7	3.7	8.1
General Plant	5.9	3.1	5.1	7.5
Total	\$60.8	\$48.0	\$51.2	\$51.8

Note: Totals in the tables above may be off due to rounding

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**Figure 12: Historical Number of Projects Less Than \$1M**

# of Projects Less than \$1M				
Function	2018	2019	2020	2021
Gas Turbine	16	13	26	12
Steam	124	136	162	137
Hydro	20	8	12	6
Wind	0	2	0	3
Transmission	13	5	12	8
Distribution	25	16	12	23
General Plant	25	16	18	29
Total	223	196	242	218

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
<b>Generation</b>						
<b>Hydro</b>						
C0028323	HYD - GIS Bypass Valve Refurbishment	784,097	965,569	4	4	16
<i>This project is for the refurbishment of the diffuser valve that allows water control at Gisborne reservoir when the hydro unit is unavailable.</i>						
C0032083	HYD - Mersey System Headcover Refurbishment	392,740	392,740	4	4	16
<i>This project is for sustaining mechanical unit investment on the Mersey River Hydro System.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
41605	HYD - Avon Arc Flash Upgrades	360,378	360,378	4	4	16
This project is for the implementation of disconnects, remote racking and relays as required to reduce arc flash risk on the Avon Hydro System.						
C0031093	HYD - SHH Interconnection Protection Panels	139,781	332,172	4	4	16
This project is for the replacement of protection panels at Ruth Falls and Malay Falls Hydro Plants for line protection and bus protection/synchronizing.						
C0032082	HYD - Mersey River Breaker Refurbishments	136,282	136,282	4	4	16
This project is for the refurbishment of switchgear and associated components on the Mersey River Hydro System.						
C0022843	HYD - TUS Powerhouse Fish Ladder Upgrade	66,579	88,713	4	4	16
This project is for refurbishments to the Tusket Powerhouse fish ladder to increase efficiencies for fish/aquatic attraction.						
Total Hydro Items Less Than \$1M		\$1,879,857	\$2,275,854			
Steam						
C0030862	POT - Coal Mill Refurbishment 2021	852,405	852,405	5	3	15
This project is for the replacement of welded steel rollers and tables with ceramic wear components, worm gear and shaft, vertical shaft and other non-repairable mill components.						
C0031177	TRE6 Mill Refurbishment 2021	783,899	783,899	5	4	20
This project is for the replacement of welded steel rollers and tables with ceramic wear components, worm gear and shaft, vertical shaft and other non-repairable mill components.						
C0031184	TRE6 Waterwall Panel Replacement 2021	772,605	772,605	4	4	16
This project includes the replacement of waterwall panels of the Trenton Unit 6 Boiler based on condition assessment.						
C0028502	LIN1 - Boiler Refurbishment 2021	719,327	719,327	5	4	20
This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Lingan Unit 1 boiler as part of the planned unit outage in 2021.						
C0030529	TUC3 Generator Refurbishment	706,226	706,226	5	3	15
This project will refurbish the Tufts Cove Unit 3 generator, including hydrogen seals, upshaft leads and end windings.						
C0028242	LIN - Mill Refurbishment 2021	703,702	703,702	4	4	16
This project is for the replacement of welded steel rollers and tables with ceramic wear components, worm gear and shaft, vertical shaft and other non-repairable mill components.						
C0028546	LIN3 - Boiler Refurbishment 2021	702,741	702,741	5	4	20
This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Lingan Unit 3 boiler as part of the planned unit outage in 2021.						
C0032864	POT - Main Turbine Valve Replacement	694,233	694,233	5	3	15
This project is for the replacement of the Main Turbine valves at the Point Tupper Generating Station.						
C0026106	TRE6 U&U 6A CW Screen Replacement	686,866	686,866	4	4	16
This project is for the replacement of one circulating water (CW) travelling screen for Trenton Unit 6.						
C0023682	TRE6 Mill Bullgear and Pinions	663,253	663,253	5	4	20
This project includes replacement of the bullgear and pinion on the Trenton Unit 6 6B Mill based on condition assessment.						
C0010321	TRE5 Parallel Slide Valve Replacement	639,450	639,450	4	4	16
This project is to replace the parallel slide valves on the Trenton Unit 5 Boiler.						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0028503	LIN4 - Boiler Refurbishment 2021	608,431	608,431	3	5	15
<i>This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Lingan Unit 4 boiler as part of the planned unit outage in 2021.</i>						
C0030982	TRE Asbestos Abatement 2021	599,392	599,392	5	3	15
<i>This project is for asbestos abatement in multiple areas of the Trenton Generating Station, in accordance with the Occupational Health and Safety Act (OHSA) and the Department of Labour's "Asbestos in the Workplace" guide.</i>						
C0031187	TRE6 - Boiler Refurbishment 2021	552,543	552,543	5	4	20
<i>This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Trenton Unit 6 boiler as part of the planned unit outage in 2021.</i>						
C0030605	LIN RO System Replacement	535,796	535,796	4	5	20
<i>This project is for the replacement of the Lingan Generating Station's reverse osmosis (RO) feed water pre-treatment system. The RO system is required to pre-treat the water supply that comes from a municipal source.</i>						
C0030942	POT - Boiler Refurbishment 2021	503,357	503,357	5	3	15
<i>This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Point Tupper boiler as part of the planned unit outage in 2021.</i>						
C0031202	PHB - Boiler Refurbishment 2021	484,514	484,514	5	4	20
<i>This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Port Hawkesbury Biomass boiler as part of the planned unit outage in 2021.</i>						
C0030488	TUC3 - Boiler Refurbishment 2021	474,419	474,419	5	3	15
<i>This project is to refurbish and replace deteriorated boiler tubes, tube bends and shields on the Tufts Cove Unit 3 boiler as part of the planned unit outage in 2021.</i>						
C0030582	ICP Rail System Refurbishment Program 2021	459,318	459,318	4	4	16
<i>This project is for the refurbishment of the rail system between the International Coal Pier and the Lingan Generating Station.</i>						
C0020842	POT Turbine Generator Fire Protection	452,006	452,006	3	5	15
<i>This project will upgrade the fire suppression system around the Point Tupper Turbine Generator.</i>						
C0031223	PHB - Precipitator Refurbishment 2021	446,126	446,126	4	4	16
<i>This project is for the refurbishment of the Port Hawkesbury Biomass precipitator through replacements of the precipitator's (P5) gas distribution screens and collectors' panels and electrodes with the addition of ducting to eliminate air and water infiltration.</i>						
C0025963	TRE CW Fish Barrier Cleaning System	442,732	442,732	3	5	15
<i>This project is for the addition of an automated cleaning rake to the Trenton circulating water (CW) Fish Barrier.</i>						
C0020744	LIN1 - Boiler Erosion Reduction System Refurbishment	428,510	429,506	3	5	15
<i>The scope of work for this project is to refurbish and replace deteriorated sections of the Boiler Erosion Reduction System made up of boiler erosion screens, envelope shields and flow baffles.</i>						
C0028302	LIN - CW Screen Refurbishment 2021	380,526	380,526	4	4	16
<i>This project is for work to be completed on two circulating water (CW) screens in 2021, based on condition assessments to be completed in 2021.</i>						
C0028842	LIN1 Turbine Valve Refurbishment	353,733	353,733	5	3	15
<i>This project will refurbish the upper and lower turbine main steam control valves (CV), the left and right combined reheat valves (CRV), and the turbine main stop valve (MSV) on Lingan Unit 1.</i>						
C0019499	LIN1 RH Tube Replacement 2020	345,096	346,779	4	4	16
<i>The scope of work for this project is to replace reheat tube bends that pass through the waterwall and connect to the reheat header.</i>						
C0030548	ICP - Rail Car Refurbishment 2021	277,666	277,666	4	4	16
<i>This project is for the refurbishment of coal delivery railcars. The refurbishment will be focused on the replacement of the shield over top of the center beam of the car which helps to protect the air brake lines from damage.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0029902	LIN Coal Crusher Replacement	272,830	272,830	4	4	16
<i>This project is for the replacement of one coal crusher at the Lingan Generating Station. The coal crusher is used to break up frozen or large pieces of coal on route to the coal silos.</i>						
C0030887	POT - Hydrogen Degas Panel Phase 2	256,345	256,345	4	4	16
<i>This project will install a non-powered vaporizer for the hydrogen degas panel to enable degassing of the unit from the control room therefore increasing the safety of this equipment.</i>						
C0030626	ICP Chute Replacement 2021	254,465	254,465	4	4	16
<i>This project is for the replacement of the conveyor chutes between the #6 and #5 conveyors, #4 and #5 conveyors, #4 and #7 conveyors, #3 to #4 conveyors. Conveyors are used to move fuel around the International Coal Pier as it is being unloaded from the shipping vessels and moved to be loaded on to rail cars.</i>						
C0029643	LIN4 ID Fan VIV Refurbishment	253,856	253,856	3	5	15
<i>This project is for the refurbishment of the variable inlet vanes (VIV) on the induced draft (ID) fan. These are required to control air flow in the boiler.</i>						
C0031209	PHB - Air Heater Refurbishment 2021	250,142	250,142	4	5	20
<i>This project is for the replacement of the tubes within the tubular air heater that are plugged and corroded on the air side.</i>						
C0031269	PTMT - E Crane Hydraulic Hose / Grease Lines	248,401	248,401	3	5	15
<i>This project is for the replacement of the E-Crane hydraulics hose and grease lines at the Point Tupper Marine Terminal.</i>						
C0026547	TUC Process Drain Upgrade	247,850	247,850	3	5	15
<i>This project will refurbish the underground drainage pipes which have broken in service in 2020.</i>						
C0030204	LIN WTP Chemical Pump Skid Replacement	241,704	241,704	3	5	15
<i>This project is for the replacement of the water treatment plant (WTP) chemical pump skids and associated piping and valves which has reached the end of its useful life. The chemical pump skids are required to transfer acid and control flow to the cation and anion demineralization trains.</i>						
C0030162	LIN Coal Amenities Building Replacement	239,677	239,677	3	5	15
<i>This project is for the replacement of the coal amenities building. The building is at the end of its useful life and requires a complete replacement.</i>						
C0030844	POT - Asbestos Abatement 2021	235,214	235,214	5	3	15
<i>This project is for asbestos abatement in multiple areas of the Point Tupper Generating Station, in accordance with the Occupational Health and Safety Act (OHSA) and the Department of Labour's "Asbestos in the Workplace" guide.</i>						
C0020604	ICP Street Crossing Light Refurbishment	227,309	227,309	3	5	15
<i>This project is for the refurbishment of the rail crossing light system on the rail system between the International Coal Pier and the Lingan Generating Station which require refurbishment to meet transport regulations.</i>						
C0030371	TUC DCS HMI Upgrade 2021	218,475	218,475	4	4	16
<i>This project will replace the obsolete Distributed Control System (DCS) Human Machine Interface (HMI) graphics for control room operation.</i>						
C0020263	LIN Coal Stacker MCC Upgrade	213,327	213,327	4	4	16
<i>This project is for the replacement of the coal stacker motor control centre (MCC) which is original to the plant and corroded allowing dust to enter the cabinet creating a safety hazard.</i>						
C0030622	LIN Wastewater Piping Replacement	212,090	212,090	4	5	20
<i>This project is for the replacement of sections of the wastewater line from the plant to the ash lagoon that have reached the end of their expected useful life. The piping is used to transfer all wastewater from the plant to ash lagoon for settling and treatment.</i>						
C0029802	LIN Ash Site Lagoon Refurbishment 2021	205,667	205,667	5	3	15
<i>This project is for refurbishments to the ash site lagoon to address deficiencies in the berm and spillway structures to allow for the continued integrity of the lagoon.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0030223	LIN Precipitator Refurbishment	201,639	201,639	4	4	16
<i>This project is for the refurbishment of the precipitator system which removes particulate from the flue gas flow at the Langan Generating Station that have reached the end of their expected useful life.</i>						
C0030362	LIN Coal Stacker Refurbishment	201,545	201,545	3	5	15
<i>This project is for the refurbishment of the coal stacker structure. The coal stacker is required to position coal on the live coal pile as it is delivered by rail to the Langan Generating Station and is an essential part of the coal delivery system.</i>						
C0020364	TRE5 Stack Access	201,292	201,292	4	4	16
<i>This project includes the refurbishment of ladders and platforms which provide access to the Trenton Unit 5 stack based on condition assessment.</i>						
C0031243	PHB - Turbine Block Valve #30	200,581	200,581	4	4	16
<i>This project is for the refurbishment of the Turbine Block valve #30 at the Port Hawkesbury Biomass Plant.</i>						
C0030006	LIN WTP Resin Replacement	199,852	199,852	3	5	15
<i>This project is for the replacement of the ion exchange resin at the water treatment plant (WTP). Ion exchange resin is used to remove contaminants from the feedwater.</i>						
C0031242	PHB - Conveyors & Handling Systems 2021	199,835	199,835	4	4	16
<i>This project is for the replacement of components on the secondary biomass fuel handling system including wear components on a drag chain conveyor, belt conveyor, screws and other fuel handling equipment.</i>						
C0030905	POT - GSCW Pump & Motor Replacement	199,284	199,284	4	4	16
<i>This project is for the replacement and additions to the general service cooling water (GSCW) system at the Point Tupper Generating Station.</i>						
C0020622	ICP Main Coal Storage Liner Refurbishment	198,741	198,741	5	3	15
<i>This project is to refurbish the impervious liner under the main coal storage area at the International Coal Pier.</i>						
C0021423	TUC - Auxiliary Boiler PLC/DCS Upgrades	174,334	174,334	3	5	15
<i>This project will upgrade the controls system for the Tufts Cove Auxiliary boiler.</i>						
C0031063	TRE Ash Site Management 2021	172,852	172,852	4	4	16
<i>This project includes the intermediate cover of exposed ash, pending final capping. This is required to meet environmental compliance.</i>						
C0029642	LIN Fire System Refurbishment 2021	164,615	164,615	4	4	16
<i>This project is for the refurbishment of the fire system in the coal system and plant proper. The work will include the replacement of piping, valves, sprinkler heads, gauges and pipe hangers to ensure the fire systems meet code.</i>						
C0028482	LIN1 Miscellaneous Valve Refurbishment 2021	161,635	161,635	4	5	20
<i>This project includes select valve refurbishments for Langan Unit 1 based on condition assessment.</i>						
C0030524	TUC2 Turbine Controls PLC Upgrade	53,769	156,628	4	4	16
<i>This project will replace obsolete electro-mechanical relays for the motor controls on the Tufts Cove Unit 2 turbine auxiliaries.</i>						
C0031742	LIN HFO/LFO Line Refurbishment	155,542	155,542	5	3	15
<i>This project is for the refurbishment of the heavy and light fuel oil lines.</i>						
C0030364	TUC Handrail Program 2021	152,780	152,780	5	4	20
<i>This project is for upgrades to handrails at Tufts Cove which are presently not the proper dimensions required by code.</i>						
C0028303	LIN Facilities Upgrades 2021	152,441	152,441	3	5	15
<i>This project is for renovations and upgrades of facilities original to the plant. This project will include work on the washrooms and control rooms.</i>						
C0028562	LIN3 Miscellaneous Valve Refurbishment 2021	151,697	151,697	4	4	16
<i>This project includes select valve refurbishments for Langan Unit 3 based on condition assessment and associated maintenance strategy.</i>						



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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0031189	TRE6 Main Feedwater Valve Replacement	150,666	150,666	5	4	20
<i>This project includes the replacement of the Trenton Unit 6 main feedwater valve based on condition assessment. This valve controls the flow of water to the boiler.</i>						
C0010333	TRE6 Air Heater Expansion Joint Refurbishment	150,149	150,149	3	5	15
<i>This project includes the refurbishment of the expansion joints on the boiler air preheater to improve efficiency and sustain reliable unit operation.</i>						
C0031266	POT - Miscellaneous Valve Refurbishment 2021	147,895	147,895	4	4	16
<i>This project includes select valve refurbishments for Point Tupper based on condition assessment and associated maintenance strategy.</i>						
C0028322	LIN Siding Refurbishment 2021	146,757	146,757	3	5	15
<i>This project is for the refurbishment of plant siding. The siding is original to the plant and is galbestos which contains asbestos in the coating. This project will focus on replacing the siding in the lowers section of the plant where the coating is beginning to degrade.</i>						
C0030567	ICP - Rail Car Truck Program 2021	145,944	145,944	4	4	16
<i>This project includes the refurbishment of the rail car trucks.</i>						
C0021602	TUC Telehandler Forklift	140,035	140,035	3	5	15
<i>This project will purchase a Telehandler forklift for various tasks to improve efficiency and eliminate the need for rental equipment.</i>						
49447	LIN3 Steam Drum Level Controls Upgrade	137,337	137,337	4	4	16
<i>This project is for the upgrade of the steam drum level controls on one of the plant's operating units as the current level controls are obsolete and no longer supported.</i>						
C0020602	ICP Silo Liner Replacement	132,100	132,100	3	5	15
<i>This project is for the replacement of the railcar loading silo liners which prevents wear on the shell of the silo. The current liner is worn and requires replacement to ensure the silo shell does not thin and cause a shell failure.</i>						
C0028422	LIN Ash Site Winter Cover 2021	131,299	131,299	3	5	15
<i>This project is for the addition of a winter cover on completed ash laydown areas preventing loose ash from becoming airborne and travelling to neighboring properties.</i>						
C0028324	LIN Plant Lighting Upgrade 2021	127,389	127,389	3	5	15
<i>This project will continue to upgrade the plant lighting to more energy efficient LED technology removing the safety hazards associated with low light conditions.</i>						
C0028524	LIN4 Miscellaneous Valve Refurbishment 2021	125,188	125,188	4	4	16
<i>This project includes select valve refurbishments for Lingan Unit 4 based on condition assessment.</i>						
C0031106	POT - Lighting Upgrades 2021	123,050	123,050	3	5	15
<i>This project will continue to upgrade the plant lighting to more energy efficient LED technology removing the safety hazards associated with low light conditions.</i>						
C0028686	LIN1 Steam Drum Level Controls Upgrade	122,081	122,081	4	4	16
<i>This project is for the upgrade of the steam drum level controls on one of the plant's operating units as the current level controls are obsolete and no longer supported.</i>						
C0028647	LIN Electric Actuator Upgrade	121,306	121,306	3	5	15
<i>This project is for the replacement of valve actuators which are failing, obsolete and parts are no longer readily available.</i>						
C0031126	POT - Facility Upgrades 2021	119,695	119,695	3	5	15
<i>This project is for renovations and upgrades of facilities original to the plant. This project will include work on a high traffic catwalk that is exposed to the elements to increase safety.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0031067	TRE 4160 & 600V Breaker Refurbishment 2021	118,770	118,770	4	4	16
<i>This project includes select replacement or refurbishment of defective electrical breakers based on condition assessments.</i>						
C0020644	AMO TUC3 Turbine Supervisory System Upgrade	118,349	118,349	3	5	15
<i>This project is for an upgrade of the existing turbine monitoring and data management system. The upgraded system will enable greater connectivity, remote access, and more advanced analytics.</i>						
C0028483	LIN Coal Plant Structural Refurbishment 2021	116,239	116,239	4	4	16
<i>This project is Phase7 of the refurbishment of the structural system in the Lingan coal reclaim. This project is required as a result of the damage caused by corrosion of the conveyer system over time. The structural refurbishment will address the associated safety concerns related to corrosion damage of the support structures while ensuring the coal handling demands are met in a safe and reliable manner.</i>						
C0030368	TUC North Service Air Compressor Replacement	114,068	114,068	4	4	16
<i>This project will replace the Tufts Cove North service air compressor which has reached the end of its expected service life.</i>						
C0029182	LIN Fan Positioner Upgrade 2021	103,698	103,698	4	4	16
<i>This project is for the upgrade from pneumatic fan positioners that have reached the end of their expected useful life to electrical actuated fan positioners. The fan positioners are used to control air flow via dampers on coal mill exhausters and combustion air duct.</i>						
C0031190	TRE6 Conveyor Refurbishments 2021	101,304	101,304	4	4	16
<i>This project includes the refurbishment of conveyor components, including belts, pulleys, scrapers and structural/electrical components. These conveyors are part of the fuel delivery system on Trenton Unit 6.</i>						
C0031205	TRE6 Acid Pump Skid Replacement	101,271	101,271	3	5	15
<i>This project includes replacement of the Trenton Unit 6 Acid Skid, based on condition assessment.</i>						
C0029222	LIN3/4 Sodium & Phosphate Meter Replacement	101,139	101,139	4	4	16
<i>This project is for the replacement of the Lingan Unit 3 and Unit 4 sodium and phosphate meters. The sodium and phosphate meters are required to measure low level sodium and phosphate in the boiler feedwater and condensate.</i>						
C0030363	TUC WTP Resin Replacements	100,952	100,952	3	5	15
<i>This project will replace polisher resin in the Tufts Cove Water Treatment Plant (WTP) train No. 3.</i>						
C0031204	PHB - Trancel Screw Refurbishment 2021	100,675	100,675	4	4	16
<i>This project is for the refurbishment of the PB3 feeding system comprising of screw conveyors that feed biomass fuel to the boiler.</i>						
C0030904	ICP Environmental System Refurbishment	100,435	100,435	4	4	16
<i>This project is for the refurbishment for the International Coal Pier coal yard environmental management system to monitor and prevent coal dust entering the adjacent community.</i>						
C0028342	LIN 4160 600V Breaker Refurbishment 2021	100,111	100,111	5	3	15
<i>This project includes select replacements of defective electrical breakers based on condition assessments.</i>						
C0030484	TUC3 4kv/600V Breaker Replacement 2021	99,617	99,617	4	4	16
<i>This project is for the replacement of 4kv and 600V breakers at Tufts Cove Unit 3 that are obsolete and have reached the end of their expected service life.</i>						
C0030922	POT - Coal Chute Refurbishment	99,462	99,462	4	4	16
<i>This project is for the refurbishment of the coal transfer chutes at the Point Tupper Generating Station</i>						
C0030372	TUC2 4kv/600V Breaker Replacement 2021	98,753	98,753	4	4	16
<i>This project is for the replacement of 4kv and 600V breakers at Tufts Cove Unit 2 that are obsolete and have reached the end of their expected service life.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0030366	TUC Lighting Program 2021	98,689	98,689	4	4	16
<i>This project will continue to upgrade the plant lighting to more energy efficient LED technology removing the safety hazards associated with low light conditions.</i>						
C0030962	POT - Bunker C Pump Replacement	98,494	98,494	3	5	15
<i>This project is for the replacement of the Point Tupper Bunker C Pump as the existing pump has reached the end of its expected useful life.</i>						
C0028645	LIN1 Auxiliary Air Upgrades	98,472	98,472	3	5	15
<i>This project will upgrade the auxiliary air damper positioners from air actuated to electrically actuated. The auxiliary air dampers control the air supply to the boiler therefore helping the control the combustion process, temperature and emissions from the boiler in conjunction with the fuel supply controls.</i>						
C0028402	LIN Grating Refurbishment 2021	98,449	98,449	5	4	20
<i>This project will refurbish grating and stairways on the bottom floor of the boiler house, CW and crusher buildings that are degrading from corrosion and wear which is affecting the structural integrity and safety of the structures.</i>						
49670	TUC1 4kv/600V Breaker Replacement 2021	97,915	97,915	4	4	16
<i>This project is for the replacement of 4kv and 600V breakers at Tufts Cove Unit 1 that are obsolete and have reached the end of their expected service life.</i>						
C0030886	POT - Polisher Valves & Solenoid Panel	94,075	94,075	4	4	16
<i>This project is for the replacement of the polisher valves and solenoid panel in the water treatment plant at the Point Tupper Generating Station.</i>						
C0031264	POT - 2021 Breaker Replacement	91,035	91,035	4	4	16
<i>This project will continue the refurbishment of Point Tupper 4kV and 600V breakers.</i>						
C0030943	ICP Pumphouse Refurbishment	90,831	90,831	3	5	15
<i>This project is for the refurbishment of the International Coal Pier water supply pumphouse which supplies process water to the pier which is used for dust suppression and vehicle washing. The pumphouse is essential to this water supply which is required to allow the plant to operate.</i>						
C0030485	TUC3 Natural Gas Valves Refurbishment 2021	90,842	90,842	4	4	16
<i>This project is for the refurbishment of natural gas burner valves that control the flow of natural gas to the Tufts Cove Unit 3 boiler.</i>						
C0030370	TUC2 West Condensate Extraction Pump Refurbishment	89,723	89,723	3	5	15
<i>This project will refurbish the Tufts Cove Unit 2 West Condensate Extraction Pump which has reached its required refurbishment interval.</i>						
C0028648	LIN GSCW Small Bore Piping Refurbishment	87,373	87,373	3	5	15
<i>This project is for the refurbishment of the general service cooling water (GSCW) small bore piping which is leaking and is preventing a proper flow of cooling water to equipment requiring cooling.</i>						
C0031207	TRE6 Sootblowers Refurbishment 2021	84,336	84,336	3	5	15
<i>This project is to refurbish the Trenton Unit 6 sootblowers through replacement of critical sootblower components to maintain heat rate and reliability of the boiler.</i>						
C0031208	TRE6 Miscellaneous Valves 2021	81,649	81,649	4	4	16
<i>This project includes select valve refurbishments for Trenton Unit 6 based on condition assessment.</i>						
C0030482	LIN Wastewater System Instrumentation Replacement	81,407	81,407	4	5	20
<i>This project is for the replacement of the wastewater PH meter and instrumentation and sample lines at the Langan Generating Station.</i>						
C0020340	TRE5 Mill Platform Phase 2	80,200	80,200	3	5	15
<i>This project includes the design and construction of access platforms for the Trenton Unit 5 Pulverizers.</i>						

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CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0033666	TUC2 Turbine Turning Gear Refurbishment	75,089	76,956	4	4	16
<i>This project will refurbish the turning gear on the Tufts Cove Unit 2 turbine including replacement of the meshing motor to allow safe automatic operation of the device.</i>						
C0030422	ICP Facility Lighting Upgrades	76,829	76,829	3	5	15
<i>This project is for the upgrade of the lighting around the coal yard at the International Coal Pier. The current lighting is failing, and parts can no longer be purchased. Lighting is essential for security and the safe operation of the coal pier.</i>						
C0031084	TRE Floor Plates 2021	75,520	75,520	4	4	16
<i>This project includes select replacement of pedestrian grating based on condition assessment.</i>						
C0031104	TRE LED Lighting Upgrades 2021	75,331	75,331	3	5	15
<i>This project is for the replacement of out of service plant lighting with LED fixtures. This project will continue to improve lighting in high risk areas, improving plant safety, with the added benefit of reducing station service requirements.</i>						
C0020567	ICP Ventilation Upgrades	73,413	73,413	3	5	15
<i>This project is for the upgrade of the ventilation system of the conveyor control building at the International Coal Pier. The ventilation system is failing due to age and the corrosive nature of coal and salt in the air where the system operates.</i>						
C0021402	TUC Oil Tanks Levels and Pump House Controls Upgrade	72,861	72,861	4	4	16
<i>This project will upgrade the existing HFO pumphouse control system that uses electro-mechanical relay to a Programmable Logic Controller (PLC) system.</i>						
C0033565	TUC3 Turbine Speeder Assembly Refurbishment	72,339	72,339	4	4	16
<i>This project is for the refurbishment of the Tufts Cove Unit 3 turbine speeder gear assembly. The speeder gear is required to properly control turbine speed at varying loads.</i>						
C0020570	ICP Conveyor Hydraulics Refurbishment	70,453	70,453	3	5	15
<i>This project is for the refurbishment of the conveyor hydraulic gate system at the International Coal Pier. The hydraulics require refurbishment due to wear operating in the corrosive coal environment and close proximity to the Sydney Harbour.</i>						
C0029962	LIN Nitrogen Generator	60,697	60,697	3	5	15
<i>This project is for the addition of a nitrogen generator to prevent corrosion in the boiler during offline periods.</i>						
C0021605	TUC Electrical Rooms Underground Upgrade	58,051	58,051	3	5	15
<i>This project is for the replacement of deteriorated underground electrical service boxes.</i>						
C0030525	TUC3 GSCW Coolers Refurbishment	57,136	57,136	3	5	15
<i>This project will refurbish the Tufts Cove Unit 3 general service cooling water (GSCW) coolers including corrosion protection and component refurbishment.</i>						
C0030490	TUC6 Breaker Refurbishment	53,825	53,825	4	4	16
<i>This project is for the refurbishment of 4kv and 600v breakers at Tufts Cove Unit 6 that have reached their service interval.</i>						
C0033906	TUC6 Battery Bank U6A Replacement	52,627	52,627	4	5	20
<i>This project will replace the Tufts Cove Unit 6 Battery Bank U6A which has reached the end of its expected service life due to reduced power output capability.</i>						
C0030544	ICP Fire Hydrants and Fire Suppression System Refurbishment	51,271	51,271	4	4	16
<i>This project is for the refurbishments of fire hydrants around the coal pile at the International Coal Pier that have reached end of useful life. These hydrants are the main fire fighting system around coal pier stock pile and are required to extinguish potential coal pile fires.</i>						
C0030373	TUC2 Natural Gas Valves Refurbishment 2021	50,431	50,431	4	4	16
<i>This project is for the refurbishment of natural gas burner valves that control the flow of natural gas to the Tufts Cove Unit 2 boiler.</i>						

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CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0030365	TUC WTP Acid Pumping Upgrade	50,067	50,067	3	5	15
<i>This project will upgrade the pumps at the Tufts Cove water treatment plant (WTP) to add additional capacity and flexibility to the sulphuric acid pumping requirements.</i>						
C0030369	TUC Electric Valve Actuator Replacements	49,604	49,604	3	5	15
<i>This project will replace obsolete valve actuators for which parts and service expertise are no longer available. These valves regulate steam and water flow around the boiler and turbines.</i>						
C0030903	POT - Sternson Resin Replacement	49,511	49,511	4	4	16
<i>The project is to replace the Sternson resin in the Cation and Anion tanks in the Point Tupper water treatment plant. This resin demineralizes the water that is coming into the plant and requires replacement.</i>						
C0031111	POT - Boiler Fill Pump Replacement 2021	49,462	49,462	3	5	15
<i>This project will replace the existing obsolete boiler fill pump at Point Tupper Generating Station. The boiler fill pump discharges the condensate from the hot well to the boiler drum.</i>						
C0031115	POT - Lube Oil Piping Replacement 2021	49,425	49,425	3	5	15
<i>This project will upgrade the lube oil piping based on inspection results that determined there was low remaining wall thickness.</i>						
C0031124	POT - Condenser Door Replacement 2021	48,385	48,385	3	5	15
<i>This project will replace the condenser doors on the north side of the condenser based on condition assessment.</i>						
C0030762	ICP Mile 0.46 Bridge Refurbishment	48,127	48,127	4	4	16
<i>This project is for the refurbishment of Mile 0.46 Rail Bridge on the rail system that runs between the International Coal Pier and the Lingan Generating Station.</i>						
C0021470	TUC1 Natural Gas Valves Refurbishment	46,676	46,676	4	4	16
<i>This project is for refurbishment of the natural gas burner valves at Tufts Cove Unit 1.</i>						
C0030489	TUC6 - HP Boiler Tube Replacement	45,199	45,199	4	4	16
<i>This project is for the replacement of a section of damaged tubing in the boiler.</i>						
C0030487	TUC3 Lube Oil Refurbishment	44,248	44,248	4	4	16
<i>This project will refurbish the TUC3 Turbine Lubrication Oil by removing it from the tank, filtering, dehumidifying, and cleaning the tank internals and re-filling to extend the service life of the oil.</i>						
C0030493	TUC3 Lube Oil Coolers Refurbishment	40,485	40,485	4	4	16
<i>This project will refurbish the Tufts Cove Unit 3 lube oil coolers, including corrosion protection and component refurbishment.</i>						
C0031163	TRE5 Conveyor Refurbishments 2021	39,405	39,405	4	4	16
<i>This project includes the refurbishment of conveyor components, including belts, pulleys, scrapers and structural/electrical components. These conveyors are part of the fuel delivery system on Trenton Unit 5.</i>						
C0031278	PTMT - Idler Assemblies for inhaul & Dock Conveyors	37,418	37,418	3	5	15
<i>This project is for the replacement of the idler assemblies for inhaul and dock conveyors at the Point Tupper Marine Terminal.</i>						
C0031277	PTMT - Rebuild Hopper Walls 2021	37,005	37,005	3	5	15
<i>This project is for upgrades to the hopper walls at the Point Tupper Marine Terminal.</i>						
C0030491	TUC6 Replace Electrical Heat Trace Panel	36,475	36,475	3	5	15
<i>This project is for the replacement of the heat trace control panel which has proven to be unreliable and will be replaced with standard PLC control equipment used elsewhere in the plant.</i>						
C0031086	TRE TAMS Toe Buttress Habitat Restoration	35,207	35,207	5	3	15
<i>This project includes habitat restoration efforts to offset new instream footprint associated with the Trenton Ash Management Site (TAMS) toe buttress installation. This project is required to maintain compliance with the Fisheries Act.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0030492	TUC6 Vacuum Pump Replacement	31,448	31,448	4	4	16
This project will replace the vacuum pump for the Tufts Cove Unit 6 condenser based on condition assessment.						
C0031206	TRE6 HP Dose Pump Replacement	31,293	31,293	4	4	16
This project includes the replacement of the Trenton Unit 6HP dosing pump based on condition assessment.						
Total Steam Items Less Than \$1M		\$28,493,193	\$28,600,599			
Gas Turbine						
C0029692	LM6000 - TUC4 Generator Rotor Ring Refurbishment	884,552	884,552	5	4	20
This project is for the refurbishment of the generator rotor ring at TUC4.						
C0030082	CT - Generator Bearings Replacement	382,180	595,172	5	3	15
This project will purchase critical spare generator bearings to allow for refurbishment throughout the CT fleet						
C0030549	CT - VJ1 - General Control and Protection Upgrade	147,789	285,643	5	3	15
This project will replace and upgrade the existing automatic voltage regulator (AVR) and general controls at protections at Victoria Junction Unit 1.						
C0029582	CT - TUS MCC Upgrades	254,076	254,076	4	5	20
This project is for the refurbishment of the Tusket Motor Control Center (MCC) which provides AC and DC power station services.						
C0029584	CT - TUS Generator Breaker Replacement	93,975	94,800	4	4	16
This project is for the replacement of the Tusket Generator Breaker which is at the end of its expected useful life.						
C0029585	CT BGT4 Generator Breaker Replacement	90,001	90,001	4	4	16
This project is for the replacement of the Burnside 4 Generator Breaker which is at the end of its expected useful life.						
C0029686	CT - VJ Fuel System Coating	83,106	83,106	4	4	16
This project is for the refurbishment of the fuel system piping coating to correct rust/coating deformities at Victoria Junction.						
C0029688	CT - TUS - Air House Refurbishment	78,115	78,115	4	5	20
This project is for the structural refurbishment of the Tusket Combustion Turbine air house						
C0029687	CT - BGT Overfill Protection Fuel Tanks	43,761	43,761	5	3	15
This project is for the replacement of the overfill protection equipment for the Burnside Fuel Tanks.						
C0029689	CT - VJ Overfill Protection F Tank	43,470	43,470	5	3	15
This project is for the replacement of the overfill protection equipment for the Victoria Junction Fuel Tanks.						
C0030502	CT -TUS - Battery Charger Replacement	36,045	36,045	4	4	16
This project is for the replacement of the battery chargers at Tusket which are at the end of their expected useful life.						
C0029684	TUS - Fuel Piping Coating Refurbishment	31,994	31,994	4	4	16
This project is for the refurbishment of the fuel system piping coating to correct rust/coating deformities at Tusket.						
Total Gas Turbine Items Less Than \$1M		\$2,169,063	\$2,520,734			

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
Wind						
C0029482	WIN - Digby SCADA Replacement	624,291	624,291	4	4	16
This project is for the upgrade of the current SCADA system and replacing turbine-level computers with more advanced controllers at the Digby Wind Farm.						
C0028305	WIN - Nuttby Wind Utility Tractor	139,150	139,150	3	5	15
This project covers the cost of a new Utility Tractor and all accessories required to complete necessary snow clearing on the Nuttby Wind Farm.						
C0010758	WIN - South Lake Wind Turbine Decommissioning	101,301	101,301	3	5	15
This project is for the decommissioning of the South Lake wind turbine located near the Wreck Cove Generating Station.						
Total Wind Items Less Than \$1M		\$864,742	\$864,742			
Total Generation Items Less Than \$1M		\$33,406,855	\$34,261,929			
Transmission						
C0031052	New System Spare Power Transformer	344,935	982,910	3	5	15
This project is for the purchase of a new system spare power transformer 7.5/10/12.5 MVA, after the last spare transformer was put in service at the 58C-Southwest Margaree in early 2020. This will maintain a sufficient stock of spare transformers for emergencies.						
C0031042	5P-MS Rewind	128,055	840,320	5	5	25
This project is for a total replacement of all windings on the 5P-MS mobile substation to remove this ongoing operating concern of excessive production of combustible gases while in service, which degrades the insulating system and leaves the unit vulnerable to internal flashovers and eventual failure.						
C0031053	L5506 Line Replacements and Upgrades	680,431	738,529	4	4	16
This project is required to replace deteriorated assets on L5506, a 8 kilometer (90 Structures) 69kV transmission line that connects 54N Abercrombie Point to 55N Pictou substations.						
C0031283	2021 Substation Theft Prevention	427,566	463,587	5	4	20
This project provides for the replacement of copper wire with theft-deterrent copper-weld grounds and composite switch cables at approximately 20 substations province-wide.						
C0022783	2021 Generation Related Power Transformer Refurbishments	402,385	402,385	5	4	20
This project is for the refurbishment of deteriorated transformers and associated components for transformers located at critical NS Power generation sites.						
C0031298	88S-T72 New Radiators	285,193	285,193	5	4	20
This project is for the replacement of seven radiators associated with 88S-T72 power transformer. The existing radiators are rusted and leaking to a point where they are becoming an environmental and operational concern.						
C0031303	82S-503 and 82S-504 Structure and Switches Replacement	205,709	221,125	3	5	15
This project is for the replacement of two existing line dropping switches and support structure at the 82S-Whitney Pier substation to allow the switches to operate as originally intended and aid in reducing the number and duration of planned and unplanned outages for the customer supplied from this site.						
C0031274	2021 Capacitor Bank Breaker Replacements	195,671	195,671	4	4	16
This project is to replace two Capacitor Banks that have been identified for replacement based on age, number of operations, maintenance history and criticality to the transmission system.						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
<b>Total Transmission Items Less Than \$1M</b>		<b>\$2,669,944</b>	<b>\$4,129,720</b>			
<b>Distribution</b>						
C0020830	85S-401 Cape Smokey Build to Roadside	630,851	815,968	4	5	20
<i>This project will add new three-phase roadside line on primary distribution feeder 85S-401 along Cabot Trail Near Cape Smokey Provincial Park to facilitate the removal of the existing deteriorated line that is currently located off-road.</i>						
C0031150	36W-301-Add Third Phase - Allendale	275,339	812,975	3	5	15
<i>This project involves adding a third phase for approximately 7.7 kilometers along Highway 3 between Little Harbour Rd and W Sable Rd near Lockeport.</i>						
C0031119	96H-412-Dufferin Mines Rd Rebuild	737,966	785,187	5	4	20
<i>This project involves moving approximately 3.5 kilometers of cross-country distribution line to roadside along Dufferin Mines Rd on 96H-412.</i>						
C0027611	67C-411 - Highway 252 Build to Roadside	481,653	755,414	5	4	20
<i>This project will relocate approximately 3.4km kilometers of three-phase line on feeder 67C-411 from cross-country to roadside, along targeted location along Highway 252.</i>						
C0031121	104S-313 - Reconductor Big Hill	690,254	746,009	4	5	20
<i>This project involves reconductoring along Highway 105 near Big Hill in Glen Tosh from D372-066 to D372-065.</i>						
C0031293	11S-411-Coxheath Reinsulate and Reconductor	447,975	712,658	5	4	20
<i>This project involves rebuilding the double circuit line on Coxheath Road in Sydney from Keltic Drive to the L6539 crossing.</i>						
C0033444	63V-312 Stronach Mountain Phase Extension	158,685	696,471	4	4	16
<i>This project involves a 2.0 km three-phase line extension on 63V-312 and reconfiguration on 63V-312 and 65V-302. The reconfiguration involves the replacement of a three-phase hydraulic recloser with a three-phase electronic recloser, the replacement and relocation of a single-phase 100A regulator and the installation of a new three-phase 200A regulator.</i>						
C0031166	2021 Downline PCB Replacements	636,225	691,297	5	4	20
<i>This project provides for the systematic removal of downline assets containing or identified as potentially containing polychlorinated biphenyl (PCB) materials, in accordance with federal guidelines. These assets include downline metering tanks, step-down transformers, and voltage regulators.</i>						
C0031164	515W-211-New Germany Conversion	378,018	645,198	4	4	16
<i>This project involves removing an off-road water crossing and replacing and reconfiguring the 515W padmounted stepdown substation and feeder with an overhead stepdown solution.</i>						
C0031304	37N-413G-South Athol Rebuild	633,974	633,974	5	3	15
<i>This project involves rebuilding approximately 3 kilometers of off-road sections of line to roadside on 37N-413G from South Hampton to South Athol.</i>						
C0031112	6S-225 - Townsend Street Conversion	295,239	602,445	5	4	20
<i>This project will implement recommendations 6.1.6.1 of the Sydney 4kV Conversion and Membertou Load Growth Planning Study 283-0212-E27 that recommends extending the existing 12kV feeder on Terrace street and all side streets, to allow for the existing 4kV circuit along and its surrounding streets to be converted to 12kV, which will facilitate the retirement of 6S substation.</i>						
C0031302	20V-311-Bluff Rd Rebuild	472,670	472,670	5	4	20
<i>This project provides for the costs to rebuild approximately 6.1 km of deteriorated single-phase distribution line on 20V-311 along Bluff Rd.</i>						



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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0031299	88H-402 Trafalgar Line Extension and Offload	403,603	435,213	4	4	16
<i>This project provides for the costs to build a four-kilometer single-phase line extension on 88H-402 to pick up customers currently fed from 89H-401, and allow for the decommissioning of 89H-T1 at the Trafalgar substation.</i>						
C0031113	61N-204 Townsend Avenue Conversion	333,554	369,841	4	5	20
<i>This project will implement recommendations 6.3.1 of the New Glasgow/Stellarton 4kV Distribution Planning Study 362-0615-E30 that recommends targeted conversion of existing 4kV line that is being supplied from 61N North Provost Street substation.</i>						
C0031297	709H-221 Bedford 4kV Conversion	242,944	348,903	4	4	16
<i>This project involves rebuilding targeted sections of deteriorated 4kV distribution line in Bedford to 25kV. This project will target 4kV conversions on Obrine Street (feeding Elgin Lane and Tophill Road), Eaglewood Drive (feeding Gold Links Road) and Shore Drive.</i>						
C0031120	76V-301 Maitland Bridge Build to Roadside	188,382	332,043	5	4	20
<i>This project is to rebuild 860 metres of the off road three phase feeder exit between the 76V Substation and highway 8 near Maitland Bridge to the roadside by upgrading the existing single phase section on highway 8 and extending the line on Northfield Road.</i>						
C0004078	83V-301 - Gaspereau River Crossing Rebuild	132,404	284,666	5	4	20
<i>This project is to rebuild the existing three phase crossing for 600 meters along the Old Highway 1 over the Gaspereau River from Highway 101 to D3A04384.</i>						
C0031300	9H-223 North St Conversion	229,089	244,987	5	3	15
<i>This project is the part of the multi-phase project to convert the remaining 4kV distribution plant in peninsular Halifax to 25kV. This project will target 4 kV conversions on Almon St and Gladstone St, as well as convert two 4 kV vaults in the area to 25kV.</i>						
C0031144	2021 Vault Replacement	217,421	217,421	5	4	20
<i>This project involves upgrading and replacing equipment in underground vaults to meet current utility standards and requirements. In addition it will reduce safety and environmental risks in the targeted vaults.</i>						
C0031289	10H-231-South Park St and Wright Ave 4kV Conversion	178,069	191,225	5	4	20
<i>This project is the part of the multi-phase project to convert the remaining 4kV distribution plant in peninsular Halifax to 25kV. This project will target conversions on Morris Street from South Park Street to Birmingham Street to 25kV and convert the remaining 4kV on South Park Street and Wright Avenue.</i>						
C0031305	37N-413-HWY 2 Rebuild - Newville Lake	153,857	165,515	4	4	16
<i>This project involves rebuilding 1.5 kilometers of cross-country three-phase distribution line on 37N-413 to roadside near Newville Lake to improve reliability for customers.</i>						
C0031110	89W-303 Oakland Rd Water Crossing	139,468	151,360	4	5	20
<i>This project involves the upgrade of the existing three phase crossing over the Mushamush River along the Lighthouse Route for 200 meters, as well as the relocation and upgrade of the 120 meter 2-phase water crossing over Mahone Bay to Oakland Road.</i>						
C0031149	Targeted Automatic Sleeve Replacements	87,708	87,708	5	3	15
<i>This project is for the proactive replacement of automatic sleeves with compression sleeves as automatic sleeves are susceptible to premature failure and compression sleeves are the current standard.</i>						
<b>Total Distribution Items Less Than \$1M</b>		<b>\$8,145,350</b>	<b>\$11,199,148</b>			

**General Plant**

C0022002	IT - Outage Map Upgrade	453,441	991,147	5	3	15
<i>This project will upgrade the outage map platform including replacement of the backup outage map. Project will address stability issues with current backup platform and implement customer outage notifications.</i>						
C0031022	IT - Identity & Access Management	852,568	982,068	5	4	20
<i>This project will implement enhanced security functionality and governance for employees and contractors in accessing NS Power's systems as the sophistication of cyber attack related identity and access is always evolving.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0031002	IT - Customer Billing & Payment Solution	357,205	978,193	4	4	16
<i>This project will implement a new solution with enhanced functionality for processing customer billing and payments, including enhancements to mitigate human error in billing and operational efficiencies in payment processing.</i>						
C0032502	IT - Time Varying Pricing Solution	625,539	625,539	3	5	15
<i>This project will implement critical peak pricing for targeted customers as described in the AMI capital work order.</i>						
C0031027	IT - Multi-Factor Authentication	586,159	586,159	5	4	20
<i>This project will implement multi-factor authentication (MFA) products that will enhance access security to applicable NS Power systems by adding an additional layer of security to mitigate unauthorized access to systems.</i>						
C0031028	IT - Network Access Control	225,243	553,009	5	4	20
<i>This project will install replacement switches and upgrade operating systems to controls to mitigate the risk of unauthorized devices connecting to our corporate network.</i>						
C0031094	IT - Cloud Integration Platform	70,882	508,515	4	4	16
<i>This project will implement a cloud platform including the build and configuration of interfaces with required on-premise and cloud based NS Power systems. Where cloud based solutions are becoming more viable options for NS Power to implement, NS Power will require a platform with the appropriate levels of security to control access to and data flow between the various systems.</i>						
C0031099	IT - Computer Telephony Integration	257,562	507,562	3	5	15
<i>This project will implement enhancements for customer service agents with a modern service agent desktop and computer telephony integration.</i>						
C0021823	IT - Customer Analytics Implementation	502,243	502,243	4	5	20
<i>This project will implement a data tenant on the enterprise data lake and the functionality to extract and transform data from source production systems for dashboarding and reporting</i>						
C0021849	IT - Wi-Fi Infrastructure Replacement	111,048	502,239	5	5	25
<i>This project will replace Wi-Fi infrastructure, including the upgrade of aging Wireless LAN Controllers (WLC) which are the central brains for our corporate wireless LAN and replacing end of life access points.</i>						
C0011302	IT - PeopleSoft Upgrade	175,551	400,551	5	5	25
<i>This project will upgrade the PeopleSoft application and related databases.</i>						
C0029928	AMO Weymouth Telecom Upgrade	372,825	372,825			
<i>This project is to upgrade the aging telecommunication infrastructure for the Weymouth hydro station. This will enable increased data collection, trending and predictive analytics, as well as greater connectivity for plant personnel.</i>						
C0021834	IT - CIS - OS Upgrade	86,066	366,329	5	5	25
<i>This project will upgrade the operating system that runs the CIS application. The operating system is approaching end of support.</i>						
C0011111	IT - ADMS Maintenance Release	162,971	359,906	5	5	25
<i>This project will implement the current release of the ADMS application that includes new functionality and updated features for reliability and security.</i>						
C0032143	GIS Underground Asset Modelling	350,902	350,902			
<i>This project will gather all data and drawings from multiple sources within NS Power related to distribution underground assets and migrate, update and model them into the GIS Solution. The outcome will be a single repository containing detailed information including drawings and relevant attributes associated with underground and on ground roadside assets.</i>						
C0032144	IT - Control Centre Applications Replacement	340,147	340,147	5	5	25
<i>This project will replace legacy Control Centre applications platform.</i>						
51963	IT - Adept Upgrade	323,718	323,718	4	5	20
<i>This project will upgrade the Adept application to the latest supported version, including interfaces and technical environment. The current version is supported on a best effort basis only by the vendor.</i>						

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**Figure 13: 2021 Capital Items with Estimated Total Project Cost of Less than \$1M**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)	Criticality	Condition	Rating
C0031203	2021 Telecom Building Replacement	146,720	323,435			
<i>This project will replace the Sackville telecommunications building which was installed around 1978. The building is deteriorated and replacement of the entire building is required.</i>						
C0032142	GIS - Telecom Asset Modelling Project	318,573	318,573			
<i>This project will enhance the GIS Solution and capture, update and model the full inventory of telecom assets into the GIS Solution. The project scope includes implementing a new ESRI module for GIS which relates specifically to Telecommunications Assets.</i>						
C0019038	AMO Hydro Water Management	201,454	251,480			
<i>This project will upgrade the existing water in-flow and water management software, including upgrades to the user interface, and streamlined spill reporting capabilities.</i>						
C0026682	EOC Facility Upgrades	227,412	227,412			
<i>The Emergency Operation Centre (EOC) is the command centre of NS Power storm restoration and response activities. In recent years, the utilization of the EOC has increased substantially. This project will upgrade equipment in the EOC to increase capacity for the EOC team members to perform required tasks and to leverage and access critical information the technology is providing.</i>						
C0031100	IT - HVCA Upgrade	200,009	200,009	5	5	25
<i>This project will implement enhancements to the High Volume Call Answer (HVCA) platform.</i>						
C0021843	IT - Upgrade Oracle OBIA	160,749	160,749	3	5	15
<i>The project will upgrade the Oracle Business Intelligence application (OBIA) application and related databases to supported versions.</i>						
C0021133	SCADA Mobile Application	114,766	114,766			
<i>This project is to introduce an application to the business for accessing SCADA screens and readings via mobile devices.</i>						
C0021822	IT - Data Catalogue & Quality Tool	104,740	104,740	4	4	16
<i>This project will implement an enterprise tool set to advance NS Power's data governance capabilities.</i>						
C0021829	IT - Domain Password Management	81,411	81,411	3	5	15
<i>The project will automate the ability for employees to reset network passwords without having to contact the Service Desk.</i>						
49832	Victoria Junction Substations Fiber Links	60,299	60,299			
<i>This project will install new fiber links, from 415S Victoria Junction Radio to the 2S VJ substations to improve the reliability and capability of communications to these sites.</i>						
48035*	AMO - NERC Management System	32,200	45,872			
<i>This project is for the development and integration of a software-based system to assist in the efficient management of the activities required for NERC compliance for Power Production, and provide information on the status compliance and upcoming activities in a consumable manner for management and under internal stakeholders.</i>						
C0031102	AMO Outage Management System	36,516	36,516			
<i>This project will provision a software-based solution to aid in the preparation for NS Power's Power Production annual planned outages, as well as provide an interface to efficiently and accurately track progress through integration with the work management system, DirectLine.</i>						
<b>Total General Plant Items Less Than \$1M</b>		<b>\$7,538,919</b>	<b>\$11,176,314</b>			
<b>Total Capital Items Less Than \$1M</b>		<b>\$51,761,067</b>	<b>\$60,767,110</b>			

\*Capital Item Related to NERC and/or NPCC Standards

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**5.5 2021 ACE Plan Capital Items – Point Aconi Generating Station**

**Figure 14** below provides the Point Aconi capital projects for 2021. These projects do not require NSUARB Approval but are provided for transparency and informational purposes.

**Figure 14: 2021 Capital Items – Point Aconi Generating Station**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)
C0020123	POA DCMS Evergreen	2,310,676	2,310,676
C0009299	POA Bag House Filter Replacement	1,621,274	1,621,274
C0030786	POA Ash Cell Capping	1,408,299	1,408,299
C0029783	POA - Boiler Refurbishment 2021	1,405,190	1,405,190
C0029695	POA - Boiler Refractory Replacement 2021	955,291	955,291
C0030783	POA Generator Refurbishment	952,116	952,116
C0034246	POA LS Quarry Reclamation 2021	682,115	682,115
C0031225	POA Light Oil Line Replacement	606,898	606,898
C0020024	POA CW Pump Refurbishment	511,625	511,625
C0030784	POA SH1 Refurbishment	503,068	503,068
C0029842	POA LS System Refurbishment 2021	336,759	336,759
C0029845	POA Coal System Refurbishment 2021	275,398	275,398
C0020142	POA Turbine Controls Evergreen	271,937	271,937
C0029697	POA - Boiler Arrowhead Replacements 2021	258,108	258,108
C0029805	POA PLC Migration 2021	255,388	255,388
C0009320	POA CW Screen Refurbishment	254,590	254,590
C0029702	POA Ash System Refurbishment 2021	251,148	251,148
C0030566	POA Ash Transport Piping	202,736	202,736
C0029782	POA Valve Component Replacement 2021	201,911	201,911
C0029698	POA Expansion Joint Replacement 2021	169,859	169,859
C0030562	POA Fire System Upgrade	160,617	160,617
C0030802	POA Diesel Generator Control Panel Upgrade	152,938	152,938
C0020023	POA LS Vacuum System	130,395	130,395
C0029803	POA Access Improvement 2021	123,175	123,175
C0030803	POA Silo Scale Upgrades	122,194	122,194
C0030882	POA Vibration Monitoring	121,725	121,725
C0030523	POA Plant Security Upgrade	119,572	119,572
C0029804	POA 4KV 600V Breaker Refurbishment 2021	111,837	111,837
C0030564	POA MCC Upgrades	100,995	100,995
C0031227	POA 1B Primary Fan Motor Lifting Device	99,756	99,756
C0030824	POA Heat Tracing Upgrades	81,057	81,057

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**Figure 14: 2021 Capital Items – Point Aconi Generating Station**

CI#	Project Title	2021 Budget (\$)	Project Total (\$)
C0030182	POA Plant Lighting Upgrade 2021	61,144	61,144
C0029862	POA Facilities Upgrades 2021	60,570	60,570
C0030906	POA Seal Oil Piping Modifications	40,916	40,916
C0011518	POA Kelly Rock Primary Crusher Refurbishment	23,760	23,760
<b>Total Point Aconi New Spending</b>		<b>\$14,945,036</b>	<b>\$14,945,036</b>
<b>Point Aconi Carryover Spending</b>		<b>\$392,516</b>	<b>\$535,639</b>
Point Aconi Routine Spending			
10718	POA - Routine Equipment Replacement	227,968	227,968
27858	POA Roofing Routine	401,285	401,285
33865	POA Heat Rate Routine	58,564	58,564
21484	POA Plant Tools & Equipment	55,000	55,000
<b>Point Aconi Routine Spending</b>		<b>\$742,818</b>	<b>\$742,818</b>
<b>Total Point Aconi Capital Spending</b>		<b>\$16,080,370</b>	<b>\$16,223,493</b>

1

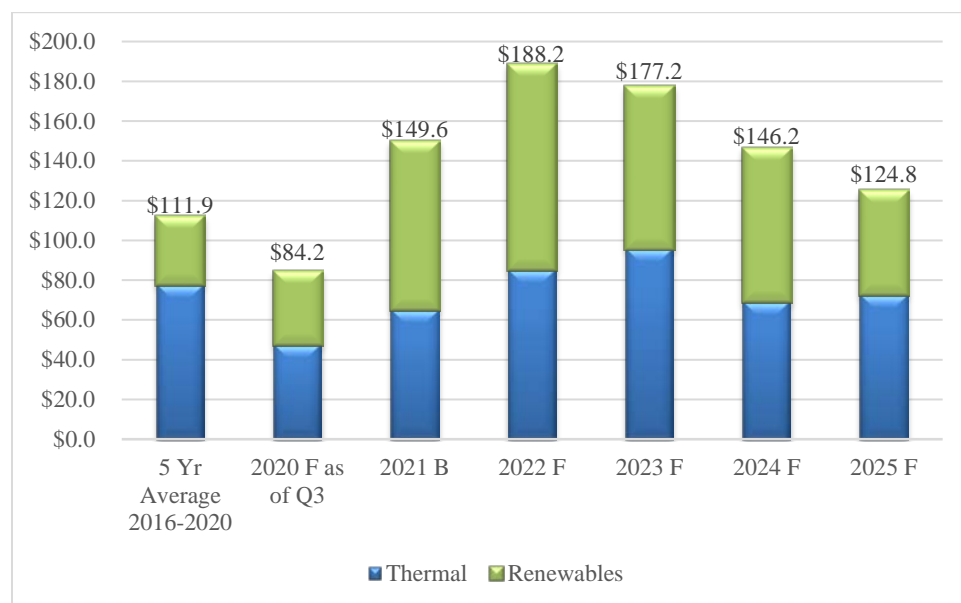
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**6.0 GENERATION**

Generation includes replacements and additions to NS Power's Thermal, Hydro, Wind, Tidal, Combustion Turbine and Biomass facilities.

**Figure 15** below illustrates NS Power's capital investment on generation, including historical, forecast and budget. The increase in investment in future years is largely attributable to the forecast investment in the Mersey Hydro System Re-Development and the Wreck Cove Hydro System Life Extension & Modernization (LEM) project.

**Figure 15: Generation Investment – Historical, Forecast and Budget**  
(Millions of dollars)



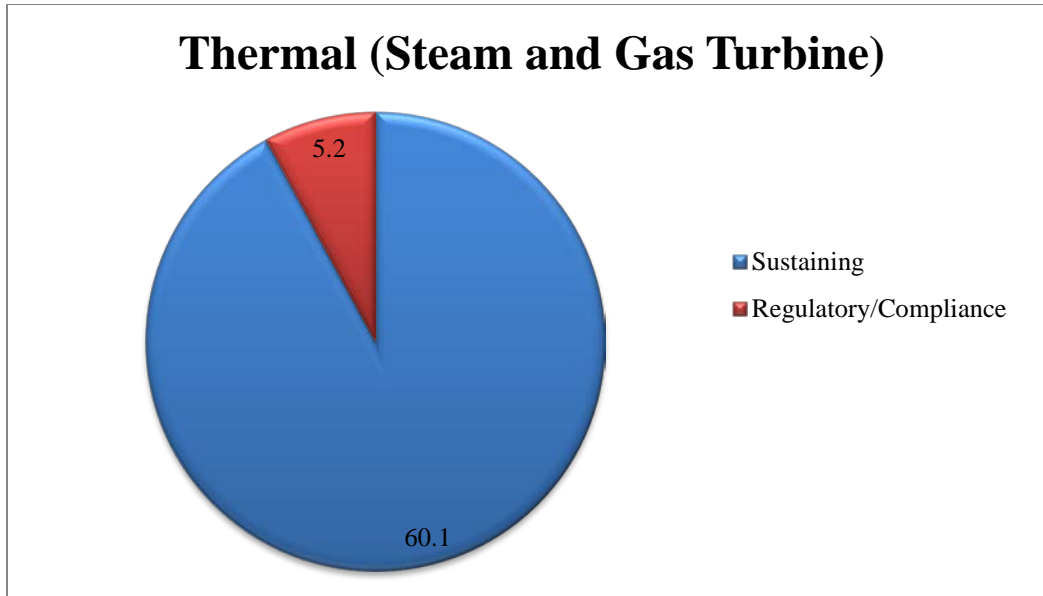
F = Forecast, B=Budget in above figure

**Figure 16** and **Figure 17** provide a breakdown of the 2021 generation investment by investment type.

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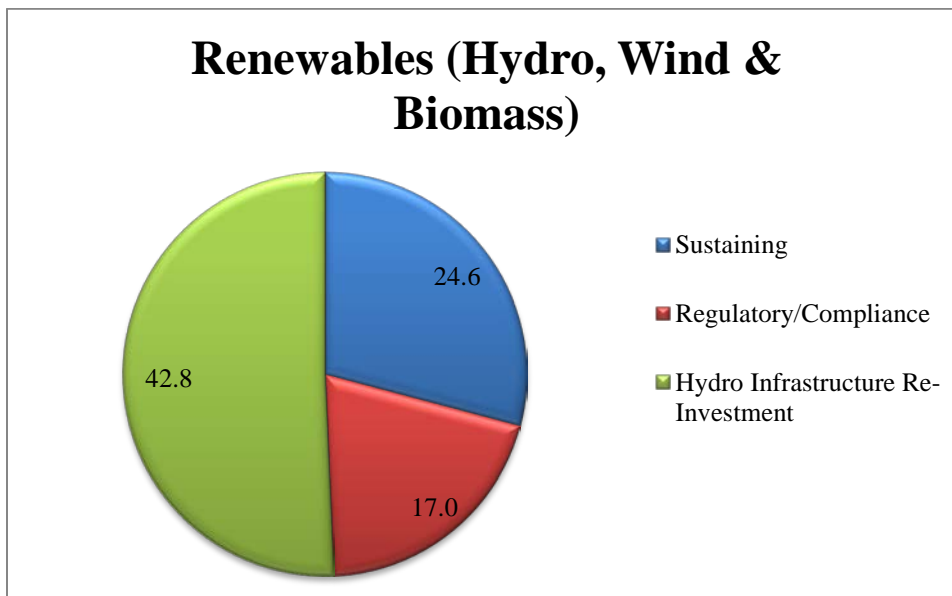
**Figure 16: 2021 Thermal Investment by Investment Type**

(Millions of dollars)



**Figure 17: 2021 Renewable Generation Investment by Investment Type**

(Millions of dollars)



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1 The Company's asset health and risk profiling methodology determines the condition and  
2 criticality of equipment and allows the most appropriate reliability risk mitigation strategy to be  
3 implemented, including effective investment of sustaining capital. NS Power's selection of  
4 generation related capital investment is based on the asset management approach as described in  
5 Section 6.2 of the CEJC. The approach enables NS Power to have the information necessary to  
6 prioritize decisions to invest in assets only when necessary to maintain safety and reliability, while  
7 managing affordability for customers. All of this is in context of the units' forecasted utilization  
8 in the near to medium term. The Thermal Generation projects in the 2021 ACE Plan have been  
9 vetted according to the asset management methodologies in consideration of requirements to  
10 ensure sufficiently reliable generation performance in the near term, in the context of evolving  
11 medium to long term utilization forecasts. The 2020 IRP process will also inform ongoing capital  
12 outlooks for Generation assets.

13  
14 Key elements of NS Power's asset management approach include:

- 15
- 16 • fleet-wide asset class programs;
  - 17 • application of the latest technologies to enhance understanding of asset health;
  - 18 • effective operational support tools and infrastructure; and
  - 19 • risk-based inspection programs.
- 20

21 NS Power engages industry experts to augment the assessment of risks and mitigating measures  
22 for the generation fleet.

23  
24 NS Power's generation asset management approach is focused on optimizing generation resources  
25 by mitigating risks through operating procedures, monitoring and assessing assets, and when  
26 necessary, capital investment. The approach also focuses on continuing to develop and improve  
27 asset health assessment and risk profiling as the utilization of the generating fleet continues to  
28 evolve.

29

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The focus for generation capital investments in 2021 is on current requirements to ensure the safe, environmentally compliant and reliable operation of the thermal assets based on utilization outlooks as well as investment in hydro infrastructure renewal. The approximately \$150 million generation capital investment plan for 2021 is summarized in **Figure 18** below.

**Figure 18: Summary of 2021 Generation Capital Investments**  
(Millions of dollars)

i	New 2021 capital spending for projects with total estimated project spending greater than \$1,000,000 and for which approval is sought. (As provided in Section 6.2)	3.6
ii	2021 capital spending for projects with total estimated project spending greater than \$1,000,000 for which approval will be sought subsequent to the filing of the 2021 ACE Plan. (As provided in Section 5.3)	12.7
iii	New capital spending for projects with total estimated spending less than \$1,000,000 for which approval is not sought. (As provided in Section 5.4)	33.4
iv	2021 capital spending for projects included in the 2020 ACE Plan for which approval will be sought in late 2020. (As provided in Section 4.2)	13.9
v	Point Aconi Generating Station capital spending. (As provided in Section 5.5)	16.0
vi	Carry-over capital spending. (As provided in Section 6.1)	65.0
vii	Routine capital spending. (As provided in Section 10)	4.9
	Total 2021 Generation Capital Investment Plan	149.6
	Request for ACE Approval (Items i and vii)	8.5

Note 1: Totals may be off due to rounding.

**6.1 Generation – Carry-over Capital Spending Summary**

**Figure 19: Generation Carry-over Capital Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure (\$)	2021 Budget (\$)	Subsequent Spending (\$)	Total Estimate (\$)
<b>Hydro Generation Plant</b>							
C0013838	HYD -WRC LEM Unit Rehabilitation and Replacement	2019/11	2025/12	8,831,043	19,391,400	64,606,767	92,829,210
29807	HYD - Tuskett Falls Main Dam	2008/01	2023/12	13,014,287	7,705,259	11,617,106	32,336,651
16374	HYD - Gaspereau Dam Safety Remedial Works	2007/05	2022/06	8,824,430	3,759,874	10,119,147	22,703,451
51236	HYD - WRC Tailrace Tunnel Rock Bolting Phase 1	2017/01	2021/12	3,536,005	5,432,109	-	8,968,114
51235	HYD - Wreck Cove Main Access Road Refurbishment	2017/06	2024/10	1,261,127	686,999	5,233,201	7,181,327
50518	HYD - Ruth Falls Main Dam Refurbishment	2017/02	2022/12	1,408,634	5,257,923	33,163	6,699,720
C0006358	HYD - Lake Mulgrave Dam Refurbishments	2018/09	2021/06	5,145,620	54,112	-	5,199,732

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**Figure 19: Generation Carry-over Capital Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure (\$)	2021 Budget (\$)	Subsequent Spending (\$)	Total Estimate (\$)
C0002539	HYD - Bridge Remediation 2019	2017/12	2021/12	3,662,172	1,430,731	-	5,092,904
49756	HYD - Marshall Falls Main Dam Refurbishment	2016/12	2023/04	390,611	250,235	4,149,931	4,790,777
48791	HYD - WRC Safety Standards Upgrades	2016/01	2022/10	1,458,872	545,172	-	2,004,045
47551	HYD - SHH Controls Upgrade	2015/07	2023/06	1,110,725	523,660	351,277	1,985,662
51234	HYD -Wreck Cove HVAC Upgrade	2017/04	2022/12	823,653	832,730	215,498	1,871,881
C0012878	HYD - Weymouth Falls Unit 1 Generator Refurbishment	2018/10	2022/03	246,875	1,620,814	-	1,867,690
51775	HYD - Fixed Ladder & Machine Guard Upgrades	2017/06	2023/06	891,126	649,128	179,990	1,720,243
C0019021	HYD - Malay Falls Unit 4 Overhaul	2020/01	2023/01	64,430	239,775	629,692	933,897
49945	HYD - Malay Falls Switchgear Replacement	2017/12	2023/04	33,497	218,290	635,908	887,695
C0020668	HYD - WRC U1 Thrust Oil Leak Repair	2019/08	2022/03	368,132	475,715	-	843,847
C0019024	HYD - RUF Switchgear Replacement	2019/09	2022/05	551,199	256,155	-	807,355
C0019023	HYD - Malay Falls Unit 4 Generator Refurbishment	2020/09	2023/08	75,414	137,291	582,177	794,881
49944	HYD - Dickie Brook Penstock Refurbishment	2018/05	2022/10	104,543	665,050	-	769,594
52262	HYD - Hells Gate #1 Overhaul	2018/10	2022/06	203,870	518,475	-	722,345
C0031105	HYD - LGB7 Blade Seal Replacement	2020/07	2021/07	489,772	61,183	-	550,954
C0006859	HYD - Wreck Cove Crane Refurbishment	2018/01	2021/12	362,831	121,310	-	484,141
52018	HYD - Renewable Energy Generation Meter Upgrade	2017/09	2021/12	455,984	4,741	-	460,724
48712	HYD - Dam Instrumentation Upgrade	2016/06	2023/05	123,746	167,743	165,686	457,174
C0024342	HYD - HG1 Rotor Refurbishment	2020/01	2022/04	75,414	331,563	-	406,976
C0003998	HYD - Wreck Cove Station Service Cable Replacement	2017/11	2021/12	186,701	163,335	-	350,036
C0013658	HYD - WRC U1 Turbine Bearing Replacement	2020/01	2022/11	185,938	123,858	-	309,796
C0019025	HYD - Sloane Dam Refurbishment	2019/05	2022/05	51,732	216,100	-	267,832
C0021943	AMO Weymouth Enhanced Monitoring	2019/12	2021/12	126,621	102,301	-	228,922
C0021342	Lumsden Intake and Butterfly Valve	2019/10	2021/12	7,426	197,881	-	205,307
C0020582	HYD - WEY 1 Mechanical Seal Install	2020/01	2021/12	8,678	162,255	-	170,932
C0020883	AMO Gulch Enhanced Monitoring	2019/12	2021/08	71,658	69,184	-	140,842
<b>Total Hydro Generation Plant</b>				<b>\$54,152,763</b>	<b>\$52,372,351</b>	<b>\$98,519,542</b>	<b>\$205,044,656</b>

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Figure 19: Generation Carry-over Capital Spending Summary

CI#	Project Title	Start Date	Final Date	Previous Expenditure (\$)	2021 Budget (\$)	Subsequent Spending (\$)	Total Estimate (\$)
<b>Steam Generation Plant</b>							
44267	TRE Ash Lagoon Site Closure	2013/05	2021/09	7,172,611	1,571,655	-	8,744,266
C0020385	LIN Heavy Oil Tank Refurbishment	2019/09	2021/12	74,967	3,193,137	-	3,268,105
C0021584	TUC3 Turbine Valves Refurbishments	2019/11	2022/05	108,448	924,168	-	1,032,615
C0021587	TUC3 - North Boiler Feedwater Pump Refurbishment	2020/01	2022/02	7,835	669,030	-	676,865
49897	POT - Fire System Upgrades 2017	2017/04	2021/12	249,506	336,753	-	586,260
C0011216	TUC3 Data Acquisition System Replacement	2020/01	2022/04	46,599	451,864	-	498,463
43429	TRE5 Turbine Lube Oil Cooler Refurbishment	2018/02	2021/12	417,912	50,052	-	467,965
47871	LIN Stack Re-Coating	2018/01	2021/12	4,593	451,980	-	456,573
C0021982	ICP U&U Unloading Hopper Replacement	2019/09	2021/12	17,653	385,845	-	403,498
C0010981	LIN Precipitator Door Refurbishment	2020/01	2021/12	360	402,165	-	402,525
C0020843	POT Burner Automation System and Soot blower Controls Upgrades	2020/01	2021/12	218,077	156,348	-	374,425
49920	AMO Thermal Fleet Life Consumption Analysis Tool	2016/08	2021/12	337,648	32,940	-	370,588
C0009090	LIN4 ACW Strainer Replacement	2020/02	2021/12	52,639	306,874	-	359,513
C0008559	POT - Diesel Generator and Essential Services Switchgear Replacement	2018/07	2021/12	293,566	64,019	-	357,585
C0018920	LIN Coal Plant Structural Refurbishment Phase 6	2020/01	2021/12	247,423	57,129	-	304,552
C0011063	TUC HFO Ship Unloading Hose Installation	2019/04	2021/08	173,755	86,094	-	259,849
48850	AMO Fleet Mobile Technology Advancement	2018/10	2021/12	208,174	37,219	-	245,394
C0019119	LIN Fly Ash System Refurbishment 2020	2020/02	2021/12	123,293	116,766	-	240,060
C0021586	TUC3 Elevator Modernization Upgrades	2020/01	2021/07	53,730	184,022	-	237,752
51394	LIN3/4 Operator Control Panel Button Upgrade	2017/04	2021/12	1,313	229,296	-	230,609
49429	LIN Coal Pile Run Off Pond Expansion	2017/05	2021/12	10,194	205,701	-	215,895
C0010944	AMO LIN4 Enhanced Monitoring	2019/04	2022/03	5,009	177,598	12,939	195,545
C0010942	AMO LIN3 Enhanced Monitoring	2020/01	2021/06	7,506	161,808	-	169,315
C0020184	LIN3 Auxiliary Air Upgrades	2020/03	2021/12	42,138	99,208	-	141,346
52234	TUC3 Low Load Operation Upgrades	2019/07	2022/05	80,381	50,995	-	131,376
C0021567	TUC2 North CW Pump Refurbishment	2020/01	2022/02	7,701	119,390	-	127,091

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Figure 19: Generation Carry-over Capital Spending Summary

CI#	Project Title	Start Date	Final Date	Previous Expenditure (\$)	2021 Budget (\$)	Subsequent Spending (\$)	Total Estimate (\$)
C0021882	LIN CW Control Panel Upgrades	2020/02	2021/12	1,254	109,151	-	110,405
C0021422	TUC Plant Security Upgrades Phase 2	2020/01	2022/04	10,454	98,568	-	109,023
C0023683	TUC3 Precipitator Inlet Expansion Joint Refurbishment	2020/08	2022/05	30,889	54,454	-	85,343
C0011214	TUC3 Aquarian Level Detection Replacement	2020/02	2022/05	1,968	72,031	-	73,999
C0020323	TRE5 Miscellaneous Valve Replacements 2020	2020/06	2022/02	20,073	53,824	-	73,897
C0021466	TUC Underground Water Lines Replacement	2020/11	2022/05	18,885	52,446	-	71,331
49657	TUC Sequence of Events Recorder Upgrade	2018/11	2021/12	25,272	44,099	-	69,371
C0019540	LIN Plant Exterior Piping Heat Tracing Refurbishment	2020/03	2021/05	59,511	8,293	-	67,805
C0021962	ICP U&U Unloading Hopper Walkway Replacement	2019/09	2021/12	43,378	22,017	-	65,395
C0026862	LIN1 CW Pipe Refurbishment	2020/03	2021/12	18,585	16,336	-	34,920
<b>Total Steam Generation Plant</b>				<b>\$10,193,304</b>	<b>\$11,053,273</b>	<b>\$12,939</b>	<b>\$21,259,516</b>
<b>Gas Turbine Generation Plant</b>							
49940	LM6000 TUC5 Control System Upgrade	2019/01	2021/12	652,550	592,342	-	1,244,892
49949	LM6000 TUC4 Control System Replacement	2017/04	2021/12	445,343	669,403	-	1,114,746
46152	LM6000 TUC4 Fast Start Upgrade	2014/09	2022/12	284,994	138,670	-	423,664
46153	LM6000 TUC5 Fast Start Upgrade	2014/09	2022/04	276,262	134,810	-	411,072
C0021029	CT Fleet ITE Breaker Refurbishment	2020/01	2021/10	390,289	17,613	-	407,903
C0020904	LM6000 191-443 HPCS 3-5 VSV Bushing Replacement	2020/01	2021/12	151,054	10,055	-	161,109
<b>Total Gas Turbine Generation Plant</b>				<b>2,200,492</b>	<b>1,562,894</b>	<b>-</b>	<b>3,763,386</b>
<b>Total Generation Carry Over Spending</b>				<b>\$66,546,559</b>	<b>\$64,988,518</b>	<b>\$98,532,481</b>	<b>\$230,067,558</b>

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6.2 Generation – New 2021 Capital Items for ACE Plan Approval

Figure 20: Generation - New 2021 Capital Items for ACE Plan Approval

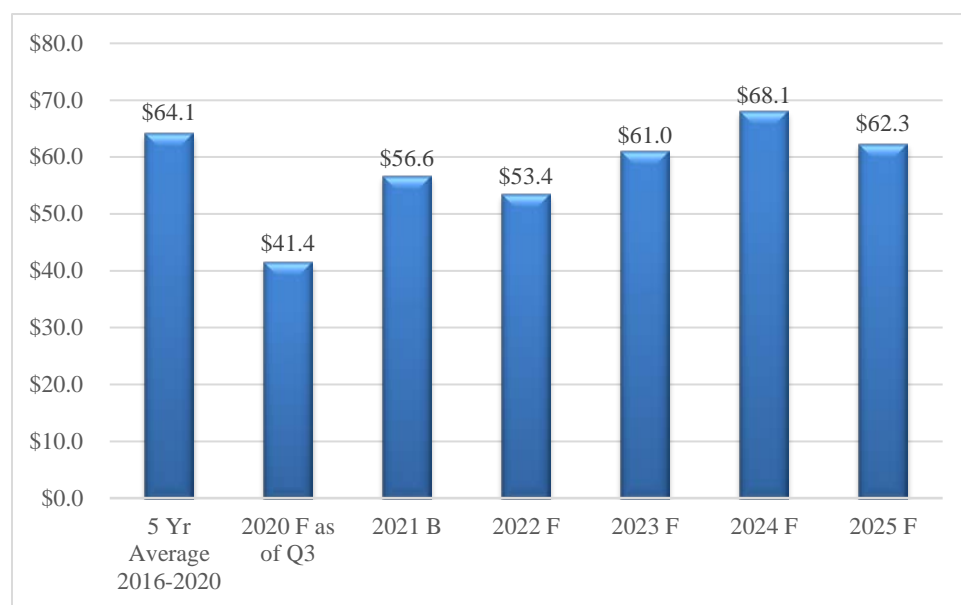
Tab #	CI#	Project Title	2021 Budget	Project Total
<b>Steam Generation Plant</b>				
<b>Turbine</b>				
G01	C0030528	TUC3 HP Turbine Refurbishment	2,085,088	2,085,094
<b>Total Steam Generation Plant</b>			<b>\$2,085,088</b>	<b>\$2,085,094</b>
<b>Gas Turbine Generation Plant</b>				
G02	C0020944	LM6000 - 191-443 Hot Section Engine Refurbishment	473,200	5,749,282
G03	46483	CT - TUS Control System Upgrade	1,046,322	1,046,322
<b>Total Gas Turbine Generation Plant</b>			<b>\$1,519,522</b>	<b>\$6,795,604</b>
<b>Total Generation New Spending</b>			<b>\$3,604,610</b>	<b>\$8,880,698</b>

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**7.0 TRANSMISSION**

Transmission includes items for replacement, reinforcement or expansion of the transmission system, which transmits electrical energy from the generation plants to distribution substations throughout the province. Transmission includes assets and equipment operating at 69 kV or higher. NS Power operates over 5,000 km of transmission circuits and related protection, controls and substation equipment. **Figure 21** below illustrates NS Power's capital investment in transmission, including historical, forecast and budget.

**Figure 21: Transmission Investment– Historical, Forecast and Budget**  
(Millions of dollars)



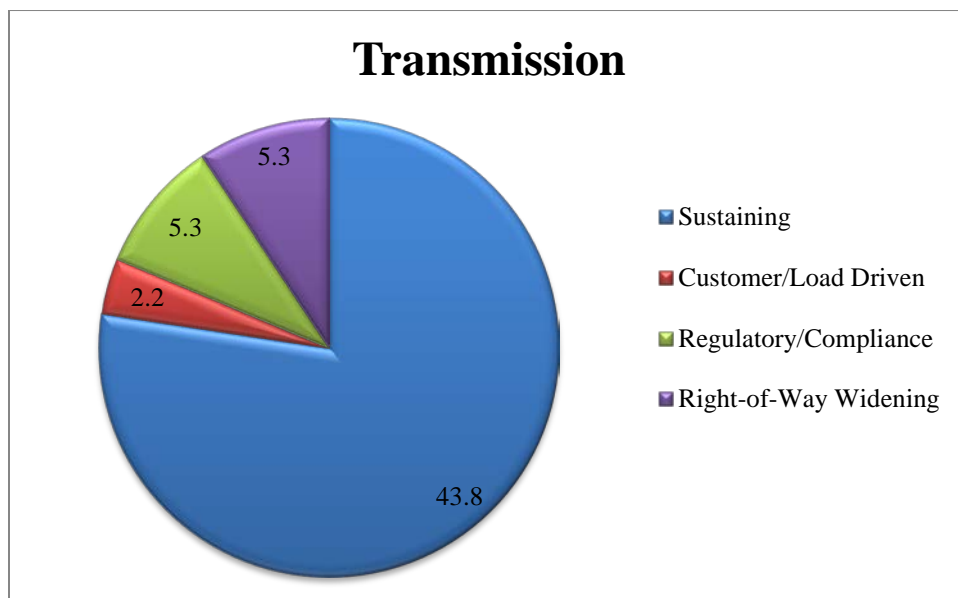
F = Forecast, B=Budget in above figure

**Figure 22** provides a breakdown of the 2021 transmission investment by investment type.

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**Figure 22: 2021 Transmission Investment by Investment Type**

(Millions of dollars)



Transmission investment is driven by the asset management approach as described in Section 6.2 of the CEJC. The asset management approach evaluates condition and criticality to determine the failure risk of different asset groups and provides priorities for the maintenance and replacement of these assets as appropriate. NS Power's asset management strategy and inspection program results for these assets feed into this selection process, aimed largely at sustaining capital investments. Please refer to Section 11.1.6 for additional detail on NS Power's strategy related to reliability.

The focus for transmission capital investments in 2021 is on sustaining system reliability. The approximately \$57 million transmission capital investment plan for 2021 is summarized in **Figure 23** below.

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**Figure 23: Summary of 2021 Transmission Capital Investments**

*(Millions of dollars)*

i	New 2021 capital spending for projects with total estimated project spend greater than \$1,000,000 and for which approval is sought. (As provided in Section 7.2)	13.6
iii	New capital spending for projects with total estimated spending less than \$1,000,000 for which approval is not sought. (As provided in Section 5.4)	2.7
iv	Carry-over capital spending. (As provided in Section 7.1)	28.2
v	Routine capital spending. (As provided in Section 10)	12.1
vi	Total 2021 Transmission Capital Investment Plan	56.6
	Request for ACE Approval (Items i and v)	25.7

Note 1: Totals may be off due to rounding.

**7.1 Transmission – Carry-over Capital Spending Summary**

**Figure 24: Transmission Carry-Over Capital Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
<b>Transmission Plant</b>							
C0021102	L5029 Replacements and Upgrades	2020/06	2022/10	57,598	2,264,095	4,395,009	6,716,702
C0020627	2020 Transmission Right-of-Way Widening 69kV	2020/01	2021/12	2,158,594	3,248,597	-	5,407,191
C0021123	2020/2021 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	2019/12	2021/11	3,278,238	1,416,306	-	4,694,544
C0011261	101W Port Mersey Substation Expansion	2019/11	2022/12	91,365	1,967,870	2,422,314	4,481,548
47954	L7012 Replacements and Upgrades	2017/04	2021/10	3,788,829	104,979	-	3,893,808
49948	2017/2018 Isolated Transmission Structure Replacements	2017/06	2021/07	2,523,897	571,219	-	3,095,116
C0021106	L7005 Replacements and Upgrades Phase 1	2020/07	2022/02	6,511	1,476,485	1,511,386	2,994,382
C0021105	L7002 Replacements and Upgrades Phase 1	2019/11	2022/10	559,783	1,409,367	967,423	2,936,573
C0010952	2019/2020 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	2018/12	2021/12	2,329,677	520,597	-	2,850,273
C0011321	L5031 Replacements and Upgrades Phase 1	2020/10	2022/10	75,597	1,626,679	1,036,790	2,739,067
C0001900	Mount Hope 69-25kV Substation	2018/01	2022/08	1,211,098	250,180	1,248,705	2,709,983
C0021107	L8001 Replacements and Upgrades Phase 1	2020/06	2022/03	40,454	1,709,852	842,438	2,592,744
C0010948	2019/2020 Sacrificial Anode Installation Program	2019/01	2021/11	791,886	1,669,946	-	2,461,832



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**Figure 24: Transmission Carry-Over Capital Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
51975	5P Mobile Substation Replacement	2018/01	2021/12	1,313,026	964,203	-	2,277,229
C0010949	2019/2020 Steel Tower Life Extension	2019/05	2021/10	1,578,664	689,015	-	2,267,679
C0011339	L6549 Replacements and Upgrades Phase 2	2019/01	2021/08	1,602,498	483,581	-	2,086,079
C0021104	L5550 Replacements and Upgrades Phase 1	2020/03	2022/08	45	1,140,145	879,107	2,019,297
C0010950	2019/2020 Steel Tower Refurbishment	2019/01	2021/06	1,736,357	264,292	-	2,000,650
C0010978	2019/2020 Transmission Switch & Breaker Replacement	2018/12	2021/10	1,168,752	52,145	-	1,220,897
52303	L7019 Replacements and Upgrades	2020/05	2022/07	6,511	906,260	294,992	1,207,763
C0010955	2020/2021 Wood Pole Retreatment Program	2020/05	2022/03	363,959	438,146	256,186	1,058,292
C0021122	2020/2021 Transmission Switch & Breaker Replacement	2020/01	2021/12	605,436	424,113	-	1,029,549
C0021323	Trenton 50N-T13 Replacement	2020/02	2022/03	17,896	959,348	-	977,244
C0021026	Willow Lane 15N-T3 Replacement	2020/02	2022/02	19,828	915,669	-	935,497
52059	L5039 Replacements and Upgrades	2018/03	2021/01	639,262	180,284	-	819,546
C0011039	Lumsden 5V Generating Transformer Replacement	2019/03	2021/12	23,707	593,606	-	617,313
51406	2018/2019 Transmission Switch & Breaker Replacement	2018/03	2021/12	505,990	52,145	-	558,135
52317	2020 Line Retirement Program	2020/01	2021/06	97,471	419,404	-	516,875
51797	2018 Oil Containment Program	2018/01	2021/11	344,911	116,856	-	461,767
C0011918	2019 Oil Containment Program	2019/02	2021/12	258,482	190,067	-	448,549
C0011851	2019 Tap Changer Replacements/Refurbishments	2019/05	2021/10	147,296	221,918	-	369,214
C0022744	2020 Oil Containment Program	2020/03	2021/12	79,815	236,810	-	316,625
C0021145	Mobile Substation Low Voltage Cable Trailer	2020/03	2021/04	7,674	258,274	-	265,948
52261	83V-503 & 83V-504 - Bring Switches to Roadside	2018/08	2021/12	116,595	126,138	-	242,734
C0021136	6P New High Side Circuit Switcher	2020/01	2021/09	12,972	170,510	-	183,482
C0011850	2019 Substation Insulator Replacement Program	2019/10	2021/12	40,547	104,840	-	145,387
43268	9W-B53 Tusket Support Structure Replacement	2018/01	2021/06	14,550	79,467	-	94,017
<b>Total Transmission Carry Over Spending</b>				<b>\$27,615,773</b>	<b>\$28,223,409</b>	<b>\$13,854,350</b>	<b>\$69,693,532</b>

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**7.2 Transmission – New 2021 Capital items for ACE Plan Approval**

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**Figure 25: Transmission - New 2021 Capital Items for ACE Plan Approval**

Tab #	CI#	Project Title	2021 Budget	Project Total
<b>Transmission Plant</b>				
T01	C0031263	2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	3,082,728	7,512,226
T02	C0031089	2021/2022 Transmission Right-of-Way Widening 69kV	2,015,923	5,288,520
T03	C0031122	L6539 Replacements and Upgrades	1,410,921	2,821,842
T04	C0031085	L6516 Line Replacement and Upgrades	1,384,963	2,730,592
T05	C0031050	New Spare Large Autotransformer	976,198	2,398,564
T06	C0033644	2021/2022 Steel Tower Life Extension	793,248	2,332,746
T07	C0033645	2021/2022 Steel Tower Refurbishment	1,190,655	1,944,005
T08	C0031069	L6020 Replacements and Upgrades	926,286	1,825,300
T09	C0031262	2020/2021 Transmission Switch and Breaker Replacement	814,495	1,483,048
T10	C0031064	L5054 Replacements and Upgrades	1,045,362	1,134,737
<b>Total Transmission New Spending</b>			<b>\$13,640,779</b>	<b>\$29,471,580</b>

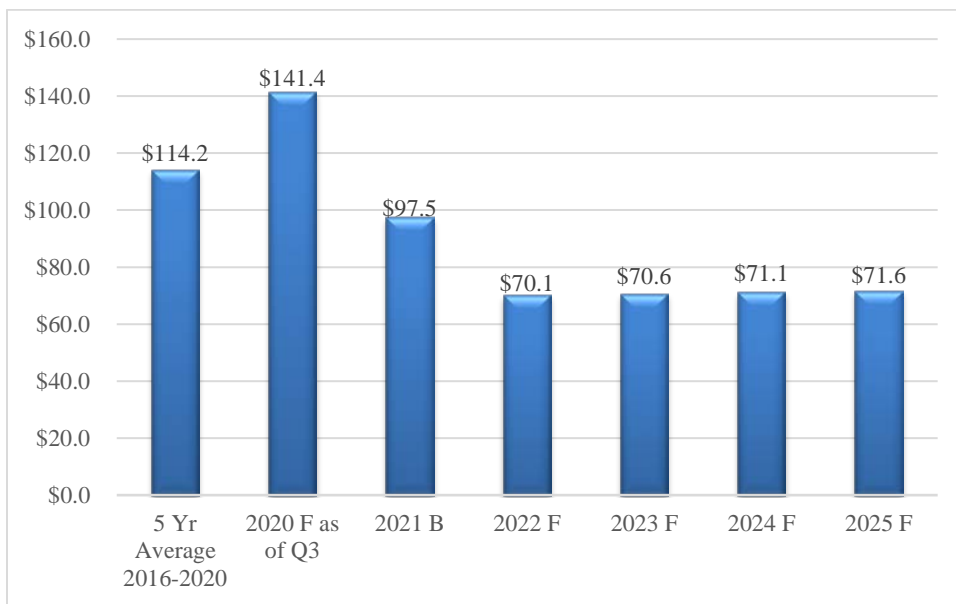
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**8.0 DISTRIBUTION**

Distribution includes replacement of and additions to equipment for delivering electricity from points on the transmission system to customers served at voltages below 69 kV. NS Power operates 26,972 km of distribution circuits and related protection, controls and transformers. The decreased investment levels starting in 2021 are primarily due to forecast completion of the AMI project, partially offset by forecast investment in the Smart Grid project. **Figure 26** below illustrates NS Power's capital spending on distribution, including historical, forecast and budget.

**Figure 26: Distribution Investment – Historical, Forecast and Budget**  
(Millions of dollars)



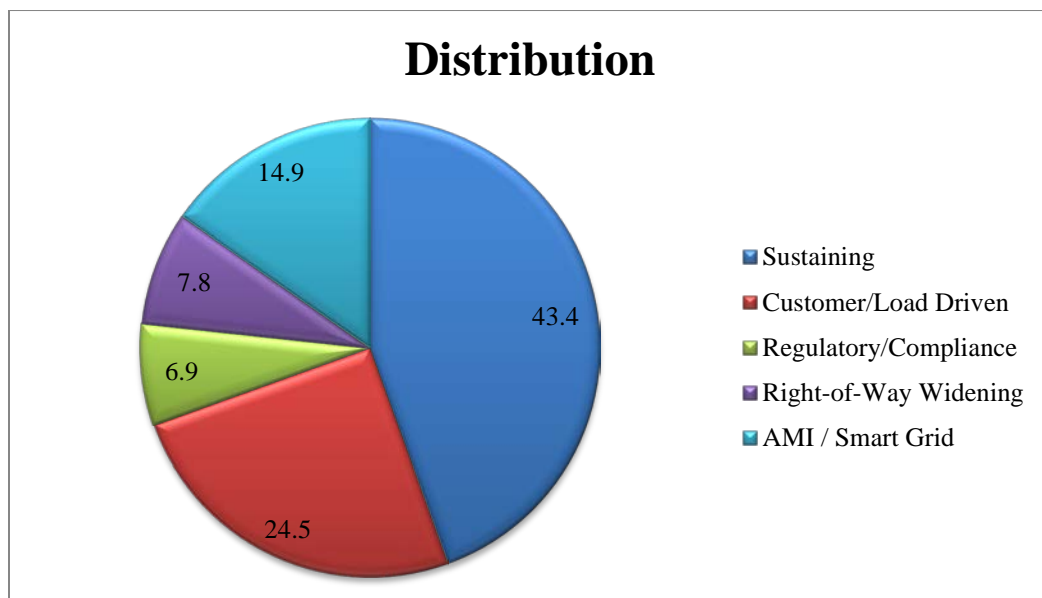
F = Forecast, B=Budget in above figure

**Figure 27** provides a breakdown of the 2021 distribution investment by investment type.

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**Figure 27: 2021 Distribution Investment by Investment Type**

(Millions of dollars)



Similar to Transmission investment, Distribution investment is driven by the asset management approach as described in Section 6.2 of the CEJC. The asset management approach evaluates both condition and criticality to determine the failure risk of different asset groups and provides priorities for the maintenance and replacement of these assets as appropriate. NS Power's asset management strategy and condition assessments feed into this selection process, aimed largely at sustaining capital investments. Please refer to Section 11.1.6 for additional detail on NS Power's strategy related to reliability.

The focus for Distribution capital investments in 2021 continues to reflect localized customer load growth, sustaining customer reliability, the culmination of the AMI project, and investment in the Smart Grid project. The approximately \$98 million Distribution capital investment plan for 2021 is summarized in **Figure 28** below.

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**Figure 28: Summary of 2021 Distribution Capital Investments**

*(Millions of dollars)*

i	New 2021 capital spending for projects with total estimated project spend greater than \$1,000,000 and for which approval is sought. (As provided in Section 8.2)	5.5
ii	2021 capital spending for projects with total estimated project spend greater than \$1,000,000 for which approval will be sought subsequent to the filing of the 2021 ACE Plan. (As provided in Section 5.3)	1.4
iii	New capital spending for projects with total estimated spending less than \$1,000,000 for which approval is not sought. (As provided in Section 5.4)	8.1
iv	Carry-over capital spending. (As provided in Section 8.1)	26.1
v	Routine capital spending. (As provided in Section 10)	56.3
	Total 2021 Distribution Capital Investment Plan	97.5
	Request for ACE Approval (Items i and v)	61.8

Note 1: Totals may be off due to rounding.

**8.1 Distribution – Carry-over Capital Spending Summary**

**Figure 29: Distribution Carry-Over Capital Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
<b>Distribution Plant</b>							
47124	Advanced Metering Infrastructure	2015/01	2021/12	129,893,213	9,996,025	-	139,889,238
C0020623	New Distribution Rights-of-Way Phase 5	2020/01	2021/11	6,503,872	3,649,413	-	10,153,285
C0010778	Smart Grid Nova Scotia Project	2018/10	2022/12	2,495,005	4,930,541	(520,689)	6,904,857
49919	2017 PCB Pole Top Transformer Replacement	2017/01	2021/12	1,733,261	391,039	-	2,124,300
C0020834	2020/2021 Inaccessible PCB Transformer Replacements	2020/06	2022/11	230,595	1,548,929	-	1,779,524
51493	2018 PCB Pole Top Transformer Replacements	2017/06	2021/12	1,180,376	334,807	-	1,515,183
C0020835	2020 Padmount Replacement Program	2020/01	2022/02	1,188,798	158,324	-	1,347,122
C0021182	93V-313G Meteghan Rebuild	2020/10	2023/02	208,470	425,035	481,464	1,114,968
41350	16W-301 Hebron Rebuild Phase 2	2017/05	2022/12	181,348	222,554	414,977	818,879
52184	37N-412 Glooscap Trail Rebuild Phase 2	2017/09	2022/05	399,593	211,863	191,358	802,814
C0014019	2019 Substation Recloser Replacements	2019/05	2022/07	606	448,827	309,270	758,702
51744	30N-411 Maccan River Crossing Rebuild	2018/01	2021/05	712,078	28,297	-	740,374
C0019379	50N-410 - 4C-430 Highway 104 Twinning	2019/10	2021/09	606,452	73,830	-	680,282

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Figure 29: Distribution Carry-Over Capital Spending Summary

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
51400	2018 Substation Recloser Replacements	2018/04	2021/12	537,754	134,840	-	672,594
C0016183	2020 Downline Asset PCB Replacements	2019/06	2021/12	531,122	76,596	-	607,719
C0026043	9H-221 Conversion - Jubilee Road Area	2020/02	2021/12	265,808	174,014	-	439,822
52205	30N-412 Hwy 242 Fundy Shore Rebuild	2018/02	2021/07	160,883	277,625	-	438,508
C0008740	Canso Distribution System Asset Replacement	2019/12	2021/06	231,538	191,693	-	423,232
C0006319	2019 PCB Pole Top Transformer Replacements	2018/03	2021/12	203,095	211,952	-	415,047
52229	16V-314H-New Edinburgh Phase Extension	2019/08	2021/05	123,281	281,453	-	404,735
C0011187	5N-301 - Masstown Road Rebuild Phase 2	2019/10	2021/12	27,488	350,953	-	378,441
52275	99H-312 Wallis Heights Replacement	2018/07	2021/09	127,102	233,112	-	360,214
C0020839	101H-411 Sackville rear lot Rebuild	2020/03	2021/11	65,949	287,427	-	353,376
C0011189	2H-411 - Cowie Hill UG System Replacements Part 3	2019/05	2021/12	27,344	319,183	-	346,527
C0011309	54H-304 Underground Device Replacement	2019/05	2021/08	238,825	88,717	-	327,542
C0011206	102W-311 Jedediah Rd Rebuild	2019/07	2022/05	19,558	85,269	200,531	305,358
C0011182	15N-202 - Dominion St and Arthur St Rebuild	2019/06	2021/06	32,517	262,074	-	294,591
C0031148	Metro-Stack insulator replacements	2020/10	2021/12	93,525	197,302	-	290,826
52186	4S Feeder Exit Cable Replacement Phase 1	2018/03	2021/08	223,891	61,190	-	285,081
C0011188	23H-303 - Willett Street Underground Replacement	2019/04	2021/07	56,621	177,411	-	234,032
49877	23H-302 Clayton Park Rebuild Phase II	2017/04	2021/12	117,104	108,320	-	225,424
C0020825	64N Lourdes Street Conversion Phase 2	2020/04	2021/06	187,121	7,259	-	194,380
49957	93V Feeder Expansion	2017/04	2021/05	132,207	22,130	-	154,337
C0031882	22C-403-404 Feeder Exit Replacement	2020/09	2021/05	135,825	9,266	-	145,090
C0006178	84W-302 Subsea Cable Removal and UG Cable Replacement	2018/02	2021/06	14,350	77,939	-	92,289
<b>Total Distribution Carry Over Spending</b>				<b>\$148,886,577</b>	<b>\$26,055,207</b>	<b>\$1,076,909</b>	<b>\$176,018,693</b>

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8.2 Distribution – New 2021 Capital Items for ACE Plan Approval

Figure 30: Distribution - New 2021 Capital Items for ACE Plan Approval

Tab #	CI#	Project Title	2021 Budget	Project Total
<b>Distribution Plant</b>				
D01	C0031083	New Distribution Rights-of-Way Phase 6	4,160,074	9,762,735
D02	C0031145	2021 Padmount Replacement Program	1,379,040	1,636,153
<b>Total Distribution New Spending</b>			<b>\$5,539,114</b>	<b>\$11,398,887</b>

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9.0 GENERAL PLANT

General plant includes information technology, computer infrastructure, operational technology (OT) and communication equipment, which comprise the majority of capital expenditures incurred under this function. Other items such as office equipment, vehicles, and construction equipment are also included. General plant also includes buildings except generating and substation facilities. General Plant infrastructure investment is required to sustain and enhance NS Power's cross-functional foundational tools and facilities that are critical to continue to provide safe, reliable, cost effective energy to customers. **Figure 31** below illustrates NS Power's capital investment in general plant, including historical, forecast and budget.

**Figure 31: General Plant Investment – Historical, Forecast and Budget**  
(Millions of dollars)



F = Forecast, B=Budget

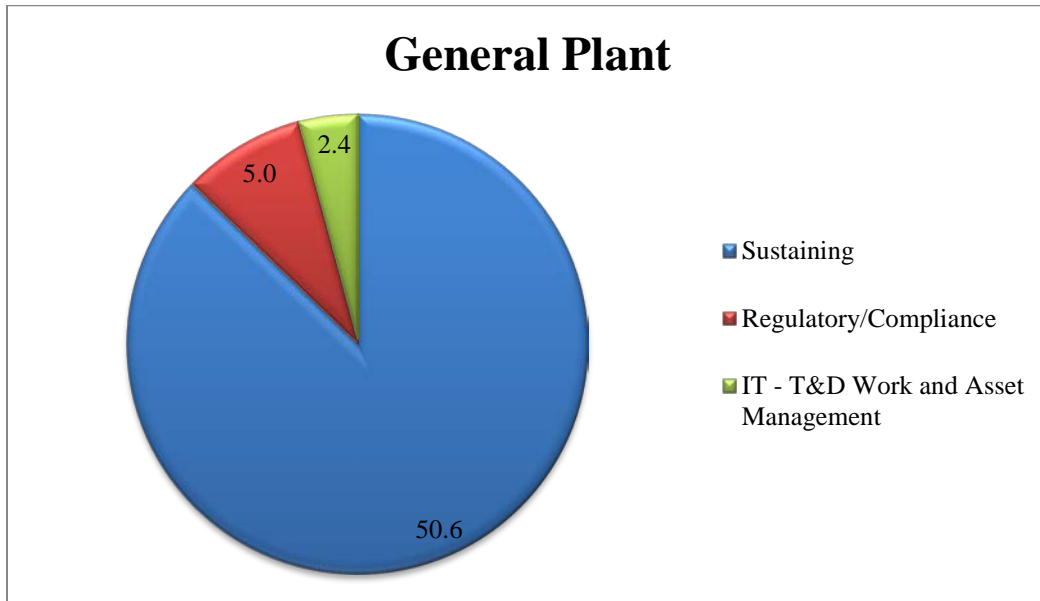
**Figure 32** provides a breakdown of the 2021 general plant spend by investment type.



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**Figure 32: 2021 General Plant Spend by Investment Type**

(Millions of dollars)



General plant capital investment in 2021 is primarily in IT and OT. The approximately \$58 million general plant capital investment plan for 2021 is summarized in **Figure 33** below.

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**Figure 33: Summary of 2021 General Plant Capital Investments**

*(Millions of dollars)*

i	New 2021 capital spending for projects with total estimated project spending greater than \$1,000,000 and for which approval is sought. (As provided in Section 9.2)	2.0
ii	2021 capital spending for projects with total estimated project spending greater than \$1,000,000 for which approval will be sought subsequent to the filing of the 2021 ACE Plan. (As provided in Section 5.3)	6.7
iii	New capital spending for projects with total estimated spending less than \$1,000,000 for which approval is not sought. (As provided in Section 5.4)	7.5
iv	2021 capital spending for projects included in the 2020 ACE Plan for which approval will be sought in late 2020. (As provided in Section 4.2)	0.5
v	Point Aconi Generating Station capital spending. (As provided in Section 5.5)	0.1
vi	Carry-over capital spending. (As provided in Section 9.1)	20.4
vii	Routine capital spending. (As provided in Section 10)	20.8
	<b>Total 2021 General Plant Capital Investment Plan</b>	<b>58.0</b>
	Request for ACE Approval (Items i and vii)	22.8

Note 1: Totals may be off due to rounding.

**9.1 General Plant – Carry-Over Capital Spending Summary**

**Figure 34: General Plant - Carry-Over Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
C0021109	New RTU Deployment Project	2020/10	2024/12	13,022	1,882,833	5,657,427	7,553,281
C0011378	Route Network Upgrade	2019/07	2022/12	448,555	3,214,945	1,789,059	5,452,559
52308	2018/2019 RTU Replacements Program	2018/03	2021/12	512,462	206,248	-	718,710
46572	2017 RTU Replacement Program	2017/01	2021/10	463,011	120,628	-	583,639
C0011380	2019 Telecom Building Replacement	2019/06	2021/12	190,765	113,914	-	304,680
C0021645	Tusket Telecom Upgrades	2020/01	2021/10	134,073	124,806	-	258,879
C0021642	13V Gulch Telecom Upgrades	2020/02	2022/07	119,973	136,456	-	256,429
<b>Total Telecommunications</b>				<b>1,881,861</b>	<b>\$5,799,831</b>	<b>\$7,446,486</b>	<b>\$15,128,178</b>

C0010019	IT - ADMS Upgrade	2018/06	2021/04	7,362,890	1,966,482	-	9,329,372
49480	IT - Data Centre Disaster Recovery	2016/05	2022/12	3,112,597	2,078,327	250,000	5,440,925

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**Figure 34: General Plant - Carry-Over Spending Summary**

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
49093	IT - Security Operations Center (SOC) and Security Information Event Monitoring (SIEM)	2016/03	2021/12	3,713,861	313,463	-	4,027,324
C0023622	AMO Substation and Transmission Asset Performance Management Program	2019/11	2022/12	659,054	853,184	712,543	2,224,781
C0023623	AMO Distribution Asset Performance Management Program	2020/01	2022/12	407,585	583,286	586,500	1,577,371
C0020338	Meridium Upgrade for Power Production	2019/08	2021/05	959,619	356,337	-	1,315,956
C0020313	IT - Customer Care Telephony Platform Upgrade	2019/07	2021/05	700,942	285,896	-	986,837
51483	IT - Public Key Infrastructure Certificate Authority	2017/05	2021/12	278,984	531,612	-	810,596
C0010158	IT - Align Fuel	2018/07	2022/11	65,480	355,920	355,920	777,320
C0011087	IT - Customer Identity & Access Management	2019/01	2022/03	279,961	396,192	-	676,154
C0023242	IT - Nexus Core Switch Replacement	2019/10	2022/10	392,864	105,334	-	498,198
C0026042	IT - Operations Management and Software Asset Management Interface Implementation Project	2020/01	2021/09	136,841	327,320	-	464,161
C0013718	AMO Run-up Optimization Tool	2018/08	2021/12	230,856	45,035	-	275,890
C0002254	IT - MV90 Upgrade	2018/02	2021/06	172,537	29,218	-	201,755
C0033584	IT - IVR Replacement	2020/10	2021/03	58,493	36,641	-	95,134
<b>Total Computers</b>				<b>\$18,532,565</b>	<b>\$8,264,248</b>	<b>\$1,904,963</b>	<b>\$28,701,777</b>
C0002137	ECC Map Board and Technology Modernization	2019/02	2022/09	149,837	1,837,869	-	1,987,707
C0017098	RAL Generator Replacement	2019/05	2021/12	97,877	1,779,822	-	1,877,699
C0010838	MCC - HVAC Replacement	2018/04	2021/07	79,907	1,413,100	-	1,493,007
48837	AMO Fleet Environmental Data Management	2016/01	2021/06	783,691	96,121	-	879,813
C0011819	2020 SCADA Upgrade	2018/11	2021/12	368,564	490,432	-	858,997
C0024302*	NERC CIP 2021 Standards Implementation	2019/12	2021/08	621,480	177,579	-	799,060
C0020783	AMO Climate Change Management System	2019/07	2021/11	319,423	148,010	-	467,433
C0002130	ADMS Distribution Fault Location	2018/01	2021/12	248,734	150,327	-	399,061
50941	AMO Portal Development	2019/01	2021/12	356,814	18,017	-	374,831
C0020341	Static Equipment Program Management System	2020/01	2022/12	15,359	112,534	8,127	136,020
C0032884	CCO Intelligent Alarms Management Solution	2020/11	2021/07	88,518	43,404	-	131,922
C0028683	AMO Mobile Technology for Hazardous Locations	2020/05	2021/12	40,669	80,937	-	121,607

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Figure 34: General Plant - Carry-Over Spending Summary

CI#	Project Title	Start Date	Final Date	Previous Expenditure	2021 Budget	Subsequent Spending	Total Estimate
C0020790	AMO Transmission Damage Model	2020/07	2021/12	51,213	15,515	-	66,727
C0019883	AMO HYD Dam Safety Mobility	2019/06	2021/03	47,100	2,832	-	49,932
Total Other General Plant				\$3,269,188	\$6,366,500	\$8,127	\$9,643,815
Total General Plant Carry Over Spending				\$23,683,614	\$20,430,579	\$9,359,576	\$53,473,769

\*Capital Item Related to NERC and/or NPCC Standards

9.2 General Plant – New 2021 Capital Items for ACE Plan Approval

Figure 35: General Plant - New 2021 Capital Items for ACE Plan Approval

Tab #	CI#	Project Title	2021 Budget	Project Total
General Plant				
GP01	49094	IT - Privilege Access Management (PAM)	1,962,056	3,211,166
Total General Plant New Spending			\$1,962,056	\$3,211,166

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**10.0 ROUTINE CAPITAL PROGRAM**

NS Power's routine capital program is for recurring annual expenditures of like-for-like replacement of equipment, additions to existing equipment base resulting from system growth, and addition of customers to the system. This section details all routine capital expenditures for generation, transmission, distribution and general plant asset classes. NS Power seeks NSUARB approval of the 2021 routine capital program in the amount of approximately \$94.1 million.

**10.1 Routine Capital Spending by Function Yr/Yr**

**Figure 36: Routine Capital Spending by Function Yr/Yr**

	2019 Actual	2020 Budget	2020 Forecast*	2021 ACE Plan
<b>Generation</b>				
Generation Equipment Replacements	3,357,780	4,072,883	3,188,686	3,792,872
Generation Other Hydro	537,784	513,612	511,070	768,954
Generation Other Thermal	428,051	333,867	215,987	331,935
	<u>\$4,323,615</u>	<u>\$4,920,363</u>	<u>\$3,915,743</u>	<u>\$4,893,761</u>
<b>Transmission</b>				
Transmission Substation Replacement, Add'ns/Mod'ns	3,152,696	2,879,774	3,821,048	3,239,301
Primary Equipment Spares	100,276	252,500	477,410	255,000
Protection Modification & Replacement	632,292	855,239	646,499	851,287
Transmission Line Replacement, Add'ns/Mod'ns	9,050,269	7,260,317	7,439,822	7,176,396
Transmission Right-of-Way Widening	715,518	599,980	505,508	584,280
	<u>\$13,651,051</u>	<u>\$11,847,810</u>	<u>\$12,890,287</u>	<u>\$12,106,265</u>
<b>Distribution</b>				
Meters	2,632,463	1,504,756	1,003,416	1,997,121
Distribution Upgrades and Replacement	50,420,711	25,269,832	31,175,574	27,825,268
New Customers	23,885,526	21,364,283	25,021,518	24,510,850
Joint Use	321,097	700,020	2,260,460	1,383,607
Distribution Right-of-Way Widening	403,439	596,140	(42,003)	584,280
	<u>\$77,663,236</u>	<u>\$49,435,032</u>	<u>\$59,418,965</u>	<u>\$56,301,126</u>
<b>General Plant</b>				
Work Vehicles	9,741,788	9,215,148	5,750,467	10,402,577

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**Figure 36: Routine Capital Spending by Function Yr/Yr**

	2019	2020	2020	2021
	Actual	Budget	Forecast*	ACE Plan
Tools and Test Equipment	1,706,134	1,717,425	1,577,308	1,747,352
Telecommunications	1,043,954	1,279,946	1,121,674	1,268,679
Computing Asset Management	2,993,142	1,821,757	1,390,140	2,069,702
Property Improvements and Furniture	3,929,494	2,875,000	1,836,785	4,023,237
Other	1,237,741	1,225,319	350,141	1,277,444
	\$20,652,252	\$18,134,595	\$12,026,514	\$20,788,991
<b>Total Routine Capital Spending</b>	<b>\$116,290,153</b>	<b>\$84,337,800</b>	<b>\$88,251,509</b>	<b>\$94,090,144</b>

Note: The entire routine program totals \$94.8 million including Point Aconi routines. The totals presented above and in the following information do not include Point Aconi routines.

\*The 2020 Forecast includes actuals up to July and forecast amounts for the remainder of the year.

**10.2 Routine Capital Spending Project Breakdown Yr/Yr**

**Figure 37: Routine Capital Spending Project Breakdown Yr/Yr**

Project #	CI #	Project Title	2019	2020	2020	2021
			Actual	Budget	Forecast*	ACE Plan
G001	10634	CT - Routine Equipment Replacements	424,262	354,000	400,000	362,031
H001	11622	HYD - Routine Equipment Replacement	781,310	787,025	671,034	702,768
H004	27867	HYD-Roofing Routine	61,004	96,960	113,394	98,898
S001	23428	GS - Routine Capital	-	-	1,134	-
	10645	POT - Routine Equipment Replacement	335,075	296,432	95,898	215,988
	10673	TRE - Routine Equipment Replacement	423,695	457,773	309,922	385,291
	43646	PHB - Routine Equipment Replacement	204,892	184,567	134,369	195,808
	10621	TUC - Routine Equipment Replacement	262,751	259,207	259,860	252,329
	10626	LIN - Routine Equipment Replacement	409,905	374,171	373,516	393,545
S004	27856	TRE - Roofing Routine	39,360	107,316	47,551	82,017
	27855	POT - Roofing Routine	11,520	327,458	54,021	110,223
	27854	TUC - Roofing Routine	52,851	53,172	13,756	61,295
	C0002249	PHB - Roofing Routine	46	30,966	-	-
	27857	LIN - Roofing Routine	260,006	143,837	46,790	162,100
W001	41830	Wind - Routine Equipment Replacement	91,102	600,000	667,438	770,581
		<b>Generation Equipment Replacements Total</b>	<b>\$3,357,780</b>	<b>\$4,072,883</b>	<b>\$3,188,686</b>	<b>\$3,792,872</b>
H005	35583	HYD - Oil Release Risk Assessment	318,791	332,004	575,711	583,710
H006	35584	HYD - Gate Refurbishment	218,994	181,608	(64,641)	185,244

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Figure 37: Routine Capital Spending Project Breakdown Yr/Yr

Project #	CI #	Project Title	2019 Actual	2020 Budget	2020 Forecast*	2021 ACE Plan
<b>Generation Hydro Total</b>			<b>\$537,784</b>	<b>\$513,612</b>	<b>\$511,070</b>	<b>\$768,954</b>
S005	33871	TUC - Heat Rate Routine	84,319	47,583	44,164	50,104
	33867	POT - Heat Rate Routine	179,707	108,285	69,385	102,452
	33869	TRE - Heat Rate Routine	67,600	86,325	51,795	85,173
	33863	LIN - Heat Rate Routine	96,426	91,674	50,644	94,206
<b>Generation Thermal Total</b>			<b>\$428,051</b>	<b>\$333,867</b>	<b>\$215,987</b>	<b>\$331,935</b>
T003	23120	Provincial - Trans Substation Primary	2,223,717	2,194,235	3,561,797	2,411,583
T004	23121	Provincial - Substation Additions & Replacements	928,978	685,539	259,251	827,718
<b>Transmission Subs Replace, Adds/Mods Total</b>			<b>\$3,152,696</b>	<b>\$2,879,774</b>	<b>\$3,821,048</b>	<b>\$3,239,301</b>
T018	14973	Primary Equipment Spares	100,276	252,500	477,410	255,000
<b>Primary Equipment Spares Total</b>			<b>\$100,276</b>	<b>\$252,500</b>	<b>\$477,410</b>	<b>\$255,000</b>
T016	14841	Protection Modification & Replacement	632,292	855,239	646,499	851,287
<b>Protection Modification &amp; Replacement Total</b>			<b>\$632,292</b>	<b>\$855,239</b>	<b>\$646,499</b>	<b>\$851,287</b>
T001	23115	Provincial Transmission Line Replace	3,601,119	1,805,336	2,038,599	1,773,646
T011	23118	Provincial Planned Trans Line Replacement	5,449,150	5,454,980	5,401,223	5,402,750
<b>Transmission Line Replacements Total</b>			<b>\$9,050,269</b>	<b>\$7,260,317</b>	<b>\$7,439,822</b>	<b>\$7,176,396</b>
T010	43827	Transmission Right of Way Widening	715,518	599,980	505,508	584,280
<b>Transmission Right-of-Way Widening Total</b>			<b>\$715,518</b>	<b>\$599,980</b>	<b>\$505,508</b>	<b>\$584,280</b>
D009	26496	Meter Routine	2,632,463	1,504,756	1,003,416	1,997,121
<b>Meters Total</b>			<b>\$2,632,463</b>	<b>\$1,504,756</b>	<b>\$1,003,416</b>	<b>\$1,997,121</b>
D005	23158	Unplanned Replace Deteriorated	15,212,750	12,839,575	15,229,842	14,603,935
D006	23135	Regulatory Replacements - Province	1,805,727	1,608,023	2,926,736	1,965,202
D008	23361	Provincial Storm	26,069,094	2,559,166	5,403,938	3,314,661
D051	29038	System Performance Improvement Routine	290,189	505,098	396,198	529,948
D055	23137	Planned Replacement Of Distribution	7,042,951	7,757,970	7,218,861	7,411,523
<b>Distribution Upgrades and Replacement Total</b>			<b>\$50,420,711</b>	<b>\$25,269,832</b>	<b>\$31,175,574</b>	<b>\$27,825,268</b>

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Figure 37: Routine Capital Spending Project Breakdown Yr/Yr

Project #	CI #	Project Title	2019 Actual	2020 Budget	2020 Forecast*	2021 ACE Plan
D004	26716	New Customer Upgrades	6,775,603	6,466,602	7,052,916	7,267,545
D018	23511	Primary Equipment Spares - Distribution	25,814	155,750	121,462	150,000
D061	39766	New Customers - Residential	10,957,250	8,953,148	11,268,679	10,591,919
D062	39770	New Customers - Commercial	6,126,859	5,788,784	6,578,461	6,501,387
<b>New Customers Total</b>			<b>\$23,885,526</b>	<b>\$21,364,283</b>	<b>\$25,021,518</b>	<b>\$24,510,850</b>
D007	23136	Contractual Replacements (Joint Use)	321,097	700,020	2,260,460	1,383,607
<b>Joint Use Total</b>			<b>\$321,097</b>	<b>\$700,020</b>	<b>\$2,260,460</b>	<b>\$1,383,607</b>
D010	23127	Provincial Widening	403,439	596,140	(42,003)	584,280
<b>Right of Way Widening Total</b>			<b>\$403,439</b>	<b>\$596,140</b>	<b>(\$42,003)</b>	<b>\$584,280</b>
P006	20945	Replacement and Additional Work Vehicles	355,286	199,929	306,698	150,000
P063	39304	Class 3 Work Vehicle Replacements	401,290	345,000	5,718	300,000
P062	39305	Work Vehicle Replacements	6,633,546	6,490,219	3,240,349	7,602,577
P061	40236	Transportation Vehicle Replacements	2,350,725	2,180,000	2,196,669	2,350,000
<b>Work Vehicles Total</b>			<b>\$9,741,788</b>	<b>\$9,215,148</b>	<b>\$5,750,467</b>	<b>\$10,402,577</b>
P002/P016		Meter Shop - Tools and Equipment	1,607,245	1,630,800	1,466,999	1,658,996
P015	11611	Hydro Production Tools, Test Equipment	98,889	86,625	110,309	88,356
<b>Tools and Test Equipment Total</b>			<b>\$1,706,134</b>	<b>\$1,717,425</b>	<b>\$1,577,308</b>	<b>\$1,747,352</b>
P025	16365	Mobile Radio Routine	35,132	244,180	146,345	238,528
P027	16551	Telecommunication Radio and Fibre Optics	214,314	195,054	197,276	191,103
P028	16550	Telecommunication Systems Replace & Modifications	609,935	663,712	603,648	654,048
P814	38243	Telecommunications Spares	184,571	177,000	174,406	185,000
<b>Telecommunications Total</b>			<b>\$1,043,954</b>	<b>\$1,279,946</b>	<b>\$1,121,674</b>	<b>\$1,268,679</b>
P010	16073	SCADA Improvements Routine	160,148	114,808	74,788	90,500
P031	29114	NSPI Non-CGI Infrastructure	2,732,568	1,500,000	1,176,072	1,761,103
P040	28522	CT's DCMS Routine	13,549	21,951	23,180	21,951
	25667	POT - DCMS Equipment Replacement Routine	4,814	49,991	20,830	51,148
	25626	TRE - DCMS Equipment Replacement Routine	4,741	45,007	11,162	50,000



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**Figure 37: Routine Capital Spending Project Breakdown Yr/Yr**

Project #	CI #	Project Title	2019 Actual	2020 Budget	2020 Forecast*	2021 ACE Plan
	25646	TUC - DCMS Equipment Replacement Routine	30,266	50,000	72,421	60,000
	25668	LIN - DCMS Equipment Replacement Routine	47,057	40,000	11,687	35,000
<b>Computing Asset Management Total</b>			<b>\$2,993,142</b>	<b>\$1,821,757</b>	<b>\$1,390,140</b>	<b>\$2,069,702</b>
P001/P030		Property Improvement and Furniture	3,929,494	2,875,000	1,836,785	4,023,237
<b>Property Improvement and Furniture Total</b>			<b>\$3,929,494</b>	<b>\$2,875,000</b>	<b>\$1,836,785</b>	<b>\$4,023,237</b>
P012/P041		Other (HYD - Security Improvement & FAC - Land Acquisition)	481,905	497,319	(296,600)	539,444
P018	48158	Environment Equipment Replacement Routine	215,835	100,000	100,050	100,000
P816	38897	FAC Enviro Property Remed Routine	146,152	214,000	214,000	214,000
P815	38896	FAC Environment Site Assess Routine	97,157	214,000	188,169	214,000
P032	38848	Purchasing Equip & Warehouse Routine	296,691	200,000	144,522	210,000
<b>Other Total</b>			<b>\$1,237,741</b>	<b>\$1,225,319</b>	<b>\$350,141</b>	<b>\$1,277,444</b>
<b>Routine Capital Spending</b>			<b>\$116,290,153</b>	<b>\$84,337,800</b>	<b>\$88,251,509</b>	<b>\$94,090,144</b>

Note: Point Aconi amounts have been removed to represent the spend amount that requires NSUARB approval.

\*The 2020 Forecast includes actuals up to July and forecast amounts for the remainder of the year.

### 10.3 Like for Like Routine Replacements

The NSUARB's 2013 ACE Plan Order Directive 2 provided as follows:

The Board directs NSPI, in the next ACE Plan application, to analyze the routine expenditures to determine what are the "like-for-like" totals. NSPI is further directed to explain why those totals, if they are similar in magnitude to the Board's analysis, are growing at an annual rate in excess of inflation.<sup>15</sup>

A summary of NS Power's total routine and like-for-like routine spending is provided in **Figure 38** below.

<sup>15</sup> NSUARB-P-128.13, 2013 Annual Capital Expenditure Plan, NSUARB Order, June 4, 2013.

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Figure 38: Annual Cost of Like for Like Routine Replacements

NOVA SCOTIA POWER (\$M)	2017 Actuals	2018 Actuals	2019 Actuals	2020 Forecast	2021 ACE
Total Routine Spending	88.8	106.6	116.3	88.3	94.1
Less:					
New Customers	22.6	25.7	23.9	25.0	24.5
System Growth and Performance	3.1	3.1	2.8	1.3	2.9
Other	1.1	1.1	1.3	0.8	1.7
Like-for-Like	62.0	76.8	88.4	61.1	65.1
Work Vehicles (Like-for-like)	8.3	9.1	9.7	5.8	10.4
Net (Like-for-like)	53.7	67.6	78.6	55.4	54.7

Routine classifications are determined by the primary classification of each routine project. If the majority of the work completed under the routine is like-for-like replacements, the routine is classified as like-for-like. New Customer routines, System Growth and Performance routines (such as heat rate, system improvement and right-of-way widening routines) and other routines (such as environmental assessment routines) were not included in the like-for-like totals.

#### 10.4 2021 Routine Capital Spending Project Details

##### Transmission

Figure 39: Transmission Substation Replacements, Additions and Modifications

T003 Provincial: Transmission Substation Primary Equipment	2021 ACE Plan Forecast
Unplanned Failures	1,600,000
22N Grounding, Fence, and Grading	66,791
2021 Substation Insulator Replacement	71,436
Structure and Footing Remediation	293,506
Substation Ground Grid Replacements	199,850
Battery Bank and Charger Replacements	180,000
<b>Total T003 Provincial: Transmission Substation Primary Equipment</b>	<b>\$2,411,583</b>

##### T004 Provincial: Substation Additions & Replacements

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**Transmission**

**Figure 39: Transmission Substation Replacements, Additions and Modifications**

<b>T003 Provincial: Transmission Substation Primary Equipment</b>	<b>2021 ACE Plan Forecast</b>
Unknown Additions	480,000
15V Add Alternate Station Service	88,274
2H Armdale New 138 kV switches for L6035	199,768
98W Grounding upgrades	59,676
<b>Total T004 Provincial: Substation Additions &amp; Replacements</b>	<b>\$827,718</b>
<b>Total Transmission Substation Replacements, Additions and Modifications</b>	<b>\$3,239,301</b>

1

**Figure 40: Primary Equipment Spares**

<b>T018 Primary Equipment Spares</b>	<b>2021 ACE Plan Forecast</b>
Spare Online DGA Monitors	155,000
Spare Tap Changer Parts	100,000
<b>Total Primary Equipment Spares</b>	<b>\$255,000</b>

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**Figure 41: Protection Modification and Replacement**

<b>T016 Protection Modification &amp; Replacement</b>	<b>2021 ACE Plan Forecast</b>
Replace SER/RTU at 51V	56,400
Replace L6538 Line protection at 3S	28,150
Replace L6539 Line protection at 3S	28,150
Replace L6545 Line protection at 85S	28,150
Replace L6549 Line protection at 85S	28,150
Replace 3S-B1 bus protection	18,200
Replace L7004 A relay at 3C	23,000
Replace L5541 protection at 50W	38,000
Replace L8001 Protection at 67N	58,000
Replace 79N-T81 B87 protection	72,479
Replace 9W-T2 Differential protection	62,000
Replace 230 kV SPS at 67N	49,000
Replace Wreck Cove frequency relays	18,200
Replace Pri Protection on L6035 at 104H	28,150

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**Figure 41: Protection Modification and Replacement**

**T016 Protection Modification & Replacement**

**2021 ACE Plan  
Forecast**

Replace LCBII relays at 50W, 104W, 101W	113,000
Replace LCBII relays on L6507 at 50N and 79N	72,479
Replace LCBII relays on L6508 at 50N and 79N	72,479
Replace Protection on L5510 at 95H	57,300

**Total Protection Modification & Replacement**

**\$851,287**

1

**Figure 42: Transmission Line Replacement, Additions, Modifications**

**2021 ACE Plan  
Forecast**

**T001 Provincial Transmission Line Replacement (Unplanned)**

This routine is budgeted based on historical T001 investment

**\$1,773,646**

**T011 Provincial- Planned Transmission Line Replacement**

**LINE # Description**

L5011	Farrell St. 99H to Imperial Oil 58H	718,809
L5046	5017 Tap L to Wolfville Ridge 83V	75,744
L5058	Springhill 74N to Pugwash 7N	67,064
L5532	Gulch Hydro 13V to Big Falls Hydro 3W	494,008
L5539	Milton 50W to Waterloo St. 48W	45,912
L6003	Sackville 90H to Tufts Cove 91H	38,601
L6009	Sackville 90H to Burnside 108H	107,360
L6025	Milton 50W to Bridgewater 99W	42,762
L6035	Water St. 1H to Kempt Rd. 104H	55,010
L6042	Tufts Cove 91H to Dartmouth East 113H	170,703
L6050	6001 Holland Rd. Tap L to Aerotech Park 127H	107,024
L6051	Brushy Hill 120H to St. Croix 17V	241,330
L6054	Canaan Rd. 43V to MacDonald Pond 101V	232,054
L6515	Port Hastings 2C to Antigonish 4C	70,140
L6518	Port Hastings 2C to STORA 47C	283,146
L6533	Victoria Jct. 2S to Langan 88S	237,461
L7004	Dalhousie Windfarm 91N to Port Hastings 3C	595,631
L7018	Onslow 67N to Brushy Hill 120H	126,878
Various	1-6 Month Inspection Driven Work	1,693,113

**T011 Provincial- Planned Transmission Line Replacement**

**\$5,402,750**

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Transmission Line Replacement Total

**\$7,176,396**

***T010 – Provincial: Transmission Right of Way Widening***

In its 2017 ACE Plan Order, the Board directed NS Power as follows:

The Board directs NSPI to update the cost estimates for vegetation management and right-of-way widening projects in the 2018 ACE Plan (and future years) based on actual historical costs incurred for this project.<sup>16</sup>

NS Power confirms that the cost estimates for vegetation management and right-of-way widening projects in the 2021 ACE Plan are based on actual historical costs incurred. This forecast is also developed based on the known level of widening in the current year as set out in **Figure 43** below:

**Figure 43: T010 Forecast by Line**

<b>&gt; 69 kV</b>	
L7003	152,796
L6537	95,497
L6012	57,299
L7004	76,398
L6514	106,792
L6020	95,497
<b>Total T010</b>	
	<b>\$584,280</b>

The Board's 2016 ACE Plan Order provided the following directive:

The Board directs that the Routine for Transmission widening be treated as a separate project, and not a routine, in future ACE Plan Applications. NSPI is to provide an annual progress report on the expenditure, works undertaken, results achieved and future plans as part of the annual ACE Plan submissions.<sup>17</sup>

<sup>16</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Order, April 4, 2017.

<sup>17</sup> M07176, NS Power 2016 Annual Capital Expenditure Plan, NSUARB Order, June 8, 2016, page 2. NS Power's annual progress report on the expenditure, works undertaken, results achieved and future plans can be found in the 2021 ACE Plan Reliability Directive in section 11.1.7.

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CI C0031089 - 2021/2022 Transmission Right-of-Way Widening 69kV is submitted in the 2021 ACE Plan in compliance with the Board's directive. With the addition of a separate capital work order for transmission Right-of-Way widening, the transmission vegetation management program is now carried-out under three broad initiatives:

1. Operating activities for transmission vegetation management;
2. Capital routine T010 - Transmission Right-of-Way Widening (for 138kV, 230kV and 345kV RoWs); and
3. New transmission rights-of-way widening individual capital projects (i.e. CI C0031089 for 69kV RoWs and subsequent phases).

Capital routine T010 remains for the widening of 138kV, 230kV and 345kV rights-of-way. This is the traditional scope of T010, but it has also previously included 69kV rights-of-way which are now assumed under CI C0031089 and subsequent phases. This was the scope of work included in the \$43.2 million eight-year program (\$5.4 million per year), which the NSUARB approved in principle and directed NS Power to include in ACE Plan filings for final approval.<sup>18</sup> The 69kV work was removed from T010 but the budget for T010 remains approximately the same due to increased North America Electric Reliability Corporation (NERC) requirements at the other voltage levels (specifically 138kV).

**Distribution**

<sup>18</sup> M06321, Review of Nova Scotia Power Inc.'s (NSPI) state of preparedness and response to Post-Tropical Storm Arthur, NSUARB Supplemental Decision, September 21, 2015, page 16. M07176, NS Power 2016 Annual Capital Expenditure Plan, NSUARB Decision, June 8, 2016, pages 26-28.

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**Figure 44: Meters - D009 Meter Routine**

Item#	Prg#	Meter Type	Meter Style	Description	2021 Forecast	Current Unit Cost	Capital for meters (\$)
<b>1.0 Element, 120-240 volt</b>							
		Form 3S (5 jaw)	3450505	CP2SRA (HW4.0) 3S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V.	192	159.60	30,643
		Form 3S (5 jaw)	3450517	CP2SRA (HW4.0) 3S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V. (TOU)BID	96	159.60	15,322
<b>1.5 Element, 120-240 volt</b>							
		C2SRD	3450510	C2SRD (HW 4.1) 2S CL200 OPENWAY RIVA CENTRON W/ DISCONNECT.	4000	111.72	446,880
		C2SRD TOU/BID	3450512	C2SRD (HW 4.1) 2S CL200 OPENWAY RIVA CENTRON W/ DISCONNECT (TOU)BID	720	111.72	80,438
		CP3SRA	0	CP3SRA (HW4.1), 2S CL200 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	4	196.84	787
<b>2.0 Element, 120-480 volt</b>							
			3450511	CN2SRD (HW 4.1) 12S CL200 OPENWAY RIVA CENTRON W/ DISCONNECT	1200	126.35	151,620
			3450513	CN2SRD (HW 4.1) 12S CL200 OPENWAY RIVA CENTRON W/ DISCONNECT (TOU)	4	126.35	505
			0	CP3SRA (HW4.1), 12S CL200 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	40	196.84	7,874
			3450518	CP2SRA (HW4.0) 45S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	96	196.84	18,897
			3450520	CP2SRA (HW4.0) 45S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 240-480V	4	196.84	787
			0	CP3SRA (HW4.1) 45S CL20 WITH KYZ OPENWAY RIVA CENTRON POLYPHASE METER. 240-480V	4	259.35	1,037
<b>3.0 Element, 120-347 volt</b>							
			3450506	CP2SRA (HW4.0) 9S/36S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	384	196.84	75,587

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Figure 44: Meters - D009 Meter Routine

Item#	Prg#	Meter Type	Meter Style	Description	2021 Forecast	Current Unit Cost	Capital for meters (\$)
			345051 6	CP2SRA (HW4.0) 9S/36S CL20 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V (TOU)	4	196.84	787
			345051 5	CP2SRA (HW4.0) 16S CL200 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	288	196.84	56,690
			345051 9	CP2SRA (HW4.0) 16S CL200 OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V (TOU)	4	196.84	787
			345050 4	CP2SRA (HW4.0) 16S CL200 OPENWAY RIVA CENTRON POLYPHASE METER. 240V-480V	288	196.84	56,690
				CP3SRA (HW4.1) 16S CL200 WITH KYZ. OPENWAY RIVA CENTRON POLYPHASE METER. 120V-277V	4	259.35	1,037
<b>Total Meters</b>					<b>7332</b>		<b>946,369</b>
<b>Misc Meters "ION"</b>					4	8,000	32,000
<b>Cellular Meters</b>					20	900	18,000
<b>CT and PT requirements</b>							180,000
<b>Wire, Adapters and switches</b>							160,000
<b>Total Materials</b>							<b>1,336,369</b>
<b>Applied Overhead</b>							<b>340,790</b>
<b>Labour</b>							<b>319,961</b>
<b>D009 Meters Total</b>							<b>1,997,121</b>



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***Distribution Upgrades and Replacement***

**Figure 45: Distribution Upgrades and Replacement**

**2021 ACE Plan  
Forecast**

**D005 Unplanned Replacement Deteriorated Equipment**

The forecast was developed based on an estimated 5,061 persondays of work at a unit cost of \$2,886/personday **\$14,603,935**

**D006 Regulatory Replacements**

The forecast is developed based on past experience or information from various government agencies. This amount could vary based on current year decisions by these agencies. **\$1,965,202**

**D008 Provincial Storm**

This forecast is developed based on past experience. There can be significant variation in this amount based on yearly storm activity. **\$3,314,661**

**D051 System Performance Improvement**

103H-432-Protection Upgrades	96,545
137H & 131H-Protection Upgrade and Reconfiguration	83,000
91W-411G-Protection Upgrades	75,000
1C & 22C-Port Hawkesbury Downline Transfer Scheme Upgrades	70,000
96H-412-Liscomb protection upgrade	57,500
100C-421-Havre Boucher protection upgrade	57,000
Various-Padmount Primary Bushing Cap Upgrade	55,903
Various-Targeted underground fault indicators upgrades	35,000

**Various-Padmount Primary Bushing Cap Upgrade**

**\$529,948**

**Total D051 System Performance Improvement**

Bin Work (Work resulting from NS Power's distribution line inspection program that has been identified as requiring follow up within one year.)	1,819,372
Streetlight/service installation & removal (This funding is to support system upgrades required for streetlight installations and upgrades. This includes transformer installs, service upgrades and/or new pole installations.)	1,234,178
Field Driven Work	1,052,019
516W-211-Ramey Rd Reconductor	234,653
13W-301H-Pembroke Rd Repole	225,000
539W-311-Sherbrooke Ln Rebuild	200,000
20H-305-Purcells Cove poles replacement	200,000
58C-405-Rebuild Margaree Water Crossing	173,000

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*Distribution Upgrades and Replacement*

**Figure 45: Distribution Upgrades and Replacement**

	<b>2021 ACE Plan Forecast</b>
100C-421-Aulds Cove Reconductor	170,000
4C-432-Highway 4 Pole Replacement	160,000
20N-203-Conversion on Church St	148,242
85S-401-Ingonish Centre Rebuild	146,000
102W-312G-Cayloon Lane Repole	144,000
126H-312G-Murphy Rd Rebuild	138,686
584N-301-Irwin Lake Rd Upgrades	127,000
658V-211-Blossom Dr Rebuild	125,000
113H-441G-Colby Dr rearlot rebuild	121,757
89W-303-89W-303 Station Rd and Pinegrove Rd Line Extension	111,500
100C-421-Harvre Boucher Reinsulate	100,000
62N-415-Trafalgar Road ICP	100,000
50N-410-Piedmont BTR	100,000
82V-403- Carroll's Corner bridge crossing	77,139
92H-331-Micou Island	76,548
48H-301-Sinclair St Pole Replacements	75,000
665H-311-Malay Falls Rd Rebuild	67,828
33N-201-Canaan Rd-Stepdown Removal	65,000
20H-303-Essex Dr Framing replacement	61,078
82V-403-Highway 277 Pole Replacements	58,523
678H-211-Lawlor Island to McNabbs Island Cable Protection	50,000
46W-301G-Port L'Hebert to McLean Lake Cable Protection	50,000
<b>Total D055 Planned Replacement of Distribution Equipment</b>	<b>\$7,411,523</b>
<b>Distribution Upgrades and Replacement Total</b>	<b>\$27,825,268</b>

*D005 Forecasting Approach*

In its Decision relating to the 2019 Distribution Routines ATO, the Board directed NS Power as follows:

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1. NS Power is to provide further breakdown of forecasting and overtime within future ACE/ATO filings in order to improve the transparency of reporting provided for the D005 Routine.
2. NS Power is to improve transparency in future ACE/ATO filings by including further information on how the historical large storm events have been incorporated into this Routine, and how they affect the ongoing forecast.<sup>19</sup>

The forecast for D005 for 2021 was developed based on an estimated 5,061 person days of work at a unit cost of \$2,886/person day.

This is based on the previous 5-year average for spend in D005 from 2016-2020. It includes the following breakdown of annual regular labour and overtime spend as inputs:

**Figure 46: 2016-2020 Spend in D005**

Year	Regular Labour (PH)	Regular Labour \$/PH	Overtime Labour (PH)	Overtime Labour \$/PH
2016	29,390	\$ 45.00	9,256	\$ 89.99
2017	43,050	\$ 45.84	16,440	\$ 91.69
2018	45,199	\$ 46.53	19,308	\$ 93.06
2019	40,148	\$ 47.46	23,723	\$ 94.92
2020	43,864	\$ 48.42	23,915	\$ 96.83

This results in a forecast 2021 spend in D005 of the following:

**Figure 47: Forecast 2021 Spend in D005**

Year	Regular Labour (PH)	Regular Labour \$/PH	Overtime Labour (PH)	Overtime Labour \$/PH
2021	40,404	\$ 49.38	18,554	\$ 98.77

This forecasting approach inherently includes an accounting for the impacts of previous years' events, such as an increase of extreme event days, through the influence on the overall D005 spending in each previous reference year detailed above. This ultimately results in budgeted

<sup>19</sup> M09656, NS Power 2019 Distribution Routines ATO, NSUARB Decision, October 21, 2020.

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amounts for D005 that reflect the trend of impacts from individual reference years from 2016-2020. The resulting forecasted D005 spend is dynamically adjusted as the number of impacts increase (or decrease) in the previous reference years. This supports an evolving response to cumulative effects as trends emerge. The nature of individual replacements undertaken in a reactive manner under D005 do not support clear attribution specifically to cumulative effects from previous years but resulting in work in the current year as opposed to in-year effects. However, NS Power believes that the 5-year budgeting methodology presented here is a reasonable approach to account for the overall effects on D005 from storm activity in prior years.

*New Customers*

**Figure 48: New Customers**

	2021 ACE Plan Forecast
<b>D004 New Customer Upgrades</b>	
This forecast is developed as a percentage of D061 and D062 net of capital contributions. In 2021, this is estimated to be approximately 43%.	\$7,267,545
<b>D018 Primary Equipment Spares Distribution</b>	
This forecast is developed based on the probable amount of distribution spare equipment required during the year.	\$150,000
<b>D061 New Customers - Residential</b>	
This forecast is for the costs associated with new residential customers net of capital contributions. Costs include metered services, unmetered services, line extensions and underground services.	\$10,591,919
<b>D062 New Customers - Commercial</b>	
This forecast is for the costs associated with new commercial customers net of capital contributions. Costs include metered services, unmetered services, line extensions and underground services.	\$6,501,387
<b>Total New Customers</b>	<b>\$24,510,850</b>

*Joint Use*

**Figure 49: Joint Use**

<b>D007 Joint Use</b>	2021 ACE Plan Forecast
This forecast is developed based on prior spending levels for both Joint Use requests from Nova Scotia Power's Joint Use Partner, Bell Aliant and communication utility requests.	\$1,383,607

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***Distribution Right of Way Widening***

In its 2017 ACE Plan Order, the Board directed NS Power as follows:

The Board directs NSPI to update the cost estimates for vegetation management and right-of-way widening projects in the 2018 ACE Plan (and future years) based on actual historical costs incurred for this project.<sup>20</sup>

NS Power confirms that the cost estimates for vegetation management and right-of-way widening projects in the 2021 ACE Plan are based on actual historical costs incurred. This forecast is also developed based on the known level of widening in the current year.

The spend in this routine reflects the work that will be required to widen the rights-of-way to standard is noted in **Figure 50**.

**Figure 50: Distribution of Right of Way Widening**

Feeder Section	Geographic Location	Length (Km)	Managed Length (Km)	Avg Cost per Km	Cost	Contract Overhead	Total Segment Cost
92W-302	East Kemptville	10.00	10.00	21,600	216,000	36,409	252,409
46W-301	Port L'Herbert	7.00	7.00	21,600	151,200	25,486	176,686
22C-402	Marble Mountain/West Bay	4.00	4.00	21,600	86,400	14,564	100,964
Provincial	Clear Cut Buffers (Other Forestry Operations) TBD	2.15	2.15	21,600	46,400	7,821	54,221
<b>Total Distribution Right of Way Widening</b>							<b>\$584,280</b>

Pursuant to CI 49611 - New Distribution Rights-of-Way Phase I, submitted to the NSUARB on November 1, 2016, Liberty Consulting Group's report on its review of NS Power's response to Post Tropical Storm Arthur (PTSA) included a recommendation that for distribution rights-of-way NS Power should "develop a comprehensive plan for reclaiming and/or widening the overgrown

<sup>20</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Order, April 4, 2017.

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ROW corridors”.<sup>21</sup> In its Supplemental Decision on September 21, 2015, the Board directed NS Power as follows:

[36] A circumstance where it will take 32 years for the distribution vegetation management program to become sustainable causes the Board significant concern.

//

[38] The Board is intrigued by the stakeholder discussion concerning innovative financing options and directs NSPI to pursue that issue and report back to the Board the results of those discussions.<sup>22</sup>

In response to the Board’s concerns, and in order to further reduce the likelihood of tree contact related outages like those during the PTSA event, NS Power increased the budget for in the 2016 ACE Plan. NS Power’s 2016 ACE Plan provided the following:

NS Power is seeking approval as part of the 2016 ACE Plan of \$3 million for the distribution widening routine, D010, in 2016. The \$3 million comes from the portion of the annual \$10.4 million that is spent on managing the vegetation in distribution ROWs to a sustainable state.<sup>23</sup>

In its 2016 ACE Plan Decision regarding D010, the Board directed NS Power as follows:

...the Board assumes that NSPI has increased the distribution Routine budget by an amount of \$2.4 million from the operating budget over the \$600,000 in the 2015 ACE Plan. This means that NSPI is reducing its operating expenses by \$2.4 million in 2016, thus increasing profits, with a corresponding increase in its rate base. This action will only increase rates which the Board does not approve. Accordingly, the Board reduces the routine budget for D010 to \$600,000, to be in line with the 2015 ACE Plan amount.<sup>24</sup>

<sup>21</sup> M06321, Review of Nova Scotia Power Inc.'s (NSPI) state of preparedness and response to Post-Tropical Storm Arthur, Liberty Consulting Group, Comments on Review of NS Power's Storm Response, Exhibit A-4, September 9, 2014, page 7.

<sup>22</sup> M06321, Review of Nova Scotia Power Inc.'s (NSPI) state of preparedness and response to Post-Tropical Storm Arthur, NSUARB Supplemental Decision, September 21, 2015, page 14. NS Power responded with its proposal to increase spend in D010 in the 2016 ACE Plan.

<sup>23</sup> M07176, NS Power 2016 Annual Capital Expenditure Plan, November 12, 2015, page 72.

<sup>24</sup> M07176, NS Power 2016 Annual Capital Expenditure Plan, NSUARB Decision, June 8, 2016, page 18.

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Consistent with prior ACE Plans, for the 2021 ACE Plan, NS Power has not increased the budget for D010 in response to the PTSA findings; rather, additional investment has been broken out into a separate capital work order, C0031083 - New Distribution Rights-of-Way Phase 6. The distribution vegetation management program is now carried-out under three broad initiatives:

1. Operating activities for distribution vegetation management;
2. Capital Routine D010 - Distribution Right-of-Way Widening; and
3. New distribution rights-of-way individual capital projects (i.e. C0031083 and subsequent phases).

The scope of work completed under operating activities will continue to focus on existing right-of-way asset reclamation, urban cycle trimming in municipalities, reactive maintenance, hazard tree mitigation, vegetation removal during storm events, customer requested tree trimming, and maintaining sustainability of existing rights-of-way.

The scope of work completed under the D010 routine will continue to focus on widening of existing rights-of-way to the current standard beyond the Department of Nova Scotia Transportation and Infrastructure Renewal (NSTIR) right-of-way.

C0031083 and subsequent phases will establish new rights-of-way where none have previously existed.

**General Plant**

**Figure 51: Work Vehicles**

	Quantity	Avg Unit Price	2021 ACE Plan Forecast
<b>P006 Replacement and Additional Work Vehicles</b>			
Reel and Pole Trailers	5	25,000	125,000
ATV / RTV	2	15,000	30,000
		Salvage	-5,000
<b>Total P006 Replacement and Additional Work Vehicles</b>			<b><u>\$150,000</u></b>

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**General Plant**

**Figure 51: Work Vehicles**

Quantity	Avg Unit Price	2021 ACE Plan Forecast
P061 Transportation Vehicle Replacements	58	42,328
		2,455,000
		Salvage
		-105,000
		<b>\$2,350,000</b>
P062 Work Vehicle Replacements	25	322,503
		8,062,577
		Salvage
		-460,000
		<b>\$7,602,577</b>
P063 Class 3 Work Vehicle Replacements	3	105,000
		315,000
		Salvage
		-15,000
		<b>\$300,000</b>
<b>Total Work Vehicles</b>		<b>\$10,402,577</b>

***Replacement of Fleet Vehicles with Electric Vehicles***

In its 2020 ACE Plan Order, the Board directed NS Power as follows:

The Board expects NS Power to fully consider all types of electric vehicles as an option for replacements to its fleet and report further in the 2021 ACE Plan application.<sup>25</sup>

While NS Power continues to encourage the adoption of electric vehicles (EV), in order for an EV to be considered a viable replacement, it must be able to perform all operational requirements of the vehicle being replaced and be of comparable cost. Prior to 2021 vehicle replacements, the battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) that are available have not satisfied both these requirements for vehicles that have been replaced. However, as costs for all types of EVs continue to decline and new models become available that are more fit for

<sup>25</sup> M09499, NS Power 2020 Annual Capital Expenditure Plan, NSUARB Order, June 25, 2020, page 2.



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1 purpose, which is beginning to occur, then they will be considered as alternatives to traditional  
2 internal combustion vehicles.

3  
4 The operational hurdles that are required to be overcome are two fold: (1) Operational Fit for  
5 Purpose: Is there an EV that can perform all the same operational tasks that the current vehicle  
6 does?; and (2) Charging Infrastructure: Continued expansion of Level 2 and 3 EV Charging  
7 stations across the province needs to continue to mitigate the current EV range restrictions. NS  
8 Power continues to explore all opportunities to increase this coverage, including a potential  
9 expansion of Level 2 charging stations at a number of our regional depots and offices.

10  
11 While the number of electric vehicles that fit both the operational and cost requirements continues  
12 to increase, the vast majority of transportation vehicles utilized by NS Power are pickup trucks,  
13 which to date have not had feasible replacements available as BEV or PHEVs. For a larger scale  
14 adoption of EVs, a feasible replacement for pickup trucks will be required.

15  
16 The 2021 ACE Plan budget for P061 – Transportation Vehicle Replacements includes nine PHEVs  
17 (Ford Escapes) that are replacing SUVs and one pickup truck that can be operationally replaced  
18 by an SUV.

19  
20 Please refer to **Figures 52 and 53** below for NS Power's latest analysis of various electric vehicles  
21 from a Total Cost of Ownership (TCO) and an emissions perspective.

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Figure 52: Electric Vehicles Total Cost of Ownership

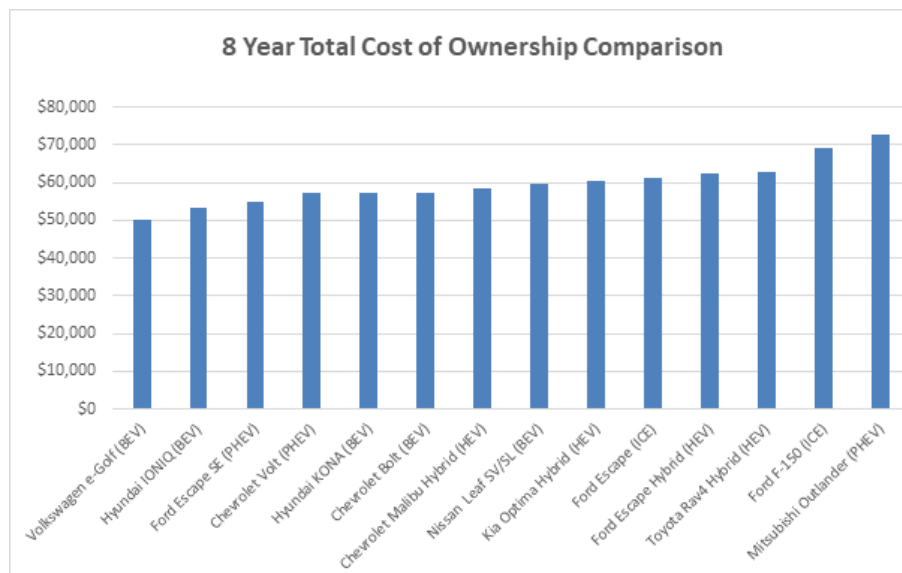


Figure 53: Electric Vehicles Estimated Emissions

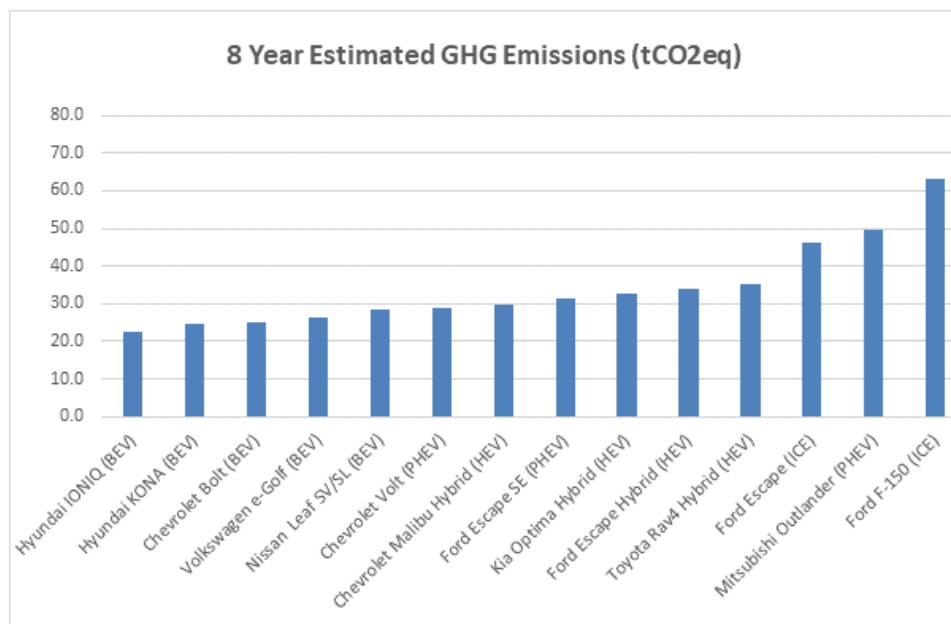


Figure 54 Tools and Test Equipment

Meter Shop Tools and Equipment

\$50,000

Provincial Line Tools & Equipment

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**Figure 54 Tools and Test Equipment**

Western Territory	110,000
North Eastern Territory	140,000
Cape Breton Territory	140,000
Central Territory	140,000
T&D Asset	480,000
System Maintenance	140,000

<b>P002 Tools and Equipment Total</b>	<b>\$1,200,000</b>
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<b>P015 Hydro Production Tools &amp; Test Equipment</b>	<b>\$88,356</b>
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**P016 Thermal Production Tools & Test Equipment**

POT Tools & Equipment	75,000
TUC Tools & Equipment	72,000
TRE Tools & Equipment	80,000
LIN Tools & Equipment	50,000
CT Tools & Equipment	28,000
PHB Tools & Equipment	103,996

<b>P016 Thermal Production Tools &amp; Test Equipment Total</b>	<b>\$408,996</b>
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<b>Tools and Test Equipment Total</b>	<b>\$1,747,352</b>
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**Figure 55: Telecommunication**

**2021 ACE Plan  
Forecast**

**P025 Mobile Radio**

Replacement radio equipment hardware and upgrades	85,000
Equipment repairs, antenna replacements and repairs	75,000
Mobile radio servers repairs and upgrades	40,000
Miscellaneous support for system	38,528

	<b>\$238,528</b>
--	------------------

**P027 Telecommunication Radio & Fibre Ops**

HVAC & Generator Upgrades	103,625
Radio Site repairs - Miscellaneous	50,348
Add Generator Alarms and Controls	17,130
Miscellaneous Upgrades and Replacements	20,000

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**Figure 55: Telecommunication**

**2021 ACE Plan  
Forecast**

**\$191,103**

**P028 Telecommunication Systems Replace & Modifications**

Miscellaneous teleprotection equipment upgrades (as required)	26,000
Upgrade miscellaneous radio links (as required)	30,000
Misc. Telecom Equipment (as required)	37,500
Nokia Equipment Repairs and Support	20,000
Telecom engineering services	53,115
Telecom engineering support services	25,100
Battery Replacements	75,500
Replace Miscellaneous Power Supplies	7,000
UPS Replacements Various Sites	6,000
Network standardization documentation	25,000
Cable & Entrance Protection - Positron	15,000
Switched Communications - System Operations Phones	5,000
Replace Fibre Optic Equipment (NEC & ADC)	32,750
Install Fibre Links for telecom sites	115,504
Network Monitoring Upgrades	54,000
Alarm Commissioning for new sites into SCADA	54,000
Review and Update System Drawings and Records	29,450
Support Services for Nokia/ALU	26,000
Tower Lighting Upgrades	17,129

**\$654,048**

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Forecast**

**P814 Telecommunications Spares**

Alcatel-Lucent MPR9500 Microwave Radio	50,500
Net Guardian Alarm Monitoring Equipment	15,000
7705 MPLS Router Spares	25,000
Ethernet Spares	4,500
MDS SD9, Transnet, INet	10,000
SEL 2505, 2506 Spares	10,000
RFL IMUX and 9745 Spares	10,000
Battery Charger Spare	10,000
RTU and Misc. Spares	50,000

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**Figure 55: Telecommunication**

**2021 ACE Plan  
Forecast**

**\$185,000**

**Telecommunications Total**

**\$1,268,679**

1

**Figure 56: Computing Asset Management**

**2021 ACE Plan  
Forecast**

**P010 SCADA Improvements**

This forecast is developed based on  
SCADA equipment/operator interfaces  
failures or modifications

**P010 SCADA Improvements Total**

**\$90,500**

**P031 NS Power IT Infrastructure**

<b>Infrastructure Component</b>	<b>Asset Management Plan</b>	<b>Volume to be Refreshed</b>	<b>2021 ACE Plan Forecast</b>
Voice and Data Network	Network Infrastructure & Equipment		241,103
Servers	Servers Refresh, Licenses, & Storage		30,000
Laptop and Desktop Computers, Personal Devices	Computers that have or will reach four (4) years old	200	360,000
	New laptop or desktop computers	75	90,000
	Mobile Devices	200	185,000
	Software & software licenses		75,000
	Application enhancements/development		740,000
Power Supplies	Replaced after 10 years		10,000
Accessories	Accessories		30,000
<b>P031 NS Power IT Infrastructure</b>			<b>1,761,103</b>

**P040 DCMS Equipment Replacement**

CT's DCMS Equipment Replacement	21,951
POT DCMS Equipment Replacement	51,148
TRE DCMS Equipment Replacement	50,000
TUC DCMS Equipment Replacement	60,000
LIN DCMS Equipment Replacement	35,000
	<b>\$218,099</b>

**Computing and Asset Management Total**

**\$2,069,702**

2

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Figure 57: Property Improvement and Furniture

2021 ACE Plan  
Forecast

Property Improvement and Furniture

P001	Building Protective Coatings	25,000
	Roofing & Emergency Refurbishment	25,000
	Grading / Drainage	136,000
	Fencing	59,500
	Pole Brow	564,000
	General Refurbishment Work	390,000
	Asphalt / Paving	70,000
	Consulting	109,500
	HVAC Improvements	185,000
	Substations	29,000
	Generator	20,000
	Protective Signage Replacement	5,000
	Security Improvements	46,000
	Depot Generator Replacements	420,000
	1H General Refurbishments	371,000
	Substation / Depot Improvements	1,568,237
	<b>Property Improvement and Furniture Total</b>	<b>\$4,023,237</b>

1

Figure 58: Other

2021 ACE Plan  
Forecast

Other		
P012	HYD - Security Improvements	489,444
P018	Environmental Equipment Replacement	100,000
P041	FAC - Land Acquisition Routine	50,000
P816	FAC - Environment Property Remediation	214,000
P815	FAC - Environment Site Assessment	214,000
P032	FAC - Equipment & Warehouse	210,000
	<b>Other Total</b>	<b>\$1,277,444</b>

2

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1 **11.0 DIRECTIVES AND MISCELLANEOUS**

3 **11.1 NSUARB ACE Plan Directives and Stakeholder Commitments**

5 NS Power has received a number of Directives from prior ACE Plan Decisions. The Company  
6 has also made a number of commitments to interested parties. Responses to each of these  
7 Directives and commitments are provided below.

9 **11.1.1 Impact of 2021 ACE Plan on Revenue Requirement and Affordability**

11 **Introduction**

13 The NSUARB has directed NS Power to provide information regarding the ACE Plan's revenue  
14 requirement impact. Directive 7 of the 2011 ACE Plan Decision<sup>26</sup> and Directive 12 of the 2012  
15 ACE Plan Decision<sup>27</sup> require NS Power to provide the estimated effect the ACE Plan may have  
16 on revenue requirement over the next five years. This information is provided in **Figure 59** below.  
17 Through discussion and agreement with stakeholders as well as further direction from the  
18 NSUARB, a version of NS Power's "Long-Term Capital Planning & Revenue Requirement" table  
19 incorporating stakeholder assumptions is provided in **Figure 60** below.

21 Considered as a whole, NS Power's assumptions and corresponding information provide the  
22 NSUARB and customers an impression of the impact NS Power's capital program is expected to  
23 have on revenue requirement. The 2021 ACE Plan is focused on the provision of safe and reliable  
24 electric service, investing where required to best maintain the performance and reliability of the  
25 Company's assets, while minimizing upward pressure on rates.

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<sup>26</sup> M08984, NS Power 2019 Annual Capital Expenditure Plan, NSUARB Decision, May 1, 2019.

<sup>27</sup> M08984, NS Power 2019 Annual Capital Expenditure Plan, NSUARB Decision, May 1, 2019, page 29, paragraphs 93 and 94.

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The overall revenue requirement table, “Long-Term Capital Planning & Revenue Requirement” contained in **Figure 59** shows that NS Power’s capital expenditures have a cumulative decreasing effect on NS Power’s revenue requirement for customers over the next five years taking into account the contribution to fixed costs provided by new customer additions.

**Overall Revenue Requirement**

The overall revenue requirement calculation shows the effect on rate base and the effect on revenue requirement. The underlying assumption of this calculation is that, to the extent capital expenditures equal depreciation expense in a given year, there is no incremental effect on rate base or associated revenue requirement and therefore it is not included in the calculation.

The revenue requirement assessment incorporates the following inputs:

- Capital expenditures compared to forecast depreciation expense annually.
  - Administrative overhead credit based on the proration of capital expenditures in excess of depreciation expense in each year.
  - Depreciation expense of assets added during the examined timeframe based on the proportion of capital expenditures in excess of depreciation expense of all assets in each year.
  - Incremental interest based on the cost of debt multiplied by the portion of debt to total capital of the incremental rate base.
  - AFUDC based on the proportion of capital expenditures in excess of depreciation expense of all assets in each year.
  - Income taxes based on the resultant effects and prorated Capital Cost Allowance for tax purposes.
  - Net earnings based on the rate of return multiplied by the portion of equity to total capital of the incremental rate base.
-



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- Additional fixed cost recovery received from customer growth achieved through capital investment to serve these customers.

Depreciation expense and additional fixed cost recoveries are delineated in the overall revenue requirement calculation.

This method does not address the revenue requirement effect should capital projects not be completed. Costs resulting from not completing certain projects include items such as increased operating costs, increased fuel costs, increased repair costs, and other risks or implications. Avoided cost benefits are not included in this revenue requirement calculation.

**Figure 59: Long-Term Capital Planning & Revenue Requirement**

LONG-TERM CAPITAL PLANNING & REVENUE REQUIREMENT

NOVA SCOTIA POWER (\$M)	2021	2022	2023	2024	2025
<b><u>Estimated Investment Related to five-year Capital Plan</u></b>					
Capital Expenditures (Investment)	\$361.8	\$365.7	\$357.0	\$338.7	\$324.5
Less: Depreciation of all assets	230.1	236.8	243.9	250.8	257.6
Incremental Investment over Depreciation (Growth)	\$131.6	\$128.8	\$113.1	\$87.9	\$66.9
<b>Incremental Investment as a portion of Total Investment</b>	36.4%	35.2%	31.7%	26.0%	20.6%
<b><u>New Incremental Regulated Capital Assets</u></b>					
Beginning Balance	-	131.6	260.5	373.5	461.4
Capital Investment	361.8	365.7	357.0	338.7	324.5
Depreciation	230.1	236.8	243.9	250.8	257.6
Ending Balance	131.6	260.5	373.5	461.4	528.4
Average Incremental Net Book Value of projects in five-year plan	65.8	196.0	317.0	417.5	494.9
<b><u>Capital Cost Allowance</u></b>					
Depreciation of Assets added 2021-2025	12.0	20.8	25.3	22.1	21.0
<b><u>Impact on Net Earnings</u></b>					
Expenses					
OM&G	(3.5)	(7.0)	(10.5)	(14.0)	(17.5)
Administrative Overhead	(16.4)	(14.4)	(13.1)	(10.6)	(8.1)
Depreciation	1.1	3.5	5.3	6.2	6.3

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**Figure 59: Long-Term Capital Planning & Revenue Requirement**

LONG-TERM CAPITAL PLANNING & REVENUE REQUIREMENT

NOVA SCOTIA POWER (\$M)	2021	2022	2023	2024	2025
Interest	2.1	6.4	10.3	13.5	16.1
AFUDC	(2.2)	(2.4)	(1.8)	(1.4)	(0.9)
Earnings before tax	(6.9)	(2.8)	2.4	9.7	14.8
Income Tax less Impact of Administrative Overhead	(5.8)	(6.5)	(5.6)	(2.2)	(0.2)
Income Tax Impact of Administrative Overhead	(3.3)	(2.9)	(2.7)	(2.1)	(1.7)
Net Earnings	\$2.2	\$6.6	\$10.7	\$14.1	\$16.7
<b><u>Incremental Revenue Requirement of five-year capital plan</u></b>					
<b>Including Fixed Cost Recovery:</b>					
Incremental Revenue Requirement of five-year capital plan	(25.7)	(16.8)	(7.3)	3.5	10.6
Change in Incremental Revenue Requirement from Previous Year	(25.7)	9.0	9.4	10.8	7.1
Rate Impact of five-year capital Plan	-2.0%	-1.3%	-0.6%	0.3%	0.8%
<b>Excluding Fixed Cost Recovery:</b>					
Incremental Revenue Requirement of five-year capital plan	(22.2)	(9.8)	3.2	17.5	28.1
Change in Incremental Revenue Requirement from Previous Year	(22.2)	12.5	12.9	14.3	10.6
Rate Impact of five-year capital Plan	-1.8%	-0.8%	0.3%	1.4%	2.2%

The overall revenue requirement shown in **Figure 59**, in the line item “Incremental Revenue Requirement of five-year capital plan” including Fixed Cost Recovery, shows a cumulative decreasing revenue requirement for years 2021 to 2025 of \$35.7 million as a result of the new capital investment. This is due to additional fixed cost recovery received from customer growth achieved through capital investments to serve these customers, Administrative Overhead and AFUDC credits related to construction of capital assets, and the income tax impact of new capital investment.

**Stakeholder Revenue Requirement Table**

In compliance with the 2016 ACE Plan Terms of Consensus and the subsequent stakeholder engagement process, NS Power has included an additional revenue requirement table using assumptions requested by stakeholders. The table shown in **Figure 60** below, first included in the 2017 ACE Plan, evolved through the 2017 ACE Plan Stakeholder Engagement process. It now

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1 includes the following significant differences from NS Power's "Long-Term Capital Planning &  
2 Revenue Requirement" table above:

- 3
- 4 • Elimination of the impact of additional fixed cost recovery as well as the administrative  
5 overhead and AFUDC credits from the revenue requirement calculation.  
6
- 7 • Elimination of the application of the incremental spend as a portion of total spend  
8 percentage to the calculated depreciation expense and capital cost allowance in the revenue  
9 requirement calculation.  
10
- 11 • Elimination of the reduction of depreciation of all assets in the calculation of New  
12 Incremental Regulated Capital Assets.  
13

14 NS Power believes the assumptions reflected in the table shown in **Figure 60** do not accurately  
15 reflect the impact of the Company's capital program because:

- 16
- 17 • Including the reduction in fixed costs in the model demonstrates the decrease in revenue  
18 requirement for current customers related to having more customers connected and sharing  
19 the fixed costs.  
20
- 21 • Including the AO and AFUDC credits in the calculation of revenue requirement is  
22 consistent with how rates are calculated and that the inclusion of these credits in the  
23 revenue requirement directive is appropriate.  
24

25 Since NS Power does not have the option to cease investment in its capital infrastructure at a  
26 sustaining level, a five year capital plan should be viewed in the context of costs that the capital  
27 program is driving in comparison to maintaining the asset base.  
28

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**Figure 60: Long-Term Capital Planning & Revenue Requirement (Stakeholder Table)**

**LONG-TERM CAPITAL PLANNING & REVENUE REQUIREMENT (STAKEHOLDER TABLE)**

<b>NOVA SCOTIA POWER (\$M)</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
Capital Expenditures (Investment)	\$361.8	\$365.7	\$357.0	\$338.7	\$324.5
Less: Depreciation of all assets	230.1	236.8	243.9	250.8	257.6
Incremental Investment over Depreciation (Growth)	131.6	128.8	113.1	87.9	66.9
Incremental Investment as a portion of Total Investment	36.4%	35.2%	31.7%	26.0%	20.6%
<b><u>Revenue Requirement Calculation</u></b>					
OM&G	-	-	-	-	-
Depreciation	3.1	9.8	16.9	23.8	30.6
Interest	5.9	17.7	29.4	40.7	51.4
AFUDC	-	-	-	-	-
Return on Equity	6.1	18.4	30.6	42.3	53.5
Income Tax less Impact of Administrative Overhead	(9.5)	(12.4)	(13.1)	(7.6)	(7.2)
Administrative Overhead	-	-	-	-	-
Income Tax Impact of Administrative Overhead	-	-	-	-	-
<b>Incremental Revenue Requirement of five-year capital plan</b>	<b>5.6</b>	<b>33.4</b>	<b>63.7</b>	<b>99.2</b>	<b>128.4</b>
Change in Incremental Revenue Requirement from Previous Year	5.6	27.8	30.3	35.4	29.2
Rate Impact of five-year capital Plan	0.4%	2.6%	5.0%	7.8%	10.1%
<b><u>RECAP</u></b>					
Expenses					
OM&G	-	-	-	-	-
Administrative Overhead	-	-	-	-	-
Depreciation	3.1	9.8	16.9	23.8	30.6
Interest	5.9	17.7	29.4	40.7	51.4
AFUDC	-	-	-	-	-
Earnings before tax	(3.4)	6.0	17.5	34.7	46.4
Income Tax less Impact of Administrative Overhead	(9.5)	(12.4)	(13.1)	(7.6)	(7.2)
Income Tax Impact of Administrative Overhead	-	-	-	-	-
Net Earnings	\$6.1	\$18.4	\$30.6	\$42.3	\$53.5
<b><u>New Incremental Regulated Capital Assets</u></b>					
Beginning Balance	-	361.8	727.4	1,084.4	1,423.1
Capital Investment	361.8	365.7	357.0	338.7	324.5
Ending Balance	361.8	727.4	1,084.4	1,423.1	1,747.6

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**Figure 60: Long-Term Capital Planning & Revenue Requirement (Stakeholder Table)**  
LONG-TERM CAPITAL PLANNING & REVENUE REQUIREMENT (STAKEHOLDER TABLE)

NOVA SCOTIA POWER (\$M)	2021	2022	2023	2024	2025
Average Balance	180.9	544.6	905.9	1,253.7	1,585.4
<b>Capital Cost Allowance</b>					
Depreciation of Assets added 2021-2025	32.4	58.6	79.5	84.8	101.6

**Conclusion**

As illustrated in **Figure 59** above, NS Power's capital program for 2021 reduces upward pressure on rates and revenue requirement. In addition, NS Power's capital program is expected to cumulatively reduce upward pressure on rates and revenue requirement over the next five years when fixed cost recovery is taken into account.

NS Power recognizes that this describes the influence of its capital program only. NS Power also recognizes that all aspects of its business contribute to the complete picture of our revenue requirement in any given year. Those other aspects include, broadly, fuel costs, operating, maintenance, and general (OM&G) costs, and past investments.

The 2021 ACE Plan emphasizes affordability for customers by maintaining its focus on sustaining capital expenditures, and appropriate investment in NS Power's generation, transmission and distribution systems.

**11.1.2 Sustaining Capital – 2021 ACE Plan Alignment with the Integrated Resource Plan (IRP)**

The 2015 ACE Plan Terms of Consensus provided the following:

NS Power will also engage with interested stakeholders on the issue of NS Power including information in future ACE Plans to show how its long-term planning assumptions regarding projections of sustaining capital investment in existing

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1 thermal plants presented in the IRP and future ACE Plans are consistent. This  
2 stakeholder consultation process will begin within 30 days of the Board issuing its  
3 decision in this matter.<sup>28</sup>  
4

5 During the stakeholder consultation process in early 2015, NS Power discussed the issue of  
6 including information in future ACE Plans to show how its long-term planning assumptions  
7 regarding projections of sustaining capital investment in existing thermal plants presented in the  
8 IRP and future ACE Plans are consistent. A mock-up of this commitment was provided to and  
9 agreed upon by stakeholders pursuant to NS Power's report submitted to the Board on June 30,  
10 2015.<sup>29</sup>  
11

12 NS Power has been providing comparisons to the 2014 IRP Assumptions since 2015. Following  
13 conclusion of the 2019 ACE Plan "hot wash" process, the parties agreed that this information could  
14 be removed from the 2020 ACE Plan, due to the 2020 IRP process. Going forward, NS Power  
15 will provide comparisons to sustaining capital assumptions used in the 2020 IRP.  
16

17 The 2021 ACE Plan was derived using the same asset management practices used for the  
18 sustaining capital forecast assumptions for the 25 year planning period of the 2020 IRP. Two  
19 sustaining capital trajectories were developed for the 2020 IRP, reflecting the two mandatory coal  
20 retirement dates that were studied (2030 and 2040). Many of the lowest-cost IRP plans, including  
21 the Reference Plan, are based on a 2040 coal retirement; accordingly, that is the sustaining capital  
22 trajectory presented for comparison in the 2021 ACE Plan. The IRP Action Plan and Roadmap  
23 are informed by a broad range of plans, including plans with 2030 coal retirement dates.  
24

25 When comparing a single capital year from an ACE Plan to a long term planning exercise such as  
26 the IRP, it is important to take into consideration the leveling of investment used for the 25 year  
27 capital forecast used within the IRP. With respect to investment profile, it should be expected that

---

<sup>28</sup> M06514, NS Power 2015 Annual Capital Expenditure Plan, Terms of Consensus Agreement, February 18, 2015, page 2.

<sup>29</sup> M06963, NS Power 2015 Annual Capital Expenditure Plan, Stakeholder Engagement Report, June 30, 2015.

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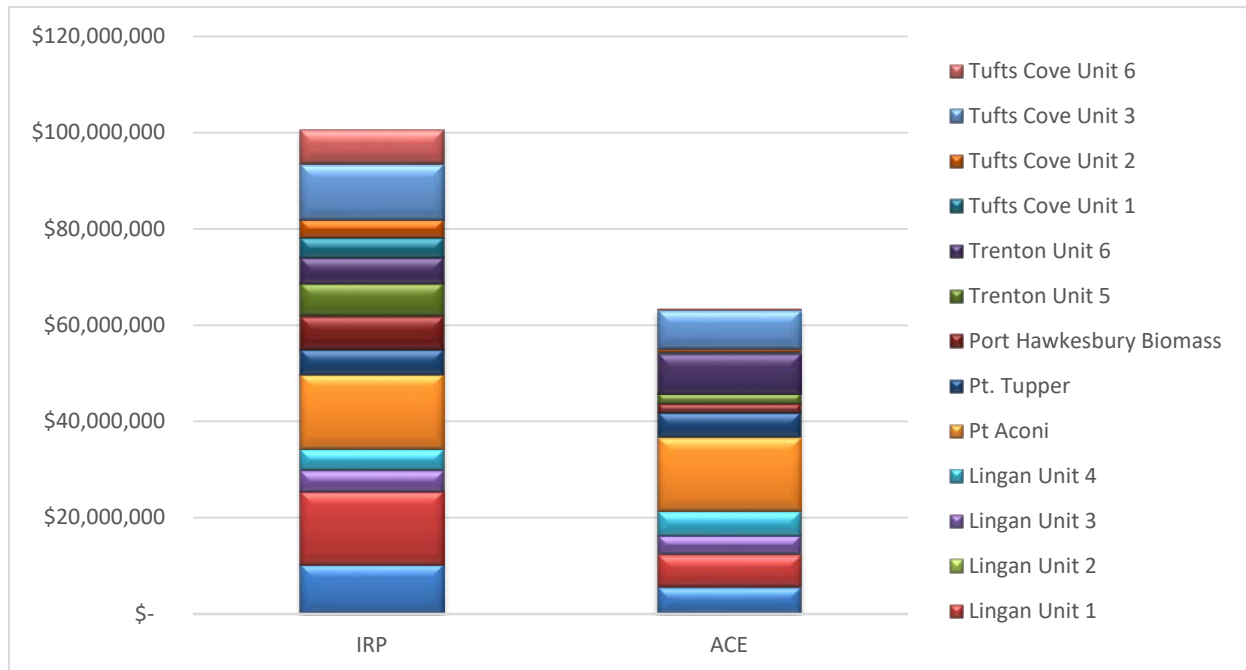
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1 the timing of investments will change from long term projections as annual assessments based on  
2 the latest operational information are essential to optimizing investment.

3  
4 As shown in **Figure 61**, NS Power thermal generation investment is below the IRP capital forecast  
5 for 2021. This variance is expected as the IRP used a top down approach with unit-specific high  
6 utilization factors for all the units, while the ACE Plan is built bottom up from current risk  
7 assessments with projected utilization factors. While the snapshot in 2021 shows a lower  
8 investment level than the IRP sustaining capital profile, this investment level is appropriately  
9 aligned with projected utilization factors. It is expected that the total thermal investment will  
10 generally align with the IRP assumptions over the modeled period. However, there will be  
11 differences in unit investment profiles in future years based on actual utilization and present  
12 conditions which drives the timing of major refurbishment intervals, causing the investment to be  
13 lower or higher than the long term IRP projection in a given year. For example, the Major Unit  
14 Outage on Lingan Unit 1 was moved to 2022 instead of 2021 as forecasted in the IRP sustaining  
15 capital profile. It is possible that the capital investment in a single future year could be above or  
16 below the IRP modeled year, but over the long term, the total annual generating unit sustaining  
17 capital investments are expected to be generally aligned with the total IRP forecasted spend.

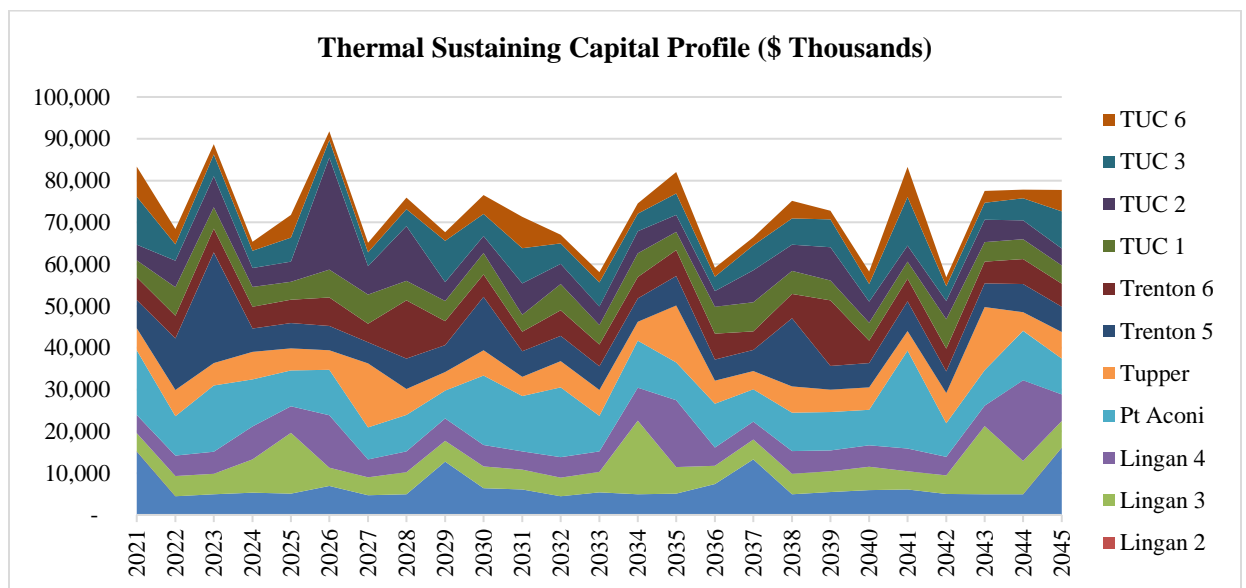
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**Figure 61: 2020 IRP vs. 2021 ACE Forecast Comparison by Unit**



**Figure 62** outlines the sustaining capital assumptions used in the 2020 IRP.

**Figure 62: 2020 IRP Sustaining Capital Forecast**





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1 **11.1.3 Annual Rating/Prioritization of Capital Projects**

2  
3 Pursuant to the NSUARB's 2011 ACE Plan Directive 11 and 2013 ACE Plan Directive 7, below  
4 is NS Power's capital project rating criteria.

5  
6 Pursuant to Section 6.1 of the CEJC, NS Power's generation, transmission and distribution capital  
7 projects are rated according to the following criteria:

- 8
- 9 • Health and Safety: Regulatory Requirements, Operating Permits, Protection of Equipment  
10 and Personnel Safety, and JOHSC actions.
  - 11
  - 12 • Environment/Regulatory Compliance: Renewable Energy Standards, Greenhouse Gas  
13 (GHG) Regulations, or Air Emission Regulations.
  - 14
  - 15 • Business Sustainability: SAIDI, SAIFI, CAIDI; unit reliability; system upgrade  
16 requirements; code requirements; NERC/NPCC Requirements, or economics (based on  
17 payback period, and revenue requirement); requirement to serve.
  - 18

19 Technically justified IT projects are broadly rated using the following criteria:

- 20
- 21 • Customer: service impacts to customers as a result of technical failure
  - 22
  - 23 • Finance: financial impacts to the Company as a result of technical failure
  - 24
  - 25 • Compliance: safety, environmental, security, legal or regulatory requirements (e.g.  
26 NERC/CIP and NI-52 compliance).
  - 27
  - 28 • Operating Sustainability: ability for NS Power staff or contractor to perform critical  
29 functions of the business.
-

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NS Power's project rating methodology is described in section 6.2 of the CEJC. This methodology uses a rating matrix which results in a final rating of 1 to 25. The rating (also termed risk) is developed by determining the "Criticality" (ranked 1 to 5) and "Condition" (ranked 1 to 5) of each asset and multiplying the two to determine the overall risk.

Criticality and Condition values are typically influenced by one predominant factor and rated accordingly. However, other factors may also influence the ranking of a project. In the event that multiple factors are present for a project, individual ratings will be taken into consideration in determining the overall Criticality ratings. For example, Health and Safety considerations for a project may warrant a Criticality rating of serious (3), while Environmental considerations for the same project may also independently warrant a Criticality rating of serious (3); this project may therefore warrant a higher Criticality rating of 4 or 5 due to multiple influencing factors.

Multiple influencing factors, ratings, and the order of completion of projects ahead of others, are subject to the evaluation and professional judgment of NS Power staff and third party industry experts.

**Figure 63 to Figure 67** below identify the projects included in the 2021 ACE Plan, their ranking categories and ranking values, where applicable.

**Figure 63: Hydro – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
48913	HYD - Tusket Facility Refurbishment	1,061,936	Business Sustainability	3	5	15
49634	HYD - Trout River Diversion Screen Replacements	600,149	Business Sustainability	4	4	16
C0028323	HYD - GIS Bypass Valve Refurbishment	784,097	Business Sustainability	4	4	16
C0032083	HYD - Mersey System Headcover Refurbishment	392,740	Business Sustainability	4	4	16
41605	HYD - Avon Arc Flash Upgrades	360,378	Health & Safety	4	4	16
C0031093	HYD - SHH Interconnection Protection Panels	139,781	Business Sustainability	4	4	16

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**Figure 63: Hydro – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0032082	HYD - Mersey River Breaker Refurbishments	136,282	Business Sustainability	4	4	16
C0022843	HYD - TUS Powerhouse Fish Ladder Upgrade	66,579	Environment	4	4	16

1

**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0030528	TUC3 HP Turbine Refurbishment	2,085,088	Business Sustainability	5	4	20
C0026285	TRE Heavy Fuel Oil Tank Refurbishment	1,644,255	Business Sustainability	5	4	20
C0030862	POT - Coal Mill Refurbishment 2021	852,405	Business Sustainability	5	3	15
C0031177	TRE6 Mill Refurbishment 2021	783,899	Business Sustainability	5	4	20
C0031184	TRE6 Waterwall Panel Replacement 2021	772,605	Business Sustainability	4	4	16
C0028502	LIN1 - Boiler Refurbishment 2021	719,327	Business Sustainability	5	4	20
C0030529	TUC3 Generator Refurbishment	706,226	Business Sustainability	5	3	15
C0028242	LIN - Mill Refurbishment 2021	703,702	Business Sustainability	4	4	16
C0028546	LIN3 - Boiler Refurbishment 2021	702,741	Business Sustainability	5	4	20
C0032864	POT - Main Turbine Valve Replacement	694,233	Business Sustainability	5	3	15
C0026106	TRE6 U&U 6A CW Screen Replacement	686,866	Business Sustainability	4	4	16
C0023682	TRE6 Mill Bullgear and Pinions	663,253	Business Sustainability	5	4	20
C0010321	TRE5 Parallel Slide Valve Replacement	639,450	Business Sustainability	4	4	16
C0028503	LIN4 - Boiler Refurbishment 2021	608,431	Business Sustainability	3	5	15
C0030982	TRE Asbestos Abatement 2021	599,392	Health & Safety	5	3	15
C0031187	TRE6 - Boiler Refurbishment 2021	552,543	Business Sustainability	5	4	20
C0030605	LIN RO System Replacement	535,796	Business Sustainability	4	5	20
C0030942	POT - Boiler Refurbishment 2021	503,357	Business Sustainability	5	3	15
C0031202	PHB - Boiler Refurbishment 2021	484,514	Business Sustainability	5	4	20
C0030488	TUC3 - Boiler Refurbishment 2021	474,419	Business Sustainability	5	3	15
C0030582	ICP Rail System Refurbishment Program 2021	459,318	Business Sustainability	4	4	16
C0020842	POT Turbine Generator Fire Protection	452,006	Health & Safety	3	5	15
C0031223	PHB - Precipitator Refurbishment 2021	446,126	Business Sustainability	4	4	16

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**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0025963	TRE CW Fish Barrier Cleaning System	442,732	Business Sustainability	3	5	15
C0028302	LIN - CW Screen Refurbishment 2021	380,526	Business Sustainability	4	4	16
C0028842	LIN1 Turbine Valve Refurbishment	353,733	Business Sustainability	5	3	15
C0030548	ICP - Rail Car Refurbishment 2021	277,666	Business Sustainability	4	4	16
C0029902	LIN Coal Crusher Replacement	272,830	Business Sustainability	4	4	16
C0030887	POT - Hydrogen Degas Panel Phase 2	256,345	Business Sustainability	4	4	16
C0030626	ICP Chute Replacement 2021	254,465	Business Sustainability	4	4	16
C0029643	LIN4 ID Fan VIV Refurbishment	253,856	Business Sustainability	3	5	15
C0031209	PHB - Air Heater Refurbishment 2021	250,142	Business Sustainability	4	5	20
C0031269	PTMT - E Crane Hydraulic Hose / Grease Lines	248,401	Business Sustainability	3	5	15
C0026547	TUC Process Drain Upgrade	247,850	Business Sustainability	3	5	15
C0030204	LIN WTP Chemical Pump Skid Replacement	241,704	Business Sustainability	3	5	15
C0030162	LIN Coal Amenities Building Replacement	239,677	Business Sustainability	3	5	15
C0030844	POT - Asbestos Abatement 2021	235,214	Health & Safety	5	3	15
C0020604	ICP Street Crossing Light Refurbishment	227,309	Business Sustainability	3	5	15
C0030371	TUC DCS HMI Upgrade 2021	218,475	Business Sustainability	4	4	16
C0020263	LIN Coal Stacker MCC Upgrade	213,327	Business Sustainability	4	4	16
C0030622	LIN Wastewater Piping Replacement	212,090	Business Sustainability	4	5	20
C0029802	LIN Ash Site Lagoon Refurbishment 2021	205,667	Business Sustainability	5	3	15
C0030223	LIN Precipitator Refurbishment	201,639	Business Sustainability	4	4	16
C0030362	LIN Coal Stacker Refurbishment	201,545	Business Sustainability	3	5	15
C0020364	TRE5 Stack Access	201,292	Business Sustainability	4	4	16
C0031243	PHB - Turbine Block Valve #30	200,581	Business Sustainability	4	4	16
C0030006	LIN WTP Resin Replacement	199,852	Business Sustainability	3	5	15
C0031242	PHB - Conveyors & Handling Systems 2021	199,835	Business Sustainability	4	4	16
C0030905	POT - GSCW Pump & Motor Replacement	199,284	Business Sustainability	4	4	16

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**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0020622	ICP Main Coal Storage Liner Refurbishment	198,741	Business Sustainability	5	3	15
C0021423	TUC - Auxiliary Boiler PLC/DCS Upgrades	174,334	Business Sustainability	3	5	15
C0031063	TRE Ash Site Management 2021	172,852	Environment	4	4	16
C0029642	LIN Fire System Refurbishment 2021	164,615	Health & Safety	4	4	16
C0028482	LIN1 Miscellaneous Valve Refurbishment 2021	161,635	Business Sustainability	4	5	20
C0030524	TUC2 Turbine Controls PLC Upgrade	53,769	Business Sustainability	4	4	16
C0031742	LIN HFO/LFO Line Refurbishment	155,542	Business Sustainability	5	3	15
C0030364	TUC Handrail Program 2021	152,780	Business Sustainability	5	4	20
C0028303	LIN Facilities Upgrades 2021	152,441	Business Sustainability	3	5	15
C0028562	LIN3 Miscellaneous Valve Refurbishment 2021	151,697	Business Sustainability	4	4	16
C0031189	TRE6 Main Feedwater Valve Replacement	150,666	Business Sustainability	5	4	20
C0010333	TRE6 Air Heater Expansion Joint Refurbishment	150,149	Business Sustainability	3	5	15
C0031266	POT - Miscellaneous Valve Refurbishment 2021	147,895	Business Sustainability	4	4	16
C0028322	LIN Siding Refurbishment 2021	146,757	Business Sustainability	3	5	15
C0030567	ICP - Rail Car Truck Program 2021	145,944	Business Sustainability	4	4	16
C0021602	TUC Telehandler Forklift	140,035	Business Sustainability	3	5	15
49447	LIN3 Steam Drum Level Controls Upgrade	137,337	Business Sustainability	4	4	16
C0020602	ICP Silo Liner Replacement	132,100	Business Sustainability	3	5	15
C0028422	LIN Ash Site Winter Cover 2021	131,299	Business Sustainability	3	5	15
C0028324	LIN Plant Lighting Upgrade 2021	127,389	Business Sustainability	3	5	15
C0028524	LIN4 Miscellaneous Valve Refurbishment 2021	125,188	Business Sustainability	4	4	16
C0031106	POT - Lighting Upgrades 2021	123,050	Business Sustainability	3	5	15
C0028686	LIN1 Steam Drum Level Controls Upgrade	122,081	Business Sustainability	4	4	16
C0028647	LIN Electric Actuator Upgrade	121,306	Business Sustainability	3	5	15
C0031126	POT - Facility Upgrades 2021	119,695	Business Sustainability	3	5	15
C0031067	TRE 4160 & 600V Breaker Refurbishment 2021	118,770	Business Sustainability	4	4	16

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**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0020644	AMO TUC3 Turbine Supervisory System Upgrade	118,349	Business Sustainability	3	5	15
C0028483	LIN Coal Plant Structural Refurbishment 2021	116,239	Business Sustainability	4	4	16
C0030368	TUC North Service Air Compressor Replacement	114,068	Business Sustainability	4	4	16
C0029182	LIN Fan Positioner Upgrade 2021	103,698	Business Sustainability	4	4	16
C0031190	TRE6 Conveyor Refurbishments 2021	101,304	Business Sustainability	4	4	16
C0031205	TRE6 Acid Pump Skid Replacement	101,271	Business Sustainability	3	5	15
C0029222	LIN3/4 Sodium & Phosphate Meter Replacement	101,139	Business Sustainability	4	4	16
C0030363	TUC WTP Resin Replacements	100,952	Business Sustainability	3	5	15
C0031204	PHB - Trancel Screw Refurbishment 2021	100,675	Business Sustainability	4	4	16
C0030904	ICP Environmental System Refurbishment	100,435	Environment	4	4	16
C0028342	LIN 4160 600V Breaker Refurbishment 2021	100,111	Business Sustainability	5	3	15
C0030484	TUC3 4kv/600V Breaker Replacement 2021	99,617	Business Sustainability	4	4	16
C0030922	POT - Coal Chute Refurbishment	99,462	Business Sustainability	4	4	16
C0030372	TUC2 4kv/600V Breaker Replacement 2021	98,753	Business Sustainability	4	4	16
C0030366	TUC Lighting Program 2021	98,689	Business Sustainability	4	4	16
C0030962	POT - Bunker C Pump Replacement	98,494	Business Sustainability	3	5	15
C0028645	LIN1 Auxiliary Air Upgrades	98,472	Business Sustainability	3	5	15
C0028402	LIN Grating Refurbishment 2021	98,449	Business Sustainability	5	4	20
49670	TUC1 4kv/600V Breaker Replacement 2021	97,915	Business Sustainability	4	4	16
C0030886	POT - Polisher Valves & Solenoid Panel	94,075	Business Sustainability	4	4	16
C0031264	POT - 2021 Breaker Replacement	91,035	Business Sustainability	4	4	16
C0030485	TUC3 Natural Gas Valves Refurbishment 2021	90,842	Business Sustainability	4	4	16
C0030943	ICP Pumphouse Refurbishment	90,831	Business Sustainability	3	5	15
C0030370	TUC2 West Condensate Extraction Pump Refurbishment	89,723	Business Sustainability	3	5	15
C0028648	LIN GSCW Small Bore Piping Refurbishment	87,373	Business Sustainability	3	5	15

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**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0031207	TRE6 Sootblowers Refurbishment 2021	84,336	Business Sustainability	3	5	15
C0031208	TRE6 Miscellaneous Valves 2021	81,649	Business Sustainability	4	4	16
C0030482	LIN Wastewater System Instrumentation Replacement	81,407	Business Sustainability	4	5	20
C0020340	TRE5 Mill Platform Phase 2	80,200	Business Sustainability	3	5	15
C0033666	TUC2 Turbine Turning Gear Refurbishment	75,089	Business Sustainability	4	4	16
C0030422	ICP Facility Lighting Upgrades	76,829	Business Sustainability	3	5	15
C0031084	TRE Floor Plates 2021	75,520	Business Sustainability	4	4	16
C0031104	TRE LED Lighting Upgrades 2021	75,331	Business Sustainability	3	5	15
C0020567	ICP Ventilation Upgrades	73,413	Business Sustainability	3	5	15
C0021402	TUC Oil Tanks Levels and Pump House Controls Upgrade	72,861	Business Sustainability	4	4	16
C0033565	TUC3 Turbine Speeder Assembly Refurbishment	72,339	Business Sustainability	4	4	16
C0020570	ICP Conveyor Hydraulics Refurbishment	70,453	Business Sustainability	3	5	15
C0029962	LIN Nitrogen Generator	60,697	Business Sustainability	3	5	15
C0021605	TUC Electrical Rooms Underground Upgrade	58,051	Business Sustainability	3	5	15
C0030525	TUC3 GSCW Coolers Refurbishment	57,136	Business Sustainability	3	5	15
C0030490	TUC6 Breaker Refurbishment	53,825	Business Sustainability	4	4	16
C0033906	TUC6 Battery Bank U6A Replacement	52,627	Business Sustainability	4	5	20
C0030544	ICP Fire Hydrants and Fire Suppression System Refurbishment	51,271	Health & Safety	4	4	16
C0030373	TUC2 Natural Gas Valves Refurbishment 2021	50,431	Business Sustainability	4	4	16
C0030365	TUC WTP Acid Pumping Upgrade	50,067	Business Sustainability	3	5	15
C0030369	TUC Electric Valve Actuator Replacements	49,604	Business Sustainability	3	5	15
C0030903	POT - Sternson Resin Replacement	49,511	Business Sustainability	4	4	16
C0031111	POT - Boiler Fill Pump Replacement 2021	49,462	Business Sustainability	3	5	15
C0031115	POT - Lube Oil Piping Replacement 2021	49,425	Business Sustainability	3	5	15
C0031124	POT - Condenser Door Replacement 2021	48,385	Business Sustainability	3	5	15
C0030762	ICP Mile 0.46 Bridge Refurbishment	48,127	Business Sustainability	4	4	16

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**Figure 64: Steam – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0021470	TUC1 Natural Gas Valves Refurbishment	46,676	Business Sustainability	4	4	16
C0030489	TUC6 - HP Boiler Tube Replacement	45,199	Business Sustainability	4	4	16
C0030487	TUC3 Lube Oil Refurbishment	44,248	Business Sustainability	4	4	16
C0030493	TUC3 Lube Oil Coolers Refurbishment	40,485	Business Sustainability	4	4	16
C0031163	TRE5 Conveyor Refurbishments 2021	39,405	Business Sustainability	4	4	16
C0031278	PTMT - Idler Assemblies for inhaul & Dock Conveyors	37,418	Business Sustainability	3	5	15
C0031277	PTMT - Rebuild Hopper Walls 2021	37,005	Business Sustainability	3	5	15
C0030491	TUC6 Replace Electrical Heat Trace Panel	36,475	Business Sustainability	3	5	15
C0031086	TRE TAMS Toe Buttress Habitat Restoration	35,207	Business Sustainability	5	3	15
C0030492	TUC6 Vacuum Pump Replacement	31,448	Business Sustainability	4	4	16

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**Figure 65: Combustion Turbine – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
C0020944	LM6000 - 191-443 Hot Section Engine Refurbishment	473,200	Business Sustainability	5	4	20
46483	CT - TUS Control System Upgrade	1,046,322	Business Sustainability	4	5	20
C0029692	LM6000 - TUC4 Generator Rotor Ring Refurbishment	884,552	Business Sustainability	5	4	20
C0030082	CT - Generator Bearings Replacement	382,180	Business Sustainability	5	3	15
C0030549	CT - VJ1 - General Control and Protection Upgrade	147,789	Business Sustainability	5	3	15
C0029582	CT - TUS MCC Upgrades	254,076	Business Sustainability	4	5	20
C0029584	CT - TUS Generator Breaker Replacement	93,975	Business Sustainability	4	4	16
C0029585	CT BGT4 Generator Breaker Replacement	90,001	Business Sustainability	4	4	16
C0029686	CT - VJ Fuel System Coating	83,106	Business Sustainability	4	4	16
C0029688	CT - TUS - Air House Refurbishment	78,115	Business Sustainability	4	5	20
C0029687	CT - BGT Overfill Protection Fuel Tanks	43,761	Business Sustainability	5	3	15
C0029689	CT - VJ Overfill Protection F Tank	43,470	Business Sustainability	5	3	15
C0030502	CT -TUS - Battery Charger Replacement	36,045	Business Sustainability	4	4	16



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C0029684	TUS - Fuel Piping Coating Refurbishment	31,994	Business Sustainability	4	4	16
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Transmission & Distribution

Figure 66: Transmission and Distribution – 2021 ACE Plan Capital Item Ratings

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
<b>Transmission Capital Items Included in 2021 ACE Plan</b>						
C0031263	2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	3,082,728	Environment	4	4	16
C0031089	2021/2022 Transmission Right-of-Way Widening 69kV	2,015,923	Business Sustainability	4	4	16
C0031122	L6539 Replacements and Upgrades	1,410,921	Business Sustainability	5	3	15
C0031085	L6516 Line Replacement and Upgrades	1,384,963	Business Sustainability	4	4	16
C0031050	New Spare Large Autotransformer	976,198	Business Sustainability	5	4	20
C0033644	2021/2022 Steel Tower Life Extension	793,248	Business Sustainability	5	4	20
C0033645	2021/2022 Steel Tower Refurbishment	1,190,655	Business Sustainability	5	4	20
C0031069	L6020 Replacements and Upgrades	926,286	Business Sustainability	4	4	16
C0031262	2020/2021 Transmission Switch and Breaker Replacement	814,495	Business Sustainability	3	5	15
C0031064	L5054 Replacements and Upgrades	1,045,362	Business Sustainability	4	4	16
C0031052	New System Spare Power Transformer	344,935	Business Sustainability	3	5	15
C0031042	5P-MS Rewind	128,055	Business Sustainability	5	5	25
C0031053	L5506 Line Replacements and Upgrades	680,431	Business Sustainability	4	4	16
C0031283	2021 Substation Theft Prevention	427,566	Business Sustainability	5	4	20
C0022783	2021 Generation Related Power Transformer Refurbishments	402,385	Business Sustainability	5	4	20
C0031298	88S-T72 New Radiators	285,193	Business Sustainability	5	4	20
C0031303	82S-503 and 82S-504 Structure and Switches Replacement	205,709	Business Sustainability	3	5	15
C0031274	2021 Capacitor Bank Breaker Replacements	195,671	Business Sustainability	4	4	16
<b>Distribution Capital Items Included in 2021 ACE Plan</b>						
C0031083	New Distribution Rights-of-Way Phase 6	4,160,074	Business Sustainability	3	5	15
C0008638	Cogswell HRM Redevelopment Program	300,967	Business Sustainability	4	4	16
C0031145	2021 Padmount Replacement Program	1,379,040	Business Sustainability	5	4	20

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**Transmission & Distribution**

**Figure 66: Transmission and Distribution – 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Rating
47794	Heckman Island Underwater Cable Replacement	1,129,537	Business Sustainability	5	4	20
C0020830	85S-401 Cape Smokey Build to Roadside	630,851	Business Sustainability	4	5	20
C0031150	36W-301-Add Third Phase - Allendale	275,339	Business Sustainability	3	5	15
C0031119	96H-412-Dufferin Mines Rd Rebuild	737,966	Business Sustainability	5	4	20
C0027611	67C-411 - Highway 252 Build to Roadside	481,653	Business Sustainability	5	4	20
C0031121	104S-313 - Reconductor Big Hill	690,254	Business Sustainability	4	5	20
C0031293	11S-411-Coxheath Reinsulate and Reconductor	447,975	Business Sustainability	5	4	20
C0033444	63V-312 Stronach Mountain Phase Extension	158,685	Business Sustainability	4	4	16
C0031166	2021 Downline PCB Replacements	636,225	Environment	5	4	20
C0031164	515W-211-New Germany Conversion	378,018	Business Sustainability	4	4	16
C0031304	37N-413G-South Athol Rebuild	633,974	Business Sustainability	5	3	15
C0031112	6S-225 - Townsend Street Conversion	295,239	Business Sustainability	5	4	20
C0031302	20V-311-Bluff Rd Rebuild	472,670	Business Sustainability	5	4	20
C0031299	88H-402 Trafalgar Line Extension and Offload	403,603	Business Sustainability	4	4	16
C0031113	61N-204 Townsend Avenue Conversion	333,554	Business Sustainability	4	5	20
C0031297	709H-221 Bedford 4kV Conversion	242,944	Business Sustainability	4	4	16
C0031120	76V-301 Maitland Bridge Build to Roadside	188,382	Business Sustainability	5	4	20
C0004078	83V-301 - Gaspereau River Crossing Rebuild	132,404	Business Sustainability	5	4	20
C0031300	9H-223 North St Conversion	229,089	Business Sustainability	5	3	15
C0031144	2021 Vault Replacement	217,421	Business Sustainability	5	4	20
C0031289	10H-231-South Park St and Wright Ave 4kV Conversion	178,069	Business Sustainability	5	4	20
C0031305	37N-413-HWY 2 Rebuild - Newville Lake	153,857	Business Sustainability	4	4	16
C0031110	89W-303 Oakland Rd Water Crossing	139,468	Business Sustainability	4	5	20
C0031149	Targeted Automatic Sleeve Replacements	87,708	Business Sustainability	5	3	15

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**Information Technology**

**Figure 67: IT - 2021 ACE Plan Capital Item Ratings**

CI	Project Title	2021 ACE Budget	Ranking Category	Criticality	Condition	Ranking
49094	IT - Privilege Access Management (PAM)	1,962,056	Business Sustainability	5	4	20
C0021839	IT - Customer Energy Insights Management	2,351,875	Business Sustainability	4	4	16
C0030987	IT - NERC CIP Environment Refresh	1,318,786	Business Sustainability	5	4	20
C0011167	IT - Backup Infrastructure Upgrade	652,768	Business Sustainability	4	4	16
C0022002	IT - Outage Map Upgrade	453,441	Business Sustainability	5	3	15
C0031022	IT - Identity & Access Management	852,568	Business Sustainability	5	4	20
C0031002	IT - Customer Billing & Payment Solution	357,205	Business Sustainability	4	4	16
C0032502	IT - Time Varying Pricing Solution	625,539	Business Sustainability	3	5	15
C0031027	IT - Multi-Factor Authentication	586,159	Business Sustainability	5	4	20
C0031028	IT - Network Access Control	225,243	Business Sustainability	5	4	20
C0031094	IT - Cloud Integration Platform	70,882	Business Sustainability	4	4	16
C0031099	IT - Computer Telephony Integration	257,562	Business Sustainability	3	5	15
C0021823	IT - Customer Analytics Implementation	502,243	Business Sustainability	4	5	20
C0021849	IT - Wi-Fi Infrastructure Replacement	111,048	Business Sustainability	5	5	25
C0011302	IT - PeopleSoft Upgrade	175,551	Business Sustainability	5	5	25
C0021834	IT - CIS - OS Upgrade	86,066	Business Sustainability	5	5	25
C0011111	IT - ADMS Maintenance Release	162,971	Business Sustainability	5	5	25
C0032144	IT - Control Centre Applications Replacement	340,147	Business Sustainability	5	5	25
51963	IT - Adept Upgrade	323,718	Business Sustainability	4	5	20
C0031100	IT - HVCA Upgrade	200,009	Business Sustainability	5	5	25
C0021843	IT - Upgrade Oracle OBIA	160,749	Business Sustainability	3	5	15
C0021822	IT - Data Catalogue & Quality Tool	104,740	Business Sustainability	4	4	16
C0021829	IT - Domain Password Management	81,411	Business Sustainability	3	5	15

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**11.1.4 2021 to 2025 Forecasted ACE Plan Expenditures by Functional Class and Spending Program**

Pursuant to 2011 ACE Plan Directive 12, NS Power provides its forecast investments by functional class and spending program. Justifications for projects determined as capital investments are scoped on an annual basis. Capital investment on the basis of health and safety, environmental compliance and requirement to serve remains non-discretionary. **Figure 68** below identifies anticipated sustaining capital by function and specific notable investments included in this ACE Plan. Investment levels from 2021 to 2025 are subject to change based on operating conditions, updated asset assessments, regulatory directives, or legislation/regulations.

Sustaining capital funding levels represent typical annual investment by function in a given year to sustain the integrity of existing assets. Notable capital projections reflect specific projects. Included in these specific projects are transformative multi-year program investments and asset growth.

**Figure 68: Forecasted ACE Plan Expenditures by Functional Class and Spending Program**  
(Millions of dollars)

	2021 ACE	2022	2023	2024	2025
<b>Base Capital Investment</b>					
Thermal Generation	61.5	71.4	92.1	68.7	75.1
Combustion Turbines	5.6	20.9	7.0	4.0	0.7
Hydro Generation	38.1	19.3	10.5	18.9	13.9
Wind Generation	1.6	0.6	0.6	0.6	0.6
Transmission	51.4	47.3	54.7	61.7	55.8
Distribution	79.7	61.1	61.4	61.8	62.1
General Plant	55.6	28.1	25.7	28.9	40.8
<b>Total Base Capital Expenditure</b>	<b>293.5</b>	<b>248.6</b>	<b>252.2</b>	<b>244.6</b>	<b>249.0</b>
<b>General Plant:</b>					
IT - CIS Replacement	0.0	0.0	3.0	20.0	25.0
IT - T&D Work and Asset Management	2.4	25.9	19.5	4.5	0.0

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**Figure 68: Forecasted ACE Plan Expenditures by Functional Class and Spending Program**  
(Millions of dollars)

	2021 ACE	2022	2023	2024	2025
<b>Distribution:</b>					
Advanced Metering Infrastructure	10.0	0.0	0.0	0.0	0.0
Distribution R.O.W Widening	7.8	9.0	9.2	9.3	9.5
<b>Transmission:</b>					
Transmission R.O.W Widening	5.3	6.1	6.2	6.4	6.5
<b>Hydro:</b>					
Hydro Infrastructural Renewal					
Wreck Cove LEM	33.3	48.0	33.2	23.9	4.2
Mersey Re-Development	9.4	28.1	33.7	30.0	30.3
<b>Total Notable Capital</b>	<b>68.2</b>	<b>117.1</b>	<b>104.8</b>	<b>94.1</b>	<b>75.5</b>
<b>Total Annual Capital Investment</b>	<b>361.8</b>	<b>365.7</b>	<b>357.0</b>	<b>338.7</b>	<b>324.5</b>

### 11.1.5 Cost Minimization

The NSUARB's 2019 ACE Plan Order Directive 5 provided as follows:

NS Power is directed, in subsequent ACE Plan applications, to provide specific examples of project execution cost minimization efforts for the prior year, complete with a description of the cost savings accrued by these efforts.

The NSUARB's 2020 ACE Plan Order Directive 6 provided as follows:

NS Power is directed in subsequent ACE Plan applications, to provide examples of cost minimization efforts during execution and construction from the prior year's projects, with project specific cost minimization examples being fully described.

Cost minimization is at the forefront of all stages of capital project development and execution. The following are examples of processes that NS Power follows in order to obtain best value for customers at the lowest cost:

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- 1
  - 2 • Preliminary engineering efforts examine technically feasible options for a capital project.
  - 3 Generally, the alternative with the least cost is chosen. Exceptions are if a more costly
  - 4 option provides additional benefits, such as offsetting economic savings. The options
  - 5 examined and their relative costs are noted under “Why do this project this way?” in each
  - 6 capital work order, where applicable.
  - 7
  - 8 • The most cost effective option is generally determined in early project development;
  - 9 however, NS Power continues to evaluate each project throughout the course of its
  - 10 development from an engineering perspective, to confirm that the chosen alternative
  - 11 remains the most cost effective technically feasible option.
  - 12
  - 13 • As projects are being executed, project managers track actual costs compared to approved
  - 14 budgets. In this way project teams are kept apprised of spending trends in real-time in
  - 15 order to mitigate potential cost overruns.
  - 16
  - 17 • Material and contract costs are subject to competitive bidding processes where applicable.
  - 18 Competitive bidding processes are designed to encourage cost competitiveness among
  - 19 multiple vendors thereby aiding in the procurement of low cost materials and services.
  - 20
  - 21 • For larger scale capital projects, NS Power looks for opportunities to participate in
  - 22 procurement consortiums with other utilities to leverage the negotiating strength of a larger
  - 23 collective of organizations.
  - 24
  - 25 • After vendor selection, NS Power continues to negotiate best value and lowest cost and
  - 26 establishes contractual assurances and protections. In extenuating circumstances, the
  - 27 Company has also negotiated services and materials at discount or no cost from its vendors
  - 28 and applies those savings directly to capital projects.
  - 29
-

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- Where possible, NS Power enters into multi-year contracts or master service agreements with vendors for services and materials. Multi-year contracts and master service agreements allow NS Power to lock into place costs and rates that would otherwise be higher if they were procured on a shorter term basis.
- Projects are scheduled during planned outages where possible. Conducting as much capital work on assets during planned outages allows for the continued economic dispatch of NS Power's generation fleet and deploys resources at one time thereby avoiding possible multiple deployments which can lead to increased costs.

In response to this directive, NS Power has identified a number of areas where costs were minimized and has categorized specific cost savings into the three categories outlined in **Figure 69** below:

**Figure 69: Cost Minimization Savings**

Savings Category	Savings (\$M)
Design & Detailed Engineering	3.6
Project Execution Efficiencies	0.7
Procurement Process/Negotiated Savings	4.6
<b>Total</b>	<b>9.0</b>

Some examples of specific project savings in each category are described further below.

*Design & Detailed Engineering*

- CI C0006358 - Lake Mulgrave Wing Dams Refurbishment – The decision was made to leave asbestos tar paper in place and construct around the existing corewall. This design change will result in savings of approximately \$1.5M in landfill costs.

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- 
- CI 49897 - POT - Fire system upgrades 2017 – Further engineering and an additional flow test was completed with the assistance of a consultant whom had access to computer software that could evaluate the friction losses in the future system with a high degree of precision. This additional engineering determined that larger pumps were not required and will result in project savings of approximately \$700K.

*Project Execution Efficiencies*

- CI C0017920 - PTMT Shuttle belt Replacement - Further Planning and scoping with the subcontractors prior to the start of the project resulted in savings of approximately \$200K.
- Various line replacement and upgrades – Matting cost installation savings of approximately \$150K across various projects by using internal oversight and the support of consultants rather than contractors.

*Procurement Process/Negotiated Savings*

- CI C0006358 - Lake Mulgrave Wing Dams Refurbishment – Procurement process and evaluation of proposals from proponents resulted in approximately \$2.3M of savings.
- CI C0010948 - 2019/2020 Sacrificial Anode Installation – This scope of work was incorporated into an existing contract through the procurement process. Achievement of early pay discounts resulted in savings of approximately \$500K.

**11.1.6 Impact of Reliability Projects**

The NSUARB's 2013 ACE Plan Decision provided the following directive:



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1 ...the Board expects NSPI to monitor the impact of the deferral of reliability  
2 projects in the original 2013 ACE Plan closely and to provide a report on the results  
3 in the next ACE Plan.<sup>30</sup>  
4

5 Pursuant to NS Power's commitment noted in the 2015 ACE Plan Terms of Consensus, this  
6 directive is expanded to include additional information regarding continued sustaining capital  
7 investments and maintaining reliability performance.  
8

9 The NSUARB's 2017 ACE Plan Order provided the following directive:  
10

11 The Board directs NSPI to identify and list any proposed capital investments related  
12 to performance standards established by the Board in future ACE Plan  
13 applications.<sup>31</sup>  
14

15 T&D projects in the 2021 ACE Plan will contribute to improving these performance standards.  
16 They are selected based on the asset management methodology pursuant to section 6.2 of the  
17 CEJC, guiding investments to where they are needed most.  
18

19 Finally, the NSUARB directed NS Power to continue providing the same information with respect  
20 to reliability and severe weather events notwithstanding the NSUARB's approval of the  
21 performance standards in 2017 and the Company's obligations to report on those standards:  
22

23 ...[T]o what extent, if any, certain aspects of the information set out in Section 8.1.7  
24 of the 2017 ACE Plan will be reproduced in the report required by the Performance  
25 Standards Decision remains to be seen.  
26

27 It is not clear such items as, for example, plans for replacement of aging  
28 transmission and distribution equipment, and storm performance information,  
29 beyond the 48-hour restoration metric, will be fully explored in the context of  
30 performance standard metrics reporting.  
31

32 As there is some uncertainty, and a part of the information provided in Section 8.1.7  
33 is derived from an agreement between stakeholders, as part of the 2015 ACE Plan  
34 process, the Board will not direct any changes to the current ACE Plan reporting

---

<sup>30</sup> M05339, NS Power 2013 Annual Capital Expenditure Plan, NSUARB Decision, May 27, 2013, page 44, line 174.

<sup>31</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Order, April 4, 2017.

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1 related to reliability at this time. The Board will monitor the ongoing relevancy of  
2 this part of the ACE Plan.

3  
4 The first report arising from the Performance Standards Decision is due March 31,  
5 2018. Once that report has been filed and analyzed, the matter should be revisited  
6 in the context of a future ACE Plan.<sup>32</sup>  
7

8 **Reliability Strategy**  
9

10 Customers of NS Power expect reliable and affordable energy. To this end, NS Power continues  
11 to pursue opportunities to manage reliability improvements on the T&D system across the  
12 province. To meet reliability challenges from severe weather and climate change, improved  
13 reliability performance analysis, technological innovation, targeted mitigating measures, and new  
14 approaches to the way we work are necessary.  
15

16 Further integration of asset management processes, tools, and data contribute to enhanced  
17 understanding of asset condition, criticality, and risk across the T&D system. Detailed analysis of  
18 this intelligence allows for targeting areas of concern and identification of appropriate corrective  
19 actions. Integration of new technologies and asset programs such as additional protection  
20 equipment, use of intelligent devices, targeted asset replacements and upgrades, and enhanced  
21 vegetation management increases the number of options available to NS Power to reduce both the  
22 frequency and duration of unplanned outages for customers. Finally, a strong focus on risk-based  
23 decision making, enhanced work prioritization, and further reliability team initiatives will help to  
24 realize improved customer experience.  
25

26 Investments associated with achieving these improvements are targeted and optimized to  
27 efficiently mitigate reliability risk in a cost effective manner while recognizing affordability for  
28 customers.  
29

30 **Reliability Statistics**

---

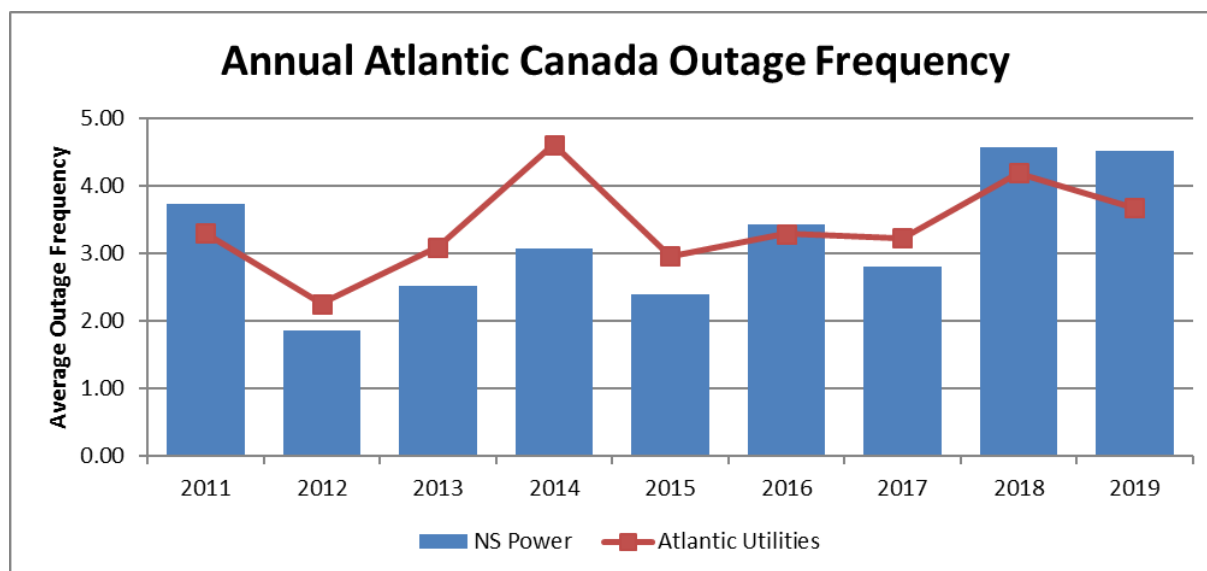
<sup>32</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Decision, April 4, 2017, paragraphs 98 to 101.

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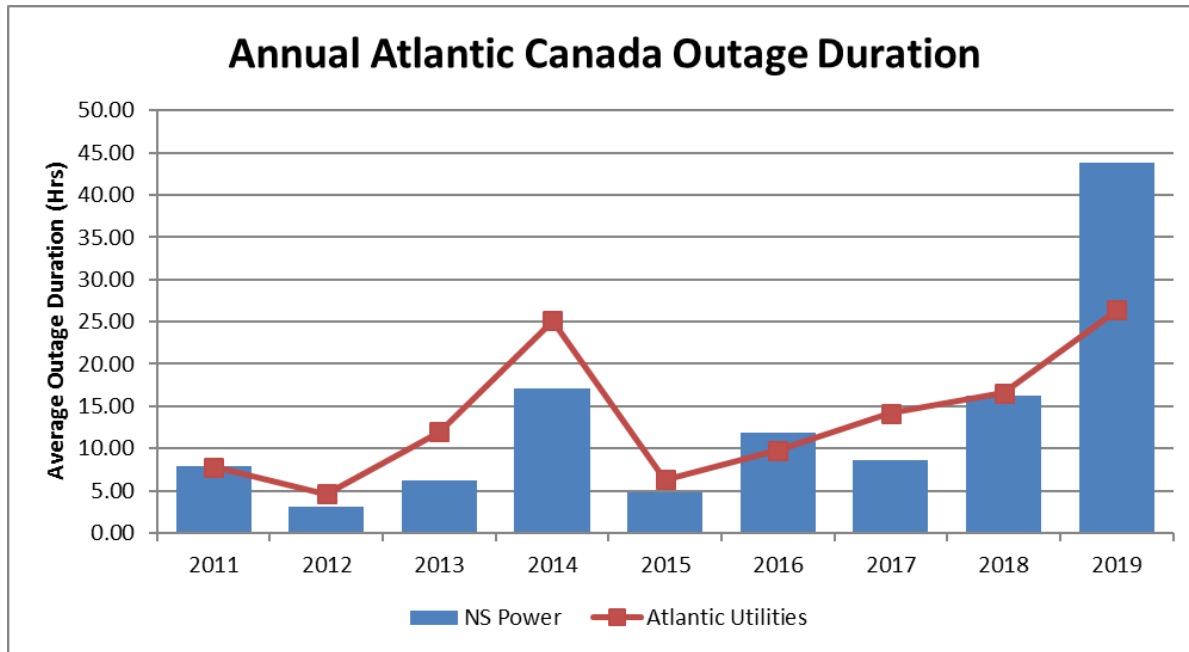
As shown in **Figure 70** and **Figure 71** below, with the exception of 2011, 2016, 2018, and 2019 largely due to challenging weather conditions, NS Power's annual outage frequency and duration continues to be below the average of Atlantic Canada utilities. The data for 2019 exceeded the average due to the significant challenges posed by Hurricane Dorian in September of that year. Dorian contributed nearly 80 percent of all customer hours of interruption in 2019, which is a significant outlier from typical performance trends.

**Figure 70: Annual Atlantic Canada Outage Frequency**



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**Figure 71: Annual Atlantic Canada Outage Duration**



**Figure 72** and **Figure 73** below represent NS Power’s reliability statistics with Major and Extreme Events (such as Hurricane Dorian and as defined by IEEE-1366) removed from the data. This shows a normalized comparison between yearly reliability performance. Performance observed in 2015, 2016, 2018, and 2019 were largely the result of a significant number of storm events, that while falling short of the IEEE-1366 standard for a major event, lead to more frequent and longer outages than would have been experienced in previous years. This in turn led to an increase in both SAIFI and SAIDI. The 10 year trend shows overall sustainment or only small deterioration of reliability for customers despite challenging weather conditions in recent years.

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Figure 72: NS Power Annual SAIFI (Major/Extreme Events Excluded)

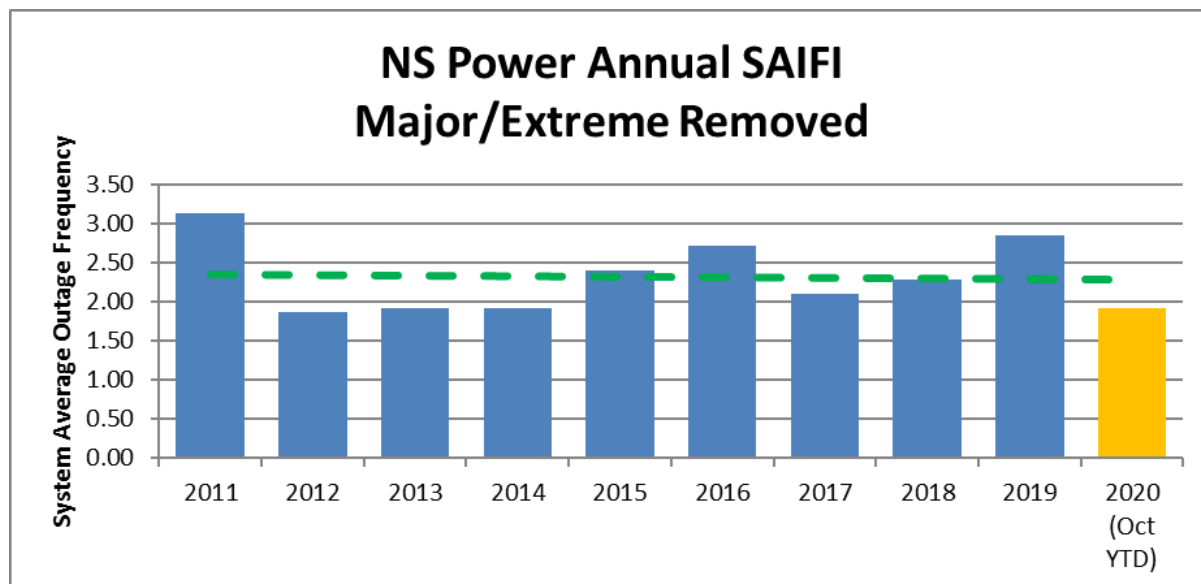


Figure 73: NS Power Annual SAIDI (Major/Extreme Events Excluded)

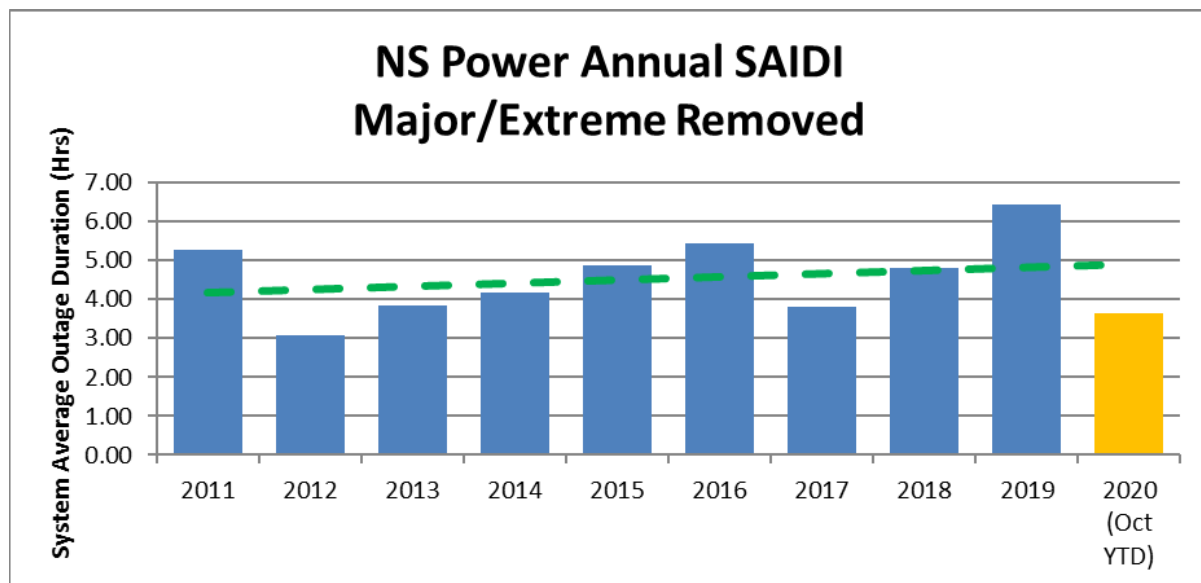


Figure 74 and Figure 75 below represent NS Power's reliability statistics with Major and Extreme Events included.

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Figure 74: NS Power Annual SAIFI (Major and Extreme Events Included)

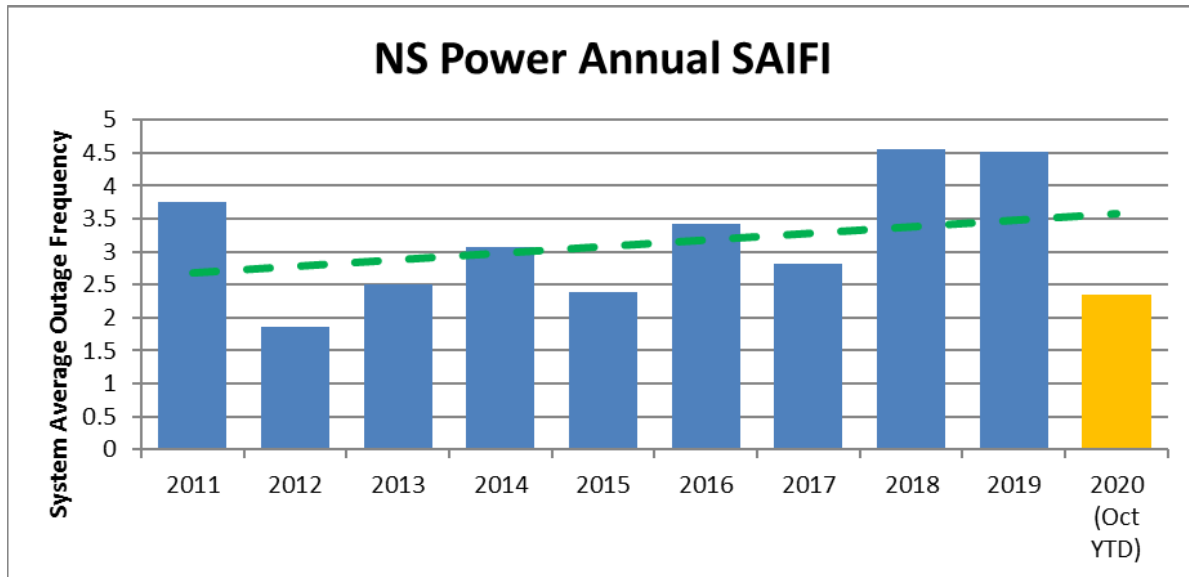
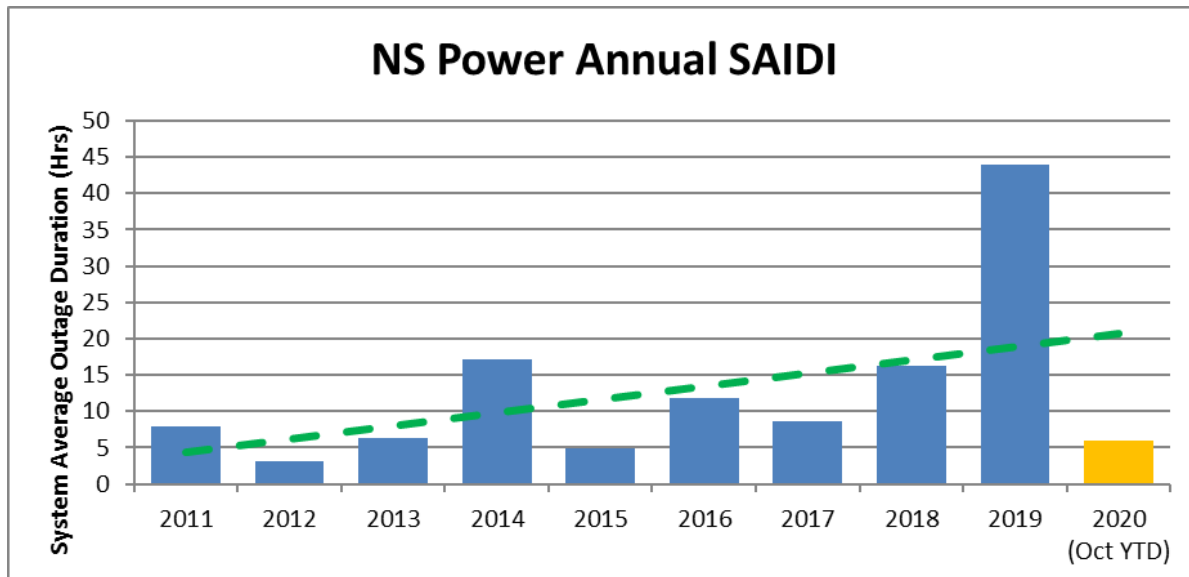


Figure 75: NS Power Annual SAIDI (Major and Extreme Events Included)



The reliability performance for SAIFI and SAIDI are strongly correlated with the number of major and extreme events that occur during the calendar year. NS Power continues to see severe weather events (Arthur 2014, Matthew 2016, Dorian 2019) as a trend which is expected to continue into the future. However, NS Power's typical performance compares favourably with the Atlantic

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1 Canada outage average for frequency and duration, and the Company continues to see consistent  
2 (sustaining) trends overall for SAIFI and SAIDI. Continued investment in annual rights-of-way  
3 clearing and other capital investment initiatives noted herein are expected to continue to sustain  
4 reliability over the long term.

5  
6 **Outage Causes**

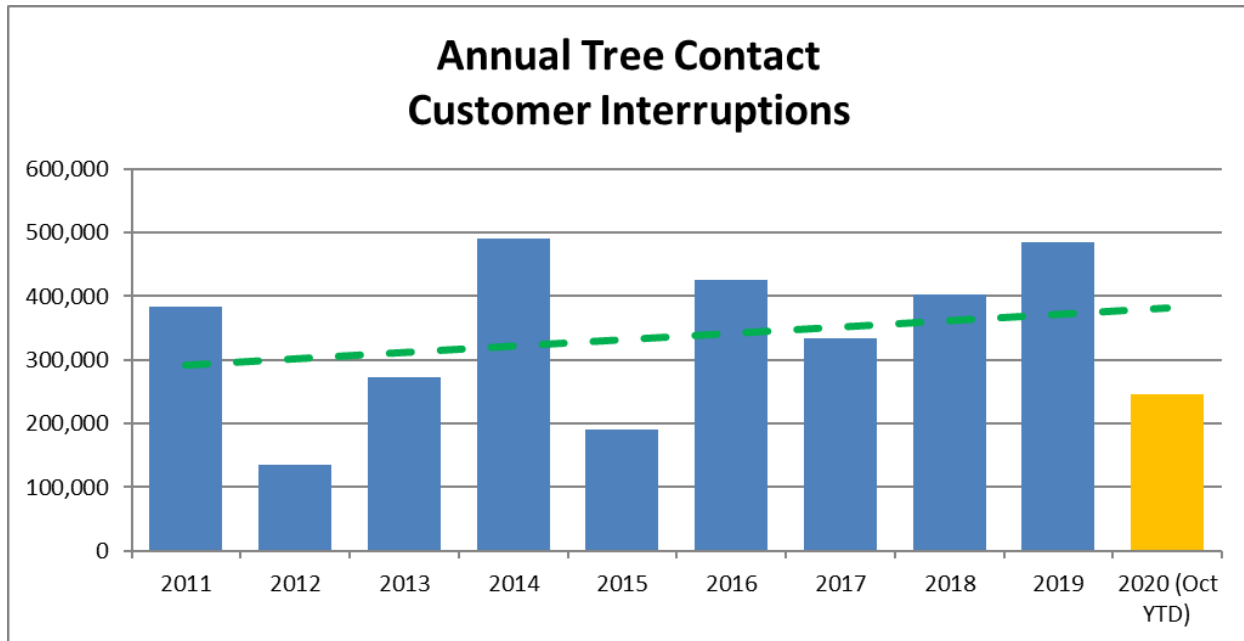
7  
8 Historically, two of the leading causes of NS Power customer outages for all days (all significant  
9 event days included) are tree contacts, and defective equipment. Outage analysis of these causes  
10 and NS Power's associated investments are described in more detail below. As elaborated in these  
11 sections, both tree contact and defective equipment related outages are influenced by the prevailing  
12 weather conditions, further contributing to the overall effects of adverse weather on system  
13 performance.

14  
15 Tree Contacts

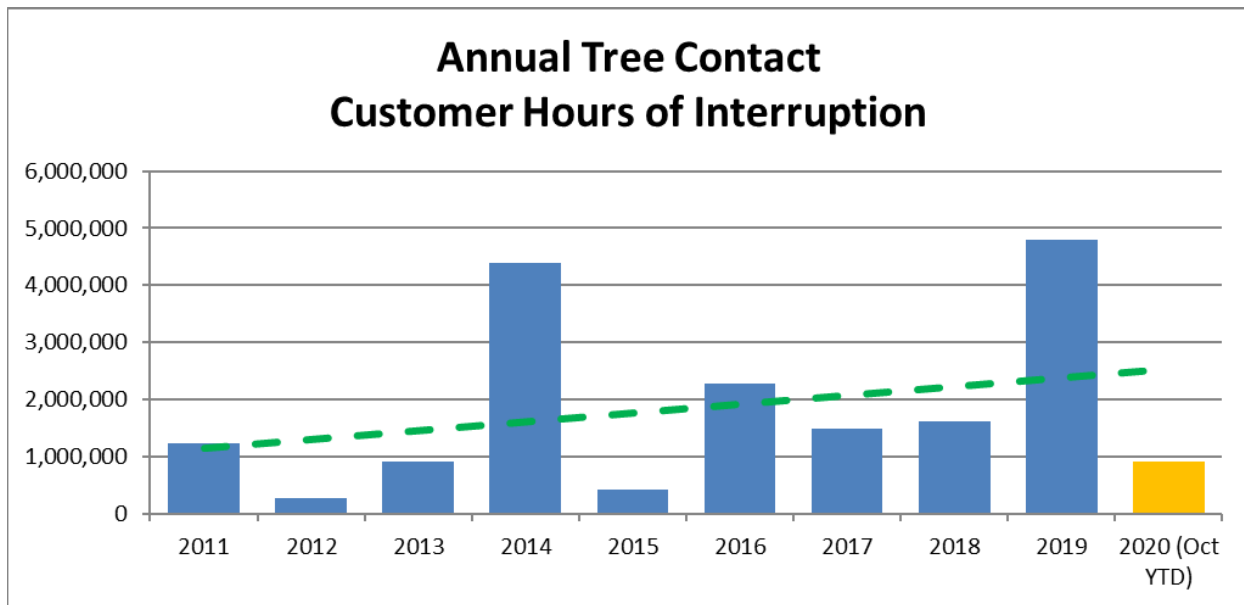
16  
17 Since 2011, tree contacts continue to be one of the largest sources of outage hours for NS Power's  
18 customers. **Figure 76** and **Figure 77** below show both customer interruptions and customer hours  
19 of interruption due to tree contacts under normal and severe weather conditions.

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**Figure 76: Annual Tree Contact – Customer Interruptions**



**Figure 77: Annual Tree Contact – Customer Hours of Interruption**

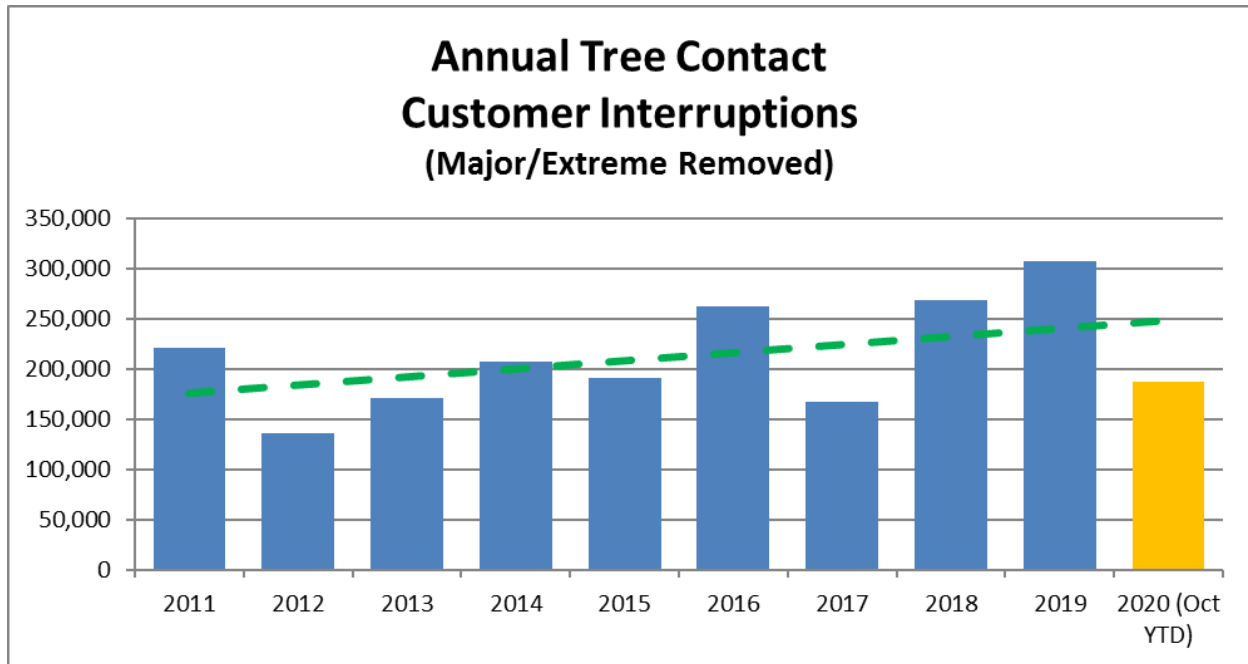


**Figure 78** and **Figure 79** below show the tree contact data normalized with Major and Extreme Events removed. With these events removed, the data demonstrates the vegetative effects of major storms and their impact for months following the extreme event.

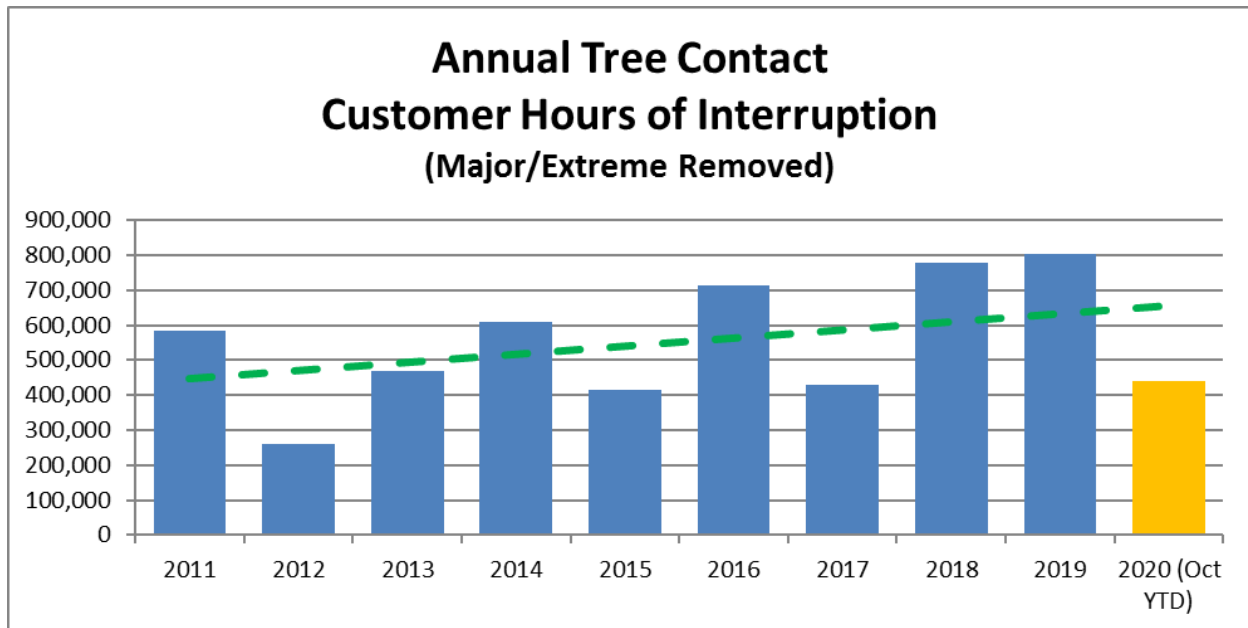


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**Figure 78: Annual Tree Contact – Customer Interruptions (Major/Extreme Events Removed)**



**Figure 79: Annual Tree Contact – Customer Hours of Interruption (Major/Extreme Events Removed)**



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1  
2 In a continued effort to minimize storm effects on overall reliability, NS Power has proposed the  
3 following spending in 2021 for transmission and distribution vegetation management. These  
4 targeted investments for managing vegetation aim to mitigate outage frequency and duration, while  
5 seeking to improve access to the system.

- 6  
7 • C0031083 – New Distribution Rights-of-Way Phase 6  
8 • C0031089 – 2021/2022 Transmission Right-of-Way Widening 69kV  
9 • D010 Distribution Right-of-Way Routine  
10 • T010 Transmission Right-of-Way Routine

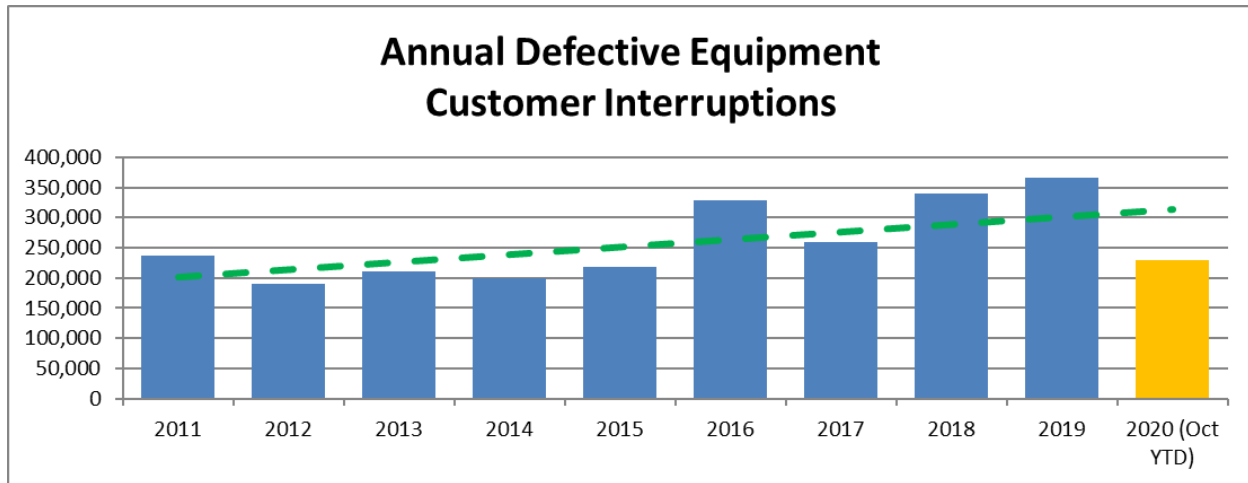
11  
12 Defective Equipment

13  
14 **Figure 80** and **Figure 81** below show the reliability results realized through upgrades and  
15 replacements of targeted distribution equipment resulting from the Reliability Investment Strategy.  
16 2020 results year to date are showing the potential for improved performance over recent years.

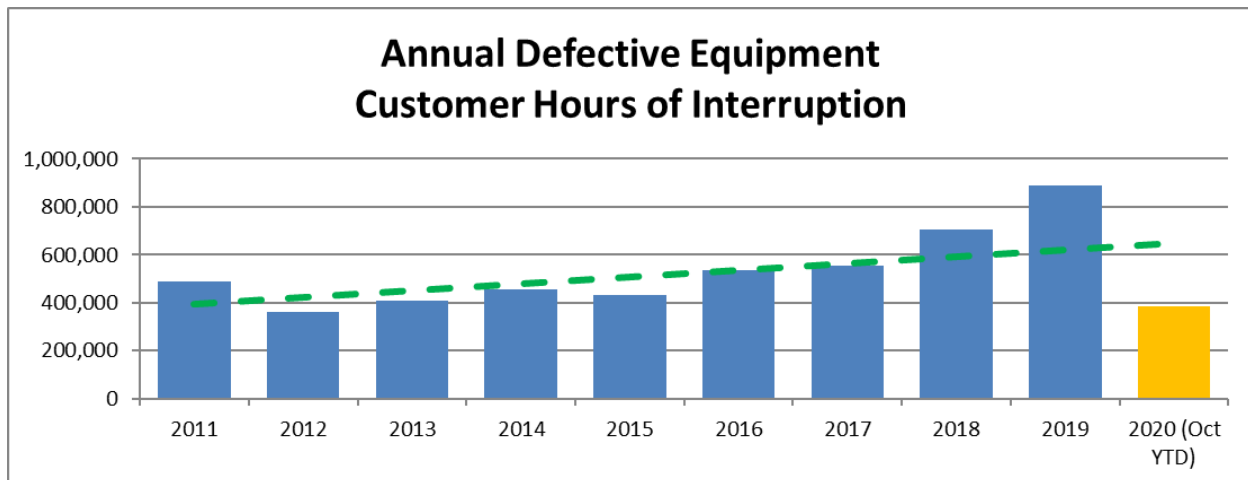
17  
18 Reliability teams are continuing to investigate improvements in maintenance strategies to identify  
19 failure modes for asset classes with the highest contributions to customer impacts. In 2018 and  
20 2019, NS Power experienced an increase of primary aerial conductor failures leading to a higher  
21 than typical contribution of frequency and duration of outages caused by defective equipment in  
22 recent history. These years were also the most challenging years for severe weather events. The  
23 increase in failed primary aerial conductors is believed to be attributed in large part to the added  
24 stress on existing infrastructure due to the high number of hours winds have exceeded warning  
25 levels. Fortunately, the combination of targeted asset investments and more favourable weather  
26 conditions to date in 2020 has contributed to overall improved equipment reliability performance.  
27 In particular, customer hours of interruption year to date are on track to be below the 5-year average  
28 for defective equipment.

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**Figure 80: Annual Defective Equipment – Customer Interruptions**



**Figure 81: Annual Defective Equipment – Customer Hours of Interruption**



Taking a further look into the 2019 reliability data, defective equipment outages can be classified by device type. This is shown in **Figure 82** below.

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**Figure 82: Customer Hours of Interruption**

Customer Hours of Interruption		
Device Type	2019	% of Hours
Primary Aerial Conductor	192,395	22.95%
Pin Insulator	146,384	17.46%
Recloser	96,225	11.48%
Lead	64,559	7.70%
Crossarm	54,929	6.55%
Tie Wire	45,249	5.40%
Cutout	42,318	5.05%
Wood Pole	36,250	4.32%
Jumper	17,651	2.11%
Fuse Link	17,281	2.06%

All distribution capital projects and routines that replace deteriorated equipment will sustain system reliability and address the device failures referenced in the table above.

The scope of the following capital projects include elements that will result in sustaining reliability by improving outage response:

- C0031119 – 96H-412 Dufferin Mines Road Rebuild
- C0027611 – 67C-411 Highway 252 Build to Roadside
- C0031120 – 76V-301 Maitland Bridge Build to Roadside

**Update on storm performance and related capital investments**

The effect of storms and storm response varies storm-to-storm and year-to-year. The wind speeds, rainfalls, time of year, time of day and weather forecast accuracy all contribute to a storm's impact.

NS Power uses the 2.5 Beta Method (IEEE-3366 Standard) to classify Major Event Days. The same methodology is applied to further classify Significant Event Days (2.0 Beta) and Extreme Event Days (3.5 Beta).

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As of October 31, 2020, NS Power experienced 3 significant event days, 3 major event days, and no extreme event days.

NS Power has the following capital programs for storm response and reactive work for 2020:

- D008 – Provincial Storm Distribution
- T001 – Transmission Line Unplanned

As noted above, NS Power continues to invest on vegetation management. These investments aim to minimize tree contact and maximize access to our transmission and distribution systems as provided for in routines T010 and D010, as well as capital work orders CI C0031083 and CI C0031089.

2020 Storm Performance vs. Previous Years

**Figure 83** to **Figure 88** below show the count of the previously identified event day<sup>33</sup> classifications, and their SAIFI and SAIDI contributions annually. They outline the frequency and impact of significant event days<sup>34</sup> to customers.

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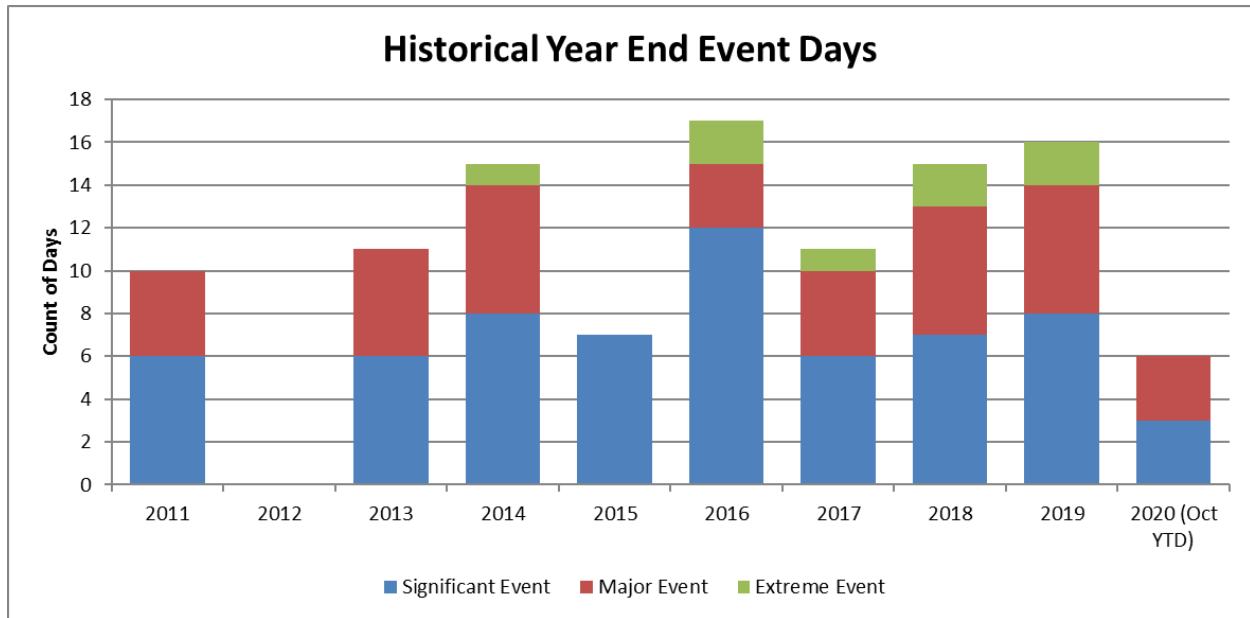
<sup>33</sup> The term “Event Day”, rather than the previous term “Storm Day” is used here to refer to those events significantly exceeding normal operations, in order to better reflect that event thresholds determined using the IEEE 1633 methodology are not exclusively due to storms or other inclement weather.

<sup>34</sup> The term “Significant Event Day”, rather than the previous term “Storm Day” is used here to reflect that event thresholds determined using the IEEE 1633 methodology, in this case the 2 $\beta$  threshold, are not exclusively due to storms or other inclement weather.

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1 **Figure 83: Historical Year End Event Days**



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Figure 84: Count of Annual Event Days – Oct YTD

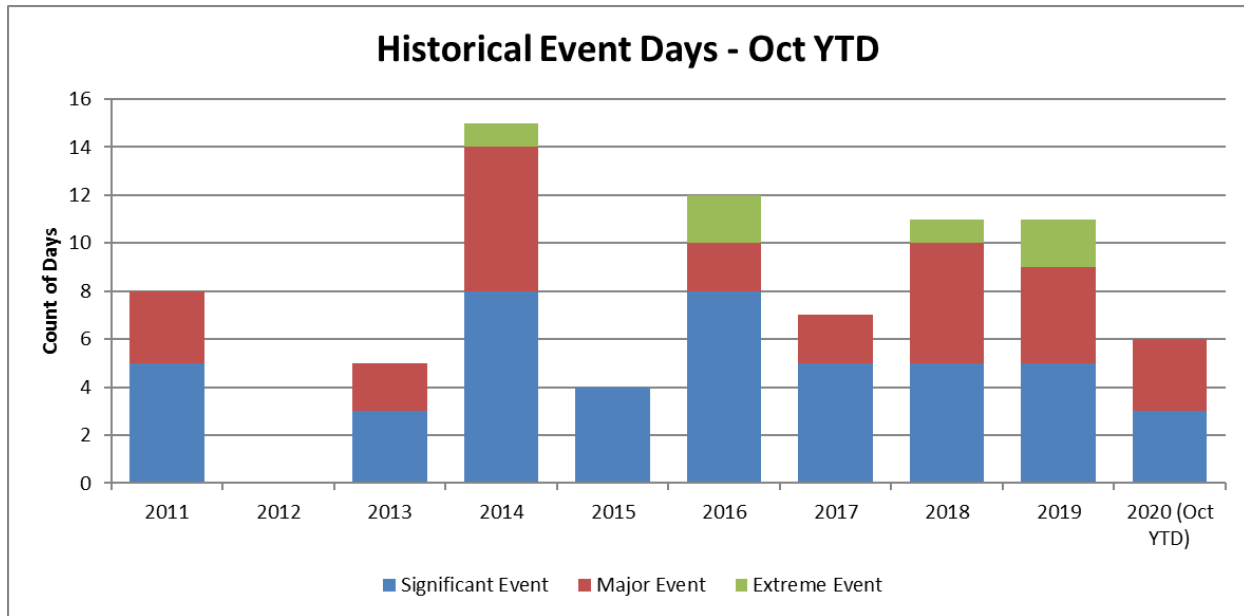
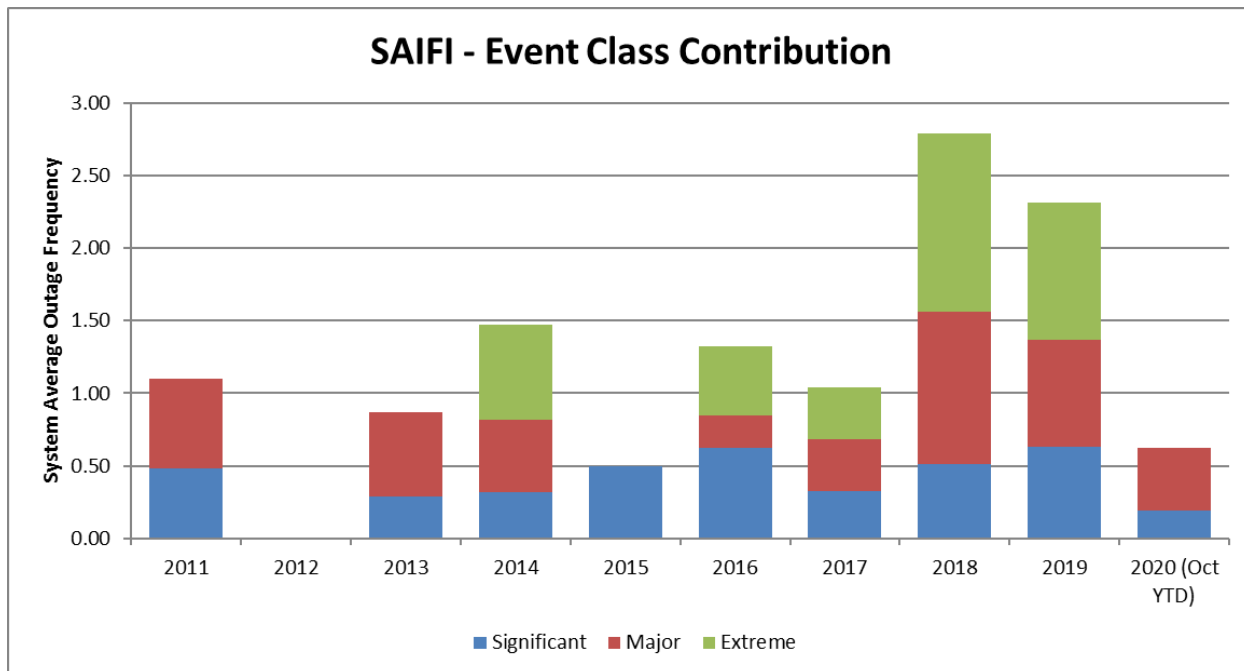


Figure 85: SAIFI- Event Class Contribution



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Figure 86: SAIFI Event Class Contribution – Oct YTD

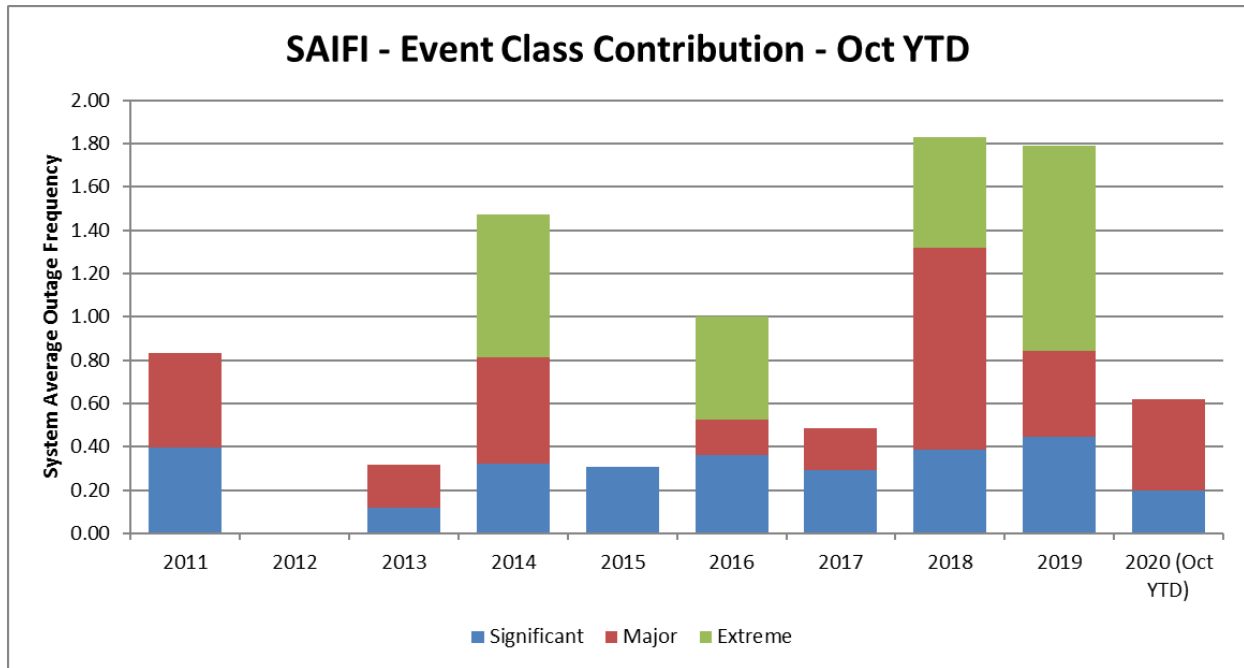
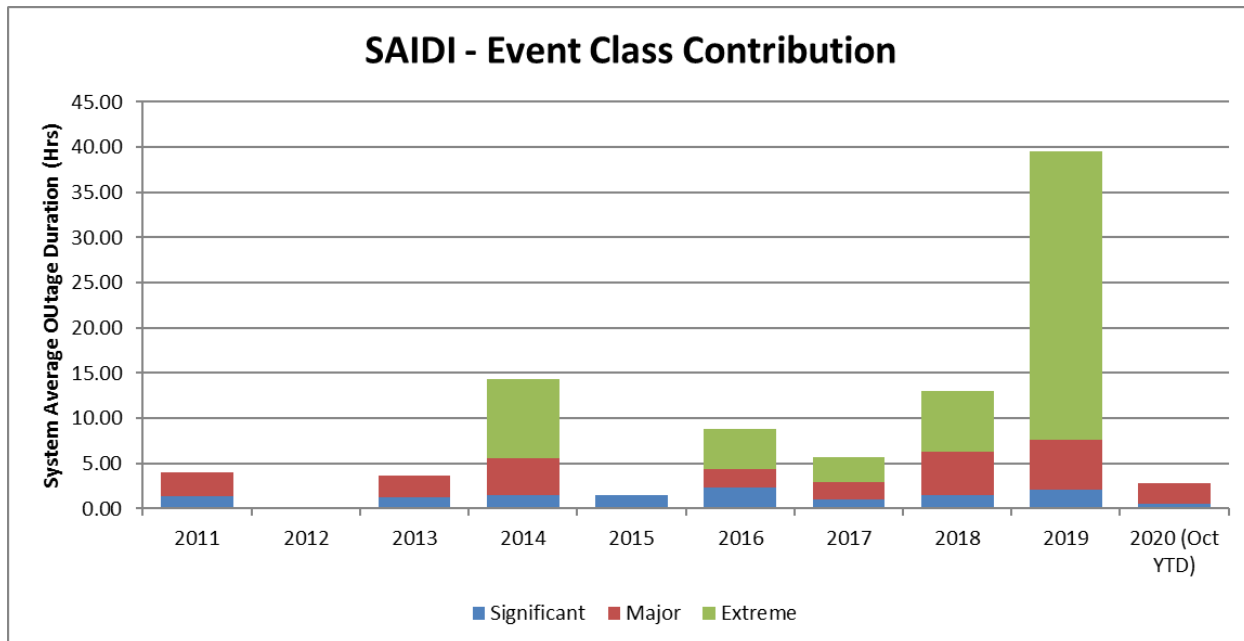


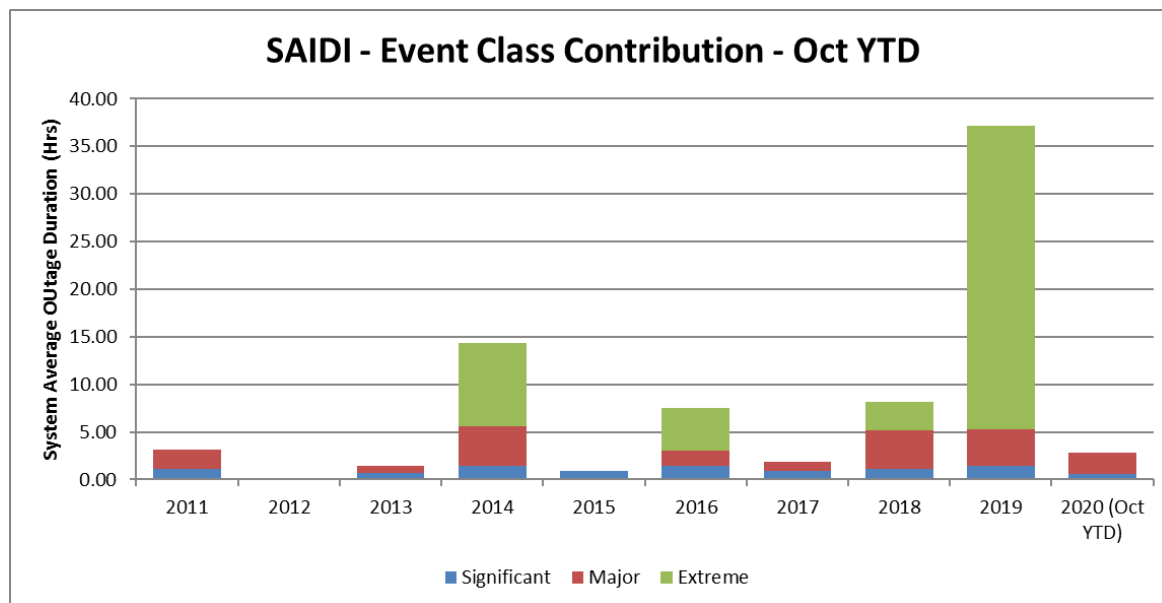
Figure 87: SAIDI – Event Class Contribution





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Figure 88: SAIDI Event Class Contribution – Oct YTD



Note: 2012 experienced no severe weather days.

Figure 89 below provides detail on outage causes for the 6 event days experienced so far in 2020.

Figure 89: Detail on Outage Causes for identified Event Days

CEA Cause Code	Description	Significant	Major	Extreme	% of Hours
		Hours of Interruption	Hours of Interruption	Hours of Interruption	
0	Unknown/Other	41,607	60,015	0	7%
1	Scheduled Outage	28	262	0	0%
2	Loss of Supply	29,849	13,491	0	3%
3	Tree Contacts	148,313	479,779	0	43%
4	Lightning	153	0	0	0%
5	Damaged Equipment	5,145	31,683	0	3%
6	Adverse Weather	52,687	583,584	0	44%
7	Adverse Environment	0	8	0	0%
8	Human Element	0	0	0	0%
9	Foreign Interference	10,388	603	0	1%
	<b>Total</b>	<b>288,170</b>	<b>1,169,425</b>	<b>0</b>	

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Forty-three percent of all identified event day outage hours year to date in 2020 have been caused by tree contacts. While NS Power always strives to minimize tree caused outages, the importance is further stressed in storm conditions. Continued investment for vegetation management and right-of-way widening will help minimize these outages in all weather conditions.

The following capital projects are identified to address vegetation management and right-of-way widening for 2021:

- C0031083 – New Distribution Rights-of-Way Phase 6
- C0031089 – 2021/2022 Transmission Right-of-Way Widening 69kV
- D010 Distribution Right-of-Way Routine
- T010 Transmission Right-of-Way Routine

**T010 and D010 Report**

In the 2016 ACE Plan Order, the NSUARB directed as follows:

The Board approves the 2016 Routine capital expenditures, with the exception of the Distribution ROW widening (D010) which is reduced to \$600,000. The Board directs that the Routine for Transmission widening be treated as a separate project, and not a routine, in future ACE Plan Applications. NSPI is to provide an annual progress report on the expenditure, works undertaken, results achieved and future plans as part of the annual ACE Plan submissions.<sup>35</sup>

In accordance with the Board's directive, NS Power provides its progress report on D010 and T010 below as of October 31, 2020.

---

<sup>35</sup> M07176, NS Power 2016 Annual Capital Expenditure Plan, NSUARB Order, June 8, 2016.

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In its 2017 ACE Plan Order, the Board directed as follows:

The Board directs NSPI to update the cost estimates for vegetation management and right-of-way widening projects in the 2018 ACE Plan (and future years) based on actual historical costs incurred for this project.<sup>36</sup>

NS Power confirms that the cost estimates for vegetation management and right-of-way widening projects in the 2021 ACE Plan are based on actual historical costs incurred.

*Expenditures, Works Undertaken, and Results*

The following progress was made on 69kV transmission widening under C0020627:

- 95 percent of planned work has been completed as of October 31, 2020
- 100 percent completion is forecasted for year end 2020
- Forecast year end spend is \$2,789,910
- Substitutions have been made from the original plan, due to revised priorities:
  - L-5530 has been substituted by L-5579

The following progress was made on >69kV transmission widening under T010:

- 100 percent of planned work has been completed as of October 31, 2020
- 100 percent completion is forecast for year end 2020
- Forecast year end spend is approximately \$508,973

The following progress was made on distribution widening under D010:

- 0 percent of planned work has been completed as of October 31, 2020
- 0 percent completion forecast for year end 2020

---

<sup>36</sup> M07745, NS Power 2017 Annual Capital Expenditure Plan, NSUARB Order, April 4, 2017.

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- 2020 scope will be carried forward into 2021.
- Forecast year end spend is \$0

**Plans for Replacement of Aging T&D Equipment & Storm Performance**

The 2015 ACE Plan Terms of Consensus included two commitments with respect to reliability:

- (4) As part of the reliability directive in future ACE Plans, NS Power will provide additional information regarding its plans for replacement of aging transmission and distribution equipment in accordance with the following recommendation on this matter made by the SBA's consultant, Mary Neal, at page 12 of her evidence in this proceeding dated January 16, 2015:

"I recommend NSPI provide more information regarding its plans for replacement of aging transmission and distribution equipment to better show how it justified the target investments. This should include (where possible):

- Descriptions of assets to be replaced and their ages,
- Goals for strategic replacement programs, such as targets for age profiles of different asset classes,
- Expected improvements in asset age profiles due to each ACE Plan project involving replacement of transmission and distribution equipment considered at end-of-life,
- More detailed descriptions of how NSPI targets specific assets every year, whether based on age, performance degradation, or other factors, and
- Any recent, relevant inspection data"

- (5) As part of the reliability directive in future ACE Plans, NS Power will provide an update on its storm performance and related capital investment strategies to improve storm performance.<sup>37</sup>

The Terms of Consensus were approved by the NSUARB on May 5, 2015. These two commitments are addressed below.

---

<sup>37</sup> M06514, NS Power 2015 Annual Capital Expenditure Plan, Terms of Consensus, February 18, 2015, page 2 of 5.

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Plans for Replacement of Aging Transmission and Distribution Equipment

The multi-year Reliability Investment Strategy has resulted in sustained reliability for NS Power customers. NS Power continually monitors outages and performance of transmission, substation and distribution assets, and future investments will continue at an appropriate level to provide affordable and reliable service. To sustain these reliability performance improvements, NS Power follows its asset management principles to prioritize investments in T&D plant in accordance with Section 6.2 of the CEJC. The project risk rating methodology found therein determines condition and criticality to rate projects for the replacement and refurbishment of T&D assets. This reduces the overall risk for the asset class.

Annual estimated replacement ranges developed based on asset age profiles, and the Iowa Survivor curves for equipment failure are used as a guide in reducing the overall risk for each asset class. While the suitable investments for a specific asset class may vary from year to year depending on system performance, the estimated replacements analysis provides a working range in which to evaluate the appropriateness of proposed sustaining capital investments.

NS Power uses a variety of factors to determine the specific assets targeted for replacement as part of the annual capital investment program. Generally, targeted assets have experienced degradation in performance manifesting in decreased reliability, increased maintenance frequency and cost, or reduced functionality. These effects are identified through reliability tracking, field inspections, and test results of the impacted assets. Criticality of the asset to continued operations of the NS Power system and any risks posed to people and the environment contribute to determining specific assets for replacement.

Asset age is a concern when the frequency of required maintenance is increased, the availability of replacement parts or critical spares is limited, or performance is negatively impacted. This information can be used to inform project prioritization. However, age profiles are used in concert with asset condition, performance, and legislated requirements; it is never the single determining

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element in an investment decision. Capital project justifications outline the reasoning behind a given replacement program considering all relevant elements.

In 2014, NS Power embarked on further formalizing the identification and prioritization of assets for replacement by creating a regimented framework to determine the condition, criticality, and risk individual assets within a given class pose to the NS Power system. While the risk score of an asset does not determine its suitability for replacement alone, it can aid in identifying assets requiring more detailed investigation by technical experts and subsequent risk mitigation activities.

The target ranges for T&D assets covered by this analysis is provided in **Figure 90** below.

**Figure 90: Age Based Replacement Ranges for T&D Assets**

Asset Classification	Quantity on Grid	High Range Replacements		Low Range Replacements	
		Estimated Useful Life	Annual Replacements	Estimated Useful Life	Annual Replacements
Distribution Conductor (km)	43,516	45	967	55	791
Distribution Structure	373,036	50	7,461	60	6,217
Pole Top Transformer	143,741	35	4,107	45	3,194
Underground Conductor (km)	384	45	9	55	7
Padmount Transformers	4,205	35	120	45	93
Transmission Conductor (km)	5,177	55	94	65	80
Transmission Structure	30,544	55	555	65	470
Substation Breakers	587	45	13	55	11
Substation Transformer	425	50	8	60	7

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1 Age demographics information is presently not available for all transmission and distribution asset  
2 classes. Substation transformers, substation breakers, transmission conductor, downline reclosers  
3 and padmount transformers are asset classes for which this information is available at this time.  
4 As asset information improves for individual asset classes, their age profiles provide a more  
5 complete picture of the current state across the T&D system.

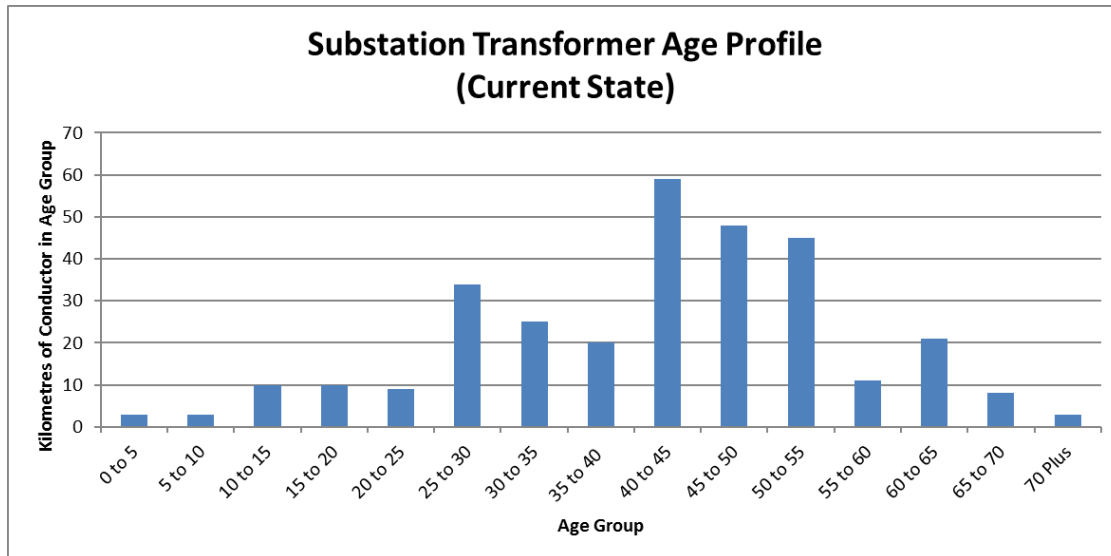
6  
7 As T&D equipment reaches end-of-life, capital investments are used to mitigate impacts related  
8 to aging infrastructure. This being said, it is important to note here, and for context with the  
9 following sections (**Figure 91-Figure 100**), that age is not the only determinant of useful life and  
10 therefore reliability or risk; older equipment can have lower risk ratings than newer equipment due  
11 to design or utilization or other operating conditions and there continues to be advancements in  
12 technologies to enable re-validation of useful life. Therefore, in addition to age-driven  
13 identification and justification for capital replacements or upgrades, observed or calculated  
14 condition, risk, reliability impact, and other factors are considered in determining a given asset  
15 class' capital program in any given year. The noted expected ranges of replacement per asset class  
16 per year serve as a guide or calibration range and are based on the age arithmetic; actual  
17 replacement plans will vary depending on the assessment of the assets' conditions and priorities  
18 in the context of each year's overall plan.

19  
20 *Substation Transformers*

21  
22 **Figure 91** below shows the substation transformer age profile (current state).  
23

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**Figure 91: Substation Transformers Age Profile (Current State)**

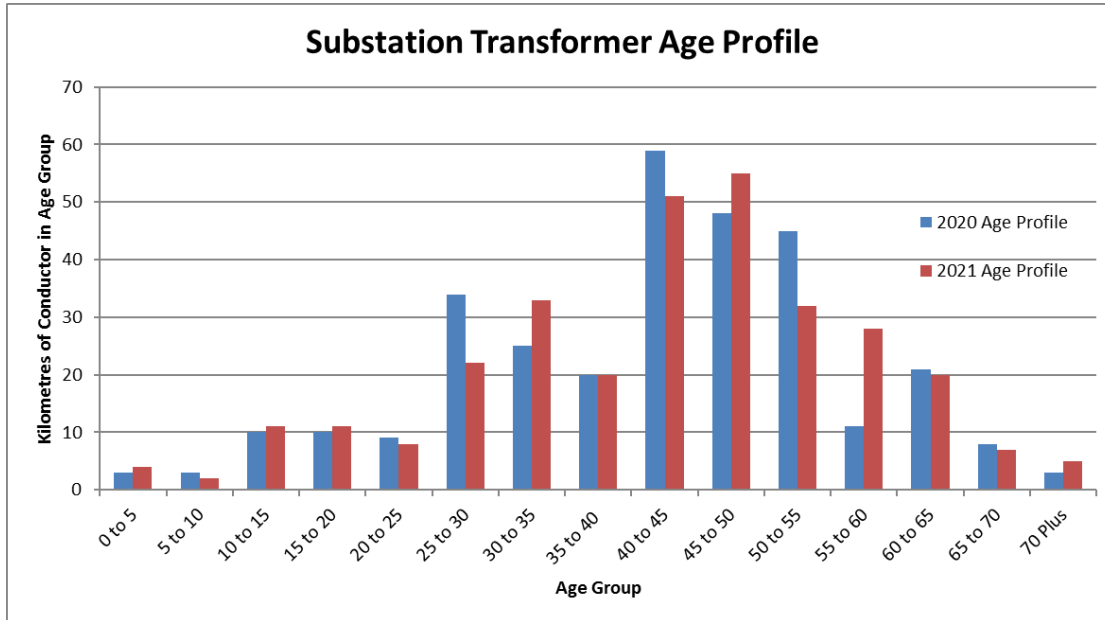


- Expected useful life of 50-60 years depending on the transformer type, utilization, and environmental conditions.
- Age Demographics – 28.5 percent of Transformers are beyond 50 years of service.
- Calculated range of annual replacement using the expected useful life only – 7-8 units per year.
- Changes to age demographics – As a result of the proposed 2021 capital investments in substation transformers, the age profile for this asset class will experience an increase of 1.4 percent in assets beyond 50 years of age. Age is only one of multiple factors in determining targeted assets in a given year. To support mitigation of risk associated with this asset class, continuation of the strategic transformer spares program and mobile substation program is planned. Proactive transformer replacements in future years will again focus on the overall condition of each unit and system criticality. **Figure 92** illustrates the overall change in asset age profile for Substation Transformers between 2020 and 2021.



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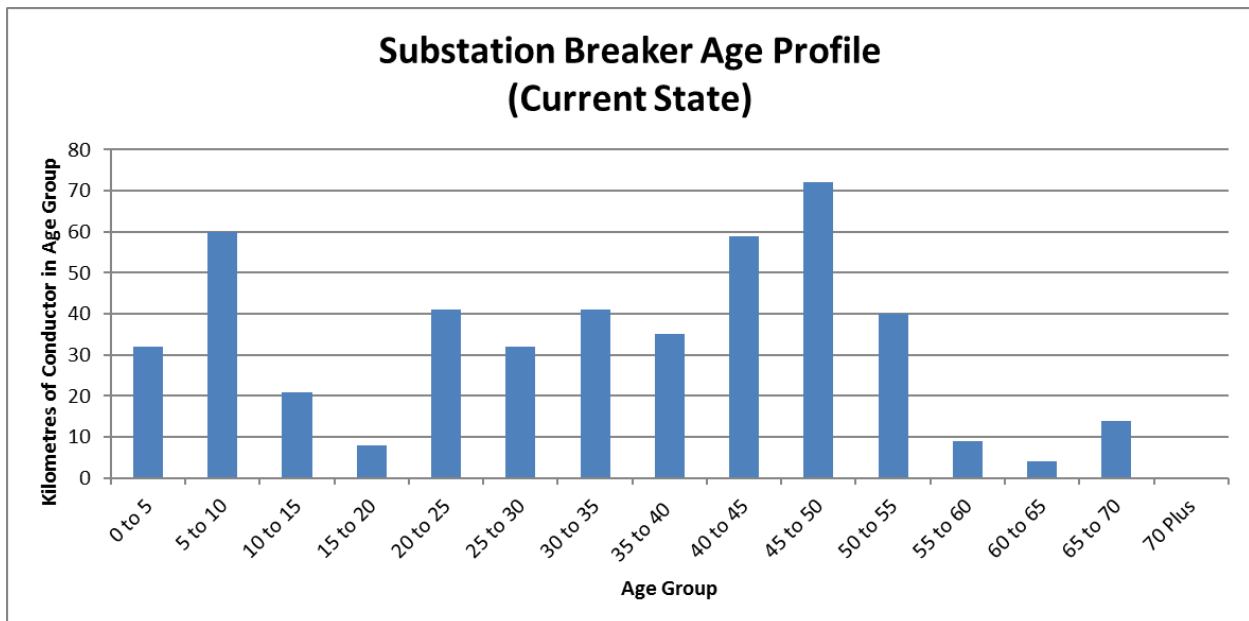
**Figure 92: Substation Transformer Age Profile**



*Substation Breakers*

**Figure 93** below shows the substation breaker age profile (current state).

**Figure 93: Substation Breakers Age Profile (Current State)**



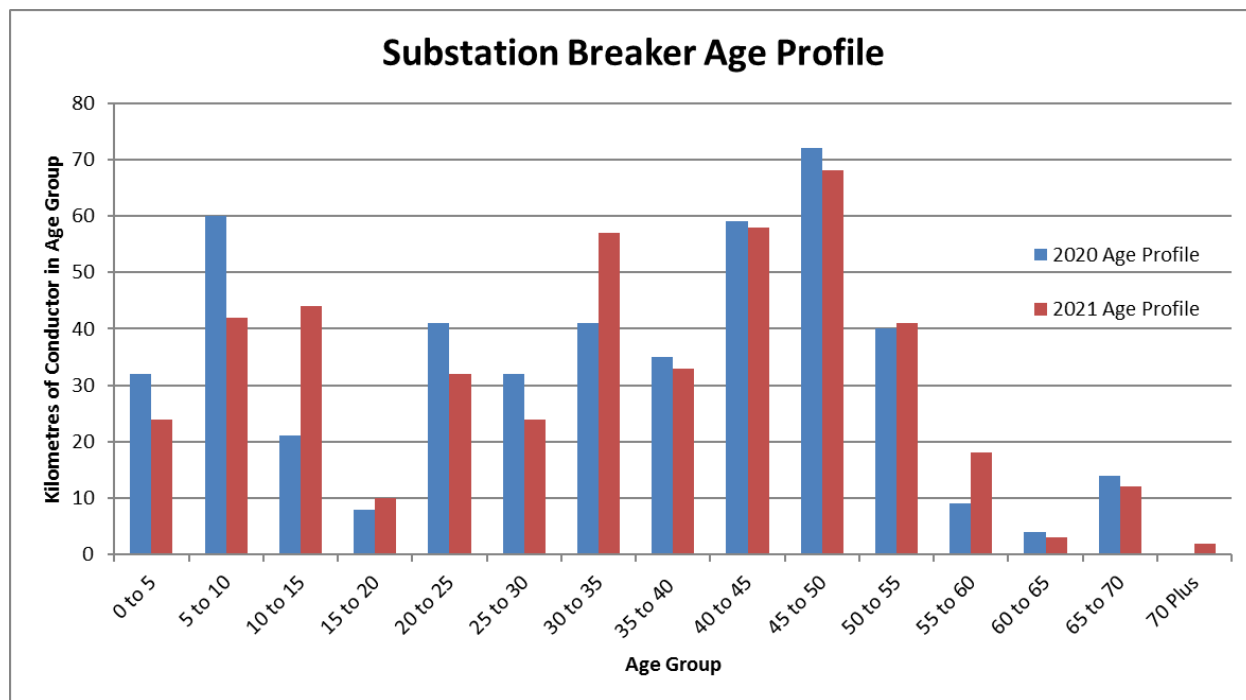
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- Expected useful life of 45-55 years depending on the breaker type, operations count, and environmental conditions.
- Age Demographics – 29.7 percent of breakers are beyond 45 years of service.
- Calculated range of annual replacement using the expected useful life only– 11-13 units per year.
- Changes to age demographics – As a result of the proposed capital investments in Substation Breakers during 2021, the age profile for this asset class will experience a 1 percent decrease of assets beyond 45 years of age. Age is only one of multiple factors in determining targeted assets in a given year. To support mitigation of risk associated with this asset class, continuation of the strategic breaker spares program is planned. **Figure 94** illustrates the overall change in asset age profile for Substation Breakers between 2020 and 2021.

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**Figure 94: Substation Breaker Age Profile**

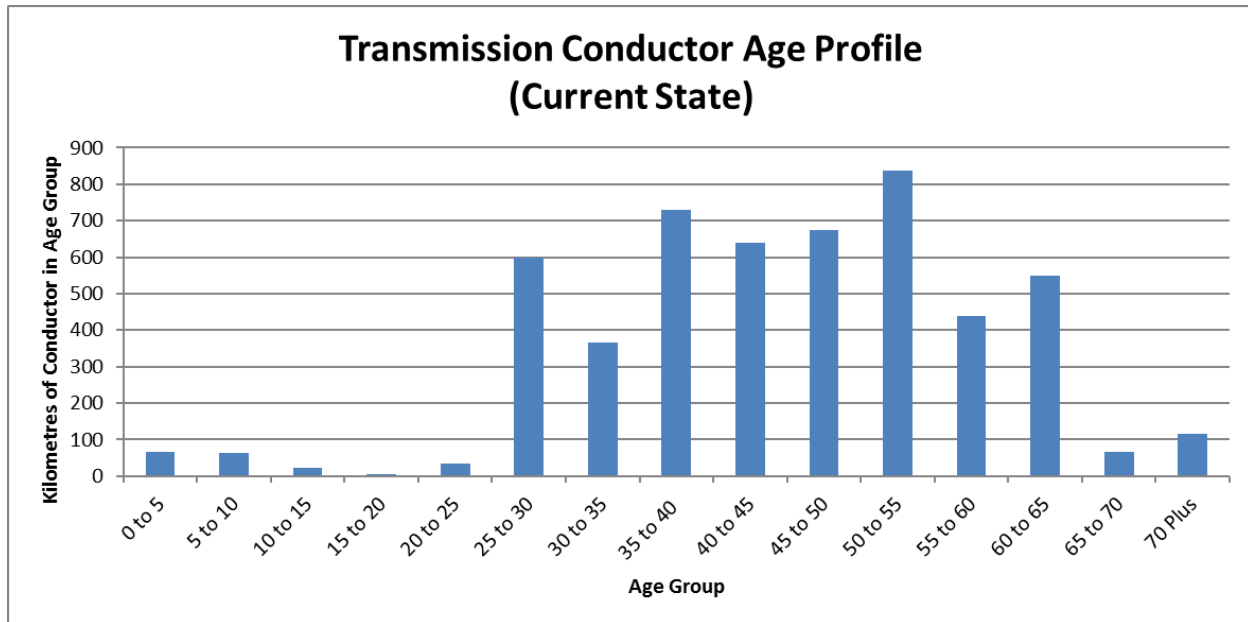


*Transmission Conductor*

**Figure 95** below shows the transmission conductor age profile (current state).

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**Figure 95: Transmission Conductor Age Profile (Current State)**

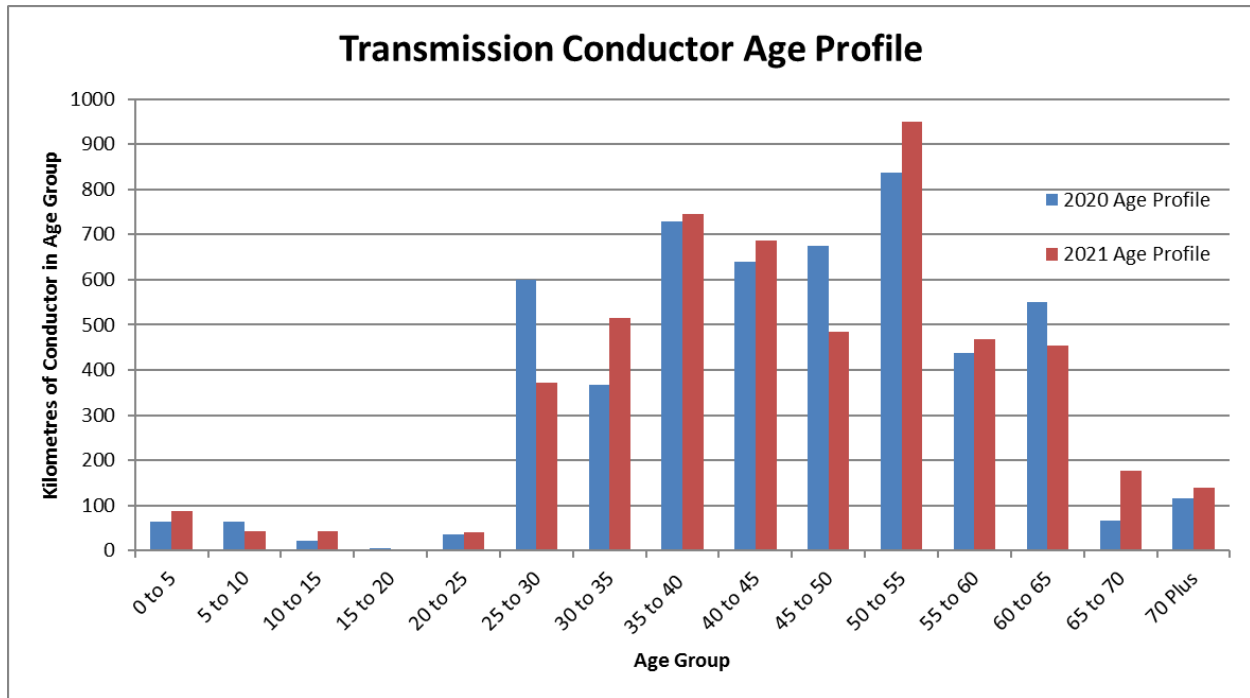


- Expected useful life of 55-65 years depending on the conductor design and environmental conditions.
- Age Demographics – 22.5 percent of conductor is beyond 55 years of service.
- Calculated range of annual replacement using the expected useful life only – 80 to 94 km per year.
- Changes to age demographics – As a result of proposed capital investments in transmission conductor in 2021, the age profile for this asset class will experience an approximately 1.3 percent increase in assets beyond 55 years of age. Age is only one of multiple factors in determining targeted assets in a given year.

**Figure 96** illustrates the overall change in asset age profile for transmission conductor between 2020 and 2021.

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**Figure 96: Transmission Conductor Age Profile**

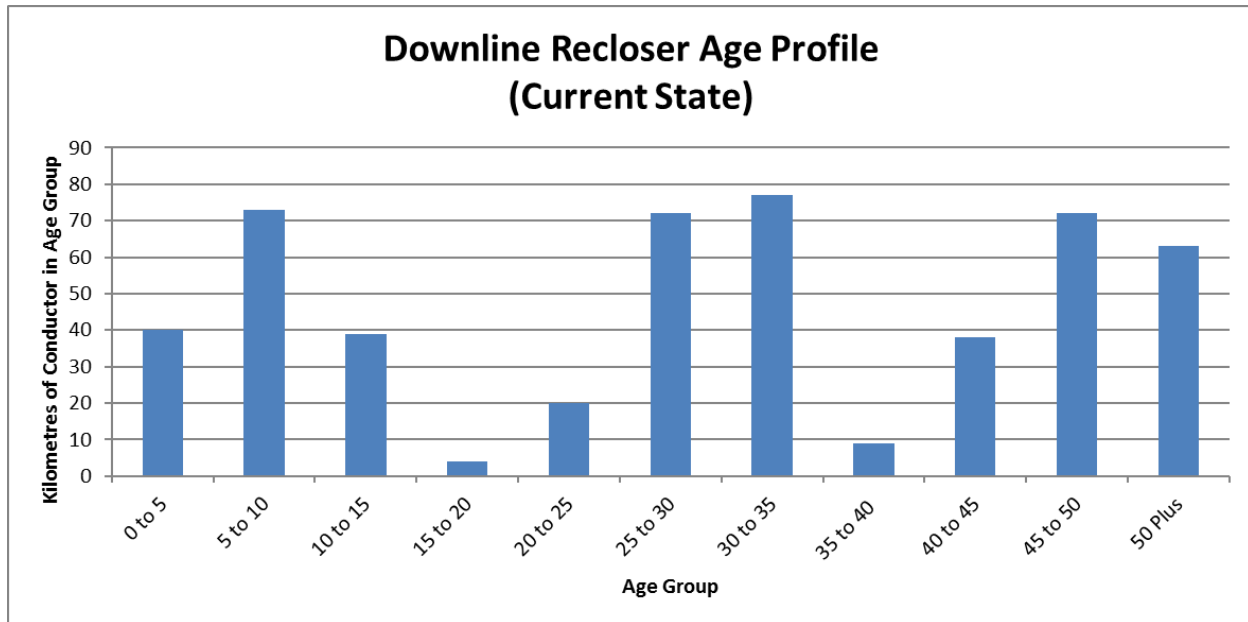


*Downline Reclosers*

**Figure 97** below shows the downline reclosers age profile (current state).

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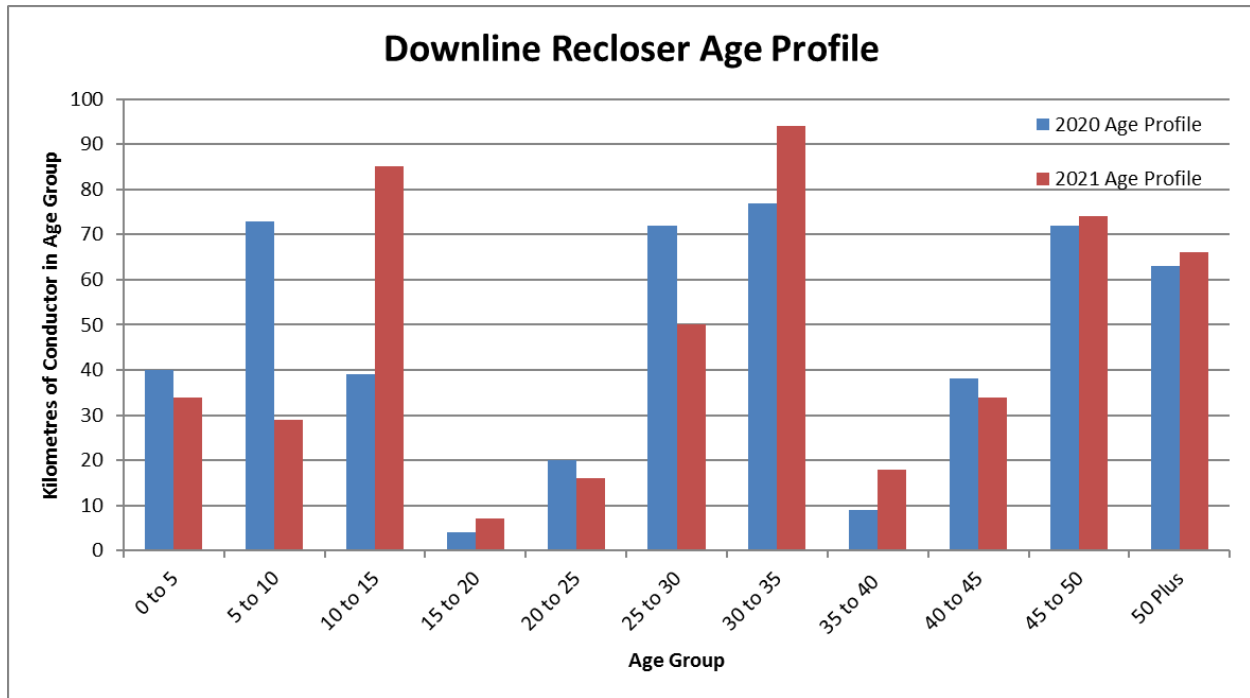
**Figure 97: Downline Reclosers Age Profile (Current State)**



- Expected useful life of 30-40 years depending on the downline recloser design, loading, and environmental conditions.
- Age Demographics – 51.08 percent of Downline Reclosers are beyond 30 years of service.
- Calculated range of annual replacement using the expected useful life only – 16 to 21 units per year.
- Changes to age demographics – As a result of the proposed capital investments in Downline Reclosers during 2021, the age profile for this asset class will experience an approximately 5.4 percent increase in assets beyond 30 years of age. Age is only one of multiple factors in determining targeted assets in a given year. To support mitigation of risk associated with this asset class, continuation of the strategic transformer Downline Recloser spares program is planned. **Figure 98** below illustrates the overall change in asset age profile for Downline Reclosers between 2020 and 2021.

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**Figure 98: Downline Recloser Age Profile**

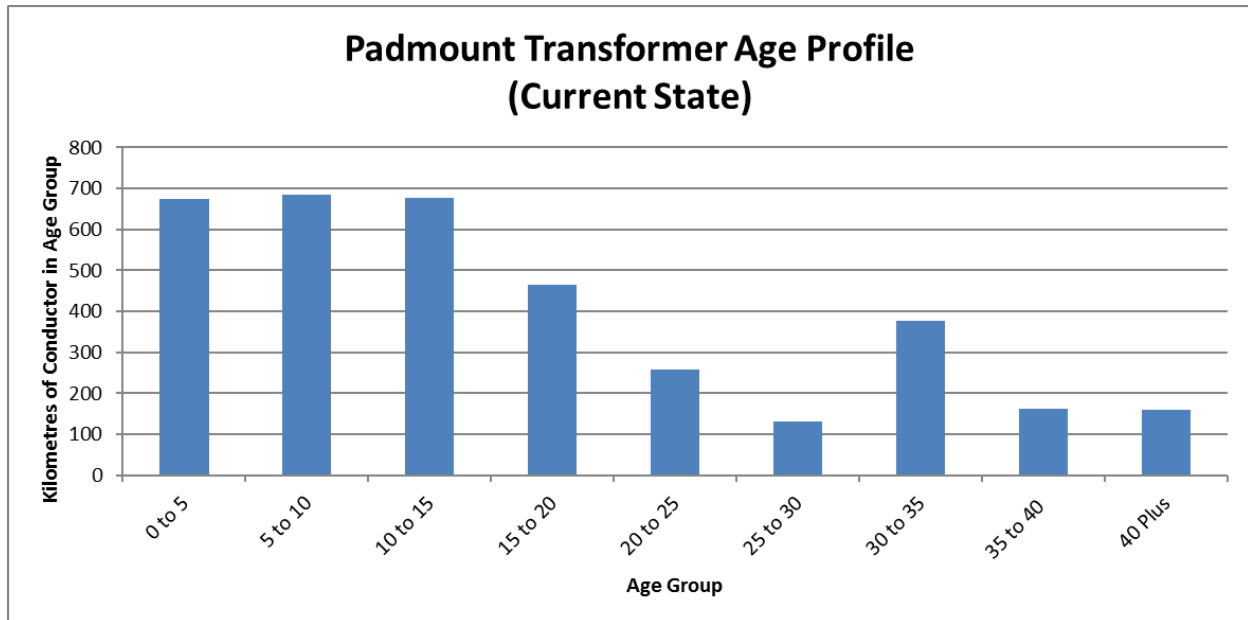


*Padmount Transformers*

**Figure 99** below shows the Padmount Transformer age profile (current state).

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**Figure 99: Padmount Transformers Age Profile (Current State)**



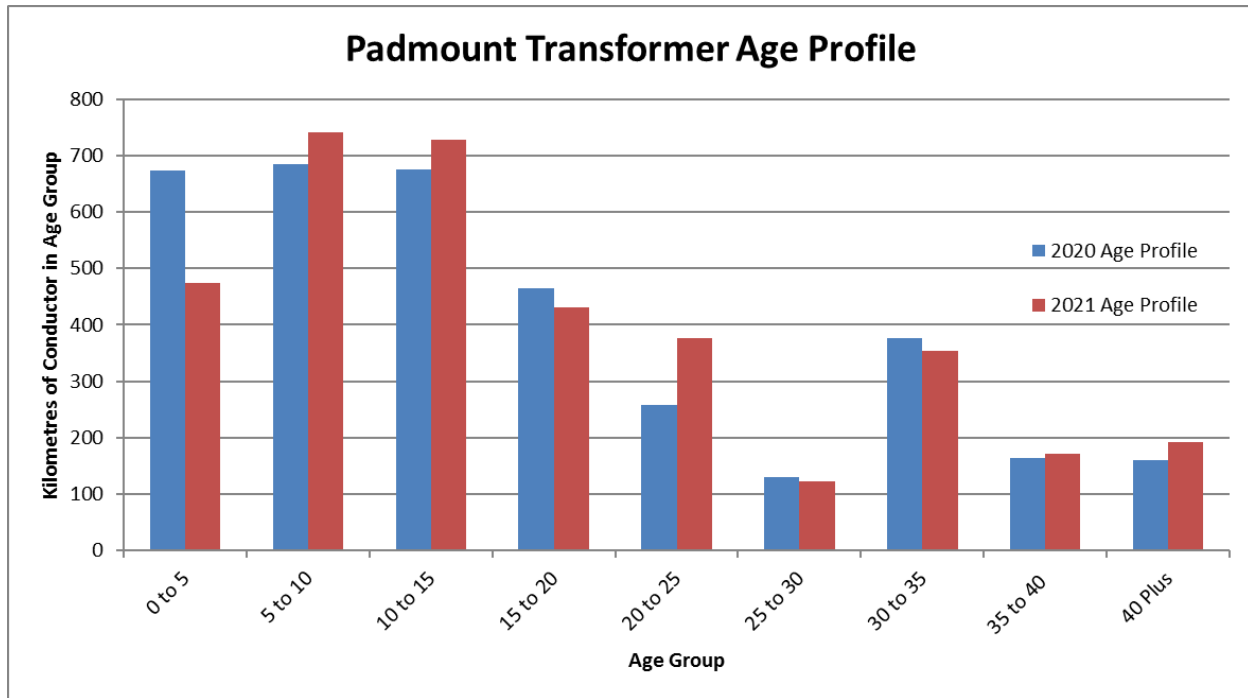
- Expected useful life of 35-45 years depending on the padmount design, loading, and environmental conditions.
- Age Demographics – 9 percent of padmounts are beyond 35 years of service.
- Calculated range of annual replacement using the expected useful life only – 94 to 124 units per year.
- Changes to age demographics – As a result of the proposed capital investments in Padmount Transformers during 2021, the age profile for this asset class will experience an approximately 1.1 percent increase in assets beyond 35 years of age.

**Figure 100** below illustrates the overall change in asset age profile for Padmount Transformers between 2020 and 2021.



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**Figure 100: Padmount Transformer Age Profile**



### 11.1.7 Contingency Information

The NSUARB's 2019 ACE Plan Order Directive 4 provided as follows:

For each capital project submitted for Board approval in 2017, 2018 and 2019 (either through or outside of the ACE Plan proceedings), that has been completed, NS Power is directed to provide the following information in its 2020 ACE Plan application:

- The Board approved original project cost (i.e., not Board approved ATO's or Final Costs);
- The total contingency amount included in the original Board approved project cost;
- The actual final incurred project cost;
- The variance between the final incurred project cost and the original Board approved project cost;
- The proposed in-service date identified in the original Board approved project application; and,
- The actual in-service date for the project.

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The NSUARB's 2020 ACE Plan Order Directives 8 and 9 updated this requirement as follows:

8. NS Power is directed to continue to track the information related to contingency spending noted in Paragraph 73 of the Board's 2019 ACE Plan Decision, with the following modifications: For each capital project submitted for Board approval in 2017, 2018, 2019 and 2020 (either through or outside of the ACE Plan proceedings, including projects submitted for subsequent approval, but excluding U&U projects) that has been completed, the Board directs NS Power to provide the following information in its 2021 ACE Plan application:

- The Board approved original project cost (i.e., not Board approved ATO's or Final Costs). For projects that were originally estimated to be under \$250k in the 2017 to 2019 ACE Plans and under \$1M in 2020 ACE Plan but exceeded these thresholds and required Board approval, the original project cost is to be the ACE Plan estimate (note that NS Power can identify the subsequently Board approved amount in a "Notes" column);
- The total contingency amount included in the original Board approved project cost;
- The actual final incurred project cost;
- The variance between the final incurred project cost and the original Board approved project cost;
- The proposed in-service date identified in the original Board approved project application; and,
- The actual in-service date for the project.

9. NS Power is directed to continue to track the information related to contingency spending, including information related to projects approved by the Board after 2020, and report it in subsequent ACE Plan applications. This reporting shall also categorize projects by function (i.e., generation, transmission, distribution and general plant), with "generation" projects further categorized by type of project (i.e., hydro, steam, gas, other renewables).

Please refer to **Appendix E**.

## 11.2 2021 Capital Spending by Justification Criteria

Items in the 2021 ACE Plan have been developed in accordance with the CEJC. Definitions of the various criteria referenced in **Figure 101** below are included in the CEJC.

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**Figure 101: Capital Expenditures by Justification**

(Millions of dollars)

Justification Criteria	2021 Budget	Projects included for Approval	Routine Spend	Less than \$1M	2020 ACE Items for Filing in late 2020	Items for Subsequent Submission	Carryover	Pt. Aconi
Innovation	\$4.9	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$4.9	\$0.0
Health & Safety	27.5	-	-	1.9	-	-	25.5	0.2
Environment	12.6	3.1	0.5	1.0	-	-	6.6	1.4
Land and Right-of-Way	0.1	-	0.1	-	-	-	-	-
Hydro, Wind and Biomass	57.9	-	2.8	2.3	13.9	11.1	27.8	-
Thermal	61.4	3.6	2.8	28.9	-	1.6	10.0	14.5
Transmission Plant	51.7	10.6	12.1	2.7	-	-	26.4	-
Distribution System	77.9	5.5	54.3	7.5	-	1.4	9.1	-
Pole Retreatment	0.4	-	-	-	-	-	0.4	-
Metering Equipment	12.0	-	2.0	-	-	-	10.0	-
Work Support Facilities	21.1	-	7.2	1.9	-	-	12.1	-
Information Technology Application and Hardware System	23.6	2.0	1.9	5.7	0.5	6.7	6.8	-
Vehicles	10.4	-	10.4	-	-	-	-	-
<b>Total</b>	<b>\$361.8</b>	<b>\$24.7</b>	<b>\$94.1</b>	<b>\$51.8</b>	<b>\$14.5</b>	<b>\$20.9</b>	<b>\$139.7</b>	<b>\$16.1</b>

\*Note: Details of justification sub-criteria are provided on the following section.

Note: Figures presented may include \$0.1M in rounding differences on some line items.

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**11.3 2021 Capital Spending by Justification Sub-Criteria**

**Figure 102** below provides 2021 capital spending by justification sub-criteria.

**Figure 102: 2021 Capital Spending by Justification Sub-Criteria**

*(Millions of dollars)*

Justification Sub-Criteria	2021 Budget	Projects included for Approval	Routine Spend	Less than \$1M	2020 ACE Items for Filing in late 2020	Items for Subsequent Submission	Carryover
<b>Distribution System</b>							
Requirement to Serve	\$52.6	\$0.0	\$52.3	\$0.0	\$0.0	\$0.3	\$0.0
Pole Strength	0.8	-	-	0.6	-	-	0.3
Deteriorated Conductor	7.7	-	-	3.3	-	1.1	3.3
Outage Performance	8.4	4.2	0.6	-	-	-	3.6
Joint Use Agreement	1.4	-	1.4	-	-	-	-
Highway Relocation	0.1	-	-	-	-	-	0.1
Other Distribution System	6.9	1.4	-	3.7	-	-	1.8
<b>Total</b>	<b>\$77.9</b>	<b>\$5.5</b>	<b>\$54.3</b>	<b>\$7.5</b>	<b>\$0.0</b>	<b>\$1.4</b>	<b>\$9.1</b>
<b>Work Support Facilities</b>							
Building Facilities/Furniture	\$5.9	\$0.0	\$4.2	\$0.2	\$0.0	\$0.0	\$1.4
Telecontrol & Telecommunications	10.9	-	1.3	1.2	-	-	8.5
Other Work Support Facilities	2.4	-	1.7	0.3	-	-	0.4
<b>Total</b>	<b>\$21.1</b>	<b>\$0.0</b>	<b>\$7.2</b>	<b>\$1.9</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$12.1</b>

Note: Figures presented may include \$0.1M in rounding differences on some line items

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**11.4 Quick Reference Sheet**

**2021 AFUDC Rate for Capital**      6.62%

In the Board's Weighted Average Cost of Capital (WACC) and Allowance for Funds Used During Construction (AFUDC) Order dated December 13, 2019, the NSUARB directed NS Power as follows:

1. The WACC and AFUDC rates are established at 6.62%, effective January 1, 2020;
2. NS Power is directed to continue to file an application for approval annually, no later than November 30, of the calculation of WACC/AFUDC, unless there is a general rate application in the same year, using the principles set out in the Board's Decision in M07215.<sup>38</sup>

Consistent with the Board's Order, the 2021 ACE Plan projects use the Board's approved AFUDC rate of 6.62 percent.

An application for the calculation of the updated WACC/AFUDC rate was filed by the Company on November 25, 2020.

**2021 O/H Rates**

Generation		Customer Operations		Shared Services	
PP Regular	25.87%	Regular	68.19%	IT	60.17%
Hydro	40.28%	Contract	16.86%		
Contract	10.08%	Vehicle	38.32%		

<sup>38</sup> M09498, NS Power WACC/AFUDC Application, NSUARB Order, December 13, 2019.

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1 11.5 2021 Depreciation Rates

2

Figure 103: 2021 Depreciation Rates

	2021
<b>Steam Production Plant</b>	
<i>Lingan</i>	
Lingan 1-2	4.12%
Lingan 3-4	2.28%
Lingan – Common	4.48%
Total Lingan	3.35%
Point Aconi 1	2.27%
<i>Point Tupper</i>	
Point Tupper 1 (Common)	3.97%
Point Tupper 2	2.82%
Total Point Tupper	2.89%
<i>Trenton</i>	
Trenton 5	3.10%
Trenton 6	2.34%
Trenton – Common	0.47%
Total Trenton	2.47%
<i>Tufts Cove</i>	
Tufts Cove 1	4.24%
Tufts Cove 2	3.68%
Tufts Cove 3	2.33%
Tufts Cove – Common	3.44%
Total Tufts Cove	3.27%
Port Hawkesbury Biomass	2.50%
Point Tupper Marine Terminal	4.06%
International Coal Pier	2.60%
General	2.82%

**2021 ACE Plan  
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**Figure 103: 2021 Depreciation Rates**

	<b>2021</b>
<b>Total Steam Production Plant</b>	<b>2.82%</b>

	<b>2021</b>
<b>Hydro Production Plant</b>	
Avon	3.02%
Bear River	1.80%
Black River	2.04%
Dickie Brook	3.16%
Fall River	1.82%
Harmony	4.55%
Lequille System	2.33%
Roseway	2.29%
Mersey	2.00%
St. Margaret's	2.85%
Sheet Harbour	3.38%
Tusket	2.64%
Wreck Cove System	1.67%
 Annapolis Tidal	 2.32%
 General	 2.10%
<b>Total Hydro Production</b>	<b>2.10%</b>

	<b>2021</b>
<b>Other Production - Combustion Turbines</b>	
Burnside	2.40%
Tusket	6.42%
Victoria Junction	3.17%
Tufts Cove Unit 4	2.55%
Tufts Cove Unit 5	2.77%
Tufts Cove Unit 6	3.03%
 <b>Wind Turbines</b>	
Pre 2009 Wind	5.52%
Post 2009 Wind	4.00%

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**Figure 103: 2021 Depreciation Rates**

	<b>2021</b>
<b>Transmission Plant</b>	
Land Rights - Easements	1.26%
Station Equipment	2.14%
Towers & Fixtures	1.26%
Poles & Fixtures	4.32%
Overhead Conductors & Devices	1.96%
Underground Conduit	1.53%
Underground Conductors & Devices	2.61%
Roads, Trails & Bridges	1.74%
<b>Total Transmission Plant</b>	<b>2.35%</b>

	<b>2021</b>
<b>Distribution Plant</b>	
Land Rights - Easements, Surveys & Clearing	1.56%
Structures & Improvements	5.31%
Station Equipment	1.28%
SCADA Equipment	9.68%
Remote Monitoring Equipment	10.32%
Station Equipment – Miscellaneous	12.49%
Poles, Towers & Fixtures	3.79%
Overhead Conductors & Devices	3.33%
Underground Conduit	1.51%
Underground Conductors & Devices	3.17%
Line Transformers	4.09%
Services	5.33%
Meters	6.87%
Street Lighting & Signal Systems	5.33%
<b>Total Distribution Plant</b>	<b>3.89%</b>

	<b>2021</b>
<b>General Plant</b>	
Land Rights - General Plant	1.93%
Structures & improvements	2.85%
Office Furniture & Equipment	9.26%
Office Furniture & Equip - Comp Hardware	20.00%
Office Furniture & Equip - Comp Software	10.00%
Transportation Equipment	9.55%



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Figure 103: 2021 Depreciation Rates

	2021
Stores Equipment	14.97%
Communication Equipment	4.38%
Communication Equipment - SCADA Eq	1.33%
Remote Monitoring Equipment	10.27%
Miscellaneous Equipment	5.02%
Roads, Bridges & Trails (Kelly Rock)	2.58%
Mining Equipment (Kelly Rock)	2.92%
<b>Total General Plant</b>	<b>8.16%</b>

	2021
<b>Smart Grid Project</b>	
Solar Generation	4.00%
Batteries	10.00%
EV Chargers	6.67%

**CI Number: C0030528**

**Title: TUC3 HP Turbine Refurbishment**

**Start Date:** 2020/09  
**In-Service Date:** 2021/12  
**Final Cost Date:** 2022/06  
**Function:** Steam  
**Forecast Amount:** \$2,085,094

**DESCRIPTION:**

This project includes the replacement of the Tufts Cove 3 steam turbine High Pressure (HP) Turbine control stage nozzles to allow for the continued safe and reliable operation of the steam turbine. The function of the control stage nozzles is to direct steam flow through the initial HP turbine stage.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the Detailed CEJC, related CIs for Steam projects includes “work completed on the same asset (turbine, boiler, etc.) and on the same unit (Lingan Unit #3, for example).”

- No other projects in 2019, 2020, 2021, 2022, or 2023

**Depreciation Class:** Steam Plant – Tufts Cove 3

**Estimated Life of the Asset:** 30 Years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.6%

**JUSTIFICATION:**

**Justification Criteria:** Thermal

**Sub Criteria:** Equipment Refurbishment/Replacement

**Why do this project?**

Replacement of the control stage nozzles is required in accordance with the Original Equipment Manufacturer (OEM) product Bulletin PB3-08-9001-ST-EN-01 (Confidential Attachment 1). Tufts Cove 3 has surpassed the expected service life of the nozzles of 200,000 hours (as noted in Confidential Attachment 1) with 270,796 hours of operation as of the end of 2019.

**Why do this project now?**

These nozzles have surpassed the end of their expected life span based on the OEM recommended hours of operation. NS Power inspected the nozzles in 2012 and based on the condition it was determined that the nozzles could remain in service with acceptable risk to align with planned major refurbishment in 2021. Failure to replace the nozzles at the next planned major interval could result in the nozzles cracking and migrating into the HP impulse row. This would further result in the generating unit not being able to generate until the nozzles were replaced and could result in higher replacement cost for the failed nozzles and potential damage to the HP turbine blading.

Completing this project in a planned manner and mitigating the risk of an unplanned failure is the preferred approach to complete this work.

**Why do this project this way?**

Refurbishment of the HP turbine through replacement of components at the appropriate time and in accordance with OEM recommendations versus complete replacement of the turbine is the most cost effective approach. This approach also ensures the continued safe and reliable operation of the Steam Turbine. In addition to maintaining the safe and

reliable operation of the turbine, completing the HP turbine refurbishment during the 2021 planned outage will allow for efficient operation of the unit in alignment with NS Power's asset management strategy.

# REDACTED (CONFIDENTIAL INFORMATION REMOVED)

REDACTED 2021 ACE Plan CI C0030528 Page 3 of 4

CI Number : C0030528

- TUC3 HP Turbine Refurbishment

Project Number C0030528

Parent CI Number :

-

Asset Location : 1173

- 1173 Tufts Cove Unit 3; Commissioned 1976, 152 Mwh

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	1000 - SGP - Turbo Gen.Instal.	1,885,570
Retirements	1000 - SGP - Turbo Gen.Instal.	199,524
Total Cost:		2,085,094
Original Cost:		433,860

Capital Project Detailed Estimate

<div> <div>Location: Tufts Cove Generating Station</div> <div>CI# : C0030528</div> <div>Title: TUC3 HP Turbine Refurbishment</div> <div>Execution Year: 2021</div> </div>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s)
Regular Labour						
Electrician	PD	10	\$ 365	\$ 3,654		
Engineering	PD	40	\$ 413	\$ 16,536		
Maintenance Trades	PD	105	\$ 372	\$ 39,069		
Power Engineer	PD	10	\$ 398	\$ 3,982		
Power Plant Technician	PD	10	\$ 390	\$ 3,897		
Utilityworker	PD	15	\$ 245	\$ 3,675		
			Sub-Total	\$ 70,814		
OT Labour						
Maintenance Trades	PD	90	\$ 744	\$ 66,975		
Electrician	PD	6	\$ 731	\$ 4,385		
Power Engineer	PD	5	\$ 796	\$ 3,982		
Power Plant Technician	PD	6	\$ 779	\$ 4,677		
Utilityworker	PD	45	\$ 490	\$ 22,048		
			Sub-Total	\$ 102,067		
Term Labour						
Maintenance Trades	PD	70	\$ 372	\$ 26,046		
Utilityworker	PD	30	\$ 245	\$ 7,349		
			Sub-Total	\$ 33,395		
Materials						
HP Nozzles & Hardware	EA	1			Attachment 2, Items 1031-1034	
HP Turbine Hardware	EA	1			Attachment 2, Items 1013-1030	
Misc. Spares/Consumables	EA	1				
			Sub-Total	\$ 384,097		
Contracts						
OEM - TFA Support, Mobilization, Demobilization, Tooling, Onsite Fundy Labor (Nights), HP Nozzles removal & Install at local shop.	EA	1	\$ 722,926	\$ 722,926		C0010142
OEM - On-site Project Admin	EA	1	\$ 15,965	\$ 15,965		
Phased Array & Boresonics	EA	1	\$ 120,000	\$ 120,000		
Scaffolding	EA	1	\$ 35,000	\$ 35,000		
Insulation	EA	1	\$ 32,000	\$ 32,000		
Grit Blasting Enclosure	EA	1	\$ 7,500	\$ 7,500		
Grit Blasting Services	EA	1	\$ 25,000	\$ 25,000		
Engineering - Metallurgy	EA	1	\$ 25,000	\$ 25,000		
Inspection - NDE Services	EA	1	\$ 30,000	\$ 30,000		
VA Services	EA	1	\$ 12,000	\$ 12,000		
Borescope / FME Services	EA	1	\$ 9,500	\$ 9,500		
Technical Supervision	EA	1	\$ 50,000	\$ 50,000		
			Sub-Total	\$ 1,084,891		
Consulting						
3rd Party Technical Advising Consultants	EA	1	\$ 75,000	\$ 75,000		C0010142
OEM - Pre-Planning	EA	1	\$ 55,478	\$ 55,478		
OEM - Steam Path Audit	EA	1	\$ 25,940	\$ 25,940		
			Sub-Total	\$ 156,418		
Other Goods & Services						
Contingency	%	5%	\$ 1,675,264	\$ 83,763		
			Sub-Total	\$ 83,763		
Interest Capitalized						
AFUDC				\$ 20,105		
			Sub-Total	\$ 20,105		
Administrative Overhead						
Labour AO				\$ 40,155		
Contractor AO				\$ 109,390		
			Sub-Total	\$ 149,545		
SUB-TOTAL (no AO, AFUDC)						
				\$ 1,915,445		
TOTAL (AO, AFUDC included)						
				\$ 2,085,094		
Original Cost						
				\$ 433,860		
<div>Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes.</div> <div>Note 2: Small differences in totals are attributable to rounding.</div>						

# Product Bulletin

Document Title

**HP Turbine Control Stage Nozzle Inspection**

**PB3-08-9001-ST-EN-01**

**Steam Turbine**

**Answers for energy.**

**SIEMENS**

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**Increasing the productivity and reliability of your assets is our goal.** This Product Bulletin is just one example of the many ways we intelligently innovate existing technology to improve plant performance.

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## EXECUTIVE SUMMARY

The construction of Parsons HP turbine control stage nozzles has followed a standard construction for over 50 years and the design has operated successfully on units up to 660 MW. While sturdy, the nozzles have a finite life and require checks to avoid failure in service.

It is recommended that the nozzles are inspected after reaching 150,000 hours of operation for signs of wear and tear that could result in cracks and mechanical failure. Further inspections should be carried out at intervals not exceeding 50,000 hours. If it is intended to operate the unit substantially beyond 200,000 hours, then new nozzles should be considered.

This letter describes the background history, areas to be inspected, the methods of inspection and the potential risks.

<b>Reason for Document:</b>	Enhancement/Recommendation
<b>Equipment Type:</b>	Steam Turbine - HP Turbine
<b>Priority:</b>	Next available opportunity
<b>Minimum Recommended Outage Duration:</b>	Minor Inspection
<b>Parts Required:</b>	Yes
<b>Parts Modification/Repair Required:</b>	Yes
<b>Controls Modification:</b>	No
<b>Special Tools Required:</b>	No
<b>Special/Critical Skills Required:</b>	Yes

## APPLICABLE UNITS

*'Parsons' designed HP Steam Turbines.*





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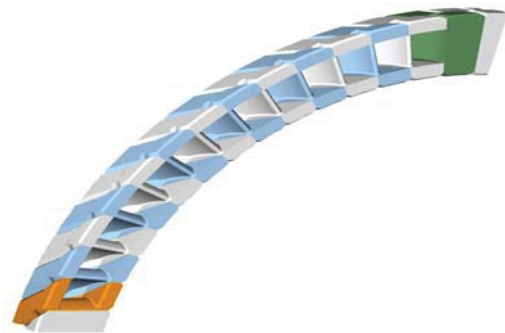
## PURPOSE

This product bulletin has been issued to give our customers important information regarding the need to inspect HP turbine control stage nozzles that have been in operation for 150,000 hours or more.

## BACKGROUND

The control stage in Parsons HP turbines employs individually machined nozzles which are welded into nozzle arcs and then slide into a groove machined into the nozzle chest.

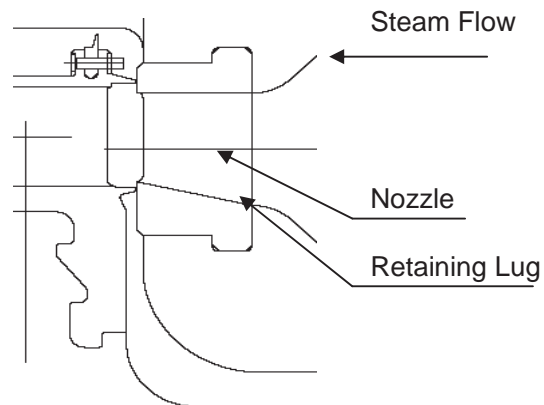
Fig 1 shows an image of a typical group of nozzle blades.



**Fig 1** Computer image of one nozzle arc

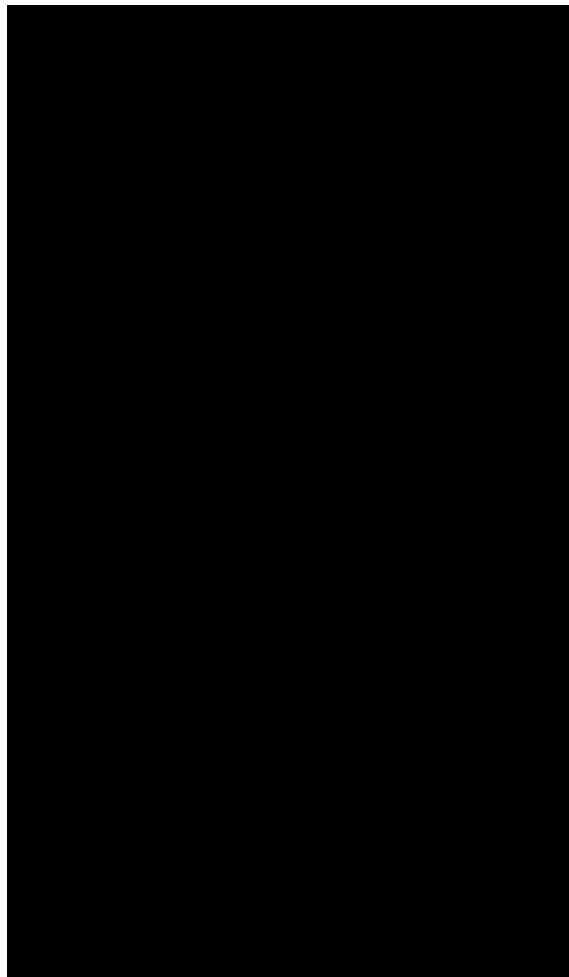
In service, steam pressure and momentum forces act to push each nozzle in the direction of the steam flow, see fig.2.

In addition, torque reaction tries to move the nozzles circumferentially within each groove. Male retaining lugs are formed integrally on each nozzle to keep them in place.



**Fig 2** Sectional view of nozzle assembly

## TECHNICAL INFORMATION



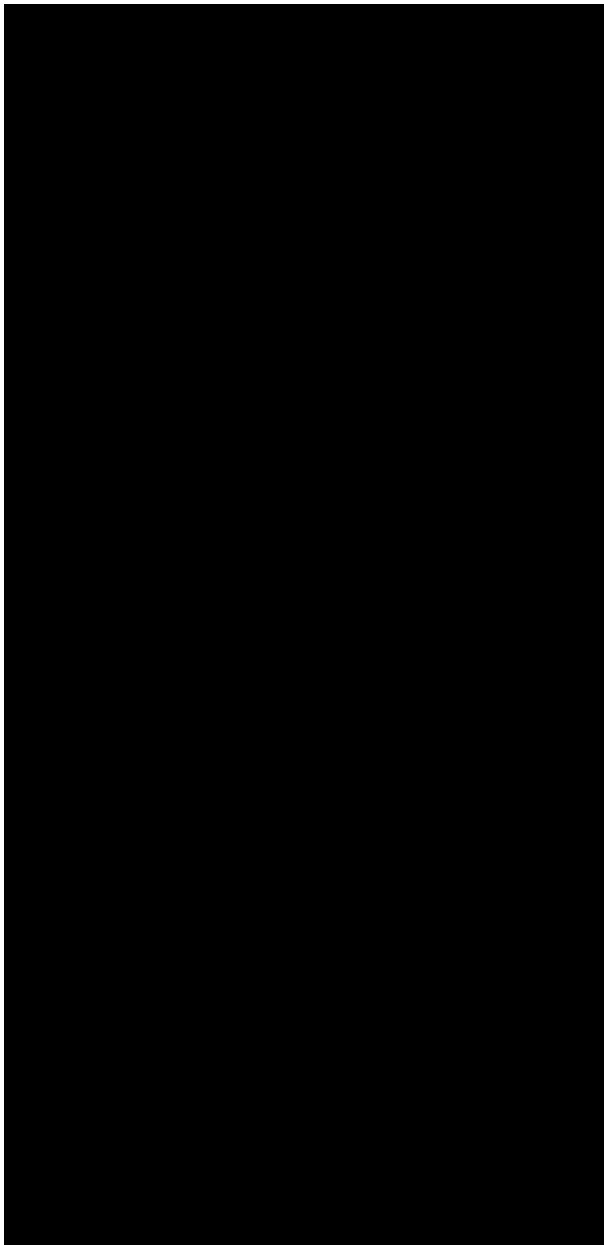


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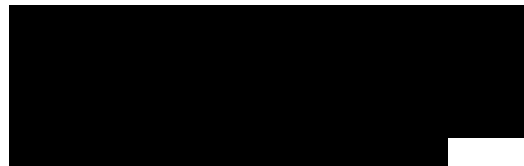
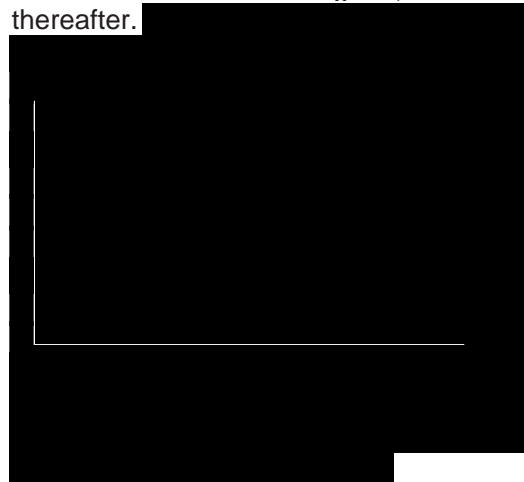
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In this latter case, if nozzles will need to be replaced then it makes sense to plan the timing to avoid the burden of repeated inspection of the original parts.

## RECOMMENDATIONS

All HP nozzles should be inspected at the first convenient outage if they have completed 150,000 hours service or more. Repeat inspections should be carried out at intervals not exceeding 50,000 hours thereafter.



For further information regarding nozzle inspection or if you require information regarding the technical service Siemens Energy Service Fossil can offer with regard to Remnant Life Assessment (RLA) please contact your local Siemens Energy Service representative.

## POTENTIAL BENEFITS

Based upon the evidence, it is believed that most machines will achieve the original design life of 200,000 hours satisfactorily but if very long service lives are intended – especially lives of 300,000 to 400,000 hours – then nozzle replacement will become necessary.



SCL Ref: SF191396537  
Cust Ref: As Per TMS Requirement  
Date: 2020-05-14

To: Greg Carlin  
CC:  
NSPI

**Subject: PROPOSAL FOR HP, LP, GEN Major Inspection Parts**

With reference to your RFQ As Per TMS Requirement dated 28-Apr-20 , we are pleased to provide the following proposal for your consideration.

RFQ ITEM	DESCRIPTION	QTY	UNIT PRICE	TOTAL PRICE	EST DELIVERY (ARO)
1001	No. 1 Laby Gland Ring 5/8" Pitch 5 Contacts Assy Dwg No.: SMC64366 Ref. 05 Detail Dwg No.: 22MC61612	3 Sets			23 Weeks
1002	No. 1 Laby Gland Ring 5/8" Pitch 9 Contacts Assy Dwg No.: SMC64366 Ref. 06 Detail Dwg No.: 22MC61611	4 Sets			23 Weeks
1003	No. 2 Laby Gland Ring 5/8" Pitch 9 Contacts Assy Dwg No.: SMC64366 Ref.07 Detail Dwg No.: 22MC61613	4 Sets			23 Weeks
1004	No. 2 Laby Gland Ring 5/8" Pitch 5 Contacts Assy Dwg No.: SMC64366 Ref.08 Detail Dwg No.: 22MC61614	3 Sets			23 Weeks
1005	Springs for Mk's 5 & 8, No. 1 & 2 Labyrinth Gland Assembly Assy Dwg No.: SMC64366 Ref.09	108 EA			11 Weeks
1006	Springs for Mk's 6 & 7, No. 1 & 2 Labyrinth Gland Assembly Assy Dwg No.: SMC64366 Ref.10	144 EA			11 Weeks
1007	Jacking Screws, No. 1 & 2 Labyrinth Gland Assembly Assy Dwg No.: SMC64366 Ref.29	40 EA			9 Weeks
1008	No. 5 Laby Gland Ring 13/16" Pitch 5 Contacts Assy Dwg No.: SMC64368 Ref.05 Detail Dwg No.: 22MC61602	4 Sets			23 Weeks
1009	No. 6 Laby Gland Ring 7/8" Pitch 5 Contacts Assy Dwg No.: SMC64368 Ref. 06 Detail Dwg No.: 22MC61603	4 Sets			23 Weeks
1010	Spring, No. 5 & 6 Labyrinth Gland Assembly Assy Dwg No.: SMC64368 Ref.23	72 EA			11 Weeks
1011	Spring, No. 5 & 6 Labyrinth Gland Assembly Assy Dwg No.: SMC64368 Ref.24	72 EA			11 Weeks
1012	Jacking Screw, No. 5 & 6 Labyrinth Gland Assembly Assy Dwg No.: SMC64368 Ref.28	96 EA			9 Weeks
1013	1 3/4" UN8 Stud bolt for Loop Piping L=10 5/8", HP Interconnecting Pipes Assy Dwg No.: SLO64551 Ref.26 Detail Dwg No.: CTU052	8 EA			15 Weeks
1014	1 3/4" UN8 Stud bolt for Loop Piping L=11 1/2", HP Interconnecting Pipes Assy Dwg No.: SLO64551 Ref.27 Detail Dwg No.: CTU052	12 EA			15 Weeks
1015	1 3/4" UN8 Cap Nut, HP Interconnecting Pipes Assy Dwg No.: SLO64551 Ref.29 Detail Dwg No.: CTU250	40 EA			15 Weeks
1016	3/4" UNF special screw for ref 16, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.17 Detail Dwg No.: CTU188	8 EA			15 Weeks
1017	1" UNF special screw for ref 13, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.18 Detail Dwg No.: CTU188	8 EA			15 Weeks
1018	3" Studs for HP Inner Cylinder A=15 3/4", HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.23 Detail Dwg No.: CCTU191	3 EA			15 Weeks
1019	3" Capnuts for Mk 23, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.24	3 EA			15 Weeks
1020	3 3/4" Studs for HP Inner Cylinder A=17 1/4", HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.25 Detail Dwg No.: CTU.192	3 EA			15 Weeks
1021	3 3/4" Capnuts for Mk 25, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.26	3 EA			15 Weeks
1022	Stud 1 1/2" CTU38 for Steam Inlets A=6 1/2", HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.44 Detail Dwg No.: CTU38	32 EA			15 Weeks
1023	UN8 Stud 1 1/2" for Steam Inlets (Pulling Up), HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.45 Detail Dwg No.: 20AU1620	16 EA			15 Weeks
1024	1 1/2" UN8 Nuts for ref 44 & 45, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.46 Detail Dwg No.: 20AU1621	48 EA			15 Weeks
1025	Flange for Ref 19 Ladish 3/4" Bore slip on 900lb, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.58	1 EA			15 Weeks
1026	3/4" Studs for Ref 56, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.65 Detail Dwg No.: CTU2	4 EA			15 Weeks
1027	3/4" Nuts for Ref 65, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.66	4 EA			15 Weeks
1028	Serrated Ring, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.75	2 EA			15 Weeks
1029	Serrated Ring, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.80	2 EA			15 Weeks
1030	Serrated Ring, HP Outer/Inner Casing Assy Dwg No.: 20AA08261 Ref.82	1 EA			15 Weeks
1031	Locking Nut, HP Nozzle Assy Dwg No.: 24LC61514 Ref.05 Detail Dwg No.: 24AU1035 (Cont #)	2 EA			22 Weeks
1032	3/4" Dia. Dowels, HP Nozzle Assy Dwg No.: 24LC61514 Ref.06 Detail Dwg No.: 24UC61519 (Cont#)	4 EA			14 Weeks
1033	1" UNF Plugs, HP Nozzle Assy Dwg No.: 24LC61514 Ref.07 Detail Dwg No.: 24UC61520	4 EA			14 Weeks
1034	Nozzle Quadrants (0.980" height) Assy Dwg No.: 24MC61517 Detail Dwg No.: 24MC61517 - Verify	1 Sets			40 Weeks
1035	HP Blading Seals - 1 Set Assy Dwg No.: SA142087 Spring Back Seal Segments (1 Set for Each Row 1 through 13), Ref. 1-13 2BA Socket Head C/Sunk Screw (Qty. 52), Ref. 14 Springs (Qty. 780), Ref. 15 Socket Set Screws (Qty. 350), Ref. 16 Retaining Plate (Qty. 52), Ref. 17	1 Sets			27 Weeks
1036	HP Dummy Seals - 1 Set Assy Dwg No.: SA042117 Spring Back Seal Segments (Qty. 2), Ref. 1 Spring Back Seal Segments (Qty. 3), Ref. 2 M6 Socket Set Screws (Qty. 240), Ref. 3 Springs (Qty. 900), Ref. 4 Retaining Plate (Qty. 20), Ref. 5 1/4" BSF Hex Sckt C/Sunk Head Screw (Qty. 20), Ref 6	1 Sets			27 Weeks
1037	Shaft Overspeed governor bolt, Overspeed Head Assy Dwg No.: SMC64087 Ref.02 Detail Dwg No.: 32UC61523	2 EA			21 Weeks
1038	Shaft Overspeed governor sleeve, Overspeed Head Assy Dwg No.: SMC64087 Ref.05 Detail Dwg No.: 32UC61525	2 EA			21 Weeks
1039	5/8" UNF collar studs, Overspeed Head Assy Dwg No.: SMC64087 Ref.07 Detail Dwg No.: 32UC61527	4 EA			21 Weeks
1040	5/8" UNF Castle Nuts for ref 7, Overspeed Head Assy Dwg No.: SMC64087 Ref.08	4 EA			21 Weeks
1041	1/8" dia locking rods for ref 8, Overspeed Head Assy Dwg No.: SMC64087 Ref.09	2 EA			21 Weeks
1042	Spring, Overspeed Head Assy Dwg No.: SMC64087 Ref.13	2 EA			21 Weeks
1043	3/8" C'sk head screw, Overspeed Head Assy Dwg No.: SMC64087 Ref.14	1 EA			21 Weeks
1044	Stop Pin for ref 18, Overspeed Head Assy Dwg No.: SMC64087 Ref.17 Detail Dwg No.: 32UC61528	2 EA			21 Weeks
1045	Locking pin for Adjusting Plug, Overspeed Head Assy Dwg No.: SMC64087 Ref.18 Detail Dwg No.: 32UC61529	2 EA			21 Weeks
1046	Spring for Ref 18, Overspeed Head Assy Dwg No.: SMC64087 Ref.19	2 EA			21 Weeks
1047	LACING WIRE (PIECE, 48" LENGTH) FOR ROW 3 SPINDLE BLADES, LP BLADING Assy Dwg No.: SL17540 Ref. 46	10 EA			21 Weeks

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1048	RADIAL SEAL STRIP (PIECE, 4" LENGTH) FOR ROWS 1 & 2, LP BLADING Assy Dwg No.: SL17540 Ref. 58	203 EA	27 Weeks
1049	LACING WIRE (PIECE, 36" LENGTH) FOR ROW 4 SPINDLE BLADES, LP BLADING Assy Dwg No.: 156080 Ref. 7	10 EA	21 Weeks
1050	LACING WIRE (PIECE, 48" LENGTH) FOR ROW 5 SPINDLE BLADES, LP BLADING Assy Dwg No.: 156080 Ref. 14	22 EA	21 Weeks
1051	FERRULES, ROW 5 SPL LP BLADING Assy Dwg No.: 156080 Ref. 15	22 EA	21 Weeks
1052	LACING WIRE OUTER (PIECE, 48" LENGTH), ROW 6 SPL LP BLADING Assy Dwg No.: 136AL1039 Ref. 3	62 EA	21 Weeks
1053	FERRULES, ROW 6 SPL LP BLADING Assy Dwg No.: 136AL1039 Ref. 4	9 EA	21 Weeks
1054	LACING WIRE INNER, ROW 6 SPL LP BLADING Assy Dwg No.: 136AL1039 Ref. 5	11 EA	21 Weeks
1055	FERRULES, ROW 6 SPL LP BLADING Assy Dwg No.: 136AL1039 Ref. 6	9 EA	21 Weeks
1056	SEALING STRIP (PIECE, 4" LONG), ROW 6 CYL RH LP BLADING Assy Dwg No.: 131AL1039 Ref. 4	29 EA	27 Weeks
1057	SEALING STRIP (PIECE, 4" LONG), ROW 7 CYL RH LP BLADING Assy Dwg No.: 130AL1047 Ref. 2	29 EA	27 Weeks
1058	SEALING STRIP (PIECE, 4" LONG), ROW 6 CYL LH LP BLADING Assy Dwg No.: 131AL1039 Ref. 4	29 EA	27 Weeks
1059	SEALING STRIP (PIECE, 4" LONG), ROW 7 CYL LH LP BLADING Assy Dwg No.: 130AL1047 Ref. 4	29 EA	27 Weeks
1060	LOCKING WEDGE, ROW 6 SPL LP BLADING Assy Dwg No.: SA143672 Ref. 4	62 EA	21 Weeks
1061	LACING WIRE (PIECE, 36" LENGTH), ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 5	5 EA	21 Weeks
1062	LACING WIRE FERRULE, ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 6	9 EA	21 Weeks
1063	LACING WIRE (PIECE, 36" LENGTH), ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 7	4 EA	21 Weeks
1064	LACING WIRE FERRULE, ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 8	9 EA	21 Weeks
1065	LH EROSION SHIELD INNER, ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 2	23 EA	21 Weeks
1066	LH EROSION SHIELD OUTER, ROW 6 SPL LH LP BLADING Assy Dwg No.: SA143672 Ref. 3	23 EA	21 Weeks
1067	LOCKING WEDGE, ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 4	62 EA	21 Weeks
1068	LACING WIRE (PIECE, 36" LENGTH), ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 5	5 EA	21 Weeks
1069	LACING WIRE FERRULE, ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 6	9 EA	21 Weeks
1070	LACING WIRE (PIECE, 36" LENGTH), ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 7	4 EA	21 Weeks
1071	LACING WIRE FERRULE, ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 8	9 EA	21 Weeks
1072	RH EROSION SHIELD INNER, ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 2	23 EA	21 Weeks
1073	RH EROSION SHIELD OUTER, ROW 6 SPL RH LP BLADING Assy Dwg No.: SA143673 Ref. 3	23 EA	21 Weeks
1074	TIP STRUT ASSEMBLY, ROW 7 SPL LH LP BLADING Assy Dwg No.: 135AA01357 Ref. 66	20 EA	21 Weeks
1075	TIP STRUT ASSEMBLY, ROW 7 SPL RH LP BLADING Assy Dwg No.: 135AA01358 Ref. 66	20 EA	21 Weeks
1076	Torsion Shaft (Spline Drive), Main Oil Pump Assy Dwg No.: SL18079 Ref. 3	1 EA	23 Weeks
1077	Lock Nut, Main Oil Pump Assy Dwg No.: SL18079 Ref. 4	1 EA	12 Weeks
1078	Key For Drive Plate, Main Oil Pump Assy Dwg No.: SL18079 Ref. 5	1 EA	12 Weeks
1079	1/4" BSF screw for ref 4, Main Oil Pump Assy Dwg No.: SL18079 Ref. 6	1 EA	9 Weeks
1080	Torsion Shaft Driven Plate, Main Oil Pump Assy Dwg No.: SL18079 Ref. 7	1 EA	25 Weeks
1081	Coupling Bolt for Ref 7, Main Oil Pump Assy Dwg No.: SL18079 Ref. 8	4 EA	12 Weeks
1082	1/2" BSF Castle Nuts, Main Oil Pump Assy Dwg No.: SL18079 Ref. 9	4 EA	9 Weeks
1083	3/32" Drive Spit Pin for ref 9, Main Oil Pump Assy Dwg No.: SL18079 Ref. 10	4 EA	9 Weeks
1084	Cover Plate for Ref 7, Main Oil Pump Assy Dwg No.: SL18079 Ref. 11	1 EA	12 Weeks
1085	1/4" BSF screw for ref 11, Main Oil Pump Assy Dwg No.: SL18079 Ref. 12	6 EA	9 Weeks
1086	3/4" BSF Studs for Horiz Joint, Main Oil Pump Assy Dwg No.: SL18079 Ref. 30	6 EA	11 Weeks
1087	5/8" BSF Studs for Discharge piping, Main Oil Pump Assy Dwg No.: SL18079 Ref. 32	10 EA	11 Weeks
1088	1/2" BSF Studs for Brg Oil feed, Main Oil Pump Assy Dwg No.: SL18079 Ref. 34	5 EA	11 Weeks
1089	3/4" BSF Nuts, Main Oil Pump Assy Dwg No.: SL18079 Ref. 35	10 EA	9 Weeks
1090	1/2" BSF Nuts, Main Oil Pump Assy Dwg No.: SL18079 Ref. 37	5 EA	9 Weeks
1091	5/8" BSF Nuts for Ref 33, Main Oil Pump Assy Dwg No.: SL18079 Ref. 36	24 EA	9 Weeks
1092	Torsion Shaft Drive Plate, Main Oil Pump Assy Dwg No.: SL18079 Ref. 40	1 EA	23 Weeks
1093	3/4" BSF Studs for Mk 40, Main Oil Pump Assy Dwg No.: SL18079 Ref. 41	6 EA	11 Weeks
1094	Driving Dowel, Main Oil Pump Assy Dwg No.: SL18079 Ref. 45	4 EA	12 Weeks
1095	Dowel Securing Ring, Main Oil Pump Assy Dwg No.: SL18079 Ref. 46	1 EA	12 Weeks
1096	O-Ring for hydrogen seal ring, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 9	2 EA	9 Weeks
1097	Cup Packing Ring, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 10	2 EA	13 Weeks
1098	Insulating sleeve for thermocouple, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 24	1 EA	8 Weeks
1099	Insulating washer for ref 29: Securing bolts for seal housing, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 31	40 EA	13 Weeks
1100	Insulating flange for seal housing, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 33	2 EA	13 Weeks
1101	Insulating bush for ref 43: Joint bolts for flange, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 44	12 EA	15 Weeks
1102	Insulating washers for ref 47&43: Joint bolts for flange, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 51	48 EA	13 Weeks
1103	Insulating flange for ref 46: Flange for oil-feed & press gauge pipes, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 52	4 EA	7 Weeks
1104	Insulating Washers for ref 65: Securing bolts for Ref 63: Oil wipers, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 67	20 EA	23 Weeks
1105	Insulating bush for ref 65: Securing bolts for Ref 63: Oil wipers, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 68	20 EA	23 Weeks
1106	Insulating flange for oil wiper, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 72	2 EA	5 Weeks
1107	Diaphragm for Exciter end, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 90	1 EA	4 Weeks
1108	Diaphragm for Turbine end, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 91	1 EA	4 Weeks
1109	Springs for Hydrogen seal, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 97	4 EA	7 Weeks
1110	Adjuster head for springs, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 18	4 EA	12 Weeks
1111	Locking nut for spring adjusters, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 19	4 EA	12 Weeks
1112	Plunger head for springs, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 20	4 EA	12 Weeks
1113	Retaining pin for springs, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 21	4 EA	12 Weeks
1114	Nuts for retaining pins, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 22	4 EA	9 Weeks
1115	Hydrogen Seal Housing, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 27	2 EA	TBD Weeks
1116	End plate for seal housing (T.E.), Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 54	1 EA	23 Weeks
1117	End plate for seal housing (E.E.), Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 55	1 EA	23 Weeks
1118	Support key for seal ring, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 40	4 EA	12 Weeks
1119	Bearing pad for seal rings, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 14	8 EA	12 Weeks
1120	Insulating Bush for thermocouple, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 23	4 EA	9 Weeks
1121	Securing clips for thermocouple, Hydrogen Seal Assembly Assy Dwg No.: SL30119 Ref. 26	8 EA	11 Weeks
1122	Thermocouple for Seal rings, Hydrogen Seal Assembly Assy Dwg No.: SL30119	4 EA	11 Weeks



PRICE	
TOTAL PRICE:	

**Prices:** Price shown is in Canadian funds, include any import duties that may be applicable, DDP Tufts Cove, NSPI, but do not include any taxes. Price shown is also based on the quantities quoted. Should the order quantity differ from the quoted quantity, we reserve the right to amend the prices.

Siemens' pricing is subject to adjustment for the impact of any new or modified taxes, duties, tariffs or equivalent measures imposed by any local or foreign governmental authority which is applicable to our offering, including any portions or components contained within the offering.

**Location of Siemens Energy Ltd. UK**  
Supply:

**Validity:** This proposal is valid for a period of 60 days from date of submission, unless extended, modified or withdrawn by Siemens Canada Limited and limits acceptance to the terms set forth herein. The return of a purchase order or any other reasonable manner of acceptance communicated to Siemens during such validity period will be sufficient to form an agreement on the terms and conditions of this offer.

Due to recent significant movements in material costs and availability, our offer is subject to review beyond the validity period.

**Quality Program:** This offer is based on a Quality Program in accordance with: ISO 9001 2015

**Payment** Net 30 days.

**Conditions** Terms and Conditions as defined and agreed upon in the Master Services Agreement (MSA), between Nova Scotia Power Inc. and Siemens Canada Ltd. of Sale: effective April 2, 2019 shall apply, except as modified in this proposal.

The worldwide outbreak of the coronavirus disease ("COVID-19") may affect usual business activities and/or the execution of work under the Contract. As the impacts from COVID-19 are continuously changing, their impacts on the Contract are unknown at this time. To avoid potentially unnecessary contingency, matters such as procurement lead-time, delivery date, resources, and schedule are provided without consideration of impacts from COVID-19 other than as specifically set out in the Contract/this offer. Siemens is closely monitoring the development of COVID-19 and its associated impacts and will endeavor to inform you of the impacts that COVID-19 has or may have on the Contract. If required to overcome the consequences directly or indirectly caused by the outbreak of COVID-19, Siemens reserves the right to adjust its obligations related to schedule, price, or any other reasonably required adjustment of the Contract, including postponing or providing partial deliveries to the extent Siemens' ability to supply or deliver is impacted.

Siemens obligation to fulfill this agreement is subject to the proviso that the fulfillment is not prevented by any impediments arising out of national or international foreign trade and customs requirements or any embargoes [or other sanctions].  
Feel free to contact us should you have any questions. We look forward to receive your instructions to proceed.

Regards,

**IJAZ**  
**IMRAN**  
Imran Ijaz  
Sales Manager  
imran.ijaz@siemens.com

Digitally signed by IJAZ IMRAN  
DN: cn=IJAZ IMRAN,  
o=Siemens,  
email=ijaz.imran@siemens.com,  
c=CA, 2020.05.14 15:07:12

Senior Management

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JASON  
DN: cn=JERMARK, JASON,  
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**CI Number: C0020944**

**Title: LM6000 - 191-443 Hot Section and Engine Refurbishment**

**Start Date:** 2021/01  
**In-Service Date:** 2022/05  
**Final Cost Date:** 2022/11  
**Function:** Gas Turbine  
**Forecast Amount:** \$5,749,282

**DESCRIPTION:**

This project includes the refurbishment of LM6000 engine serial number 191-443, including the hot section assemblies. Engine 191-443 was first installed in the Tufts Cove Unit 5 enclosure in July 2003. The scope of this project includes engine removal, shipment to the depot, hot section and engine refurbishment, engine testing and return shipment to NS Power.

An LM6000 engine is made up of a hot section (low pressure turbine, high pressure turbine and combustor end of the engine), and a cold section (high pressure compressor, low pressure compressor and inlet end of the engine). These components are subject to refurbishment intervals, based on condition assessments, unit utilization and Original Equipment Manufacturer (OEM) recommended refurbishment intervals.

The OEM recommended interval for refurbishment is 25,000 fired engine hours under ideal base loaded operational conditions. This interval is dependent upon a variety of conditions, including mode of operation, air/fuel/water quality, maintenance practices and refurbishment practices. When the engine refurbishment is planned to be completed in June 2021, the engine will have accumulated approximately 29,000 fired engine hours and will be due for refurbishment in accordance with OEM recommendations to ensure it can continue to operate reliably.

As the engine is disassembled to complete the hot section refurbishment, components other than the hot section specific materials will be exposed. This equipment will be inspected and compared to Original Equipment Manufacturer (OEM) and industry expert's limits and tolerances to determine if any additional refurbishment activities will be required.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the Detailed CEJC, related CIs for Gas Turbine projects includes "work completed on the same asset (turbine, boiler, etc.) and on the same unit (Lingan Unit #3, for example)."

- No related capital projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Tufts Cove CT Unit 5

**Estimated Life of the Asset:** 8-10 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 12.9%

**JUSTIFICATION:**

**Justification Criteria:** Thermal

**Sub Criteria:** Equipment Replacement/Refurbishment

**Why do this project?**

The hot section is among the higher stressed areas of the engine due to the high temperatures, pressures, and rotational forces to which these components are subjected during normal operation. As a result of these factors, the hot section requires refurbishment at shorter intervals than other engine components. A hot section refurbishment was last completed on this engine in 2012. A condition based engine refurbishment completed on 191-443 in 2015 (CI 49061 LM6000 – Engine 191-443 Refurbishment) did not include refurbishment of the components included in this project.

This project needs to be completed in order to ensure the engine continues to operate reliably until the next major reinvestment interval in the next five to seven years.

**Why do this project now?**

Based on the condition of engine 191-443 hot section, forecast unit utilization, and the engine currently having accumulated approximately 27,000 operating hours, it has been determined that a hot section refurbishment is required in 2021. The engine refurbishment will take place during the planned annual maintenance outage in 2021. At that time, the engine is expected to have exceeded the OEM prescribed refurbishment interval of 25,000 hours and accumulated approximately 29,000 hours.

**Why do this project this way?**

Refurbishment of this engine through component replacement is the most cost-effective alternative, as a full engine replacement is significantly more costly and not considered to be required at this time.

# REDACTED (CONFIDENTIAL INFORMATION REMOVED)

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CI Number : C0020944 - LM6000 - 191-443 Hot Section and Engine Refurbishment

Project Number C0020944

Parent CI Number : -

Asset Location : 1175 - 1175 Tufts Cove 5 LM6000, 47 Mwh

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	3000 - GTG - Gas Turbine Engines	5,614,969
Retirements	3000 - GTG - Gas Turbine Engines	134,313
Total Cost:		5,749,282
Original Cost:		4,990,176



Capital Project Detailed Estimate

<b>Location: Gas Turbine</b> <b>CI#: C0020944</b> <b>Title: LM6000 - 191-443 Hot Section Engine Refurbishment</b> <b>Execution Year: 2021-2022</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
Engineering	PD	60	\$ 413	\$ 24,780		
Gas Turbine Operators	PD	73	\$ 365	\$ 26,645		
Project Support	Lot	1	\$ 1,700	\$ 1,700		
			Sub-Total	\$ 53,125		
<b>OT Labour</b>						
Gas Turbine Operators	PD	22	\$ 730	\$ 16,060		
			Sub-Total	\$ 16,060		
<b>Travel Expense</b>						
Travel Expense - Gas Turbines Operators	Lot	1	\$ 5,500	\$ 5,500		
Travel expense - Engine assessment/acceptance	Lot	1	\$ 8,400	\$ 8,400		
			Sub-Total	\$ 13,900		
<b>Materials</b>						
TransCanada Turbines Supply Hot Section	Lot	1			Attachment 1, Item 3B	
Gas Turbine Disassembly and Reassembly	Lot	1			Attachment 1, Item 2	
TransCanada Turbines Supply Combustor	Lot	1			Attachment 1, Item 4	
Fuel Nozzles Refurbishment	Lot	1			Attachment 1, Item 5	
High Pressure Compressor Stage 3-5 Blade/Spool Inspections	Lot	1			Attachment 1, Item 6	
High Pressure Compressor Stage 3-5 Service Bulletin 310	Lot	1			Attachment 1, Item 7 and 8	
Engine Test	Lot	1			Attachment 1, Item 9	
Engine Mount Kit	Kit	1				
Engine Change Kit	Kit	1	\$ 25,000	\$ 25,000		
US to CDN Exchange	%	31%	\$ 2,966,500	\$ 919,615		
			Sub-Total	\$ 3,886,115		
<b>Contracts</b>						
TransCanada Turbines site support	Lot	1			Attachment 2, Item 1	
US to CDN Exchange	%	31%				
Loading and unloading engine; Assembling removal/installation tooling	Lot	1	\$ 11,000	\$ 11,000		
Load Testing Lifting Gear	Lot	1	\$ 5,000	\$ 5,000		
Scaffolding and Insulation	Lot	1	\$ 30,000	\$ 30,000		
			Sub-Total	\$ 235,950		
<b>OT Meals</b>						
Gas Turbine Operator OT Meals	Lot	1	\$ 600	\$ 600		
			Sub-Total	\$ 600		
<b>Freight</b>						
Transporting Engine	Lot	1	\$ 36,000	\$ 36,000		
			Sub-Total	\$ 36,000		
<b>Consulting</b>						
Shop Supervision	Lot	1	\$ 60,000	\$ 60,000		
US to CDN Exchange	%	31%	\$ 60,000	\$ 18,600		
Package Baseline Vibration Signature; Engine Test Baseline Vibration Signature and Reporting	Lot	1	\$ 32,000	\$ 32,000		
Supporting Technical Letter	Lot	1	\$ 29,009	\$ 29,009		
			Sub-Total	\$ 139,609		
<b>Meals</b>						
Meals	Lot	1	\$ 1,800	\$ 1,800		
			Sub-Total	\$ 1,800		
<b>Other Goods &amp; Services</b>						
Contingency	%	30%	\$ 4,191,250	\$ 1,257,375		
			Sub-Total	\$ 1,257,375		
<b>Interest Capitalized</b>						
AFUDC				\$ 69,139		
			Sub-Total	\$ 69,139		
<b>Administrative Overhead</b>						
Labour AO				\$ 15,818		
Contracts AO				\$ 23,791		
			Sub-Total	\$ 39,609		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 5,640,534		
<b>TOTAL (AO, AFUDC included)</b>				\$ 5,749,282		
<b>Original Cost</b>				\$ 4,990,176		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						

C0020944
LM6000 191-443 Hot Section Engine Refurbishment
Cost Support 1
Budgetary estimate; TransCanada Turbines Received July 17, 2020

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
2	1	GT Disassembly and Reassembly	

- ~ Induct engine into depot and take photos of as-received condition
- ~ Complete incoming borescope inspection
- ~ Disassemble GT as required to replace HPT, Combustor and Fuel Nozzles
- ~ Includes consumables for GT disassembly and reassembly
- ~ Work performed per Industrial Repair Manual (IRM) GEK 98492

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
3B	1	High Pressure Turbine (HPT) Exchange	

- ~ TCT will provide one Hot Section in exchange for Customer's removed asset
- ~ Hot Section Includes:
  - HPT Stage 1 Nozzle Assembly
  - HPT Rotor
  - HPT Stage 2 Nozzle Assembly
- ~ TCT will retain ownership of removed assets
- ~ Fixed price regardless of fallout to the HPT blades, nozzles, and shrouds
- ~ Price assumes the major HPT components are repairable
- ~ An Exchange Agreement must be in place for title transfer of assets
- ~ Hot section to be made compliant with the following Service Bulletins:
  - SB 162 HPT Stator Interstage Stationary Air Seal Replacement
  - SB 173 Introduction of Improved HPT Leaf Seal Retention Pin and Spring
  - SB 185 HPT Stage 2 Shroud Coating Change
  - SB 188 TBC on HPT Stator Stg 1 Nozzles
  - SB 210 HPT Rotor S1 Disk Rework
  - SB 215 HPT Stage 1 Blade Replacement
  - SB 216 HPT Rotor Diffuser Vane Ring
  - SB 238 HPT State 2 Nozzle Outer Platform Cooling
  - SB 241 HPT Rotor Stage 1 disk Enhanced Inspection
  - SB 246 S1 HPT Rotor Disk Forward Cavity Erosion
  - SB 266 HPT Integral Pressure Tube/Coupling Nut Insp & Replacement
  - SB 339 HPT Stage 2 Nozzle Cooling Air Tube (Spoolie) Retaining Ring

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
4	1	Combustor (overhaul or exchange)	

- ~ Overhaul / exchange current G42 combustor
- ~ Assumes removed combustor is in repairable condition.

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
5	1	Fuel Nozzles (overhaul or exchange) ~ Overhaul or exchange fuel nozzles ~ P61/P62 part number compliant with SB 284 ~ Assumes the set of fuel nozzles are in repairable condition. Any unrepairable fuel nozzles will be charged back to Customer at list price	

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
6	1	HPCR Stage 3-5 Blade/Spool Inspections ~ Inspect and itemize HPCR Stage 3-5 corresponding blade/spool inspection ~ Assembly and check balance of HPCR	

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
7	1	HPC Stg 3-5 (SB310) ~ TCT will provide one (1) SB310 kit in new or overhauled condition ~ Rotable Exchange - TCT will retain ownership of removed blades ~ Assumes removed blades are "K" blades ~ Pre-ground set ~ Parts subject to availability. Please confirm parts availability prior to issuance of ~ Assumes OEM voucher program still available	

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
8	1	Additional Hardware Required for SB 310 ~ 2032M95G12 Locking Lug, Blade-Compressor Rotor, Stage 3-9 (2) ~ 2032M95G13 Locking Lug, Blade-Compressor Rotor, Stage 3-9 (2) ~ 2032M95G17 Locking Lug, Blade-Compressor Rotor, Stage 3-9 (2) ~ 9193M20P01 Weight Balance, Stage 3 (5) ~ 9396M16P01 Weight Balance, Stage 4 (5) ~ 9396M16P02 Weight Balance, Stage 5 (5)	

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
9	1	Engine Test ~ Engine performance test completed at TCT LM6000 test cell ~ Record test results and analyze with TCT engineering ~ Complete post-test borescope inspection ~ Prepare engine for shipment back to site ~ Price includes labor and fuel	

C0020944  
LM6000 191-443 Hot Section Engine Refurbishment  
  
Cost Support 2  
  
Budgetary estimate; TransCanada Turbines  
Received July 17, 2020

<u>Item</u>	<u>Qty</u>	<u>Description</u>	<u>Estimated Price</u>
1	1	Field Service (4 mechanical technicians, 6 days total, day shifts only, 12-hrs per shift) ~ Remove / install GT w/alignment ~ Estimated 3 days for removal ~ Estimated 3 days for installation ~ Includes travel time, food, and accommodations ~ Includes tooling transportation ~ TCT will provide 4 mechanical technicians working 12-hour shifts	

**CI Number: 46483**

**Title: CT - TUS Control System Upgrade**

**Start Date:** 2021/01  
**In-Service Date:** 2021/12  
**Final Cost Date:** 2022/06  
**Function:** Gas Turbine  
**Forecast Amount:** \$1,046,322

**DESCRIPTION:**

This project is for the upgrade of the Tusket Combustion Turbine (CT) control system, including the sequencer programmable logic controllers, fuel controls system, data acquisition system, cameras, field devices and human machine interface graphics package to modernize Tusket CT Controls.

The Tusket CT, installed 1973, is comprised of one 33MW combustion turbine located in Tusket, NS and provides 10-minute reserve, Volt-Ampere Reactive support, and firm capacity to the NS Power electrical system. Tusket CT assets support peak generation and essential grid services that provide the appropriate level of supply reliability to customers.

The Tusket CT is fully automated, enabling remote operation with minimal site intervention, and is a hybrid of original equipment and other upgrades from the 1980s that are now beyond their expected useful life. The control systems required to enable this mode of operation are fully integrated and distributed throughout the unit. The control system manages all engine processes, all generator processes, and specific auxiliary processes. The control system upgrade will also enable remote monitoring and diagnostic functionality, improving condition-based maintenance and long term investment planning.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Gas Turbine projects include “work completed on the same asset (turbine, boiler, etc.) and on the same unit (Lingan Unit #3, for example).”

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Other Production – Gas Turbines Tusket

**Estimated Life of the Asset:** 20 Years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 1.7%

**JUSTIFICATION:**

**Justification Criteria:** Thermal

**Sub Criteria:** Equipment Replacement/Refurbishment

**Why do this project?**

Portions of the existing control system are obsolete and becoming difficult to source replacement parts for, troubleshoot and diagnose. The new control system integrates improved user interface software, and improved troubleshooting aids. New unit process management equipment, new software, and improved control system process management will also reduce false indication, resultant nuisance trips and related forced outages. The new controls will ensure the safe and reliable operation of the combustion turbine. The new control system is of a modular design that will reduce the impact of component obsolescence as well as overall project cost, as only the individual components will require replacement rather than the entire system.

**Why do this project now?**

Portions of the existing control system that were installed in the 1980s are obsolete and becoming difficult to source replacement parts for, troubleshoot and diagnose. As time progresses, spare parts availability will decrease and lead times will increase. Replacement lead times for many of the current control system components are lengthy and replacement components will eventually become unavailable.

The control system will be replaced during the regularly scheduled annual outage, providing the most cost effective, low impact approach to replacing the existing control system.

**Why do this project this way?**

Replacement of the entire system at this time is the only option due to the obsolescence of the system and scarcity of replacement component parts. The new control system is designed with an improvement on obsolescence management in mind, as the new system is of a modular design. This is expected to improve service life and reduce costs going forward by enabling the replacement of obsolete modules rather than the entire system.

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CI Number : 46483

- CT - TUS - Control System Upgrade

Project Number 46483

Parent CI Number :

-

Asset Location : 1191

- 1191 Tuskett Combustion Turbine, 25 Mwh unit

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	1100 - GTG - Plant Control and Inst	1,027,304
Retirements	1100 - GTG - Plant Control and Inst	19,018
Total Cost:		1,046,322
Original Cost:		236,377

**Capital Project Detailed Estimate**

<b>Location: Gas Turbine</b> <b>CI# : 46483</b> <b>Title: CT - TUS Control System Upgrade</b> <b>Execution Year: 2021</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
Engineering	PD	125	\$ 413	\$ 51,676		
Gas Turbine Operators	PD	55	\$ 365	\$ 20,100		
CADD Operators	PD	20	\$ 300	\$ 5,999		
			Sub-Total	\$ 77,775		
<b>OT Labour</b>						
Internal Commissioning Site Time	PD	10	\$ 730	\$ 7,309		
			Sub-Total	\$ 7,309		
<b>Travel Expense</b>						
Travel and Accommodations	Lot	1	\$ 11,250	\$ 11,250		
			Sub-Total	\$ 11,250		
<b>Materials</b>						
Fossil - Controls Materials	Lot	1			Attachment 1, Item 2.1, 2.2, 2.3, 2.4	
Misc. Field Material (wiring, fuses, cable)	Lot	1				
Engineering Workstation/Licenses	Lot	1	\$ 15,000	\$ 15,000		
Cameras	Lot	1	\$ 5,000	\$ 5,000		
			Sub-Total	\$ 515,861		
<b>Contracts</b>						
Fossil (Controls)	Lot	1			Attachment 1, Item 2.5, 2.6	
Electrical Contractor	Lot	1				
Camera Installation	Lot	1	\$ 15,000	\$ 15,000		
			Sub-Total	\$ 213,900		
<b>Consulting</b>						
Electrical Site Design	Lot	1	\$ 20,000	\$ 20,000		
			Sub-Total	\$ 20,000		
<b>Meals</b>						
Meals	Lot	1	\$ 7,500	\$ 7,500		
			Sub-Total	\$ 7,500		
<b>Other Goods &amp; Services</b>						
Contingency	%	15%	\$ 853,595	\$ 128,039		
			Sub-Total	\$ 128,039		
<b>Interest Capitalized</b>						
AFUDC				\$ 22,058		
			Sub-Total	\$ 22,058		
<b>Administrative Overhead</b>						
Labour AO				\$ 21,063		
Contractor AO				\$ 21,568		
			Sub-Total	\$ 42,630		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 981,635		
<b>TOTAL (AO, AFUDC included)</b>				\$ 1,046,322		
<b>Original Cost</b>				\$ 236,377		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						



**NOVA SCOTIA POWER  
PROPOSAL FOR  
TUSKET COMBUSTION TURBINE  
CONTROLS SYSTEM UPGRADE  
TUSKET, NOVA SCOTIA**



FPS PROPOSAL 20x096 (REV0)  
JUNE 19, 2020

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Nova Scotia Power – Tusket Combustion Turbine Controls Upgrade  
Rev0 – June 24, 2020

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## **1 OVERVIEW**

### **1.1 INTRODUCTION**

The following proposal is for the design, fabrication, and commissioning of a complete controls system upgrade at Nova Scotia Power's combustion turbine site in Tusket, NS. The scope of supply is based on details communicated by NSP.

This proposal provides pricing to completely upgrade the control system, including enough I/O available based on the assumptions listed in section 1.2. Allen-Bradley ControlLogix I/O will be used. Graphics for the new system will be built on existing VTScada HMI workstations, with upgraded touchscreens and software. The system will also be remotely accessible from the NSPI network.

Also included will be all the required I/O cables, terminal blocks, drawings, and manuals. The existing cabinet will be re-used.

### **1.2 DESIGN PHILOSOPHY & PROJECT ASSUMPTIONS**

The primary goals of this project are:

- a) Upgrade sequencer PLC from Rockwell PLC5 hardware to ControlLogix and ensure all changes will continue to meet the needs of plant operations and maintenance.
- b) Upgrade the fuel control system from Modicon PLC hardware to ControlLogix, encompassing valve control based on the new Woodward card.
- c) Integrate the sequencer, fuel control and DAS system logic, into a single ControlLogix based upgraded control system. The new vibration monitoring system will be integrated into the ControlLogix network.
- d) Provide new terminal blocks, power supplies, racks, and interconnecting cables to interface with field IO.
- e) Provide a new VTScada HMI graphics package and touchscreen hardware, designed for the upgraded software.
- f) Upgrade engine and generator field instrumentation from digital switches to analog transmitters.
- g) Provide commissioning services for all equipment outlined in this proposal.
- h) Provide all wiring and layout drawings and documentation required to properly document and troubleshoot the system.

This proposal is based on the following assumptions:

- a) The maximum I/O count required is 16 TC, 16 TC/RTD, 12 RTD, 32 AI, 4 AO, 112 DI, 128 DO.
- b) The PLC system will be non-redundant (processor and IO), with similar IO count to BGT4.
- c) Field instrumentation replacement is assumed to be similar to BGT4. If scope of instrumentation replacement changes after the site assessment, a change order will be required.
- d) The replacement of hardwired switches, meters and indicators on the control system panel door is assumed to be the same scope as was supplied for BGT4.
- e) All panel installation, instrument installation including any required pipe stands, and wiring terminations, as well as the pulling of any new cables, are the responsibility of NSP.
- f) Purchase of VTScada software upgrades are the responsibility of NSP.
- g) NSP is responsible for testing the new vibration probes on a shaker table, with direction from FPS.

### **1.2.1 PLC SYSTEM DESIGN**

New back panels complete with new PLC hardware, will be provided, which will be installed in the existing control cabinet. The logic will be programmed based on both the existing design, and the design of the new system installed at Burnside Unit 4.

The PLC system will be completely tested such that the entire system operation is verified prior to the functional acceptance test, and prior to the equipment being shipped to site.

The PLC system shall be designed and fabricated to meet the requirements of the Canadian Electrical Code (CEC) as well as any other international or local codes, as required.

The PLC system shall be designed to ensure the execution of a safe, orderly operating sequence in the start-up and shutdown of plant systems by providing clear alarm monitoring and trending capabilities for important process systems and data monitoring points.

### **1.2.2 OPERATOR INTERFACE DESIGN**

New graphics will be supplied based on the Burnside Unit 4 graphical interface, using VTScada software. Modifications will be made as necessary to account for any additional display information or improvements required. The workstation hardware will not require an upgrade, but a new HMI touchscreen will be provided, replacing the HMI monitor currently in place.

## **2 STANDARD HARDWARE & ENGINEERING DESIGN**

Fossil Power proposes to supply the following standard items as part of the controls system upgrade.

1. Allen-Bradley control hardware, back panels, power distribution equipment, interconnecting cabling and terminal blocks.
2. New instrumentation, including an upgrade from digital switches to analog transmitters where ever possible.
3. A new Woodward Servo Position Controller for fuel control.
4. New junction boxes to marshal the IO in the field, for connection to the new PLC panel.
5. System Engineering including wiring drawings, alarm set-point sheets and programming.
6. Complete system documentation.

### **2.1 PLC UPGRADE**

FPS proposes to supply all required hardware for the new ControlLogix based PLC control system mounted on custom built panels. The new system consists of a single non-redundant processor and all IO hardware and communication interface hardware to replace the current sequencer, fuel controller and DAS systems. The new Rockwell based vibration monitoring system will communicate on the new control network. Two 13-slot racks will be mounted on the new panels, which will be manufactured at FPS in Burnside, NS and will ship fully wired, programmed and tested. The panels will be installed in the existing control room cabinet.

The PLC hardware selected is based on the system IO assumptions noted in section 1.2 of this proposal. A list of the PLC hardware required is shown in the table below. A Prosoft card is included, which will be the Modbus interface to the Bitronics meter. Please note all communication is via ethernet and requires no special cards to be mounted in the HMI computers. A new 24" HMI touchscreen will be provided as an upgrade to the HMI monitor currently in service.

Also included is supply of the Woodward Servo Position Controller to replace the PEPCO fuel modulation valve driver. The module will be mounted on a steel panel for installation in the control cabinet.

Nova Scotia Power – Tusket Combustion Turbine Controls Upgrade  
Rev0 – June 24, 2020

**Control System Hardware**

Qty	Description	Part Number
1	Processor	1756-L71
4	Redundant Power Supply	1756-PB75R
2	Redundant Power Supply Adapter	1756-PSCA2
4	Redundant Power Supply Cable	1756-CPR2U
2	13 slot chassis	1756-A13
1	Ethernet Comms	1756-EN2T
2	Ethernet IO	1756-EN2TR
3	32pt DC Input Card	1756-IB32
1	16pt DC Input Card	1756-IB16
1	16pt DC Isolated Output Card	1756-OB16I
7	16pt Contact Output Card	1756-OW16I
2	16pt Analog Input Card, HART, isolated	1756-IF16IH
1	4pt Analog Output Card	1756-IF4XOF2F
2	8pt RTD/TC Input Card	1756-IRT8I
1	16pt TC Input Card	1756-IT16
1	RTD Input Card	1756-IR12
3	CJC THERMISTORS (QTY 2)	1756-CJC
1	20pt PLC Terminal Block	1756-TBNH
17	36pt PLC Terminal Block	1756-TBCH
18	Ext. Term. Block Housing	1756-TBE
1	Prosoft Card	MVI56E-MNET

## 2.2 VIBRATION MONITORING HARDWARE

Vibration monitoring hardware will be provided and connected to the redundant Ethernet card in the new Controllogix PLC rack. Redundant 24VDC power supplies will be provided for the monitoring modules. All new hardware provided will result in a vibration system similar to the equipment supplied for Burnside Unit 4.

Two (2) new Metrix vibration probes will be provided for measuring the clutch housing, and exciter NDE vibrations. One (1) new sealed Metrix vibration probe will be provided for measuring the 14.5" bearing vibration. Each probe will come with an integral cable of appropriate length to be wired into the generator junction box (GJB). Existing vibration probe cables between the GJB and control room should be assessed and reused if possible.

Nova Scotia Power – Tusket Combustion Turbine Controls Upgrade  
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**Vibration Monitoring Hardware**

Qty	Description	Part Number
2	Rockwell Dynamix Condition Monitoring Modules	1444-DYN04-01RA
2	Rockwell Dynamix 1444 Module Base	1444-TB-A
2	Rockwell Dynamix Module Terminals	1444-DYN-RPC-SCW-01
2	24VDC Power Supply	TBD
1	Rockwell Controllogix Redundant Ethernet Card	1756-EN2TR
2	Metrix Non-Sealed Vibration Sensor with 60ft cable	5485C-005-060
1	Metrix Sealed Vibration Sensor with 10m cable	SA6200UW-0-5-010

**2.3 ENGINEERING DESIGN & TESTING**

Complete engineering design, drafting and related documentation is included in the scope of this project. All documentation will be provided in English only and will be provided in electronic formats, including Adobe Acrobat, Microsoft Word, Microsoft Excel, and/or Microsoft Project, as required.

1. Project Schedule
2. Equipment list
3. Equipment architecture and layout drawings (including Bill of Materials)
4. Terminal block wiring and equipment interface drawings
5. Program Logic drawings
6. FAT checklist
7. Recommended spare parts list
8. Operation and maintenance (O&M) manuals
9. Onsite Commissioning Checklist

A factory acceptance test (FAT) will be conducted at the FPS factory in Dartmouth, NS. This FAT will include personnel from NSP and FPS. The FAT will be comprised of a hardware simulation of the system I/O which will thoroughly test and verify all panel wiring, system logic and operator interface.

To ensure a smooth and productive FAT, the system wiring and logic will be 100% tested by FPS engineers prior to the arrival of NSP personnel.

## **2.4 INSTRUMENTATION & PANEL HARDWARE**

Engine and generator instrumentation is to be upgraded from digital switches to HART enabled analog transmitters where ever possible. Diagnostic program logic will be implemented to detect a HART configuration mismatch between the field instrument and the PLC analog channel. Installation of the new transmitters is the responsibility of NSP.

This proposal assumes that the following signals will be converted to analog transmitters:

- Fuel pressure
- Engine, turbine, generator lube oil pressures
- AC lube oil pump pressure
- Engine, turbine breather pressures
- Starter signal pressure, starter duct pressure, air receiver pressure
- Engine, turbine, generator lube oil levels
- Fuel oil filter DP

The instrumentation provided also includes a Fluke FLK 154 handheld HART configuration tool and required software.

Temperature signals measured by type T thermocouple devices that are in good working order should be re-used in the new control system. If awarded this project FPS will conduct a detailed assessment of site instrumentation to determine if additional instrumentation requires replacement. New thermocouple probes and transmitters will be supplied for those signals which are currently not in good working order.

This proposal assumes a total of 7 temperature probes, including HART enabled temperature transmitters will be replaced.

The pricing in section 3 is based on the assumption that only the items listed above will be supplied/upgraded. If further instrumentation requires replacement, a change order will be requested.

The hardwired switches, meters and indicators on the control system panel door will also be upgraded. Custom metal plates complete with SBM style local control switches, indicator lamps, and instrument meters will be provided. The new plates will bolt on to the existing cabinets after the old fronts have been cut out and removed. Another set of plates will be provided to accommodate the new cut-out for the upgraded HMI touchscreen.

New junction boxes will be assembled and shipped, to marshal the IO in the field prior to connection to the PLC panel.

## **2.5 TRAINING COURSE**

Pricing has been included for a customer training course with the applicable NSP staff. Training course will consist of an on-site presentation, hard copies of training material and question & answer session.

## **2.6 SITE ASSESSMENT – SITE TIME (ESTIMATE)**

To complete the site assessment, which entails gathering all information required for the engineering design, it is assumed one engineer will be required to travel to Tusket and spend five 8-hour days at the plant.

Time will be billed at the standard FPS rate as required. Only actual expenses and hours spent at site will be billed.

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## **2.7 INSTALLATION AND COMMISSIONING SUPERVISION - SITE TIME (ESTIMATE)**

All panel, instrument installation and wiring terminations will be performed by a 3rd party electrical contractor. The contractor will run new cables between the control room, engine and generator buildings through existing conduit as required by the new controls system. The new junction boxes provided by FPS will be installed by the contractor as needed to marshal the IO in the field before being wired to the new PLC panel.

Based on the scope of work FPS estimates the time required for an engineer to be on-site to supervise the electrical installation to be approximately 15 days per unit, and the time required for an engineer to commission the system to be approximately 20 days per unit. For the purpose of this proposal, it is assumed that one engineer will be required, working 8-hour days, and the electrical installation supervision will be a separate trip to Tusket.

Contractor Supervision Site Time (Estimate)	15 days @ 8 hours/day
Commissioning Site Time (Estimate)	20 days @ 8 hours/day

Time will be billed at the standard FPS rate as required. Only actual hours spent at site will be billed.



Nova Scotia Power – Tusket Combustion Turbine Controls Upgrade  
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### **3 PRICING SUMMARY**

Pricing to complete the contract is as follows (all pricing in CAD). Spare part pricing will be quoted separately.

**TUSKET:**

ITEM 2.1 – Hardware & Engineering  
ITEM 2.2 – Vibration Monitoring System  
ITEM 2.3 – HART Communicator  
ITEM 2.4 – Training Course  
ITEM 2.5 – Site Time Pre-Assessment (Estimate)  
ITEM 2.6 – Installation & Commissioning Supervision (Estimate)



**TOTAL PRICING:**

**Note: Terms of payment based on full contract amount. First 20% progress payment to be invoiced once scope and total contract price has been finalized.**

### **4 COMMERCIAL TERMS**

<b>Delivery:</b>	26 weeks after receipt of order	
<b>Shipping:</b>	Included	
<b>FOB:</b>	Tusket	
<b>Taxes and Duties:</b>	Extra	
<b>Country of Origin:</b>	Canada	
<b>Bid Validity:</b>	3 months from receipt	
<b>Terms of Payment (Items 2.1-2.4):</b>	ARO	20%
	Submission of drawings	20%
	Material Ordered	30%
	Ready for shipment	20%
	Satisfactory operation	
	(or 90 days after shipment)	10%
<b>Terms of Payment (Items 2.5, 2.6):</b>	Upon completion	100%

**Note: Payment required within 30 days of invoicing.**

**CI Number: C0031263**

**Title: 2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal**

**Start Date:** 2021/03  
**In-Service Date:** 2021/03  
**Final Cost Date:** 2023/06  
**Function Class:** Transmission  
**Amount:** \$7,512,226

**DESCRIPTION:**

This project will replace substation devices that have polychlorinated biphenyl (PCB) levels of 50 mg/kg or more to comply with 2008 Federal Environmental PCB Regulations. PCB sampling of all accessible substation equipment was completed in prior year projects and the focus is now on equipment removal.

A portion of the capital costs associated with this capital item will contribute toward settling the Company's Asset Retirement Obligation for PCB contaminated oil.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2019 CI C0010952 2019/2020 Substation PCB Equipment Removal \$2,786,245
- 2020 CI C0021123 2020/2021 Substation PCB Equipment Removal \$5,197,372
- 2022 CI TBD 2022/2023 Substation PCB Equipment Removal \$TBD
- 2023 CI TBD 2023/2024 Substation PCB Equipment Removal \$TBD

**Depreciation Class:** Transmission Plant – Station Equipment  
Transmission Plant – Structures and Improvements

**Estimated Useful Life:** 40 Years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.3%

**JUSTIFICATION:**

**Justification Criteria:** Environment

**Why do this project?**

This project is required to enable NS Power to comply with the revised 2008 Federal PCB Regulations as set by the Federal Government, which includes a deadline of year end 2025 for the elimination of all equipment containing PCBs in concentrations at or above 50 mg/kg.

**Why do this project now?**

This project needs to be completed now to support the orderly replacement of all applicable PCB contaminated substation equipment before the year end 2025 deadline.

This project is deemed in-service when the first device is replaced (March 2021), therefore the Final Cost Date (May 2023) is listed as six months after the last device is replaced (November 2022).

**Why do this project this way?**

The replacement of equipment containing greater than 50 mg/kg concentration of PCBs must be planned over a period of several years to manage outages effectively and comply with the 2008 Federal PCB Regulations.

**CI Number** : C0031263

- 2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal **Project Number** C0031263

**Parent CI Number** :

-

**Asset Location** : 1455

- 1455 Transmission Plant General

**Budget Version** 2021 ACE Plan

**Capital Item Accounts**

Exp. Type	Utility Account	Forecast Amount
Additions	0300 - TP - Bldg.,Struct.Grnd.	787,856
Additions	2200 - TP - Elec Contr.Equip.	646,804
Additions	2300 - TP - Power Equip.-Station S	116,793
Additions	4300 - TP - Substn Dev.	2,343,434
Additions	4400 - TP - Substn.Transf.	2,646,082
Retirements	4300 - TP - Substn Dev.	518,887
Retirements	4400 - TP - Substn.Transf.	452,369
Total Cost:		7,512,226
Original Cost:		1,678,480

Capital Project Detailed Estimate

Location: Transmission											
CI#: C0031263											
Title: 2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal											
Execution Year: 2021-2022											
Description					Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)	
Regular Labour											
T&D Labour - Electrician/Technician					PD	2195	\$ 395	\$ 867,024			
T&D Labour - Design					PD	916	\$ 395	\$ 361,694			
T&D Labour - Commissioning					PD	388	\$ 402	\$ 156,000			
							Sub-Total	\$ 1,384,718			
Travel Expense											
Travel Expenses					Lot	1	\$ 5,940	\$ 5,940			
							Sub-Total	\$ 5,940			
Materials											
Building Structures					Lot	1	\$ 116,930	\$ 116,930			
Electrical Control Equipment					Lot	1	\$ 167,850	\$ 167,850			
Power Substation Equipment					Lot	1	\$ 43,200	\$ 43,200			
Substation Device					Lot	1	\$ 1,035,400	\$ 1,035,400			
Substation Transformer					Lot	1	\$ 840,000	\$ 840,000			
Design					Lot	1	\$ 20,000	\$ 20,000			
							Sub-Total	\$ 2,223,380			
Contracts											
Building Structures					Lot	1	\$ 362,915	\$ 362,915			
Electrical Control Equipment					Lot	1	\$ 100,000	\$ 100,000			
Substation Devices					Lot	1	\$ 400,050	\$ 400,050			
Substation Transformer					Lot	1	\$ 751,200	\$ 751,200			
							Sub-Total	\$ 1,614,165			
Consulting											
Inspection & Witnessing of Tests					Lot	1	\$ 13,500	\$ 13,500			
							Sub-Total	\$ 13,500			
Other Goods & Services											
Contingency					%	10%	\$ 5,235,763	\$ 523,576			
							Sub-Total	\$ 523,576			
Vehicle Overhead											
Vehicle AO								\$ 530,582			
							Sub-Total	\$ 530,582			
Administrative Overhead											
Labour AO								\$ 944,281			
Contract AO								\$ 272,084			
							Sub-Total	\$ 1,216,364			
SUB-TOTAL (no AO, AFUDC)								\$ 5,765,279			
TOTAL (AO, AFUDC included)								\$ 7,512,226			
Original Cost								\$ 1,678,480			

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

**CI Number: C0031089**

**Title: 2021 Transmission Right-of-Way Widening 69kV**

**Start Date:** 2021/04  
**In-Service Date:** 2021/04  
**Final Cost Date:** 2022/12  
**Function Class:** Transmission  
**Forecast Amount:** \$5,288,520

**DESCRIPTION:**

This project will widen rights-of-way to reduce the occurrence of edge and off right-of-way tree contacts by increasing the separation between trees and transmission lines. The vegetation management practices performed under NS Power's maintenance program target vegetation within the rights-of-way and maintain existing, sustainable rights-of-way. These activities prevent tree growth from causing outages, but do not address edge or off rights-of-way trees.

This is year six of the eight-year 69kV Transmission Rights-of-Way Widening Plan accepted by the NSUARB through the Post Tropical Storm Arthur review process. Increasing the rights-of-way width for 69kV transmission lines to 30-40 meters where possible will significantly reduce the risk of trees contacting power lines during storms. Currently, 242 km of transmission rights-of-way is targeted for widening in 2021.

The 69kV transmission lines and the length of rights-of-way currently planned for widening in 2021 are shown in the table below. The transmission lines completed can be expected to vary as further inspections, and changes in prioritization occur throughout 2021.

<b>Line #</b>	<b>Region</b>	<b>Length of Right-of way to be Widened (km)</b>
L-5026	Annapolis	81.2
L-5050	Digby	16.2
L-5532	Queens / Annapolis	81.9
L-5540	Queens	2.6
L-5541	Queens	23.0
L-5544	Queens	11.5
L-5581	Digby	25.8
<b>TOTAL</b>		<b>242.2</b>

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2019 CI C0010042 2019 Transmission Right of Way Widening 69kV \$5,650,794
- 2020 CI C0020627 2020 Transmission Right-of-Way Widening 69kV \$5,489,820
- 2022 CI TBD 2022 Transmission Right of Way Widening 69kV \$TBD
- 2023 CI TBD 2023 Transmission Right of Way Widening 69kV \$TBD

**Depreciation Class:** Transmission Plant- Land Rights- Easements

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

NS Power's standard right-of-way width for a 69kV transmission line was previously 20 meters. Given the power line structure is usually in the center of the right-of-way, this resulted in a cleared area of 10m on each side of the centerline. The distance between the forest edge and conductor varies, depending on structure type. While this distance provides ample clearance for the safe maintenance and operation of all types of structures, it is not wide enough to prevent many tree species that are tall enough to span the entire right-of-way width from making contact with the power lines when they fall. Increasing the right-of-way width for 69kV transmission lines to 30-40 meters will significantly reduce the risk of trees contacting the power lines during storms. Additionally, expanding the ROW for existing 69kV transmission allows for future replacement/conversion of these lines to 138kV, which requires a 30m ROW, if ever needed.

**Why do this project now?**

This is year six of the eight-year 69kV Transmission Rights-of-Way Widening Plan. The transmission rights-of-way currently targeted for widening in 2021 are noted above and are consistent with the prioritization outlined in the Widening Plan. The transmission rights-of-way completed can be expected to vary as prioritization can change throughout the program due to inspections and/or reliability data.

This project is deemed in-service when the first transmission right-of-way is widened (April 2021), therefore the Final Cost date (December 2022) is six months after the last right-of-way is expected to be completed on this project (June 2022).

**Why do this project this way?**

Prioritizing the widening of the 69kV transmission rights-of-way based on customer count and transmission system redundancy will provide the largest reliability benefit. This method of widening the 69kV transmission rights-of-way was accepted as part of the Post Tropical Storm stakeholder engagement.

**CI Number** : C0031089 - 2021/2022 Transmission Right-of-Way Widening 69kV

**Project Number** C0031089

**Parent CI Number** : -

**Asset Location** : 1455 - 1455 Transmission Plant General

**Budget Version** 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	0200 - TP - Land Rights	5,288,520
Total Cost:		5,288,520
Original Cost:		

**Capital Project Detailed Estimate**

<b>Location: Transmission</b> <b>CI#: C0031089</b> <b>Title: 2021 Transmission Right-of-Way Widening 69kV</b> <b>Execution Year: 2021-2022</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s)
<b>Royalties &amp; Easements</b>						
Easement Costs	Lot	1	\$ 20,000	\$ 20,000		
Sub-Total				\$ 20,000		
<b>Travel</b>						
Travel	Lot	1	\$ 10,000	\$ 10,000		
Sub-Total				\$ 10,000		
<b>Contracts</b>						
Tree Trimming	Lot	1	\$ 4,500,000	\$ 4,500,000	This estimate is based on historical costs for similar work completed on the 69kV system	
Sub-Total				\$ 4,500,000		
<b>Administrative Overhead</b>						
Contract AO				\$ 758,520		
Sub-Total				\$ 758,520		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 4,530,000		
<b>TOTAL (AO, AFUDC included)</b>				\$ 5,288,520		
<b>Original Cost</b>						
Note 1: The labor figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						



**CI Number: C0031122**

**Title: L6539 Replacements and Upgrades**

**Start Date:** 2021/01  
**In-Service Date:** 2021/01  
**Final Cost Date:** 2023/06  
**Function Class:** Transmission  
**Forecast Amount:** \$2,821,842

**DESCRIPTION:**

L6539 is a 35.7 kilometre (178 Structures) 138kV transmission line, built in 1971, that connects 2S Victoria Junction to 3S Gannon Road substations. This project is required to replace deteriorated assets that have been identified through NS Power's inspection program. This project includes the replacement of deteriorated assets on approximately 116 structures. This project will be completed over two years.

The project scope includes:

- Structure Replacements: 28 Structures
- Pole Replacements: 2 Structures
- Timber and Insulator Replacements: 66 Structures
- Insulator Replacements: 11 Structures
- Bond and Guy Wire Replacements: 6 Structures
- Other Deteriorated Assets: 3 Structures

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Transmission Plant – Overhead Conductor and Devices  
 Transmission Plant – Poles and Fixtures

**Estimated Life of the Asset:** 45 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.1%

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

The transmission inspection program identified deteriorated assets that require replacement to avoid transmission interruptions. Failure to complete this project would compromise the reliable operation of this line. Asset failures on this line would decrease system redundancy.

**Why do this project now?**

This work has been prioritized based on the condition of the transmission line assets as determined through NS Power's inspection program results, as well as the criticality of the line to the overall system operation. This project is required to support the reliable operation of the transmission line.

This project is deemed in-service when the first portion of work is completed (January 2021), therefore the Final Cost Date (June 2023) is listed as six months after the last portion of work is completed (December 2022).

**Why do this project this way?**

Replacing the existing deteriorated assets is the only technically feasible option to accomplish the intended scope of this project.

**CI Number** : C0031122                      - L6539 Replacements and Upgrades

**Project Number**      C0031122

**Parent CI Number** :    -

**Asset Location** : 1455                                      - 1455 Transmission Plant General

**Budget Version**      2021 ACE Plan

**Capital Item Accounts**

Exp. Type	Utility Account	Forecast Amount
Additions	3500 - TP - Wood Poles	1,769,262
Additions	3800 - TP - Insulators	526,016
Additions	3900 - TP - O/H Cond.	6,818
Retirements	3500 - TP - Wood Poles	368,111
Retirements	3800 - TP - Insulators	151,635
Total Cost:		2,821,842
Original Cost:		350,958

Capital Project Detailed Estimate

<b>Location: Transmission</b>										
<b>CI#: C0031122</b>										
<b>Title: L6539 Replacements and Upgrades</b>										
<b>Execution Year: 2021/2022</b>										
Description					Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>										
T&D Labour - Design					PD	14	\$ 418	\$ 6,000		
T&D Labour - Site Supervision					PD	77	\$ 402	\$ 30,966		
							Sub-Total	\$ 36,966		
<b>Materials</b>										
Wood Poles					Lot	1	\$ 259,380	\$ 259,380		
Insulators					Lot	1	\$ 34,795	\$ 34,795		
O/H Conductors					Lot	1	\$ 30	\$ 30		
							Sub-Total	\$ 294,204		
<b>Contracts</b>										
Wood Poles					Lot	1	\$ 1,404,943	\$ 1,404,943		
Insulators					Lot	1	\$ 496,128	\$ 496,128		
O/H Conductors					Lot	1	\$ 5,170	\$ 5,170		
							Sub-Total	\$ 1,906,241		
<b>Other Goods &amp; Services</b>										
Contingency					%	10%	\$ 2,237,411	\$ 223,741		
							Sub-Total	\$ 223,741		
<b>Vehicle Overhead</b>										
Vehicle AO								\$ 14,165		
							Sub-Total	\$ 14,165		
<b>Administrative Overhead</b>										
Labour AO								\$ 25,209		
Contract AO								\$ 321,316		
							Sub-Total	\$ 346,525		
								<b>SUB-TOTAL (no AO, AFUDC)</b>	\$ 2,461,152	
								<b>TOTAL (AO, AFUDC included)</b>	\$ 2,821,842	
<b>Original Cost</b>								\$ 350,958		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes.										
Note 2: Small differences in totals are attributable to rounding.										

**CI Number: C0031085**

**Title: L6516 Replacements and Upgrades Phase 1**

**Start Date:** 2021/01  
**In-Service Date:** 2021/01  
**Final Cost Date:** 2022/06  
**Function Class:** Transmission  
**Forecast Amount:** \$2,730,592

**DESCRIPTION:**

L6516 is a 127 kilometre (508 Structures) 138kV transmission line, built in 1964, that connects 2C Port Hastings to 2S Victoria Junction substations. This project is required to replace deteriorated assets that have been identified through NS Power's inspection program. The first phase of this project includes the replacement of deteriorated assets on approximately 77 structures.

The project scope includes:

- Structure Replacements: 55 Structures
- Timber and Insulator Replacements: 3 Structures
- Insulator Replacements: 17 Structures
- Other Deteriorated Assets: 2 Structures

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2022 CI TBD L6516 Replacements and Upgrades Phase 2 \$TBD
- 2023 CI TBD L6516 Replacements and Upgrades Phase 3 \$TBD

**Depreciation Class:** Transmission Plant – Overhead Conductor and Devices  
Transmission Plant – Poles and Fixtures

**Estimated Life of the Asset:** 45 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.1%

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

The transmission inspection program identified deteriorated assets that require replacement to avoid transmission interruptions. Failure to complete this project would compromise the reliable operation of this line. Asset failures on this line would decrease system redundancy.

**Why do this project now?**

This work has been prioritized based on the condition of the transmission line assets as determined through NS Power's inspection program results, as well as the criticality of the line to the overall system operation. This project is required to support the reliable operation of the transmission line.

This project is deemed in-service when the first portion of work is completed (January 2021), therefore the Final Cost Date (June 2022) is listed as six months after the last portion of work is completed (December 2021).

**Why do this project this way?**

Replacing the existing deteriorated assets is the only technically feasible option to accomplish the intended scope of this project.

# REDACTED (CONFIDENTIAL INFORMATION REMOVED)

CI Number : C0031085

- L6516 Line Replacement and Upgrades

Project Number

C0031085

2021 ACE Plan CI C0031085 Page 3 of 4

Parent CI Number :

-

Asset Location : 1455

- 1455 Transmission General

Budget Version

2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	3500 - TP - Wood Poles	1,597,542
Additions	3800 - TP - Insulators	40,548
Additions	3900 - TP - O/H Cond.	157,922
Retirements	3500 - TP - Wood Poles	774,356
Retirements	3800 - TP - Insulators	160,223
Total Cost:		2,730,592
Original Cost:		197,432

Capital Project Detailed Estimate

<b>Location: Transmission</b> <b>CI#: C0031085</b> <b>Title: L6516 Replacements and Upgrades Phase 1</b> <b>Execution Year: 2021</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
T&D Labour - Design	PD	13	\$ 418	\$ 5,396		
T&D Labour - Site Supervision	PD	57	\$ 402	\$ 23,023		
			Sub-Total	\$ 28,419		
<b>Materials</b>						
Wood Poles	Lot	1	\$ 262,638	\$ 262,638		
Insulators	Lot	1	\$ 7,161	\$ 7,161		
O/H Conductors	Lot	1	\$ 323	\$ 323		
			Sub-Total	\$ 270,122		
<b>Contracts</b>						
Wood Poles	Lot	1	\$ 1,587,611	\$ 1,587,611		
Insulators	Lot	1	\$ 160,094	\$ 160,094		
O/H Conductors	Lot	1	\$ 117,075	\$ 117,075		
Survey and Mapping	Lot	1	\$ 5,000	\$ 5,000		
			Sub-Total	\$ 1,869,780		
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 2,168,321	\$ 216,832		
			Sub-Total	\$ 216,832		
<b>Vehicle Overhead</b>						
Vehicle AO				\$ 10,889		
			Sub-Total	\$ 10,889		
<b>Administrative Overhead</b>						
Labour AO				\$ 19,380		
Contract AO				\$ 315,170		
			Sub-Total	\$ 334,550		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 2,385,152		
<b>TOTAL (AO, AFUDC included)</b>				\$ 2,730,592		
<b>Original Cost</b>				\$ 197,432		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						



**CI Number: C0031050**

**Title: 138/69kV Spare Autotransformer**

**Start Date:** 2021/01  
**In-Service Date:** 2022/09  
**Final Cost Date:** 2023/03  
**Function:** Transmission  
**Forecast Amount:** \$2,398,564

**DESCRIPTION:**

This project is for the purchase, assembly, installation, and commissioning of a 60/80/100 MVA, 138/69 kV autotransformer equipped with an on-load tap changer at the NS Power system spares storage site in Onslow.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include “Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line).”

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Transmission Plant - Station Equipment

**Estimated Useful Life:** 40 Years

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

NS Power has a number of 138kV-69kV autotransformers in service that are nearing end of life and require a revised mitigation strategy based on the risk. Procuring a spare for these assets greatly reduces the risk of extended outages in the event a transformer that is in service requires immediate replacement.

The availability of a spare unit of this size and voltage class within Nova Scotia will expedite the return to service by 12-15 weeks if an unplanned replacement is required and reduce operating risk to the business.

**Why do this project now?**

NS Power has ten similar-sized 138-69 kV autotransformers in service throughout the province. These were built between 1959 and 1987 and have an average age of approximately 46 years. This average age exceeds the estimated useful life of the asset of 40 years. NS Power’s fleet is aging to a point where the risk of failure is increasing. NS Power recently experienced an unplanned failure on this family of transformers which is further evidence that a mitigation strategy to procure a spare auto transformer is required at this time. While NS Power’s 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. The availability of a spare to deploy immediately upon failure of one of these units significantly reduces the risks associated with these scenarios, such as loss of transmission flexibility or forced derating of an economic generation source.

**Why do this project this way?**

A spare 60/80/100MVA, 138-69 kV autotransformer will be purchased to NS Power’s technical specifications and be centrally located within Nova Scotia to minimize future interruptions to the provincial transmission grid. This will allow a planned, orderly and more cost-effective restoration process. NS Power’s historical experience has shown that even if a replacement is available for immediate purchase, arranging the logistics for purchase and transport can result in a 12-15 week delay in getting the unit where it’s needed. This delay is eliminated when NS Power is already in possession of the necessary spare.

Procuring a spare 138-69kV autotransformer will allow NS Power to manage the risk with this vintage of transformers, extending the life and minimizing risk for customers. The other alternative would be to proactively procure and install new transformers at much higher cost for customers than having a spare in the event of unplanned event.

CI Number : C0031050 - 138/69kV Spare Autotransformer

Project Number C0031050

Parent CI Number : -

Asset Location : 1455 - 1455 Transmission General

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	0300 - TP - Bldg.,Struct.Grnd.	22,269
Additions	2300 - TP - Power Equip.-Station S	3,913
Additions	4300 - TP - Substn Dev.	122
Additions	4400 - TP - Substn.Transf.	2,372,260
Total Cost:		2,398,564
Original Cost:		

**Capital Project Detailed Estimate**

<b>Location: Transmission</b> <b>CI#: C0031050</b> <b>Title: 138/69kV Spare Autotransformer</b> <b>Execution Year: 2021/2022</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
T&D Labour - PLT	PD	14	\$ 387	\$ 5,408		
T&D Labour - Design	PD	67	\$ 418	\$ 28,169		
T&D Labour - Commissioning	PD	29	\$ 402	\$ 11,639		
T&D Labour - Field Supervision	PD	15	\$ 402	\$ 6,155		
			Sub-Total	\$ 51,371		
<b>Overtime Labour</b>						
T&D Labour - PLT	PD	8	\$ 774	\$ 6,080		
			Sub-Total	\$ 6,080		
<b>Travel Expense</b>						
Travel Expenses - Substation Transformer	Lot	1	\$ 1,800	\$ 1,800		
Travel Expenses - Field Supervision	Lot	1	\$ 370	\$ 370		
			Sub-Total	\$ 2,170		
<b>Materials</b>						
Building, Structures and Grounds	Lot	1	\$ 270	\$ 270		
Electrical Control Equipment	Lot	1	\$ 1,650	\$ 1,650		
Substation Devices	Lot	1	\$ 100	\$ 100		
Substation Transformer	Lot	1	\$ 1,850,000	\$ 1,850,000		
Design	Lot	1	\$ 500	\$ 500		
			Sub-Total	\$ 1,852,520		
<b>Contracts</b>						
Transformer Installation/Placement	Lot	1	\$ 80,400	\$ 80,400		
Concrete Foundations	Lot	1	\$ 16,400	\$ 16,400		
			Sub-Total	\$ 96,800		
<b>Consulting</b>						
Consulting	Lot	1	\$ 30,000	\$ 30,000		
			Sub-Total	\$ 30,000		
<b>Meals</b>						
Meals	Lot	1	\$ 600	\$ 600		
			Sub-Total	\$ 600		
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 2,039,541	\$ 203,954		
			Sub-Total	\$ 203,954		
<b>Interest Capitalized</b>						
AFUDC				\$ 80,799		
			Sub-Total	\$ 80,799		
<b>Vehicle Overhead</b>						
Vehicle AO				\$ 20,849		
			Sub-Total	\$ 20,849		
<b>Administrative Overhead</b>						
Labour AO				\$ 37,105		
Contract AO				\$ 16,317		
			Sub-Total	\$ 53,421		
				<b>SUB-TOTAL (no AO, AFUDC)</b>	\$ 2,243,495	
				<b>TOTAL (AO, AFUDC included)</b>	\$ 2,398,564	
<b>Original Cost</b>						
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						

**CI Number: C0033644**

**Title: 2021/2022 Steel Tower Life Extension**

**Start Date:** 2021/09  
**In-Service Date:** 2021/09  
**Final Cost Date:** 2023/06  
**Function Class:** Transmission  
**Amount:** \$2,332,746

**DESCRIPTION:**

This project is to apply protective coating to 40 lattice steel towers in the Waverley area and Halifax area to extend the life of the structures. The towers to be coated will be prioritized based on the latest inspection data. Current inspection results indicate the towers in the Waverley and Halifax areas should be recoated in order to prevent further degradation and extend the expected useful life of the assets. The cost includes the removal, collection, and disposal of lead paint where required, working at heights in proximity to energized lines, as well as material costs for coating of 30 steel towers in the Waverley area and 10 steel towers in the Halifax area. Applying protective coatings on steel transmission structures is a common and accepted form of corrosion control used in the utility industry.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include “Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line).”

- 2019 CI C0010949 2019/2020 Steel Tower Life Extension \$2,414,140
- 2022 CI TBD 2022/2023 Steel Tower Life Extension \$TBD
- 2023 CI TBD 2023/2024 Steel Tower Life Extension \$TBD

**Depreciation Class:** Transmission Equipment – Towers and Fixtures

**Estimated Useful Life:** 55 years (65 years with coating)

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

The environmental conditions that these towers are exposed to have led to the deterioration of the protective coating on the structures. These structures are an average of 49 years old and are showing signs of steel structure corrosion.

**Why do this project now?**

Current inspection results indicate that 40 steel towers in the Waverley and Halifax areas should be recoated in order to extend the expected useful life of the assets. These towers require recoating to be completed in order to reduce corrosion and material loss, which will extend the life of the towers beyond their originally estimated useful life of 50-55 years. A conservative estimate for the life extension from coating the tower is 10 years, resulting in a revised useful life of 60-65 years. The towers will be selected based on the age and condition of the structures. Restoration of protective coating before failure of the coating system prevents corrosion damage to structural steel tower components.

This project is deemed in-service when the first tower is completed (September 2021), therefore the Final Cost Date (June 2023) is listed as six months after the last tower is completed (December 2022).

**Why do this project this way?**

The most cost effective approach is to recoat the steel towers prior to the failure of the protective coating which would lead to corrosion damage to the structural steel. If corrosion damage occurs in the structural steel components of a transmission tower, costly replacement of steel members may be necessary to preserve the integrity of the tower. The average cost of a tower replacement is \$500,000 and protective coating costs approximately \$60,000 per tower. The protective coating extends the expected useful life of the steel tower by 10 years (from 55 years to 65 years). The

average cost per year of service for a steel tower without protective coating is \$9,090 ( $\$500,000 / 55$  years); with the protective coating applied, the average cost per year for the additional 10 years of service is reduced to \$6,000 ( $\$60,000 / 10$  years).

CI Number : C0033644

- 2021-2022 Steel Tower Life Extension

Project Number C0033644

Parent CI Number :

-

Asset Location : 1455

- 1455 Transmission General

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	3700 - TP - Steel Towers	2,332,746
Total Cost:		2,332,746
Original Cost:		

Capital Project Detailed Estimate

<b>Location: Transmission</b> <b>C#:</b> C0033644 <b>Title:</b> 2021/2022 Steel Tower Life Extension <b>Execution Year:</b> 2021-2022						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
T&D Labour - PLT	PD	19	\$ 395	\$ 7,444		
T&D Labour - Site Supervision	PD	114	\$ 410	\$ 46,680		
Procurement / Financial Support	Lot	1	\$ 2,876	\$ 2,876		
			Sub-Total	\$ 57,000		
<b>Overtime Labour</b>						
T&D Labour - PLT	PD	111	\$ 790	\$ 88,020		
			Sub-Total	\$ 88,020		
<b>Travel Expense</b>						
Travel	Lot	1	\$ 5,000	\$ 5,000		
			Sub-Total	\$ 5,000		
<b>Materials</b>						
Coating for Towers	EA	40	\$ 5,000	\$ 200,000		
			Sub-Total	\$ 200,000		
<b>Contracts</b>						
Coating of Towers - External Contracts	EA	40	\$ 30,000	\$ 1,200,000		
External Engineering Assessments	EA	60	\$ 617	\$ 37,020		
Grounding & Permit Holding - External Contracts	EA	40	\$ 5,000	\$ 200,000		
External Quality Auditing	EA	40	\$ 295	\$ 11,818		
			Sub-Total	\$ 1,448,838		
<b>Meals</b>						
Meals	Lot	1	\$ 2,000	\$ 2,000		
			Sub-Total	\$ 2,000		
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 1,800,859	\$ 180,086		
			Sub-Total	\$ 180,086		
<b>Vehicle Overhead</b>						
Vehicle AO				\$ 38,704		
			Sub-Total	\$ 38,704		
<b>Administrative Overhead</b>						
Labour AO				\$ 68,882		
Contract AO				\$ 244,216		
			Sub-Total	\$ 313,098		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 1,980,944		
<b>TOTAL (AO, AFUDC included)</b>				\$ 2,332,746		
<b>Original Cost</b>				\$ -		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						



**CI Number: C0033645**

**Title: 2021/2022 Steel Tower Refurbishment**

**Start Date:** 2021/01  
**In-Service Date:** 2021/01  
**Final Cost Date:** 2023/06  
**Function Class:** Transmission  
**Amount:** \$1,944,005

**DESCRIPTION:**

This project is required to replace deteriorated steel tower components. NS Power has approximately 2,000 steel towers installed on the transmission system. These deteriorated steel tower components are identified through the NS Power transmission inspection program. Components that will be replaced include hardware, guy wires, tower legs and grillages, footings and steel members. The age profile of the steel tower assets is illustrated in the table below.

Age Range	Kilometers of Transmission Line	% of Steel Structures
0-10	0	0%
11-20	0	0%
21-30	317	44%
31-40	72	10%
41-50	166	23%
51-55	42	6%
55+	120	17%

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include “Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line).”

- 2019 CI C0010950 2019/2020 Steel Tower Refurbishment \$2,009,268
- 2022 CI TBD 2022/2023 Steel Tower Refurbishment \$TBD
- 2023 CI TBD 2023/2024 Steel Tower Refurbishment \$TBD

**Depreciation Class:** Transmission Plant - Towers and Fixtures

**Estimated Useful Life:** 50-55 Years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.4%

**JUSTIFICATION:**

**Justification Criteria:** Transmission

**Why do this project?**

NS Power’s transmission inspection program has identified deteriorated components on steel towers that require replacement. Transmission assets are critical to the reliable operation of the power system. Work on these deficiencies will be prioritized based on inspection results and engineering assessments, consistent with how work has been completed under this program in the past. The towers that will be refurbished under this project will be determined throughout the prioritization process associated with this program.

**Why do this project now?**

This work included in this project is based on transmission inspection results and will be prioritized based on specialized structural steel inspections. Many of these steel tower components have reached the end of their expected service lives and if replacements are not completed, the reliability of the structures and the associated transmission lines will be compromised.

This project is deemed in-service when refurbishment of the first tower is completed (January 2021), therefore the Final Cost Date (June 2023) is listed as six months after the last tower is forecasted to be completed under this project (December 2022).

**Why do this project this way?**

Proactively replacing the existing deteriorated steel tower components will assure the continued reliable operation of the transmission system and is more cost effective than replacement of entire steel towers .



Capital Project Detailed Estimate

<b>Location: Transmission</b> <b>CI#: C0033645</b> <b>Title: 2021/2022 Steel Tower Refurbishment</b> <b>Execution Year: 2021/2022</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
T&D Labour - Site Supervision	PD	120	\$ 410	\$ 49,403		
Procurement / Financial Support	Lot	1	\$ 2,400	\$ 2,400		
			Sub-Total	\$ 51,803		
<b>Materials</b>						
Steel Tower Components	Lot	1	\$ 120,000	\$ 120,000		
			Sub-Total	\$ 120,000		
<b>Contracts</b>						
Contract Line Work	Lot	1	\$ 1,174,800	\$ 1,174,800		
External Supervision	Lot	1	\$ 75,000	\$ 75,000		
			Sub-Total	\$ 1,249,800		
<b>Consulting</b>						
External Civil Design	Lot	1	\$ 100,000	\$ 100,000		
			Sub-Total	\$ 100,000		
<b>Meals</b>						
Meals	Lot	1	\$ 4,000	\$ 4,000		
			Sub-Total	\$ 4,000		
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 1,525,603	\$ 152,560		
			Sub-Total	\$ 152,560		
<b>Vehicle Overhead</b>						
Vehicle AO				\$ 19,849		
			Sub-Total	\$ 19,849		
<b>Administrative Overhead</b>						
Labour AO				\$ 35,326		
Contract AO				\$ 210,666		
			Sub-Total	\$ 245,992		
<b>SUB-TOTAL (no AO, AFUDC)</b>					\$ 1,678,163	
<b>TOTAL (AO, AFUDC included)</b>					\$ 1,944,005	
<b>Original Cost</b>					\$ 388,389	
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						

**CI Number: C0031069**

**Title: L6020 Replacements and Upgrades**

**Start Date:** 2021/01  
**In-Service Date:** 2021/01  
**Final Cost Date:** 2022/06  
**Function Class:** Transmission  
**Forecast Amount:** \$1,825,300

**DESCRIPTION:**

L6020 is a 58 kilometre (283 Structures) 138kV transmission line, built in 1963, that connects 50W Milton to 30W Souriquois substations. This project is required to replace deteriorated assets that have been identified through NS Power's inspection program. This project includes the replacement of deteriorated assets on approximately 76 structures.

The project scope includes:

- Structure Replacements: 11 Structures
- Timber and Insulator Replacements: 58 Structures
- Timber Replacements: 1 Structure
- Insulator Replacements: 5 Structures
- Pole Replacements: 1 Structure

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Transmission Plant – Overhead Conductors and Devices  
 Transmission Plant – Poles and Fixtures

**Estimated Life of the Asset:** 45 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420- Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.0%

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

The transmission inspection program identified deteriorated assets that require replacement to avoid transmission interruptions. Failure to complete this project would compromise the reliable operation of this line. Asset failures on this line would decrease system redundancy.

**Why do this project now?**

This work has been prioritized based on the condition of the transmission line assets as determined through NS Power's inspection program results, as well as the criticality of the line to the overall system operation. This project is required to support the reliable operation of the transmission line.

This project is deemed in-service when the first portion of work is completed (January 2021), therefore the Final Cost Date (June 2022) is listed as six months after the last portion of work is completed (December 2021).

**Why do this project this way?**

Replacing the existing deteriorated assets is the only technically feasible option to accomplish the intended scope of this project.

CI Number : C0031069

- L6020 Replacements and Upgrades

Project Number C0031069

Parent CI Number :

-

Asset Location : 1455

- 1455 Transmission General

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	3500 - TP - Wood Poles	601,038
Additions	3800 - TP - Insulators	485,276
Additions	3900 - TP - O/H Cond.	307,440
Retirements	3500 - TP - Wood Poles	217,457
Retirements	3800 - TP - Insulators	214,090
Total Cost:		1,825,300
Original Cost:		128,548

Capital Project Detailed Estimate

<b>Location: Transmission</b> <b>CI#:</b> C0031069 <b>Title:</b> L6020 Replacements and Upgrades <b>Execution Year:</b> 2021										
Description					Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>										
T&D Labour - Design					PD	6	\$ 418	\$ 2,560		
T&D Labour - Site Supervision					PD	46	\$ 402	\$ 18,461		
							Sub-Total	\$ 21,021		
<b>Materials</b>										
Wood Poles					Lot	1	\$ 96,491	\$ 96,491		
Insulators					Lot	1	\$ 30,069	\$ 30,069		
O/H Conductors					Lot	1	\$ 33	\$ 33		
							Sub-Total	\$ 126,593		
<b>Contracts</b>										
Wood Poles					Lot	1	\$ 803,514	\$ 803,514		
Insulators					Lot	1	\$ 484,879	\$ 484,879		
O/H Conductors					Lot	1	\$ 4,833	\$ 4,833		
							Sub-Total	\$ 1,293,226		
<b>Other Goods &amp; Services</b>										
Contingency					%	10%	\$ 1,440,840	\$ 144,084		
							Sub-Total	\$ 144,084		
<b>Vehicle Overhead</b>										
Vehicle AO								\$ 8,055		
							Sub-Total	\$ 8,055		
<b>Administrative Overhead</b>										
Labour AO								\$ 14,335		
Contract AO								\$ 217,986		
							Sub-Total	\$ 232,321		



**CI Number: C0031262**

**Title: 2021/2022 Transmission Switch & Breaker Replacement**

**Start Date:** 2021/03  
**In-Service Date:** 2021/03  
**Final Cost Date:** 2022/11  
**Function:** Transmission  
**Forecast Amount:** \$1,483,048

**DESCRIPTION:**

This project provides for the replacement of deteriorated substation circuit breakers and transmission switches on the NS Power transmission system. The project estimate includes the retirements and replacement of four 138kV circuit breakers, six 138kV transmission line switches, and four 69kV transmission line switches. The circuit breakers and switches being replaced have been prioritized based on the maintenance history, age, number of operations, electrical test results, design or manufacturing issues, inspection results, customers supplied, system redundancy and safety and environmental issues.

NS Power anticipates that a portion of the capital costs associated with this capital item will contribute toward settling the Company's Asset Retirement Obligation for PCB contaminated oil.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2019 CI C0010978 2019/2020 Transmission Switch & Breaker Replacement \$1,044,148
- 2020 CI C0021122 2020/2021 Transmission Switch & Breaker Replacement \$1,312,643
- 2022 CI TBD 2022/2023 Transmission Switch & Breaker Replacement \$TBD
- 2023 CI TBD 2023/2024 Transmission Switch & Breaker Replacement \$TBD

**Depreciation Class:** Transmission Plant – Structures and Improvements  
 Transmission Plant – Station Equipment  
 Transmission Plant – Poles and Fixtures  
 Transmission Plant – Overhead Conductor and Devices  
 Transmission Plant – Underground Conduit

**Estimated Useful Life:** 40 Years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.0%

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Sub Criteria:** Equipment Replacement

**Why do this project?**

This project will replace deteriorated substation circuit breakers and transmission switches. Completing this project will mitigate transmission supply interruptions and maintain reliable operation of the transmission system for customers.

This project is being undertaken primarily to replace assets at the end of their expected useful life, and secondarily to reduce environmental risks by removing oil filled equipment.

**Why do this project now?**

The circuit breakers being replaced are, on average, 50 years old. The expected useful life of a circuit breaker is 40 years. Switches have an expected useful life of 40 years as well and the switches being evaluated for replacement are approaching or past this expected useful life.

This project is deemed in-service when the first disconnect switch or circuit breaker is replaced (March 2021), therefore, the Final Cost Date (November 2022) is listed as six months after the last item is completed (May 2022).

**Why do this project this way?**

Replacement of the transmission breakers and switches is the only option. Due to the age of the devices, replacement parts are no longer available for the majority of the circuit breakers that are being replaced.

**CI Number** : C0031262 - 2020-2021 Transmission Switch and Breaker Replacement

**Project Number** C0031262

**Parent CI Number** : -

**Asset Location** : 1455 - 1455 Transmission General

**Budget Version** 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	0300 - TP - Bldg.,Struct.Grnd.	160,179
Additions	2200 - TP - Elec Contr.Equip.	82,007
Additions	3500 - TP - Wood Poles	71,087
Additions	3900 - TP - O/H Cond.	82,160
Additions	4300 - TP - Substn Dev.	941,796
Additions	4500 - TP - U/G Conduit	41,012
Retirements	3500 - TP - Wood Poles	3,553
Retirements	4300 - TP - Substn Dev.	101,254
Total Cost:		1,483,048
Original Cost:		219,002

Capital Project Detailed Estimate

Location: Transmission											
CI#: C0031262											
Title: 2021/2022 Transmission Switch & Breaker Replacement											
Execution Year: 2021/2022											
Description					Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)	
Regular Labour											
T&D Labour - Electrician/Technician					PD	418	\$ 388	\$ 162,108			
T&D Labour - Design					PD	108	\$ 426	\$ 45,869			
							Sub-Total	\$ 207,977			
Materials											
Building Structures					Lot	1	\$ 58,800	\$ 58,800			
O/H Conductor					Lot	1	\$ 12,100	\$ 12,100			
Electrical Control Equipment					Lot	1	\$ 24,800	\$ 24,800			
Wood poles					Lot	1	\$ 30,000	\$ 30,000			
Substation Devices					Lot	1	\$ 558,800	\$ 558,800			
							Sub-Total	\$ 684,500			
Contracts											
Building Structures					Lot	1	\$ 58,370	\$ 58,370			
Electrical Control Equipment					Lot	1	\$ 24,000	\$ 24,000			
Wood poles					Lot	1	\$ 24,000	\$ 24,000			
O/H Conductor					Lot	1	\$ 48,000	\$ 48,000			
Substation Devices					Lot	1	\$ 36,200	\$ 36,200			
Underground Conduit					Lot	1	\$ 30,000	\$ 30,000			
							Sub-Total	\$ 220,570			
Other Goods & Services											
Contingency					%	10%	\$ 1,113,047	\$ 111,305			
							Sub-Total	\$ 111,305			
Vehicle Overhead											
Vehicle AO								\$ 79,691			
							Sub-Total	\$ 79,691			
Administrative Overhead											
Labour AO								\$ 141,826			
Contract AO								\$ 37,179			
							Sub-Total	\$ 179,005			
SUB-TOTAL (no AO, AFUDC)								\$ 1,224,352			
TOTAL (AO, AFUDC included)								\$ 1,483,048			
Original Cost								\$ 219,002			

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

**CI Number: C0031064**

**Title: L5054 Replacements and Upgrades**

**Start Date:** 2021/01  
**In-Service Date:** 2021/01  
**Final Cost Date:** 2022/06  
**Function Class:** Transmission  
**Forecast Amount:** \$1,134,737

**DESCRIPTION:**

L5054 is a 23 kilometre (86 Structures) 69kV transmission line, built in 1982, that radially connects 16V Weymouth to 93V Saulnierville substations. This project is required to replace deteriorated assets that have been identified through NS Power’s inspection program. This project includes the replacement of deteriorated assets on approximately 20 structures.

The project scope includes:

- Structure Replacements: 3 Structures
- Timber and Insulator Replacements: 10 Structures
- Insulator Replacements: 4 Structures
- Pole Replacements: 2 Structures
- Other Deteriorated Assets: 1 Structure

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include “Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line).”

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** Transmission Plant - Poles and Fixtures

**Estimated Life of the Asset:** 45 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.2%

**JUSTIFICATION:**

**Justification Criteria:** Transmission Plant

**Why do this project?**

The transmission inspection program identified deteriorated assets that require replacement to avoid transmission interruptions. Failure to complete this project would compromise the reliable operation of this transmission line. L5054 is a radial feed to approximately 4,300 customers, and asset failures on this transmission line could result in extended power outages.

**Why do this project now?**

This work has been prioritized based on condition of the transmission line assets as determined through NS Power’s transmission inspection program results, as well as the criticality of the line to overall system operation. This project is required to support the reliable operation of the transmission line.

This project is deemed in-service when the first portion of the work is complete (January 2021), therefore the Final Cost Date (June 2022) is listed as six months after the final work is completed (December 2021).

**Why do this project this way?**

Replacing the existing deteriorated assets is the only technically feasible option to accomplish the intended scope of this project.



Capital Project Detailed Estimate

<b>Location: Transmission</b> <b>CI#: C0031064</b> <b>Title: L5054 Replacements and Upgrades</b> <b>Execution Year: 2021</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
T&D Labour - Design	PD	2	\$ 418	\$ 861		
T&D Labour - Site Supervision	PD	21	\$ 402	\$ 8,337		
			Sub-Total	\$ 9,198		
<b>Materials</b>						
Wood Poles	Lot	1	\$ 37,094	\$ 37,094		
Insulators	Lot	1	\$ 5,964	\$ 5,964		
			Sub-Total	\$ 43,058		
<b>Contracts</b>						
Wood Poles	Lot	1	\$ 705,599	\$ 705,599		
Insulators	Lot	1	\$ 135,873	\$ 135,873		
			Sub-Total	\$ 841,473		
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 893,729	\$ 89,373		
			Sub-Total	\$ 89,373		
<b>Vehicle Overhead</b>						
Vehicle AO				\$ 3,524		
			Sub-Total	\$ 3,524		
<b>Administrative Overhead</b>						
Labour AO				\$ 6,273		
Contract AO				\$ 141,839		
			Sub-Total	\$ 148,111		
				<b>SUB-TOTAL (no AO, AFUDC)</b>	\$ 983,101	
				<b>TOTAL (AO, AFUDC included)</b>	\$ 1,134,737	
<b>Original Cost</b>				\$ 410,861		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						



**CI Number: C0031083**

**Title: New Distribution Rights-of-Way Phase 6**

**Start Date:** 2021/05  
**In-Service Date:** 2021/05  
**Final Cost Date:** 2022/12  
**Function Class:** Distribution  
**Amount:** \$9,762,735

**DESCRIPTION**

This project is to establish new rights-of-way for distribution feeders (where rights of way have not previously existed) on targeted circuits and where current vegetation management maintenance practices have limited impact on preventing off right-of-way tree contacts and their negative influence on reliable operation of NS Power's system. The new rights-of-way will primarily be established adjacent to the road right-of-way edge, where the majority of distribution feeders are currently located and bordered by vegetation.

The total New Distribution Rights-of-Way program is estimated to cost between \$80 million and \$97 million over ten phases. NS Power anticipates the cost of the 10-year program to be between \$8 million to \$10 million per year. This is the sixth year of the 10-year program.

The targeted circuits expected to be included in this project, subject to change based on feeder risk factors such as performance, criticality, and permissions are as follows:

<b>Feeder</b>	<b>Geographic Location</b>	<b>Kilometres of Treatment</b>
1N-405	Truro	13
11S-301	Coxheath	15
104S-311	Baddeck	15
18V-412	Windsor	15
18V-413	Burlington	25
37N-411	Parrsboro	13
37N-413	Parrsboro	5
50W-412	Milton	10
57C-422	Guysborough	11
73W-411	Bridgewater	93
83V-303	New Minas	19
84W-301	Chester	10
96H-412	Sheet Harbour	30
91W-411	Labelle/Greenfield	20
88H-402	Upper Musquodobit	30
13V-303	Bear River	12
1V-443	Vaughan	5

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2019 CI C0010040 New Distribution Rights-of-Way Phase 4 \$10,275,861
- 2020 CI C0020623 New Distribution Rights-of-Way Phase 5 \$10,015,266
- 2022 CI TBD New Distribution Rights-of-Way Phase 7 \$TBD
- 2023 CI TBD New Distribution Rights-of-Way Phase 8 \$TBD

**Depreciation Class:** Distribution Plant - Land Rights- Easements, Surveys and Clearing

**JUSTIFICATION:**

**Justification Criteria:** Distribution System

**Sub Criteria:** Outage Performance

**Why do this project?**

Tree contacts are the leading cause of outage impacts to customers, both during non-storm and storm events. Over the last five years (2015-2019), tree contacts have caused over 15,400 outage events, 1.8 million customer interruptions and 10.5 million customer hours of interruption, which represents 22 percent, 20 percent and 24 percent of these totals, respectively. Approximately 80 percent of these tree contacts are caused by fallen trees from outside of the right-of-way. The vegetation management practices performed under NS Power's asset management program targets vegetation within the rights-of-way, maintaining existing rights-of-way. These activities prevent tree growth from causing outages from within the right-of-way, but do not address edge or off right-of-way trees. Establishing new rights-of-way will reduce the occurrence of edge of right-of-way tree contacts by increasing the separation between trees and distribution feeders.

**Why do this project now?**

During the Post-Tropical Storm Arthur Review (M06321), the Board's consultant, The Liberty Consulting Group (Liberty) recommended NS Power accelerate the Distribution Right-of-Way sustainability efforts in order to achieve additional reliability benefits during major storm events. As set out in NS Power's February 13, 2015 Stakeholder Consultation Report, there was general stakeholder support for accelerating the sustainability program.

A focus on removing trees within and along the edge of the NSTIR rights-of-way will result in more immediate improvements in reliability and require less reactive maintenance going forward. Proactive establishment of new distribution rights-of-way will further improve customer reliability during major and extreme weather events with respect to tree contacts.

This project is forecast to be in-service when the first right of way is created/widened (May 2021), therefore the Final Cost date (December 2022) is six months after the last new right of way is forecast to be established (June 2022).

**Why do this project this way?**

Liberty's report on its review of NS Power's response to Post-Tropical Storm Arthur included the recommendation that, for distribution rights-of-way, NS Power should "develop a comprehensive plan for reclaiming and/or widening the overgrown ROW corridors".<sup>1</sup>

The distribution vegetation management program will be carried-out under three broad initiatives:

- (1) Operating activities for distribution vegetation management
- (2) Capital Routine D010 - Distribution Right-of-Way Widening
- (3) New Distribution Right-of-Ways individual capital projects (i.e. CI 49611, CI 50796, CI C0001950, CI C0010040, CI C0020623 and CI C0031083)

Taken together, these initiatives will address the findings of the Post-Tropical Storm Arthur proceeding. The scope of work to be completed under this CI and subsequent phases is to establish new rights-of-way where none have previously existed. The new rights-of-way will primarily be established adjacent to the road right-of-way edge, where the majority of distribution feeders are currently located and bordered by vegetation.

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<sup>1</sup> Review of Nova Scotia Power Inc.'s (NSPI) state of preparedness and response to Post-Tropical Storm Arthur, M06321, The Liberty Consulting Group, Comments on Review of NS Power's Storm Response, Exhibit A-4, September 9, 2014, page 7.

# REDACTED (CONFIDENTIAL INFORMATION REMOVED)

2021 ACE Plan CI C0031083 Page 3 of 4

CI Number : C0031083

- New Distribution Rights-of-Way Phase 6

Project Number C0031083

Parent CI Number :

-

Asset Location : 1456

- 1456 Distribution Plant General

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	0200 - DP - Land Rights	9,762,735
Total Cost:		9,762,735
Original Cost:		

Capital Project Detailed Estimate

<b>Location: Distribution</b> <b>CI#:</b> C0031083 <b>Title:</b> New Distribution Rights-of-Way Phase 6 <b>Execution Year:</b> 2021-2022						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#'s)
<b>Contracts</b>						
1N-405	km	13	\$ 24,500	\$ 318,500		
11S-301	km	15	\$ 24,500	\$ 367,500		
104S-311	km	15	\$ 24,500	\$ 367,500		
18V-412	km	15	\$ 24,500	\$ 367,500		
18V-413	km	25	\$ 24,500	\$ 612,500		
37N-411	km	13	\$ 24,500	\$ 318,500		
37N-413	km	5	\$ 24,500	\$ 122,500		
50W-412	km	10	\$ 24,500	\$ 245,000		
57C-422	km	11	\$ 24,500	\$ 269,500		
73W-411	km	93	\$ 24,500	\$ 2,278,500		
83V-303	km	19	\$ 24,500	\$ 465,500		
84W-301	km	10	\$ 24,500	\$ 245,000		
96H-412	km	30	\$ 24,500	\$ 735,000		
91W-411	km	20	\$ 24,500	\$ 490,000		
88H-402	km	30	\$ 24,500	\$ 735,000		
13V-303	km	12	\$ 24,500	\$ 294,000		
1V-443	km	5	\$ 24,500	\$ 122,500		
Sub-Total				\$ 8,354,500		
<b>Administrative Overhead</b>						
Contract AO				\$ 1,408,235		
Sub-Total				\$ 1,408,235		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 8,354,500		
<b>TOTAL (AO, AFUDC included)</b>				\$ 9,762,735		
<b>Original Cost</b>				\$ -		
Note 1: The labor figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						

**CI Number: C0031145**

**Title: 2021 Padmount Replacement Program**

**Start Date:** 2021/02  
**In-Service Date:** 2021/02  
**Final Cost Date:** 2022/07  
**Function Class:** Distribution  
**Forecast Amount:** \$1,636,153

**DESCRIPTION:**

This project will replace 70 padmount transformers identified through the padmount inspection program to be at or near end of expected useful life. NS Power has 4,205 padmount transformers across its fleet which are inspected annually. The expected useful life of these assets is between 35-45 years. This is an ongoing program as part of lifecycle and condition management of the in-service distribution padmount transformer inventory.

NS Power anticipates that a portion of the costs associated with this capital item will contribute toward settling the Company's Asset Retirement Obligation for Polychlorinated Biphenyls (PCB) contaminated oil.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for Transmission/Distribution include "Work completed on the same asset class (Padmount transformers, Breakers, etc.) or in the same location (feeder, Transmission Line)."

- 2019 CI C0011208 2019 Padmount Replacement Program \$1,413,544
- 2020 CI C0020835 2020 Padmount Replacement Program \$1,612,389
- 2022 CI TBD 2022 Padmount Replacement Program \$TBD
- 2023 CI TBD 2023 Padmount Replacement Program \$TBD

**Depreciation Class:** Distribution Plant – Line Transformers  
 Distribution Plant – Underground Conductors and Devices

**Estimated Useful Life:** 40 years

**Retirement Information:**

- Categorization of Retirement: Accounting Policy 6420 - Retirement and Disposal of Capital Assets
- Percentage of Asset Pool: 0.1%

**JUSTIFICATION:**

**Justification Criteria:** Distribution System

**Why do this project?**

Padmount transformer inspections have identified transformers that need to be replaced in 2021 due to deterioration. Proactive, planned replacement of end of expected useful life padmount transformers mitigates the potential for prolonged, unplanned customer outages from transformer failure.

This project will also aid in the prevention of environmental incidents, as padmount transformer failures can result in an oil release, which is prohibited by environmental regulations and result in remediation costs.

**Why do this project now?**

Padmount transformers at or near the end of useful life were identified through the padmount inspection process and prioritized for replacement. They will be replaced in a planned manner as part of NS Power's environmental due diligence.

This project is deemed in-service when the first transformer is completed (February 2021), therefore the Final Cost Date (July 2022) is listed as six months after the last transformer is completed (January 2022)

**Why do this project this way?**

Padmount transformers are typically associated with commercial customers. Planned replacement of end of expected useful life padmount transformers is conducted during an outage coordinated with the customer. The planned replacement of these transformers under this project will minimize unplanned customer outages and mitigate potential environmental impact.

**CI Number** : C0031145 - 2021 Padmount Replacement Program

**Project Number** C0031145

**Parent CI Number** :

**Asset Location** : 1456 - 1456 Distribution General

**Budget Version** 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	4600 - DP - U/G Conductor	97,764
Additions	4800 - DP - U/G Line Transf.	1,453,991
Retirements	4800 - DP - U/G Line Transf.	84,398
Total Cost:		1,636,153
Original Cost:		623,442

**Capital Project Detailed Estimate**

<b>Location: Distribution</b>											
<b>CI#: C0031145</b>											
<b>Title: 2021 Padmount Replacement Program</b>											
<b>Execution Year: 2021</b>											
Description					Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)	
<b>Regular Labour</b>											
T&D Labour - Design					PD	118	\$ 426	\$ 50,125			
T&D Labour - PLT					PD	280	\$ 395	\$ 110,620			
							Sub-Total	\$ 160,745			
<b>Materials</b>											
U/G Conductor					LOT	1	\$ 76,631	\$ 76,631			
U/G Line Transformer					LOT	1	\$ 986,669	\$ 986,669			
							Sub-Total	\$ 1,063,300			
<b>Contracts</b>											
U/G Line Transformer					LOT	1	\$ 93,408	\$ 93,408			
							Sub-Total	\$ 93,408			
<b>Other Goods &amp; Services</b>											
Contingency					%	10%	\$ 1,317,453	\$ 131,745			
							Sub-Total	\$ 131,745			
<b>Vehicle Overhead</b>											
Vehicle AO								\$ 61,593			
							Sub-Total	\$ 61,593			
<b>Administrative Overhead</b>											
Labour AO								\$ 109,617			
Contract AO								\$ 15,745			
							Sub-Total	\$ 125,362			
<b>SUB-TOTAL (no AO, AFUDC)</b>								\$ 1,449,198			
<b>TOTAL (AO, AFUDC included)</b>								\$ 1,636,153			
<b>Original Cost</b>								\$ 623,442			

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



**CI Number: 49094**

**Title: IT – Privileged Access Management**

**Start Date:** 2016/06  
**In-Service Date:** 2021/09  
**Final Cost Date:** 2022/06  
**Function:** General Plant  
**Forecast Amount:** \$3,211,166

**DESCRIPTION:**

This project will select, design, configure, and implement a Privileged Access Management (PAM) solution, including all related hardware and software. A PAM solution removes or reduces cyber related risks by eliminating unnecessary local admin privileges, blocking privileged credential theft attempts and ransomware attacks, auditing malicious behavior and strengthening the security of privileged accounts. A privileged account is a user account that has more privileges than ordinary users. Privileged accounts might, for example, be able to install or remove software, upgrade the operating system, or modify system or application configurations. Privileged access accounts are held by authorized employees and third-party service providers. Privileged access accounts permit administrative access to sensitive data across critical Information Technology (IT) assets and applications that support the delivery of services to customers. Privileged accounts exist at the user, infrastructure, and application levels across NS Power’s technology environments.

A PAM solution will integrate across all NS Power IT platforms (including cloud-based services) and automate the governance of and provide real-time monitoring and reporting of cyber threats associated with privileged access accounts. A PAM solution provides the controls required to meet Sarbanes–Oxley (SOX) and North American Electric Reliability Corporation (NERC) compliance requirements.

The most lucrative data breach is usually a targeted threat seeking some sort of admin-based privileged account credentials, allowing cyber-criminals to either extract data, make configuration changes, or begin the work of a ransomware case. In addition to outside threats from cyber-criminals, PAM is crucial to protect against insider threats, usually from users already in network environment.

**Summary of Related CIs +/- 2 years:**

Pursuant to Section 11.2 of the CEJC, related CIs for General Plant projects include “work completed on the same asset (application, building, etc.).”

- No other projects in 2019, 2020, 2021, 2022 or 2023

**Depreciation Class:** General Plant – Computer Software

**Estimated Life of the Asset:** 6 years

**JUSTIFICATION:**

**Justification Criteria:** Information Technology Application and Hardware System

**Sub Criteria:** Technical

**Why do this project?**

NS Power’s current process to protect privileged accounts is a manual process. As cyber criminals become more sophisticated and NS Power’s technology footprint increases, the risk of a cyber related data breach targeted at privileged accounts increases, therefore the manual monitoring of these accounts is not sustainable to mitigate the risk. The implementation of an automated PAM solution is required.

Attacking privileged accounts is one of the most common techniques used by cyber threat parties leveraging malicious software looking to gain access into an organization. Privileged accounts have access over and above a typical user account and are either granted to employees or in many cases, built into applications and technology platforms for emergency use. Compromising a privileged account allows anyone who gains possession of them to control and disrupt critical systems, disable security controls, and access sensitive data. 74 percent of data breaches are related to

privileged access credential abuse by cyber-attacks that target and gain access to these accounts to disrupt business operations or steal company data.<sup>1</sup>

A PAM solution will automate the overall methodology for governance, access, monitoring and reporting. It will reduce manual operational overhead and mitigate the risk of sensitive information being obtained without proper identification, authentication, and authorization of the user. This will be achieved by centralizing and standardizing the use of privileged access and applying automated governance to enforce who is able to access and use them.

### Why do this project now?

Privileged accounts today have manual governance processes before they are approved for use but must continuously be reviewed, tracked, and managed so that should they be a target of a cyber-attack, it would reduce the amount of time an account would be available for an attack and thereby mitigate any impact. Currently, privileged accounts are tightly tracked, managed, and controlled. These accounts are only provided to a small group of individuals. This manual approach is not scalable as NS Power invests in additional technology solutions across the business and the number of privileged accounts used internally or by third parties cannot be sustainably managed.

Adversaries and security practitioners are both aware of the exposure and risk of privileged access. Privileged account access is a top priority among security practitioners.<sup>3</sup> With the increased sophistication of cyber threats, privileged accounts represent the primary way that damage can be done if not properly secured.

A PAM solution is deployed for a number of applications and infrastructure that will be completed over the duration of the project. This project will be considered in-service when the solution is implemented for the first application and/or piece of infrastructure is completed (September 2021), therefore the Final Cost Date (June 2022) is listed as six months after the last portion of work is completed (December 2021).

### Why do this project this way?

A centralized automated PAM solution to manage policy and access of privileged accounts is the accepted best practice across organizations of the size and complexity of NS Power.<sup>2</sup> The following alternatives were considered:

- an on-premises solution (completely within the NS Power data center);
- Software as a Service (SaaS) (located in the cloud); and
- a hybrid solution, which includes a combination of on-premises for infrastructure, and SaaS for securing user workstation privileges.

A fully on-premises solution did not meet the requirements for securing user workstation privileges (e.g. laptops) as the vendor is moving to a SaaS first model for this component and therefore the solution that supports the capabilities for user workstation will no longer receive functional updates. The full SaaS model did not meet NS Power's business requirements for the storing of sensitive information within the cloud related to NERC. Because neither the fully on-premises nor SaaS solutions met business requirements, they were not considered further. A hybrid solution which includes a combination of on-premises infrastructure and SaaS for securing user workstations privileges was chosen as it will fully meet the requirements of both core risk areas.

<sup>1</sup> <https://www.forbes.com/sites/louiscolumbus/2019/02/26/74-of-data-breaches-start-with-privileged-credential-abuse/#7d4fd7b53ce4>

<sup>2</sup> Ibid

<sup>3</sup> [Surge in Attacker Access to Privileged Accounts and Services Puts Businesses at Risk | 2020-03-03 | Security Magazine](#)

# REDACTED (CONFIDENTIAL INFORMATION REMOVED)

REDACTED 2021 ACE Plan CI 49094 Page 3 of 4

CI Number : 49094-P996

- IT - Privileg Access Management

Project Number 49094-P996

Parent CI Number :

-

Asset Location : 1500

- 1500 General Plant General

Budget Version 2021 ACE Plan

## Capital Item Accounts

Exp. Type	Utility Account	Forecast Amount
Additions	7800 - GP - Comp. Appl. Software	3,211,166
Total Cost:		3,211,166
Original Cost:		

<b>Location: General Plant</b> <b>CI#: 49094</b> <b>Title: IT - Privileged Access Management</b> <b>Execution Year: 2021-2022</b>						
Description	Unit	Quantity	Unit Estimate	Total Estimate	Cost Support Reference	Completed Similar Projects (FP#s)
<b>Regular Labour</b>						
Technical Lead/Solution Architect	PD	246	\$ 350	\$ 86,100		
Project Manager	PD	273	\$ 350	\$ 95,550		
Business Analyst	PD	280	\$ 350	\$ 98,000		
OCM	PD	124	\$ 350	\$ 43,400		
IT Security Analyst	PD	283	\$ 350	\$ 99,050		
BSA - Network Analyst	PD	32	\$ 350	\$ 11,200		
BSA- Infrastructure Analyst	PD	42	\$ 350	\$ 14,700		
BSA- ITSM (ServiceNow Support)	PD	34	\$ 350	\$ 11,900		
QA Test Analyst/Test Lead	PD	191	\$ 350	\$ 66,850		
PAM App support/Platform SME	PD	273	\$ 350	\$ 95,550		
BSA-ERP HR (PeopleSoft Support)	PD	44	\$ 350	\$ 15,400		
Business SMEs	PD	53	\$ 350	\$ 18,550		
PMO	PD	68	\$ 350	\$ 23,800		
			Sub-Total	\$ 680,050		
<b>Software</b>						
Core PAS Licenses (Named)	Unit	80			Attachment 1, page 38, line item 1	
Named user license for 3rd party / external vendor	Unit	50			Attachment 1, page 38, line item 2	
Application Authentication and Credential Retrieval (Rapid7)	Unit	1			Attachment 1, page 38, line item 3	
Microsoft Server Datacenter license+ Software Assurance	Unit	60			Attachment 2	
VMWare license	Unit	10			Attachment 3	
USD Exchange	%	31%				
			Sub-Total	\$ 288,914		
<b>Hardware</b>						
HX-CPU-I6230 (CPU)	Lot	1			Attachment 4, line item 1.1.19	
HX-MR-X32G2RT-H (RAM)	Lot	1			Attachment 4, line item 1.1.18	
Hyperflex Infrastructure	Lot	1			Attachment 4, line items identified as "Hyperflex Infrastructure"	
			Sub-Total			
<b>Consulting</b>						
PAM Vendor	Lot	1			Attachment 1, page 40	
MSP Support	Lot	1				
VM set up fee	Ea	10	\$ 842	\$ 8,420		
Project Manager	PD	85	\$ 1,000	\$ 85,000		
Business Analyst	PD	85	\$ 950	\$ 80,750		
OCM	PD	47	\$ 1,100	\$ 51,700		
Technical Lead/CyberSecurity SME	PD	87	\$ 1,100	\$ 95,700		
Infrastructure planning support (CGI)	Lot	1	\$ 1,921	\$ 1,921		
			Sub-Total	\$ 1,210,218		
<b>Training</b>						
Training	Ea	4			Attachment 1, page 38, line item 9	
			Sub-Total			
<b>Other Goods &amp; Services</b>						
Contingency	%	10%	\$ 2,503,291	\$ 250,329		
			Sub-Total	\$ 250,329		
<b>Interest Capitalized</b>						
AFUDC				\$ 51,389		
			Sub-Total	\$ 51,389		
<b>Administrative Overhead</b>						
Labour AO				\$ 406,157		
			Sub-Total	\$ 406,157		
<b>SUB-TOTAL (no AO, AFUDC)</b>				\$ 2,753,620		
<b>TOTAL (AO, AFUDC included)</b>				\$ 3,211,166		
<b>Original Cost</b>				\$ -		
Note 1: The labour figures noted above are an average of salaries across a variety of jobs within similar classifications including fringe, and are used solely for budgeting purposes. Note 2: Small differences in totals are attributable to rounding.						

**2021 ACE Plan CI 49094 Attachment 1 has been removed  
due to confidentiality.**

**Quote Number: Q-81875**

**Client:** Nova Scotia Power Inc.

**Bill To**  
**Address:** 1223 LOWER WATER ST  
 BLOCK A, 3RD FLOOR HALIFAX, NS  
 B3J 3S8

**Phone Number:**  
**Contact Name:**  
**Contact Email:**

**Enterprise Agreement: BUDGETARY  
ESTIMATE ONLY**

**Currency:** CAD

**Ship To:**  
**Address:** 1223 LOWER WATER ST  
 BLOCK A, 3RD FLOOR HALIFAX, NS  
 B3J 3S8

Quote Date: **05-Oct/2020**  
 Quoted By: Karim Siaghi | (514) 932-3675 |  
 karim.siaghi@softchoice.com  
 AM: Jonathan Lazzarotto



Authorization Number  
 Quote Start Date: 01-Nov-2020  
 Months Quoted: 36  
 Previous Authorization Number:

Payment options are only available in listed currency and not billable in other currencies. Pricing, availability and special offers are subject to change at any time. As noted in the Microsoft Enterprise Agreement, any subscription services within this quote will automatically renew unless Softchoice is notified in writing at least 30 days prior to your anniversary. If you are within the final year of your agreement the previous statement does not apply; new products and quantities will be reviewed in your renewal process.

Quote Summary		
Payment Due	01-Nov/2020	

Product Pool	Level	Product #	Item Description	License Type	Unit Price	Coverage in Months	Quantity	Extended Cost
Servers		2000239458	WinSvrDCCore ALNG LicSAPk MVL 2Lic CoreLic	Perpetual License & Maintenance		1		
Sub Total:								

DELIVERY: Ground - 3 to 5 days						\$0.00
HST						
All currency in this quote is in (CAD).						TOTAL

my vmware

Products

Support

Accounts

Knowledge



Home / Redeem Products

# Review Products in your Cart

Account

Nova Scotia Power Inc.

Fund

TRUE-UP

Products

\$0.00 Products

Product	Quantity	Unit Cost	Cost
<b>VMware vCloud / VCLOUD-VC</b> VMware vCloud Suite 2018 Standard CL18-STD-C <a href="#">SnS: Duration for 588 days</a>	10 <a href="#">edit</a> 		

Due Now

License Cost

SnS Cost

Remaining Fund Balance

### Price Estimate

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CANADA  
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CANADA

Price Estimate for planning and information purposes only and is not a binding offer from Cisco.

Date: 02-Oct-2020

Estimate ID: HV119391711TI  
Deal ID: NA  
Product Total  
Service Total :  
Subscription Total  
Total Price:

All prices are shown in CAD

Line Number	Part Number	Smart Account Mandatory	Description	Service Duration (Months)	Estimated Lead Time (Days)	Pricing Term	Qty	Unit Net Price	Extended Net Price
Group Name: Hyperflex Cluster Expansion									Subtotal=
1.0	HX2X0C-M5S	-	Cisco Hyperconverged System	---	N/A		1		
1.1	HX240C-M5SX	-	Cisco HyperFlex HX240c M5 Node	---	14		7		
1.1.0.1	CON-SNTP-240CM5SX	-	SNTP 24X7X4 Cisco HyperFlex HX240c M5 Node Start Date 30-Nov-2020 End Date 28-Dec-2022	24.96666667	N/A		7		
1.1.1	HX-M2-240GB	-	240GB SATA M.2	---	14		7		
1.1.2	HX-MLOM-C25Q-04	-	Cisco UCS VIC 1457 Quad Port 10/25G SFP28 CNA MLOM	---	14		7		
1.1.3	HX-MSD-32G	-	32GB Micro SD Card for UCS M5 servers	---	14		7		
1.1.4	HX-PSU1-1050W	-	Cisco UCS 1050W AC Power Supply for Rack Server	---	14		14		
1.1.5	HX-RAILB-M4	-	Ball Bearing Rail Kit for C220 M4 and C240 M4 rack servers	---	14		7		
1.1.11	HX-SAS-M5HD	-	Cisco 12G Modular SAS HBA for up to 26 drives	---	14		7		
1.1.12	HX-HD24TB10K4KN	-	2.4 TB 12G SAS 10K RPM SFF HDD (4K)	---	14		140		
1.1.13	HX-SD240GM1X-EV	-	240GB 2.5 inch Enterprise Value 6G SATA SSD	---	14		7		
1.1.14	HX-CMAF-M4	-	Reversible CMA for C220 M4 friction & ball bearing rail kits	---	14		7		
1.1.15	HX-SD16T123X-EP	-	1.6TB 2.5in Enterprise Performance 12G SAS SSD(3X endurance)	---	14		7		
1.1.16	HX-VSP-6-5-FND-D	-	Factory Installed -vSphere SW 6.5 Enduser to provide License	---	14		7		
1.1.18	HX-MR-X32G2RT-H	-	32GB DDR4-2933-MHz RDIMM/2Rx4/1.2v	---	14		84		
1.1.19	HX-CPU-I6230	-	Intel 6230 2.1GHz/125W 20C/22 MB 3DX DDR4 2933 MHz	---	14		14		
1.1.20	HX-RIS-1-240M5	-	Riser 1 3PCIe slots (x8, x16, x8); slot 3 req CPU2, For T4	---	14		7		
1.1.21	CAB-N5K6A-NA	-	Power Cord, 200/240V 6A North America	---	7		14		
1.3	HXDP-S001-3YR=	Yes	Cisco HyperFlex Data Platform Standard Edition 3 Yr Subscrip	---	14		7		
1.3.0.1	HXDP-S001-3YR	-	HyperFlex Data Platform Standard Edition 3 Yr Subscription	36	N/A		7		
2.0	SFP-H25G-CU3M=	-	25GBASE-CU SFP28 Cable 3 Meter	---	70		14		

Valid through: 30-Nov-2020

FOB Point: None

Notes

\*This Price Estimate does not constitute an offer by CISCO to sell products, but is instead an invitation to issue a purchase order to CISCO until the valid date specified in this price estimate. Such a purchase order will be subject to Cisco's standard procedures, terms and conditions for the acceptance of purchase orders. This order may be subject to indirect tax (VAT, GST, sales tax or other indirect taxes), duty and freight charges even if not noted on this estimate.\*



CONFIDENTIALITY MATRIX

<b>LEGEND</b>	
Confidential in Entirety (shaded)	TS = Technical Support
Partially Confidential (Italicized)	CS = Cost Support
(1) = Commercial/Cost Information	
(2) = Third Party Proprietary Information	*Includes Description, PowerPlant (PP), Detailed Cost Estimate (DCE), and Economic Analysis Model (EAM).
(3) = System Security	

Function/Tab#	Capital Work Order	Work Order Main Body*	Attachment 1	Attachment 2	Attachment 3	Attachment 4
Generation						
	Steam Projects					
	Turbine					
G01	C0030528 - TUC3 HP Turbine Refurbishment	DCE (1)	TS: OEM Bulletin (2)	CS: Vendor Quote (1)		
	Gas Turbine					
G02	C0020944 - LM6000 - 191-443 Hot Section and Engine Refurbishment	DCE (1)	CS: Vendor Quote (1)	CS: Vendor Quote (1)		
G03	46483 - CT - TUS Control System Upgrade	DCE (1)	CS: Vendor Quote (1)			
Transmission						
T01	C0031263 - 2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal					
T02	C0031089 - 2021/2022 Transmission Right-of-Way Widening 69kV					
T03	C0031122 - L6539 Replacements and Upgrades					
T04	C0031085 - L6516 Replacements and Upgrades Phase 1					
T05	C0031050 - New Large Spare Autotransformer					
T06	C0033644 - 2021/2022 Steel Tower Life Extension					
T07	C0033645 - 2021/2022 Steel Tower Refurbishment					
T08	C0031069 - L6020 Replacements and Upgrades					
T09	C0031262 - 2021/2022 Transmission Switch & Breaker Replacement					
T10	C0031064 - L5054 Replacements and Upgrades					
Distribution						
D01	C0031083 - New Distribution Rights-of-Way Phase 6					
D02	C0031145 - 2021 Padmount Replacement Program					
General Plant						
GP01	49094 - IT – Privileged Access Management	DCE (1)	CS: Vendor Proposal (2)	CS: Vendor Quote (1)	CS: Vendor Quote (1)	CS: Vendor Quote (1)

**1 - Commercial Information**

To protect value for customers and mitigate the risk of prospective proponents having access to the information itemized in the confidentiality matrix, and maintain good business relations with vendors, this information is confidential.

The more a supplier is aware of NS Power's specific requirements and a competing vendor's costs, the better the supplier's ability to obtain the highest price, reduce competition and ultimately increase the cost for NS Power and its customers. The cost of such transparency is not always immediately evident. Information from regulatory proceedings can provide competitive advantages over other suppliers, and that could be advantageous in bidding or negotiation. Higher prices, or avoidable contractual constraints, will result in unnecessary higher costs to customers.

NS Power seeks to keep the terms and conditions of suppliers pricing and arrangements confidential from their other customers or potential competitors. This prevents competitors from using the information to gain a competitive advantage. This is equally true for NS Power, which desires to protect its ability to acquire services and equipment on the most competitive terms. Those "best" terms may not be available if there is a risk that they will be disclosed to the customers or competitors of the supplier.

Since NS Power customer rates are cost-based, the maintenance of confidentiality for this item is to the direct benefit of customers.

**2 - Third Party Proprietary Information**

This is information belonging to third parties for which those third parties have asserted confidentiality over proprietary cost and technical information.

**3 - System Security**

One-Line diagrams frequently included in system planning studies are confidential due to system security concerns. Protection of the power system preserves reliability and reduces the risks associated with external threats.

**2021 ACE Plan Appendix B has been filed electronically.**

NS Power 2020 Capital Spend

3rd Quarter Overview - as of September 30, 2020

	Generation	Distribution	Transmission	General Property	Total NS Power
<b>2020 Submitted ACE Total</b>	<b>\$ 140,127,337</b>	<b>\$ 122,830,819</b>	<b>\$ 54,580,234</b>	<b>\$ 58,554,104</b>	<b>\$ 376,092,493</b>
<b>Total YTD Spend</b>	44,023,635	105,914,206	31,999,740	23,004,604	204,942,186
<b>Variance YTD/ACE Spend</b>	(96,103,701)	(16,916,613)	(22,580,494)	(35,549,500)	(171,150,307)
<b>Percentage of ACE Spent as of September 30, 2020</b>	31%	86%	59%	39%	54%
<b>Add:</b>					
ATOs	763,142	50,483	-	-	813,626
U&Us/P&As	2,140,601	-	1,700,679	2,229,267	6,070,547
Changes to ACE Items for Subsequent Approval	1,562,558	(116,592)	-	1,164,598	2,610,563
<b>Total Increase</b>	<b>4,466,301</b>	<b>(66,109)</b>	<b>1,700,679</b>	<b>3,393,865</b>	<b>9,494,736</b>
<b>Less:</b>					
Projects cancelled	(39,861)	-	(391,978)	-	(431,839)
Projects deferred	(9,733,010)	(255,732)	(1,136,018)	(1,116,212)	(12,240,972)
<b>Total Decrease</b>	<b>(9,772,871)</b>	<b>(255,732)</b>	<b>(1,527,996)</b>	<b>(1,116,212)</b>	<b>(12,672,811)</b>
<b>2020 Potential Capital Spend*</b>	<b>\$ 134,820,767</b>	<b>\$ 122,508,977</b>	<b>\$ 54,752,918</b>	<b>\$ 60,831,757</b>	<b>\$ 372,914,419</b>

\* Amounts do not reflect the reforecast of capital projects since the 2020 ACE Plan submission, or reforecasting of subsequent items filed.

NS Power Capital Item Status Update

2020 3rd Quarter Overview - Updated for ACE 2021

This report includes all projects submitted to the UARB and remain active, as well as ACE Plan subsequent submittal projects. Projects are removed from this report once the project has been final costed (internal or external), cancelled, or falls below \$1M.

Status	Category	CI Number	Title	ACE Plan Reference (or U&U and P&A)	Submission/Date	ACE Amount	Submission or Approved Amount	Actual Spend	FIN Submission Date	FIN Amount	Variance
Approved	Transmission	43267	13V Gulch Hydro Replace 13V-GT1 and 13V-WR1	2015 ACE Plan	2015 ACE Plan	\$ 1,061,902	\$ 1,061,902	\$ 1,061,936			
Approved	Transmission	52314	1C-GT1/UT1 Replacement	2018 ACE Plan	2018 ACE Plan	\$ 2,032,393	\$ 2,032,393	\$ 1,300,374			
Internally FIN'd	Transmission	49814	2017 / 2018 Steel Tower Life Extension	2017 ACE Plan	2017 ACE Plan	\$ 1,462,100	\$ 1,462,100	\$ 1,643,871			
Approved	Transmission	49815	2017 / 2018 Steel Tower Refurbishment	2017 ACE Plan	2017 ACE Plan	\$ 2,003,317	\$ 2,003,317	\$ 1,909,207			
Internally FIN'd	Distribution	49806	2017 Padmount Replacement Program	2017 ACE Plan	2017 ACE Plan	\$ 1,703,774	\$ 1,703,774	\$ 1,719,177			
Approved	Distribution	49919	2017 PCB Pole Top Transformer Replacement	2017 ACE Plan	2017 ACE Plan	\$ 2,446,051	\$ 2,446,051	\$ 1,669,967			
Internally FIN'd	Transmission	49813	2017 Sacrificial Anode Installation Program	2017 ACE Plan	2017 ACE Plan	\$ 1,532,340	\$ 1,532,340	\$ 1,749,977			
Internally FIN'd	Transmission	49922	2017 Transmission Right of Way Widening	2017 ACE Plan	2017 ACE Plan	\$ 5,400,855	\$ 5,400,855	\$ 5,494,423			
Approved	Transmission	49948	2017/2018 Isolated Structure Replacements	2017 ACE Plan	2017 ACE Plan	\$ 3,822,487	\$ 3,822,487	\$ 2,523,897			
Approved	Transmission	49838	2017/2018 Substation Polychlorinated Biphenyl (PCB) Equipment Removal Program	2017 ACE Plan	2017 ACE Plan	\$ 4,127,023	\$ 4,127,023	\$ 4,339,730			
Approved	Transmission	49818	2017/2018 Transmission Switch & Breaker Replacement	2017 ACE Plan	2017 ACE Plan	\$ 1,074,472	\$ 1,074,472	\$ 1,045,371			
Approved	Distribution	52271	2018 Padmount Replacement	2018 ACE Plan	2018 ACE Plan	\$ 1,657,205	\$ 1,657,205	\$ 1,617,507			
Approved	Distribution	51493	2018 PCB Pole Top Transformer Replacement	2018 ACE Plan	2018 ACE Plan	\$ 1,360,354	\$ 1,360,354	\$ 1,169,156			
Approved	Transmission	51403	2018 PCB Removal Program	2018 ACE Plan	2018 ACE Plan	\$ 4,402,342	\$ 4,402,342	\$ 3,429,101			
Internally FIN'd	Transmission	51969	2018 Transmission ROW Widening 69kV	2018 ACE Plan	2018 ACE Plan	\$ 5,487,686	\$ 5,487,686	\$ 5,542,106			
Approved	Transmission	51405	2018 Wood Pole Retirement Program	2018 ACE Plan	2018 ACE Plan	\$ 1,361,076	\$ 1,361,076	\$ 924,524			
Approved	Transmission	52258	2018/2019 Isolated Structure Replacement	2018 ACE Plan	2018 ACE Plan	\$ 4,818,521	\$ 4,818,521	\$ 294,849			
Approved	Transmission	51402	2018/2019 Sacrificial Anode Installation	2018 ACE Plan	2018 ACE Plan	\$ 3,023,668	\$ 3,023,668	\$ 3,073,226			
Internally FIN'd	Transmission	51404	2018/2019 Steel Tower PA	P&A	OTQ - September 15, 2017	\$	\$ 2,981,318	\$ 2,992,783			
Approved	Transmission	51398	2018/2019 Steel Tower Refurbishment	2018 ACE Plan	2018 ACE Plan	\$ 1,992,692	\$ 1,992,692	\$ 2,017,761			
Approved	Transmission	51406	2018/2019 Transmission Switch & Breaker Replacement	2018 ACE Plan	2018 ACE Plan	\$ 1,405,891	\$ 1,405,891	\$ 500,120			
Approved	Distribution	47787	2H Armadale New Feeders	2017 ACE Plan (for Subsequent Approval)	OTQ - April 6, 2020	\$ 1,285,679	\$ 1,734,221	\$ 1,733,516			
Approved	Transmission	48811	2H Armadale Transformer Addition	2016 ACE Plan (for Subsequent Approval)	OTQ June 30, 2016	\$ 2,545,596	\$ 2,568,861	\$ 2,816,287			
Approved	Transmission	48131	48H-T1 Replacement	2018 ACE Plan	2018 ACE Plan	\$ 1,281,449	\$ 1,281,449	\$ 1,212,547			
Approved	Transmission	52328	56N-T1 Transformer Upgrades	2018 ACE Plan	2018 ACE Plan	\$ 1,279,271	\$ 1,279,271	\$ 1,116,746			
Approved	Transmission	51975	5P Mobile Substation Replacement	2018 ACE Plan	2018 ACE Plan	\$ 4,829,458	\$ 4,829,458	\$ 1,285,333			
Deferred	Transmission	45053	69kV Structure Replacements West	2017 ACE Plan (for Subsequent Approval)		\$ 4,818,017	\$	\$ 225,494			
Approved	Transmission	51956	6P Mobile Substation Rewind U&U	U&U	Q3 2017 - October 30, 2017	\$	\$ 1,516,121	\$ 1,699,942			
Internally FIN'd	Transmission	47760	8S-402 Re-Insulator	2017 ACE Plan (for Subsequent Approval)	OTQ - March 30, 2017	\$ 1,259,666	\$ 1,551,859	\$ 1,700,024			
Approved	Distribution	47124	Advanced Metering Infrastructure	2017 ACE Plan (for Subsequent Approval)	OTQ - October 19, 2017	\$ 8,274,738	\$ 133,228,953	\$ 122,955,467			
Internally FIN'd	General Plant	48552	Backbone Communications System Upgrade	2015 ACE Plan (for Subsequent Approval)	OTQ - September 30, 2015	\$ 12,525,792	\$ 8,913,092	\$ 9,030,024			
Deferred	Generation	45116	CT - BG71 GGAC-1D Engine Refurbishment	2015 ACE Plan		\$ 1,168,167	\$ 1,168,167	\$ -			
Approved	Generation	51711	CT Burnside #2 Generator Replacement	P&A	OTQ - July 17, 2018	\$	\$ 3,306,710	\$ 3,162,296			
Approved	Generation	33142	CT - Burnside #4 Unit Restoration	2015 ACE Plan (for Subsequent Approval)	OTQ - September 15, 2017	\$ 3,469,160	\$ 9,552,963	\$ 9,664,304			
Approved	Generation	51526	CT Tusket Generator Replacement	P&A	OTQ - July 17, 2018	\$	\$ 3,810,417	\$ 3,566,345			
Internally FIN'd	Generation	49946	HYD - Fourth Lake Overhaul	2018 ACE Plan	2018 ACE Plan	\$ 1,025,769	\$ 1,025,769	\$ 1,145,995			
Approved	Generation	48918	HYD - Malara Falls Facility Repair	2017 ACE Plan (for Subsequent Approval)	Q3 2017 - October 30, 2017	\$ 446,237	\$ 1,034,045	\$ 91,227			
Internally FIN'd	Generation	49943	HYD - Ruth Falls Facility Refurbishment	2018 ACE Plan	2018 ACE Plan	\$ 1,234,931	\$ 1,234,931	\$ 1,448,745			
Approved	Generation	47551	HYD - SHH Controls Upgrade	2016 ACE Plan (for Subsequent Approval)	Q4 2015 - January 29, 2016	\$ 1,092,851	\$ 1,749,212	\$ 920,401			
Deferred	Generation	49942	HYD - Tidewater Facility Refurbishment	2018 ACE Plan	2018 ACE Plan	\$ 1,234,178	\$ 1,234,178	\$ 76,781			
Approved	Generation	29807	HYD - Tusket Falls Main Dam	2017 ACE Plan (for Subsequent Approval)	OTQ - July 5, 2017	\$ 9,940,664	\$ 18,157,609	\$ 12,326,148			
Approved	Generation	51234	HYD - WRC HVAC Upgrade	2018 ACE Plan	2018 ACE Plan	\$ 1,876,537	\$ 1,876,537	\$ 1,766,632			
Approved	Generation	51235	HYD - WRC Main Access Rd Refurbishment	2018 ACE Plan	2018 ACE Plan	\$ 2,686,075	\$ 2,686,075	\$ 1,194,342			
Approved	Generation	48793	HYD - WRC Safety Standards Upgrades	2018 ACE Plan (for Subsequent Approval)	OTQ - June 4, 2018	\$ 1,019,920	\$ 1,760,570	\$ 1,133,462			
Approved	Generation	51236	HYD - WRC Tailrace Road Bolting	2018 ACE Plan	2018 ACE Plan	\$ 8,861,996	\$ 8,861,996	\$ 3,454,294			
Approved	Generation	48052	HYD Amnapolis HVAC Upgrade	2017 ACE Plan (for Subsequent Approval)	OTQ - March 8, 2017	\$ 1,498,367	\$ 1,573,596	\$ 1,672,853			
Approved	Generation	51775	HYD Fixed Ladder & Machine Guard	2018 ACE Plan (for Subsequent Approval)	OTQ - June 4, 2018	\$ 999,149	\$ 1,985,179	\$ 739,610			
Internally FIN'd	Generation	48533	HYD Lequille Headpond Refurbishment	2018 ACE Plan	2018 ACE Plan	\$ 4,472,369	\$ 4,472,369	\$ 4,653,541			
Internally FIN'd	Generation	49033	HYD WRC Tunnel 1-2 Intake Replacement	2018 ACE Plan	2018 ACE Plan	\$ 2,851,582	\$ 2,851,582	\$ 2,759,407			
Approved	Generation	44978	HYD-Wreck Cove Automation	2015 ACE Plan (for Subsequent Approval)	Q2 2015 - July 31, 2015	\$ 2,379,999	\$ 3,802,446	\$ 2,541,829			
Internally FIN'd	Generation	49869	ICP U&U Armour Stone Replacement	U&U	OTQ - December 16, 2016	\$ 2,793,935	\$ 2,793,935	\$ 2,945,238			
Approved	Distribution	49787	Intelligent Feeder Project	2017 ACE Plan (for Subsequent Approval)	OTQ - March 31, 2017	\$ 2,399,368	\$ 2,782,384	\$ 3,031,513			
Deferred	General Plant	49601	IT - Data Loss Prevention	2017 ACE Plan (for Subsequent Approval)		\$ 1,199,013	\$	\$ -			
Deferred	General Plant	49600	IT - Network Architecture Redesign	2017 ACE Plan (for Subsequent Approval)		\$ 1,183,826	\$	\$ 296,526			
Internally FIN'd	General Plant	47477	IT - Next Generation Firewall	2016 ACE Plan (for Subsequent Approval)	OTQ - May 31, 2016	\$ 2,536,182	\$ 3,927,576	\$ 3,965,429			
Approved	General Plant	48254	IT - Outage Comm Tech Cap Improvement	2016 ACE Plan (for Subsequent Approval)	OTQ - May 31, 2016	\$ 1,500,000	\$ 2,146,081	\$ 2,006,658			
Approved	General Plant	49860	IT - SharePoint Upgrade	2017 ACE Plan (for Subsequent Approval)	Q3 2017 - October 30, 2017	\$ 4,021,915	\$ 3,903,594	\$ 4,141,059			
Internally FIN'd	General Plant	49857	IT - Storage Infrastructure Upgrade	2017 ACE Plan (for Subsequent Approval)	OTQ - November 27, 2017	\$ 5,045,955	\$ 1,901,189	\$ 1,954,220			
Approved	General Plant	48773	IT - VDP Expansion to NSP sites	2017 ACE Plan (for Subsequent Approval)	Q3 2017 - October 30, 2017	\$ 1,499,731	\$ 1,708,923	\$ 1,837,566			
Approved	General Plant	49855	IT Desktop SW Modernization	2017 ACE Plan (for Subsequent Approval)	Q3 2017 - October 30, 2017	\$ 2,013,034	\$ 4,620,516	\$ 4,501,621			
Approved	General Plant	49043	IT-Contact Centre Infrastructure	U&U	OTQ - November 1, 2016	\$	\$ 2,499,405	\$ 2,744,311			
Approved	General Plant	44671	IT - Enterprise Resource Plan (ERP)	2016 ACE Plan (for Subsequent Approval)	OTQ - November 10, 2016	\$ 9,891,170	\$ 89,664,000	\$ 88,156,572			
Approved	Transmission	47950	L5017 Replacements & Upgrades	2016 ACE Plan	Q1 2018 - May 7, 2018	\$ 2,182,142	\$ 3,062,664	\$ 2,853,690			
Approved	Transmission	49782	L50278 Replacements and Upgrades	2017 ACE Plan	OTQ - July 3, 2018	\$ 1,093,542	\$ 1,655,146	\$ 1,532,096			
Approved	Transmission	47949	L5028 Replacements and Upgrades	2016 ACE Plan	2016 ACE Plan	\$ 1,144,351	\$ 1,144,351	\$ 891,792			
Approved	Transmission	49790	L5505 Replacements and Upgrades	2017 ACE Plan	2017 ACE Plan	\$ 1,223,571	\$ 1,223,571	\$ 749,401			
Approved	Transmission	49774	L5527 Replacements and Upgrades	2017 ACE Plan	2017 ACE Plan	\$ 1,537,852	\$ 1,537,852	\$ 1,784,759			
Approved	Transmission	49778	L5535 Replacements and Upgrades	2017 ACE Plan	OTQ - April 16, 2018	\$ 1,261,920	\$ 2,590,269	\$ 2,290,957			
Approved	Transmission	49779	L6537 Replacements and Upgrades	2018 ACE Plan	OTQ - March 4, 2019	\$ 1,255,220	\$ 2,331,474	\$ 1,942,240			
Approved	Transmission	47914	L6537 Replacements and Upgrades	2016 ACE Plan	2016 ACE Plan	\$ 1,382,705	\$ 1,382,705	\$ 1,552,439			
Approved	Transmission	52320	L6549 2018 Replacements & Upgrades	2018 ACE Plan	2018 ACE Plan	\$ 1,406,535	\$ 1,406,535	\$ 1,454,596			
Approved	Transmission	44867	L7003 U&U Upgrades	2016 ACE Plan (for Subsequent Approval)	OTQ - August 31, 2015	\$ 6,885,913	\$ 11,032,215	\$ 10,344,174			
Approved	Transmission	49792	L7011 Replacements and Upgrades	2017 ACE Plan	OTQ - April 1, 2019	\$ 3,843,484	\$ 4,830,276	\$ 4,595,804			
Approved	Transmission	47954	L7012 Replacements and Upgrades	2017 ACE Plan	2017 ACE Plan	\$ 4,428,520	\$ 4,428,520	\$ 4,396,365			
Approved w/ Directives	Distribution	40320	LED Street Light Conversion	2015 ACE Plan (for Subsequent Approval)	OTQ - July 3, 2015	\$ 40,609,354	\$ 36,041,594	\$ 37,754,125			
Approved	Generation	49940	LM6000 TUCS Control System Upgrade	2017 ACE Plan (for Subsequent Approval)	OTQ - July 3, 2018	\$ 1,018,769	\$ 1,275,559	\$ 553,956			
Approved	Transmission	C0001900	Mount Hope 69-25kV Substation	2018 ACE Plan	2018 ACE Plan	\$ 2,982,338	\$ 2,982,338	\$ 512,882			
Internally FIN'd	General Plant	46671	NERC CIP Version 5 Implementation	2016 ACE Plan (for Subsequent Approval)	Q4 2015 - January 29, 2016	\$ 1,528,492	\$ 2,433,239	\$ 2,563,772			
Internally FIN'd	General Plant	C0001950	New Distribution Rights of Way Ph 3	2018 ACE Plan	2018 ACE Plan	\$ 9,822,493	\$ 9,822,493	\$ 10,284,858			
Internally FIN'd	Distribution	49613	New Distribution Rights of Way Phase 1	2016 ACE Plan - Routines	OTQ - November 1, 2016	\$ 2,400,000	\$ 2,215,397	\$ 2,055,132			
Approved	Transmission	48061	New Mobile Substation 7.5MVA	2016 ACE Plan (for Subsequent Approval)	OTQ - June 30, 2016	\$ 1,728,234	\$ 2,390,744	\$ 2,534,236			
Approved	Transmission	52323	Port Hastings 2C BPS Upgrade	P&A	Q2 - August 7, 2018	\$	\$ 4,201,449	\$ 3,977,959			
Approved	Generation	47611	POT - Demolish Unit 1 Stack	2016 ACE Plan	2016 ACE Plan	\$ 1,732,346	\$ 1,732,346	\$ 5,959			
Approved	General Plant	43202	Replace Mobile Radio System	2017 ACE Plan (for Subsequent Approval)	Q4 2016 - January 31, 2017	\$ 6,537,700	\$ 6,296,878	\$ 6,499,458			
Approved	General Plant	50153	Self Serve Development Phase 2	2017 ACE Plan (for Subsequent Approval)	OTQ - September 15, 2017	\$ 1,827,720	\$ 1,160,528	\$ 1,316,494			
Pending Submission	Transmission	43678	Separate LB004/L2005 on Canoe Crossing Double Circuit Tower(DCT)	2017 ACE Plan (for Subsequent Approval)		\$ 16,183,691	\$	\$ 20,865,511			
Approved	Distribution	49023	Spider Lake Substation Addition	2016 ACE Plan (for Subsequent Approval)	OTQ - March 4, 2019	\$ 6,348,981	\$ 9,158,260	\$ 9,066,398			
Approved	Distribution	44749	Theriot Tower Refurbishment	2017 ACE Plan (for Subsequent Approval)	OTQ - January 6, 2019	\$ 1,058,200	\$ 1,954,524	\$ 2,149,989			
Partial Approval	Generation	44267	TRE Ash Lagoon Site Closure	2015 ACE Plan	OTQ - July 7, 2017 (partially approved)	\$ 7,994,849	\$ 8,993,879	\$ 7,172,611			
Approved	Generation	49534	TRE6 EH/G/Turbine Controls Upgrade	2018 ACE Plan	2018 ACE Plan	\$ 2,725,344	\$	\$ 1,229,506			
Approved	Generation	51788	TRE6 Turbine Packing, Diaphragm and Journal U&U	U&U	OTQ - January 12, 2018	\$	\$ 1,935,087	\$ 1,958,156			

**NS Power Capital Item Status Update**  
**2020 3rd Quarter Overview - Updated for ACE 2021**

This report includes all projects submitted to the UARB and remain active, as well as ACE Plan subsequent submittal projects. Projects are removed from this report once the project has been final costed (internal or external), cancelled, or falls below \$1M.

Status	Category	CI Number	Title	ACE Plan Reference (or U&U and P&A)	Submission/Date	ACE Amount	Submission or Approved Amount	Actual Spend	FIN Submission Date	FIN Amount	Variance
Approved	Generation	15808	TUC HFO Piping Refurbishments	2018 ACE Plan (for Subsequent Approval)	OTQ - April 1, 2019	\$ 1,291,933	\$ 3,460,625	\$ 3,469,473			
Approved	Generation	50518	HYD - Ruth Falls Main Dam Refurbishment	2019 ACE Plan	2019 ACE Plan	\$ 7,244,422	\$ 7,244,422	\$ 7,244,422			
Approved	Generation	C0002539	HYD - Bridge Remediation 2019	2019 ACE Plan	2019 ACE Plan	\$ 6,843,686	\$ 6,843,686	\$ 3,667,684			
Approved	Generation	46254	HYD - Mill Lake Surge Tank Replacement	2019 ACE Plan	2019 ACE Plan	\$ 3,598,193	\$ 3,598,193	\$ 3,400,909			
Approved	Generation	C0004058	HYD - Tidewater 2 Overhaul	2019 ACE Plan	2019 ACE Plan	\$ 1,916,321	\$ 1,916,321	\$ 1,959,646			
Approved	Generation	C0010957	HYD - Malay Falls Unit 6 Overhaul	2019 ACE Plan	2019 ACE Plan	\$ 1,273,280	\$ 1,273,280	\$ 1,118,780			
Approved	Generation	C0011076	POT - Boiler Refurbishment 2019	2019 ACE Plan	2019 ACE Plan	\$ 1,388,434	\$ 1,388,434	\$ 1,442,731			
Approved	Generation	C0010118	TRE - Boiler Refurbishment 2019	2019 ACE Plan	2019 ACE Plan	\$ 1,016,384	\$ 1,016,384	\$ 1,114,994			
Approved	Generation	C0010141	POT - IP/LP Turbine Refurbishment	2019 ACE Plan	2019 ACE Plan	\$ 2,938,990	\$ 2,938,990	\$ 2,956,698			
Approved	Generation	C0010142	POT - HP Turbine Refurbishment	2019 ACE Plan	2019 ACE Plan	\$ 1,813,421	\$ 1,813,421	\$ 1,942,027			
Approved	Generation	C0007638	POT - Generator Auxiliary Equipment Refurbishment	2019 ACE Plan	2019 ACE Plan	\$ 3,473,920	\$ 3,473,920	\$ 3,601,411			
Approved	Generation	50632	TRE - (Bunker C) HFO Refurbishment Project Phase 2	2019 ACE Plan	2019 ACE Plan	\$ 2,573,137	\$ 2,573,137	\$ 2,112,962			
Approved	Generation	48638	TRE - Rail Car Fuel Delivery Upgrade	2019 ACE Plan	2019 ACE Plan	\$ 1,236,623	\$ 1,236,623	\$ 1,010,676			
Approved	Generation	51238	TRE - Asbestos Abatement 2019	2019 ACE Plan	2019 ACE Plan	\$ 1,030,841	\$ 1,030,841	\$ 1,125,150			
Approved	Generation	49874	CT - RCOT Replace Nelson Fire Protection	2019 ACE Plan	2019 ACE Plan	\$ 1,149,153	\$ 1,149,153	\$ 1,320,318			
Approved	Transmission	C0010042	2019 Transmission Right-of-Way Widening 69kV	2019 ACE Plan	2019 ACE Plan	\$ 5,650,794	\$ 5,650,794	\$ 5,662,462			
Approved	Transmission	C0010948	2019/2020 Sacrificial Anode Installation Program	2019 ACE Plan	2019 ACE Plan	\$ 3,099,862	\$ 3,099,862	\$ 326,344			
Approved	Transmission	C0010952	2019/2020 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	2019 ACE Plan	2019 ACE Plan	\$ 2,786,245	\$ 2,786,245	\$ 2,278,052			
Approved	Transmission	C0010949	2019/2020 Steel Tower Life Extension	2019 ACE Plan	2019 ACE Plan	\$ 2,414,140	\$ 2,414,140	\$ 1,136,851			
Approved	Transmission	C0011339	16549 - Replacements and Upgrades Phase 2	2019 ACE Plan	2019 ACE Plan	\$ 2,209,907	\$ 2,209,907	\$ 1,520,900			
Approved	Transmission	C0010950	2019/2020 Steel Tower Refurbishment	2019 ACE Plan	2019 ACE Plan	\$ 2,009,268	\$ 2,009,268	\$ 1,562,785			
Approved	Transmission	C0011338	15548 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,699,381	\$ 1,699,381	\$ 1,064,940			
Approved	Transmission	C0011242	15541 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,624,850	\$ 1,624,850	\$ 1,865,583			
Approved	Transmission	C0011241	15026 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,498,789	\$ 1,498,789	\$ 1,305,793			
Approved	Transmission	C0011300	17005 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,346,026	\$ 1,346,026	\$ 1,235,774			
Approved	Transmission	C0011240	15511 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,255,087	\$ 1,255,087	\$ 1,485,117			
Approved	Transmission	C0010978	2019/2020 Transmission Switch & Breaker Replacement	2019 ACE Plan	2019 ACE Plan	\$ 1,044,148	\$ 1,044,148	\$ 1,115,566			
Approved	Transmission	C0011243	15551 - Replacements and Upgrades	2019 ACE Plan	2019 ACE Plan	\$ 1,014,077	\$ 1,014,077	\$ 898,171			
Approved	Transmission	C0010040	New Distribution Rights-of-Way Widening Phase 4	2019 ACE Plan	2019 ACE Plan	\$ 10,275,263	\$ 10,275,263	\$ 10,356,562			
Approved	Distribution	C0011208	2019 Padmount Replacement Program	2019 ACE Plan	2019 ACE Plan	\$ 1,413,544	\$ 1,413,544	\$ 1,379,873			
Approved	Distribution	C0011209	855-403 - Cabot Trail Rebuild	2019 ACE Plan	2019 ACE Plan	\$ 1,305,919	\$ 1,305,919	\$ 1,515,370			
Approved	Distribution	C0006319	2019 PCB Pole Top Transformer Replacements	2019 ACE Plan	2019 ACE Plan	\$ 1,177,592	\$ 1,177,592	\$ 169,789			
Approved	General Plant	C0013438	IT - T&O WAM Phase 1 - GIS and Field Design System	2019 ACE Plan (2018 Pending Submission)	OTQ - December 7, 2018	\$ 7,978,434	\$ 7,978,434	\$ 7,544,207			
Approved	General Plant	51481	IT - Content Management Software Upgrade	2019 ACE Plan (2018 Pending Submission)	OTQ - December 7, 2018	\$ 2,053,010	\$ 2,213,246	\$ 2,193,507			
Pending Submission	Generation	39472	HYD - Mersey Redevelopment Phase 1	2021 ACE Plan (for Subsequent Approval)		\$ 159,822,112	\$ -	\$ 11,505,348			
Awaiting Approval	Generation	C0013838	HYD WRC LEM Unit Rehabilitation	2020 ACE Plan (2019 Pending Submission)	OTQ - February 21, 2020	\$ 109,691,967	\$ 109,214,439	\$ 7,622,886			
Pending Submission	Distribution	47794	Hedkman Island Underwater Cable Replacement	2021 ACE Plan (for Subsequent Approval)		\$ 1,296,112	\$ -	\$ 160,117			
Approved	General Plant	C0011378	Route Network Upgrades	2020 ACE Plan (2019 Pending Submission)	OTQ - December 2, 2019	\$ 5,724,240	\$ 5,717,752	\$ 137,137			
Not Approved at this time	General Plant	47751	ECC - Dynamic Line Rating Implementation	2020 ACE Plan (2019 Pending Submission)	OTQ - December 2, 2019	\$ 5,033,968	\$ 4,978,090	\$ 224,445			
Approved	General Plant	49093	IT - Security Operations Center (SOC) and Security Information Event Monitoring (SIEM)	2019 ACE Plan (for Subsequent Approval)	OTQ - July 2, 2019	\$ 2,489,673	\$ 4,074,948	\$ 3,154,144			
Approved	General Plant	49480	IT - Data Centre Disaster Recovery	2020 ACE Plan (2019 Pending Submission)	OTQ - December 2, 2019	\$ 6,103,798	\$ 6,335,162	\$ 3,039,597			
Approved	General Plant	C0010838	MCC - HVAC Replacement	2019 ACE Plan (for Subsequent Approval)	Q3 - November 4, 2019	\$ 1,071,364	\$ 1,105,002	\$ 53,166			
Approved	General Plant	C0002137	ECC - Map Board and Technology Modernization	2019 ACE Plan (for Subsequent Approval)	Q3 - November 6, 2019	\$ 2,568,789	\$ 2,506,268	\$ 133,813			
Internally FIN'd	Hydro	C0011181	HYD LEO Stator Refurbishment U&U	2019 ACE Plan (for Subsequent Approval)	OTQ - January 7, 2019	\$ 1,051,127	\$ 1,051,127	\$ 2,041,002			
Approved	General Plant	C0011858	FAC Lower Water Street Roof Replacement	U&U	OTQ - April 1, 2019	\$ -	\$ 1,672,596	\$ 1,629,789			
Approved	Distribution	C0018059	SBC-403 Rebuild Hwy 19 South West Margaree	P&A	Q1 2019 - May 6, 2019	\$ -	\$ 1,127,220	\$ 1,249,977			
Approved	Steam	C0013578	TRE Circulating Water Fish Barrier	U&U	OTQ - June 3, 2019	\$ -	\$ 1,454,175	\$ 1,344,143			
Approved	General Plant	C0021006	IT - Microsoft Exchange Upgrade (replaces CI 49858)	2019 ACE Plan (for Subsequent Approval)	Q2 - August 6, 2019	\$ 1,517,875	\$ 1,013,478	\$ 1,164,945			
Approved	General Plant	C0020338	AMO Meridium Upgrade for Power Production	P&A	Q3 - November 4, 2019	\$ -	\$ 1,571,516	\$ 709,947			
Approved	Transmission	C0021105	17002 Replacements and Upgrades Phase 2	P&A	Q3 - November 4, 2019	\$ -	\$ 3,121,442	\$ 559,783			
Approved	Hydro	C0006358	HYD - Lake Maligne Dam Refurbishment	2020 ACE Plan	2020 ACE Plan	\$ 5,853,650	\$ 5,853,650	\$ 2,812,824			
Approved	Distribution	C0020623	New Distribution Rights-of-Way Phase 5	2020 ACE Plan	2020 ACE Plan	\$ 10,015,266	\$ 10,015,266	\$ 5,999,909			
Approved	Transmission	C0020627	2020 Transmission Right-of-Way Widening 69kV	2020 ACE Plan	2020 ACE Plan	\$ 5,489,820	\$ 5,489,820	\$ 2,104,360			
Approved	Transmission	52785	15524 Replacements and Upgrades	2020 ACE Plan	2020 ACE Plan	\$ 2,161,314	\$ 2,161,314	\$ 1,440,420			
Approved	Hydro	C0012878	HYD - Weymouth Falls Unit 1 Generator Refurbishment	2020 ACE Plan	2020 ACE Plan	\$ 2,264,326	\$ 2,264,326	\$ 245,840			
Approved	Transmission	C0011261	101W Port Mersey Substation Expansion	2020 ACE Plan	2020 ACE Plan	\$ 4,653,384	\$ 4,653,384	\$ 58,057			
Approved	Transmission	C0021123	2020/2021 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	2020 ACE Plan	2020 ACE Plan	\$ 5,197,372	\$ 5,197,372	\$ 3,357,706			
Approved	Transmission	C0021106	17005 Replacements and Upgrades Phase 1	2020 ACE Plan	2020 ACE Plan	\$ 3,576,991	\$ 3,576,991	\$ -			
Approved	Transmission	C0021102	15029 Replacements and Upgrades	2020 ACE Plan	2020 ACE Plan	\$ 6,206,677	\$ 6,206,677	\$ -			
Approved	Gas Turbine	49949	LM6000 TUC4 Control System Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,149,996	\$ 1,149,996	\$ 437,604			
Approved	Transmission	C0021130	48H Metalclad Switchgear Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,210,706	\$ 1,210,706	\$ 1,053,843			
Approved	Transmission	C0011321	15031 Replacements and Upgrades Phase 1	2020 ACE Plan	2020 ACE Plan	\$ 2,147,212	\$ 2,147,212	\$ -			
Approved	Transmission	C0021104	15550 Replacements and Upgrades Phase 1	2020 ACE Plan	2020 ACE Plan	\$ 2,234,816	\$ 2,234,816	\$ 45			
Approved	Transmission	C0021107	18061 Replacements and Upgrades Phase 1	2020 ACE Plan	2020 ACE Plan	\$ 2,292,093	\$ 2,292,093	\$ -			
Approved	Distribution	C0020835	2020 Padmount Replacement Program	2020 ACE Plan	2020 ACE Plan	\$ 1,612,389	\$ 1,612,389	\$ 725,977			
Approved	Transmission	C0021122	2020/2021 Transmission Switch & Breaker Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,312,643	\$ 1,312,643	\$ 501,084			
Approved	Transmission	C0010955	2020/2021 Wood Pole Retirement Program	2020 ACE Plan	2020 ACE Plan	\$ 1,410,561	\$ 1,410,561	\$ 104,929			
Approved	Distribution	C0020834	2020/2021 Inaccessible PCB Transformer Replacements	2020 ACE Plan	2020 ACE Plan	\$ 2,950,294	\$ 2,950,294	\$ 130,813			
Approved	General Plant	C0021109	New RTU Deployment Project	2020 ACE Plan	2020 ACE Plan	\$ 8,028,097	\$ 8,028,097	\$ -			
Approved	Transmission	52303	17019 Replacements and Upgrades	2020 ACE Plan	2020 ACE Plan	\$ 1,374,092	\$ 1,374,092	\$ -			
Approved	Transmission	C0021233	Trenton 50N-113 Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,516,880	\$ 1,516,880	\$ 5,746			
Approved	Transmission	C0021026	Wilow Line 15A-113 Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,326,647	\$ 1,326,647	\$ 6,544			
Approved	Steam	C0021584	TUC3 Turbine Valves Refurbishments	2020 ACE Plan	2020 ACE Plan	\$ 1,043,020	\$ 1,043,020	\$ 107,937			
Approved	Hydro	49756	HYD - Marshall Falls Main Dam Refurbishment	2020 ACE Plan	2020 ACE Plan	\$ 5,452,794	\$ 5,452,794	\$ 358,235			
Approved	Transmission	C0021142	19W-TS1 Transformer Replacement	2020 ACE Plan	2020 ACE Plan	\$ 1,512,336	\$ 1,512,336	\$ -			
Approved	Distribution	C0021182	93V-313-Meteghan Rebuild	2020 ACE Plan	2020 ACE Plan	\$ 1,075,625	\$ 1,075,625	\$ -			
Pending Submission	General Plant	46075	IT - T&O WAM Phase 2 - Work Management and Scheduling & Dispatch	2021 ACE Plan (for Subsequent Approval)		\$ 55,899,483	\$ -	\$ 6,855,687			
Approved	Distribution	C0010778	Smart Grid Nova Scotia Project	2020 ACE Plan (for Subsequent Approval)	OTQ - December 5, 2019	\$ 6,740,589	\$ 7,053,622	\$ 1,390,269			
Approved	General Plant	C0010019	IT - ADAMS Upgrade	2020 ACE Plan (for Subsequent Approval)	OTQ - March 2, 2020	\$ 8,962,443	\$ 9,628,891	\$ 5,603,953			
Pending Submission	General Plant	C0021826	IT - Enterprise Data Lake	2021 ACE Plan (2020 Pending Submission)		\$ 1,260,147	\$ -	\$ 240,361			
Approved	General Plant	C0021805	IT - Microsoft EA Renewal 2020	2020 ACE Plan (for Subsequent Approval)	Q1 2020 - May 4, 2020	\$ -	\$ 3,139,727	\$ -			
Approved	Distribution	C0019379	50N-410 - 4C-430 Highway 104 Twinning	2020 ACE Plan (for Subsequent Approval)	OTQ - June 1, 2020	\$ 1,361,237	\$ 1,137,223	\$ 584,475			
Deferred	Transmission	C0021140	New 138KV-25KV Substation - Stellarton	2020 ACE Plan (for Subsequent Approval)		\$ 5,057,118	\$ -	\$ -			
Pending Submission	Distribution	C0008638	Cogswell HRM Redevelopment Program	2021 ACE Plan (for Subsequent Approval)		\$ 2,904,326	\$ -	\$ 155,519			
Deferred	Transmission	C0022247	LN-Onslow 138 KV Add Second 42 MVA Power Transformer	2020 ACE Plan (for Subsequent Approval)		\$ 4,506,388	\$ -	\$ 3,033			
Not Approved at this time	Steam	C0020385	LN Heavy Oil Tank Refurbishment	2020 ACE Plan (for Subsequent Approval)	Q1 2020 - May 4, 2020	\$ 1,162,325	\$ 3,309,343	\$ 64,250			
Approved	General Plant	C0021622	AMO Substation and Transmission APM Program	2020 ACE Plan (for Subsequent Approval)	OTQ - April 6, 2020	\$ 2,087,841	\$ 2,217,589	\$ 177,191			
Deferred	Transmission	C0010956	78W Substation Relocation and New Power Transformer	2020 ACE Plan (for Subsequent Approval)		\$ 2,542,645	\$ -	\$ 166,769			
Pending Submission	Hydro	C0014218	HYD WRC LEM Balance of Plant	2021 ACE Plan (2020 Pending Submission)		\$ 21,186,378	\$ -	\$ 544,678			
Approved	General Plant	C0023623	AMO Distribution APM Program	2020 ACE Plan (for Subsequent Approval)	OTQ - April 6, 2020	\$ 1,708,240	\$ 1,721,484	\$ 349,662			
Deferred	General Plant	C0021108	2020/2021 LIIR Deployment Project	2020 ACE Plan (for Subsequent Approval)		\$ 5,092,708	\$ -	\$ -			

## NS Power Capital Item Status Update

### 2020 3rd Quarter Overview - Updated for ACE 2021

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Status	Category	CI Number	Title	ACE Plan Reference (or U&U and P&A)	Submission/Date	ACE Amount	Submission or Approved Amount	Actual Spend	FIN Submission Date	FIN Amount	Variance
Approved	General Plant	49659	IT - Windows Server 2008 Upgrade	2020 ACE Plan (for Subsequent Approval)	OTQ - December 2, 2019	\$ 1,183,310	\$ 1,183,310	\$ 1,180,037			
Not Approved at this time	Gas Turbine	C0018880	V12 Engine Refurbishment	P&A	OTQ - January 16, 2020		\$ 2,140,601	\$ 2,142,833			
Approved	Steam	C0021202	TRE AAMS Water Treatment System Upgrade	U&U	OTQ - December 2, 2019		\$ 1,039,746	\$ 1,102,986			
Approved	Transmission	C0024486	25-T1 Transformer Replacement	U&U	Q1 2020 - May 4, 2020		\$ 2,648,403	\$ 2,748,450			
Awaiting Approval	Hydro	16374	HYD Gaspereau Dam Safety	2008 ACE Plan	OTQ - February 23, 2020	\$ 4,354,889	\$ 22,703,451	\$ 8,728,719			
Approved	General Plant	C0017098	Ragged Lake Generator Replacement	P&A	Q2 2020 - August 4, 2020		\$ 2,229,267	\$ 95,756			
Awaiting Approval	Distribution	C0031083	New Distribution Rights-of-Way Phase 6	2021 ACE Plan	2021 ACE Plan	\$ 9,762,735	\$ 9,762,735	\$ -			
Awaiting Approval	Transmission	C0031263	2021/2022 Substation Polychlorinated Biphenyl (PCB) Equipment Removal	2021 ACE Plan	2021 ACE Plan	\$ 7,512,226	\$ 7,512,226	\$ -			
Awaiting Approval	Gas Turbine	C0020944	LM6000 - 191-443 Hot Section Engine Refurbishment	2021 ACE Plan	2021 ACE Plan	\$ 5,749,282	\$ 5,749,282	\$ -			
Awaiting Approval	Transmission	C0031089	2021/2022 Transmission Right-of-Way Widening 69KV	2021 ACE Plan	2021 ACE Plan	\$ 5,288,520	\$ 5,288,520	\$ -			
Awaiting Approval	General Plant	49094	IT - Privilege Access Management (PAM)	2021 ACE Plan	2021 ACE Plan	\$ 3,211,166	\$ 3,211,166	\$ 337,051			
Awaiting Approval	Transmission	C0031122	L6539 Replacements and Upgrades	2021 ACE Plan	2021 ACE Plan	\$ 2,821,842	\$ 2,821,842	\$ -			
Awaiting Approval	Transmission	C0031085	L6516 Line Replacement and Upgrades	2021 ACE Plan	2021 ACE Plan	\$ 2,730,592	\$ 2,730,592	\$ -			
Awaiting Approval	Steam	C0030528	TUC3 HP Turbine Refurbishment	2021 ACE Plan	2021 ACE Plan	\$ 2,085,094	\$ 2,085,094	\$ 593			
Awaiting Approval	Transmission	C0031050	New Spare Large Autotransformer	2021 ACE Plan	2021 ACE Plan	\$ 2,398,564	\$ 2,398,564	\$ -			
Awaiting Approval	Transmission	C0033644	2021/2022 Steel Tower Life Extension	2021 ACE Plan	2021 ACE Plan	\$ 2,332,746	\$ 2,332,746	\$ -			
Awaiting Approval	Transmission	C0033645	2021/2022 Steel Tower Refurbishment	2021 ACE Plan	2021 ACE Plan	\$ 1,944,005	\$ 1,944,005	\$ -			
Awaiting Approval	Transmission	C0031069	L6020 Replacements and Upgrades	2021 ACE Plan	2021 ACE Plan	\$ 1,825,300	\$ 1,825,300	\$ -			
Awaiting Approval	Distribution	C0031145	2021 Padmount Replacement Program	2021 ACE Plan	2021 ACE Plan	\$ 1,636,153	\$ 1,636,153	\$ -			
Awaiting Approval	Transmission	C0031262	2020/2021 Transmission Switch and Breaker Replacement	2021 ACE Plan	2021 ACE Plan	\$ 1,483,048	\$ 1,483,048	\$ -			
Awaiting Approval	Transmission	C0031064	L5054 Replacements and Upgrades	2021 ACE Plan	2021 ACE Plan	\$ 1,134,737	\$ 1,134,737	\$ -			
Awaiting Approval	Gas Turbine	46483	CT - TUS Control System Upgrade	2021 ACE Plan	2021 ACE Plan	\$ 1,046,322	\$ 1,046,322	\$ -			
Pending Submission	General Plant	C0021839	IT - Customer Energy Insights Management	2021 ACE Plan (for Subsequent Approval)		\$ 2,560,958		\$ 138,665			
Pending Submission	Hydro	48913	HYD - Tusket Facility Refurbishment	2021 ACE Plan (for Subsequent Approval)		\$ 2,544,240		\$ 53,763			
Pending Submission	Steam	C0026285	TRE Heavy Fuel Oil Tank Refurbishment	2021 ACE Plan (for Subsequent Approval)		\$ 1,732,921		\$ -			
Pending Submission	General Plant	C0030987	IT - NERC CIP Environment Refresh	2021 ACE Plan (for Subsequent Approval)		\$ 1,318,786		\$ -			
Pending Submission	General Plant	C0011167	IT - Backup Infrastructure Upgrade	2021 ACE Plan (for Subsequent Approval)		\$ 1,015,253		\$ -			
Pending Submission	Hydro	49634	HYD - Trout River Diversion Screen Replacements	2021 ACE Plan (for Subsequent Approval)		\$ 1,013,722		\$ 49,469			

### NS Power 2020 ACE Plan Items – Deferred or Cancelled

This report includes any deferred or cancelled projects that were included in the 2020 ACE Plan.

CI	Project Title	2020 ACE Amount	2020 ACE Project Total	Cancelled / Deferred	Deferred To	Prior Approval	2020 ACE Plan Reference	Commentary
<b>Generation</b>								
C0019904	HYD - Safety Boom Deployment Vessel	191,692	191,692	Deferred	2022		Less than \$1M	Deferred due to a delay in RFP responses from vendors in 2020.
C0020644	AMO TUC3 Turbine Supervisory System Upgrade	126,441	126,441	Deferred	2021		Less than \$1M	Delay in the execution of C1 C0020685, AMO TUC3 Turbine Supervisory System Upgrade, has resulted in the deferral of this project.
C0020842	POT Turbine Generator Fire Protection	454,769	455,769	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0011116	POT - Acid Skid for WWTP	138,183	138,183	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020362	TRES 5-2 BFP Refurbishment	197,263	197,263	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020363	TRES 5-1 Pulverizer Refurbishment	173,625	173,625	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0010331	TRES Precipitator Controls Upgrade	166,711	166,711	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020364	TRES Stack Access	155,128	155,128	Deferred	2021		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020310	TRE Roofing Anchor Points	152,181	152,181	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020366	TRES Precipitator Refurbishments	146,770	146,770	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020367	TRES Main Oil Pump & Gearbox Refurbishment	101,461	101,461	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
52152	TRES Relay Room and Cable Spreading Area - Fire Protection	96,945	96,945	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020797	TRES 4160V Switchgear Room Fire Sealant	47,633	47,633	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0010321	TRES Parallel Slide Valve Replacement	649,217	649,217	Deferred	2021		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020325	TRES Pulverizer Fuel Line Refurbishment Phase 2	265,618	265,618	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020332	TRES ACW Piping to Coolers Replacement	148,148	148,148	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020337	TRES Low Load Valve Refurbishment	147,155	147,155	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020336	TRES Wire Cable Sprinkler Protection	122,260	122,260	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0020305	TRE Common Water Replacement 2020	107,540	107,540	Deferred	2022		Less than \$1M	Higher priority work limiting available resources in 2020.
C0021468	TUC Waste Water Treatment Plant Roof Replacement	295,465	295,465	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021723	TUC Parking Lot Refurbishment	245,305	245,305	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021469	TUC Facilities Upgrade Phase3	219,439	219,439	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021423	TUC Auxiliary Boiler PLC/DCS Upgrades	120,398	120,398	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021464	TUC Turbine Air Dehumidifier Units	120,225	120,225	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021607	TUC1 Boiler Flue Gas Containment	107,591	107,591	Deferred	2022		Less than \$1M	Deferred due to the forecasted unit utilization of Tufts Cove Unit 1.
C0021463	TUC Turbine Bay Louvers Refurbishment	98,167	98,167	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021602	TUC Telehandler Forklift	75,790	75,790	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021402	TUC Oil Tanks Levels and Pump House Controls Upgrade	73,594	73,594	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021605	TUC Electrical Rooms Underground Upgrade	50,772	50,772	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021606	TUC Cation Chromatograph Replacement	39,861	39,861	Cancelled			Less than \$1M	NS Power has utilized other alternative technical solutions to mitigate risk and avoid replacement at this time.
C0021562	TUC1 CW Intake Canal Refurbishment	146,103	146,103	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
52276	TUC1 Obsolete Valve Replacement	98,635	98,635	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021462	TUC Plant Siding Refurbishment	97,395	97,395	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021502	TUC1 FD Fan VVV Actuator Replacement	72,411	72,411	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021470	TUC1 Natural Gas Valves Refurbishment	43,810	43,810	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020664	TUC2 Online Generator Monitoring	126,723	126,723	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
49670	TUC2 4kV/800V Breaker Replacement	97,431	97,431	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020744	LIN1 - Boiler Erosion Reduction System Refurbishment	403,089	403,089	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0019499	LIN1 RH Tube Replacement 2020	311,584	311,584	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
49447	LIN Steam Drum Level Controls Upgrade	122,348	122,348	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020263	LIN Coal Stackler MCC Upgrade	190,057	190,057	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
52038	LIN Precipitator Pressurizing Fan Replacement	173,707	173,707	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020604	ICP Street Crossing Light Refurbishment	222,515	222,515	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020622	ICP Main Coal Storage Liner Refurbishment	199,439	199,439	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020602	ICP Silo Liner Replacement	133,269	133,269	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020570	ICP Conveyor Hydraulics Refurbishment	75,176	75,176	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020603	ICP Locomotive Traction Motor Refurbishment	71,341	71,341	Deferred	2022		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0020567	ICP Ventilation Upgrades	72,907	72,907	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
<b>Distribution</b>								
C0020830	855-401 Cape Smokey Build to Roadside	255,732	830,149	Deferred	2021		Less than \$1M	Build to roadside work was contingent on the completion of Transportation Infrastructure Renewal work in the area which will not be completed until late 2020.
C0008638	Cogswell HRM Redevelopment Program	595,593	5,628,280	Deferred	2021		Subsequent Submittal	Deferred due to ongoing discussions with HRM.
<b>Transmission</b>								
C0022743	Retire 9H-Yale Street Substation	188,681	188,681	Cancelled			Less than \$1M	The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.
C0022742	Retire 65-Terrace Street	158,264	158,264	Cancelled			Less than \$1M	The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.
	Retire 4H-Marginal Rd Substation	45,033	45,033	Cancelled			Less than \$1M	The distribution feeders in this area are in the process of being upgraded to 12 or 25kV from the existing 4kV that is currently connected to the substation. The retirement of this substation will be reconsidered once this work has been completed.
C0021149	New 138KV-25KV Subst - Stellarton	1,136,018	5,057,118	Deferred	2022		Subsequent Submittal	Deferred due to delays in land acquisition and design planning.
C0022783	2020/2021 Generation Related Power Transformer Refurbishments	469,001	511,394	Deferred	2021		Less than \$1M	Higher priority work limiting available resources in 2020.
C0022247	1N-Onslow 138 kV Add Second 42 MVA Power Transformer	501,941	4,506,388	Deferred	2022		Subsequent Submittal	Forecast additional load that determined the need for this project did not materialize and the project has now been deferred.
C0010956	78W Substation Relocation and New Power Transformer	405,071	2,542,645	Deferred	2022		Subsequent Submittal	Deferred due to delays in land acquisition and design planning.
<b>General Plant</b>								
C0021838	IT - Customer Billing Enhancements	211,012	511,012	Cancelled			Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0022002	IT - Storm Centre Upgrade	393,269	493,269	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
C0021108	2020 LIN Deployment Project	463,930	5,092,708	Deferred	2022		Subsequent Submittal	This project has been deferred due to restrictions related to the COVID pandemic.
C0021133	SCADA Mobile Application	258,001	258,001	Deferred	2021		Less than \$1M	This project has been deferred due to restrictions related to the COVID pandemic.
49094	IT - Privilege Access Management	334,338	590,301	Deferred	2021		Less than \$1M	Higher priority work limiting available resources in 2020.
<b>Previously listed as deferred, now active in 2020.</b>								
C0021106	L7005 Replacements and Upgrades Phase 1	1,622,087	3,576,991	Deferred	2021	Request Approval		Project will now begin in Q4 2020
C0021102	L5029 Replacements and Upgrades	1,585,260	6,206,677	Deferred	2021	Request Approval		Project will now begin in Q4 2020
C0021107	L8001 Replacements and Upgrades Phase 1	1,058,782	2,292,093	Deferred	2021	Request Approval		Project will now begin in Q4 2020
52303	L7019 Replacements and Upgrades	467,832	1,374,092	Deferred	2021	Request Approval		Project will now begin in Q4 2020
C0010944	AMO LIN4 Enhanced Monitoring	161,187	188,040	Deferred	2021		Less than \$1M	Project will now begin in Q4 2020
C0020323	TRES Miscellaneous Valve Replacements 2020	53,241	53,241	Deferred	2021		Less than \$1M	Project will now begin in Q4 2020
C0021466	TUC Underground Water Lines Replacement	148,309	148,309	Deferred	2021		Less than \$1M	Project will now begin in Q4 2020



**Final Cost Report**

This report includes a list of all FIN capital work orders that have fallen outside the timelines under the CEJC. (Within six months of in-service.)

These projects have either been completed and are outside the FIN tolerances or forecasted to be outside of the FIN tolerances. (The greater of +/- 5% or +/- \$250,000.)

Projects that have been in-service for 6 months, but have a project forecast within the allowed FIN tolerance, are not included on this list.

Project #	Project	In-service Date	UARB Approval	Spend to September 30, 2020	Comment
40103	U&U Load Control Demo	12/31/2010	4,293,793	3,610,833	Project is now completed and expected to be submitted for Final Cost application in 2021.
40648	IT - Field Mobility System	9/30/2015	3,332,515	1,993,697	Remaining work on this project is tied to Phase 3 of the overall T&D Work & Asset Management initiative, as noted in the 2019 ACE Plan. NS Power has delayed the remaining work originally included in CI 40648 so that it can aligned with the overall T&D WAM effort.
49534	TRE6 EHG/Turbine Controls Upgrade	8/15/2019	2,725,344	1,229,506	The controls upgrade has been completed and NERC testing is required in order finalize this project and submit for Final Cost application. NERC testing is expected to be completed in early 2021 and a Final Cost Application submitted in late 2021.

**2021 ACE Plan Appendix D has been filed electronically.**

Filing Type	CI Number	Project Title	Function Class	Status	Original Submission Amounts			Actual Amounts			Comments/Notes
					Estimated In-Service Date	Approved Estimate	Contingency on Approved Estimate	Actual In-Service Date	Actual Spend (as of 09/30/2020)	Variance to Approved Estimate	
2015 ACE Plan	44716	TUC2 North Boiler Feedwater Pump Refurbishment	Steam Generation Plant	Complete - Final Costed	3/15/2017	191,007	-	5/31/2019	784,759	593,752	Subsequently approved >\$250 in 2017 for \$274,951. NSUARB letter dated November 8, 2019 advised
2016 ACE Plan	48111	East Switch Upgrades 15S	Transmission Plant	Complete - Final Costed	8/31/2017	122,220	8,400	7/31/2019	290,265	168,045	NSUARB approval of ATO not required due to PUA changes.
2016 ACE Plan	47874	LIN Ash Scale Replacement	Steam Generation Plant	Complete - Final Costed	10/31/2017	237,241	-	6/30/2017	520,573	283,333	Subsequently approved >\$250 in 2017 for \$304,379.
2016 ACE Plan	47933	LIN4 Turbine Vibration Monitoring Upgrade	Steam Generation Plant	Complete - Final Costed	6/19/2016	238,216	-	6/30/2016	291,238	53,022	Subsequently approved >\$250 in 2017 for \$481,252.
2016 ACE Plan	47947	TUC6 Condenser Waterbox Coating Replacement	Steam Generation Plant	Complete - Final Costed	10/26/2016	225,210	-	10/28/2016	368,637	143,427	Subsequently approved >\$250 in 2017 for \$280,095.
2016 ACE Plan	47600	TRE Asbestos Abatement (2016)	Steam Generation Plant	Complete - Final Costed	12/15/2016	154,303	-	11/29/2016	2,088,671	1,934,368	Subsequently approved >\$250 in 2017 for \$366,978.
2016 ACE Plan	47606	TRE5 Sootblower Controls Upgrade	Steam Generation Plant	Complete - Final Costed	12/15/2016	158,399	-	12/31/2016	286,649	128,251	Subsequently approved >\$250 in 2017 for \$2,096,391.
2016 ACE Plan	47756	36V-303 Recondutor Middle Dyke Rd	Distribution Plant	Complete - Final Costed	1/31/2017	226,303	9,878	1/30/2017	287,678	61,375	Subsequently approved >\$250 in 2017 for \$285,301.
2017	49039	HYD Lequille Controls Upgrades	Hydro Generation Plant	In-service Complete	9/30/2017	762,912	117,200	3/30/2018	724,137	(38,775)	
2017	48396	HYD Bridge Remediation	Hydro Generation Plant	Complete - Final Costed	12/30/2017	677,591	40,615	12/1/2018	714,834	37,243	
2017	43202	Replace Mobile Radio System	General Plant	In-service Complete	7/31/2017	6,296,878	407,840	2/1/2018	6,499,458	202,580	
2017	48893	TUC3 IP Turbine Refurbishment	Steam Generation Plant	Complete - Final Costed	12/1/2017	4,871,454	-	1/31/2018	5,466,520	595,066	ATO approved October 9, 2018.
2017	38931	HYD Harmony Stabilization	Hydro Generation Plant	Complete - Final Costed	1/30/2018	931,942	112,492	10/31/2017	777,750	(154,192)	
2017	50295	Electric Vehicle Infrastructure Deployment	General Plant	In-service Complete	3/31/2018	419,908	-	6/15/2018	509,295	89,387	2017 submission was not approved by NSUARB.
2017	46499	Stator Rewind Kit Capital Spare	Steam Generation Plant	Complete - Final Costed	3/4/2018	2,871,003	-	8/17/2018	2,917,466	46,462	
2017	47786	129H Kearney Lake Load Transfer	Distribution Plant	Complete - Final Costed	10/30/2017	286,280	-	2/28/2018	315,886	29,606	
2017	49857	IT - Storage Infrastructure Upgrade	General Plant	Complete - Final Costed	2/28/2018	1,901,189	88,961	5/31/2018	1,954,220	53,032	
2017	49953	IT - CIS High Availability	General Plant	In-service Complete	12/31/2017	519,023	64,771	6/18/2018	560,760	41,737	
2017	47682	HYD Lequille Switchgear Replacement	Hydro Generation Plant	In-service Complete	10/31/2017	776,391	91,199	3/22/2018	739,596	(36,794)	
2017	47876	HYD - Lequille Overhaul	Hydro Generation Plant	Complete - Final Costed	11/30/2017	1,395,229	111,626	3/22/2018	2,378,233	983,004	ATO approved April 10, 2018.
2017	47648	HYD - Lequille Pipeline Replacement	Hydro Generation Plant	Complete - Final Costed	9/30/2017	1,121,253	194,400	12/15/2017	925,167	(196,087)	
2017	47553	TRE6 Turbine Valve Refurbishment	Steam Generation Plant	Complete - Final Costed	10/15/2017	570,600	22,480	11/14/2017	601,996	31,396	
2017	44776	TUC#5 LM6000 Generator Stator Re-wedge	Gas Turbine Generation Plant	Complete - Final Costed	8/31/2017	1,361,301	106,055	8/31/2017	1,213,520	(147,781)	
2017	47654	HYD - Gulch Penstock & Surge Tank Replacement	Hydro Generation Plant	Complete - Final Costed	11/15/2017	4,970,542	597,463	4/18/2018	5,067,474	96,931	
2017	49538	TRE6 Generator Rotor Flux Probe Installation	Steam Generation Plant	Complete - Final Costed	10/15/2017	784,610	-	11/15/2017	852,045	67,435	
2017	49596	HYD - Hells Gate 2 Overhaul	Hydro Generation Plant	Complete - Final Costed	11/30/2017	1,204,263	150,476	2/20/2018	1,144,529	(59,734)	FIN approved October 26, 2018.
2017	49674	TUC2 Boiler Selective Waterwall Tube Replacements	Steam Generation Plant	Complete - Final Costed	5/30/2017	421,518	-	6/30/2017	656,906	235,388	
2017	51053	TRE6 HIP Turbine Diaphragm Partition Refurbishment	Steam Generation Plant	Complete - Final Costed	10/15/2017	1,185,445	-	11/15/2017	1,314,746	129,301	
2017	49273	BGT2 Engine Refurbishment	Gas Turbine Generation Plant	Complete - Final Costed	10/31/2017	2,170,157	98,005	11/30/2017	1,981,224	(188,933)	
2017	51052	TRE6 Generator High Voltage Bushings Critical Spare	Steam Generation Plant	Complete - Final Costed	8/15/2017	264,250	-	1/17/2018	265,783	1,533	
2017	49499	PHB - Boiler Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	8/31/2017	593,740	50,552	8/4/2017	401,915	(191,825)	
2017	49922	Western Switching Upgrades	Transmission Plant	Complete - Final Costed	8/30/2017	378,843	29,475	6/30/2018	650,674	271,831	ATO approved June 11, 2019.
2017	49438	LIN A Gallery Floor Replacement	Steam Generation Plant	Complete - Final Costed	11/16/2017	591,761	44,548	8/31/2017	404,299	(187,462)	
2017	47531	TRE6 LP Turbine Diaphragm Tip Seal Replacement	Steam Generation Plant	Complete - Final Costed	10/15/2017	1,704,784	-	11/15/2017	1,784,904	80,120	FIN approved June 12, 2018.
2017	47760	85S-402 Re-Insulate	Distribution Plant	Complete - Final Costed	8/31/2018	1,551,859	101,256	3/31/2017	1,700,924	149,066	
2017	49111	POT Air Heater Refurbishment	Steam Generation Plant	Complete - Final Costed	5/30/2017	272,538	23,538	6/1/2017	363,699	91,161	
2017 ACE Plan	50020	LIN CEMS Replacement	Steam Generation Plant	Complete - Final Costed	9/30/2017	170,281	-	10/31/2018	689,032	518,750	Subsequently approved >\$250 in 2017 for \$633,355.
2017 ACE Plan	49553	TRE Asbestos Abatement 2017	Steam Generation Plant	Complete - Final Costed	7/15/2017	226,451	-	8/2/2017	684,184	457,733	Subsequently approved >\$250 in 2017 for \$728,886.
2017 ACE Plan	49551	TRE5 CEMS Replacement	Steam Generation Plant	Complete - Final Costed	11/15/2017	162,647	-	5/11/2018	759,657	597,009	Subsequently approved >\$250 in 2017 for \$679,922.
2017 ACE Plan	49862	50N-410 Rebuild Trenton	Distribution Plant	Complete - Final Costed	6/30/2017	247,773	15,996	7/31/2017	486,542	238,769	Subsequently approved >\$250 in 2017 for \$440,329.
2017 ACE Plan	49693	TUC HFO Tank Dyke Piping Refurbishments	Steam Generation Plant	Complete - Final Costed	12/30/2017	219,022	-	12/15/2017	884,473	665,451	Subsequently approved >\$250 in 2017 for \$664,753.
2017 ACE Plan	49806	2017 Padmount Replacement Program	Distribution Plant	Complete - Final Costed	1/20/2017	1,703,774	129,960	4/30/2017	1,719,177	15,403	
2017 ACE Plan	49902	2017 Telecom Building Replacement - Wittenburg	General Plant	Complete - Final Costed	12/30/2017	294,000	18,550	5/31/2018	301,948	7,948	
2017 ACE Plan	49992	2017 Transmission Right of Way Widening	Transmission Plant	Complete - Final Costed	12/30/2017	5,400,855	-	1/1/2017	5,494,423	93,568	
2017 ACE Plan	49867	55V-313-Berwick North Replacements	Distribution Plant	Complete - Final Costed	10/30/2017	345,565	16,882	2/2/2018	417,926	72,361	
2017 ACE Plan	47769	509V-301 Overcove Rd Replacements	Distribution Plant	Complete - Final Costed	5/31/2017	402,493	28,300	2/28/2018	360,036	(42,458)	
2017 ACE Plan	50073	4S-332 Bernard Lind Drive Conversion	Distribution Plant	Complete - Final Costed	7/1/2017	302,893	15,284	11/30/2017	345,727	42,834	
2017 ACE Plan	49799	532N Elm Street Conversion Phase 1	Distribution Plant	Complete - Final Costed	6/30/2017	548,688	28,106	1/31/2018	525,501	(23,187)	
2017 ACE Plan	49880	Meter Shop Test Console Replacement	General Plant	Complete - Final Costed	2/15/2017	410,457	-	11/30/2017	400,133	(10,324)	
2017 ACE Plan	49861	IT - PI System Upgrade	General Plant	In-service Complete	12/31/2017	801,253	64,155	7/21/2018	814,726	13,473	
2017 ACE Plan	48774	HYD - Milton Shop HVAC Upgrade	Hydro Generation Plant	Complete - Final Costed	10/31/2017	564,347	98,240	8/20/2018	721,810	157,463	
2017 ACE Plan	49707	TUC2 Generator Bushing Replacement	Steam Generation Plant	Complete - Final Costed	7/25/2017	440,082	-	6/15/2018	726,401	286,319	ATO approved July 26, 2018.
2017 ACE Plan	47953	LIN Railcar Positioner Refurbishment	Steam Generation Plant	Complete - Final Costed	9/20/2017	566,619	-	10/31/2017	607,545	40,926	
2017 ACE Plan	49821	Mersey River Hydro Spare Transformer	Transmission Plant	Complete - Final Costed	3/1/2018	519,994	44,006	10/31/2018	439,280	(80,715)	
2017 ACE Plan	49818	2017/2018 Transmission Switch & Breaker Replacement	Transmission Plant	In-service Complete	4/30/2017	1,074,472	81,794	1/31/2018	1,045,371	(29,101)	
2017 ACE Plan	49792	2017 Transmission Line Retirement Program	Transmission Plant	Complete - Final Costed	3/1/2017	526,064	37,660	6/1/2017	544,382	18,318	
2017 ACE Plan	49466	PTMT - Dock and Inhaul Conveyor Replacement	Steam Generation Plant	In-service Complete	7/1/2017	467,607	42,068	12/22/2017	928,290	460,683	ATO approved January 26, 2018.
2017 ACE Plan	49815	2017 / 2018 Steel Tower Refurbishment	Transmission Plant	In-service Complete	2/28/2017	2,003,317	143,733	2/28/2017	1,909,207	(94,110)	
2017 ACE Plan	49533	TRE6 Boiler Refurbishment	Steam Generation Plant	Complete - Final Costed	10/15/2017	1,259,454	-	11/14/2017	1,490,498	231,045	
2017 ACE Plan	49431	LIN Mill Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	10/16/2017	665,839	-	6/22/2017	763,974	98,135	
2017 ACE Plan	49918	54H-303 Underground Device Replacements Phase I	Distribution Plant	Complete - Final Costed	12/30/2017	469,604	-	7/31/2017	521,501	51,897	
2017 ACE Plan	49057	TRE6 Excitation System Replacement	Steam Generation Plant	Complete - Final Costed	10/15/2017	904,011	84,695	11/30/2017	893,489	(10,522)	
2017 ACE Plan	49419	POT Boiler Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	6/30/2017	969,292	82,805	6/5/2017	1,180,397	211,105	
2017 ACE Plan	47687	POT Boiler Chemical Reconditioning	Steam Generation Plant	Complete - Final Costed	6/30/2017	974,604	81,610	6/5/2017	1,588,495	613,891	ATO approved November 2, 2017.
2017 ACE Plan	49430	LIN CW Pump Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	6/16/2017	516,270	-	6/22/2017	560,231	43,962	
2017 ACE Plan	49532	TRE6 Air Heater Refurbishment	Steam Generation Plant	Complete - Final Costed	10/15/2017	1,428,236	60,066	11/14/2017	1,548,759	120,523	
2017 ACE Plan	49536	TRE5 Boiler Refurbishments 2017	Steam Generation Plant	Complete - Final Costed	5/15/2017	717,589	60,017	5/8/2017	925,492	207,903	
2017 ACE Plan	49836	11S-302 11S-401 Rebuild Coxheath Phase 2	Distribution Plant	Complete - Final Costed	4/1/2017	807,456	53,550	12/29/2017	774,528	(32,928)	
2017 ACE Plan	49434	LIN CW Screen Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	10/16/2017	347,062	-	8/31/2017	334,390	(12,672)	
2017 ACE Plan	49535	TRE6 Mills Refurbishment 2017	Steam Generation Plant	Complete - Final Costed	10/15/2017	822,141	47,605	11/14/2017	860,580	38,439	
2017 ACE Plan	49675	TUC2 Cooling Water Piping Refurbishment	Steam Generation Plant	Complete - Final Costed	6/30/2017	568,673	-	6/30/2017	812,353	243,680	
2017 ACE Plan	49866	512N-Toney River Replacements	Distribution Plant	Complete - Final Costed	11/3/2017	285,219	-	12/29/2017	453,402	168,182	
2017 ACE Plan	49463	POT Coal Mill Overhauls 2017	Steam Generation Plant	Complete - Final Costed	7/30/2017	328,410	40,597	12/14/2017	501,140	172,730	
2017 ACE Plan	49878	2017 Substation Insulator Replacement Program	Transmission Plant	Complete - Final Costed	2/15/2017	508,893	34,971	3/31/2017	353,315	(155,578)	
2017 ACE Plan	49833	2017 Oil Containment Program	Transmission Plant	Complete - Final Costed	11/1/2017	432,518	34,525	12/31/2017	339,360	(93,159)	
2017 ACE Plan	47956	L7004 Replacements and Upgrades	Transmission Plant	Complete - Final Costed	9/28/2017	672,131	42,872	7/31/2017	481,723	(190,408)	
2017 ACE Plan	49591	3S Feeder Exit Cable Replacement	Distribution Plant	Complete - Final Costed	9/30/2017	335,842	-	12/31/2017	581,561	245,719	
2017 ACE Plan	49798	2017 / 2018 Capacitor Bank Breaker Replacements	Transmission Plant	Complete - Final Costed	4/1/2018	378,150	26,923	6/30/2017	209,820	(168,329)	
2017 ACE Plan	49789	L651S Replacements and Upgrades	Transmission Plant	Complete - Final Costed	9/30/2017	2,340,989	152,937	6/30/2017	2,590,653	249,664	
2017 ACE Plan	49814	2017 / 2018 Steel Tower Life Extension	Transmission Plant	Complete - Final Costed	6/1/2017	1,462,100	103,000	6/1/2017	1,643,871	181,771	
2017 ACE Plan	49791	3N Oxford Conversion Phase 3	Distribution Plant	Complete - Final Costed	3/1/2017	358,369	-	3/31/2017	604,785	246,416	
2017 ACE Plan	49813	2017 Sacrificial Anode Installation Program	Transmission Plant	Complete - Final Costed	1/31/2017	1,532,340	105,000	3/31/2017	1,749,977	217,637	
2017 ACE Plan	50071	T&D Inspection Application Upgrade Phase 1	General Plant	Complete - Final Costed	9/30/2017	411,191	24,170	1/31/2018	652,957	241,766	
2017 ACE Plan	47893	TUC3 PE Generator Hydrogen Panel Replacement	Steam Generation Plant	Complete - Final Costed	10/12/2017	423,798	-	12/15/2017	468,010	44,211	
2017 ACE Plan	49427	LIN Coal Plant Structural Refurbishment Phase 3	Steam Generation Plant	Complete - Final Costed	8/16/2017	365,003	-	9/18/2017	466,204	101,201	
2017 ACE Plan	49433	LIN1 SH5 Boiler Tube Replacement	Steam Generation Plant	Complete - Final Costed	5/16/2017	493,396	-	6/22/2017	930,561	437,165	ATO approved September 12, 2017.
2017 ACE Plan	47597										

						Original Submission Amounts			Actual Amounts			
Filing Type	CI Number	Project Title	Function Class	Status	Estimated In-Service Date	Approved Estimate	Contingency on Approved Estimate	Actual In-Service Date	Actual Spend (as of 09/30/2020)	Variance to Approved Estimate	Comments/Notes	
2017 ACE Plan	49891	509V Recloser and Voltage Regulator Replacement	Distribution Plant	In-service Complete	11/1/2017	319,649	12,091		138,465	(181,184)		
2017 ACE Plan	48535	HYD Scragg Lake Dam and Spillway Refurbishment	Hydro Generation Plant	Complete - Final Costed	10/30/2017	1,956,298	227,841	11/30/2017	1,625,672	(330,626)	FIN approved December 6, 2018.	
2017 ACE Plan	48631	HYD - Gulch Spillway Refurbishment	Hydro Generation Plant	Complete - Final Costed	10/30/2017	617,034	72,153	10/25/2018	637,103	20,069		
2018	52143	LM6000 - 191-332 Hot Section and Engine Refurbishment	Gas Turbine Generation Plant	Complete - Final Costed	11/30/2019	3,140,533	283,503	8/9/2019	3,364,401	223,868		
2018	52107	TUC6 CW Screen Replacement	Steam Generation Plant	Complete - Final Costed	12/30/2018	856,984	46,607	9/14/2018	1,058,298	201,313		
2018 ACE Plan	52239	TUC6 Main and Induction Stop Valve Refurbishment	Steam Generation Plant	Complete - Final Costed	7/27/2018	160,053	-	9/14/2018	300,398	140,344	Subsequently approved >\$250 in 2018 for \$335,693.	
2018 ACE Plan	52271	2018 Padmount Replacement	Distribution Plant	In-service Complete	1/25/2018	1,657,205	135,231	2/28/2018	1,617,507	(39,698)		
2018 ACE Plan	52192	54H-303 Underground Device Replacement	Distribution Plant	In-service Complete	12/31/2018	309,230	19,273	5/31/2018	388,517	79,287		
2018 ACE Plan	51969	2018 Transmission ROW Widening 69kV	Transmission Plant	Complete - Final Costed	1/30/2018	5,487,686	-	2/20/2018	5,542,106	54,421		
2018 ACE Plan	49943	HYD - Ruth Falls Facility Refurbishment	Hydro Generation Plant	Complete - Final Costed	7/31/2018	1,234,931	143,550	11/19/2019	1,448,745	213,814		
2018 ACE Plan	52207	678H-211 McNab's Island Replacement	Distribution Plant	In-service Complete	3/31/2019	350,176	26,624	7/31/2018	263,145	(87,031)		
2018 ACE Plan	51500	2018 Pin Insulator Replacements	Distribution Plant	Complete - Final Costed	1/1/2018	350,100	20,156	6/30/2019	321,249	(28,851)		
2018 ACE Plan	52267	16W-302H-Brenton Rd Rebuild	Distribution Plant	Complete - Final Costed	4/28/2019	387,767	28,642	12/13/2018	344,278	(43,488)		
2018 ACE Plan	49946	HYD - Fourth Lake Overhaul	Hydro Generation Plant	Complete - Final Costed	11/30/2018	1,025,769	81,354	1/30/2019	1,145,995	120,225		
2018 ACE Plan	52093	ICP Rail Crossing Refurbishment	Steam Generation Plant	In-service Complete	8/20/2018	592,402	50,144	9/5/2018	450,582	(141,821)		
2018 ACE Plan	51825	POT Boiler Refurbishment 2018	Steam Generation Plant	In-service Complete	4/30/2018	568,740	36,375	5/4/2018	639,602	70,862		
2018 ACE Plan	51839	LIN Coal Plant Structural Refurbishment	Steam Generation Plant	Complete - Final Costed	8/21/2018	354,067	-	9/5/2018	427,548	73,481		
2018 ACE Plan	51866	HYD - 4th Lake Penstock Refurbishment	Hydro Generation Plant	In-service Complete	9/30/2018	696,963	56,683	9/1/2018	902,486	205,523		
2018 ACE Plan	51805	LIN4 Boiler Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	4/29/2018	739,657	-	8/1/2018	828,067	88,410		
2018 ACE Plan	52156	LIN Vacuum Pump Upgrades	Steam Generation Plant	Complete - Final Costed	9/25/2018	302,714	-	4/14/2018	322,107	19,393		
2018 ACE Plan	51835	TUC2 H2 Panel Upgrades	Steam Generation Plant	Complete - Final Costed	6/21/2018	454,886	-	6/21/2018	501,488	46,602		
2018 ACE Plan	52253	LIN3 Economizer Header Refurbishment	Steam Generation Plant	Complete - Final Costed	3/27/2018	499,951	38,000	5/16/2018	560,687	60,736		
2018 ACE Plan	51803	TUC2 Generator Flux Probe Installation	Steam Generation Plant	Complete - Final Costed	6/21/2018	840,158	-	6/15/2018	863,302	23,144		
2018 ACE Plan	52252	LIN1 SH5 Tube Replacement	Steam Generation Plant	Complete - Final Costed	10/27/2018	521,259	38,000	10/2/2018	600,706	79,447		
2018 ACE Plan	51853	LIN3 Turbine Valve Refurb 2018	Steam Generation Plant	Complete - Final Costed	4/21/2018	295,709	-	4/14/2018	351,882	56,173		
2018 ACE Plan	51804	LIN3&4 ACW Duplex Strainer Replacement	Steam Generation Plant	In-service Complete	8/21/2018	333,808	34,800	6/24/2019	326,553	(7,255)		
2018 ACE Plan	51815	LIN CW Pump Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	10/21/2018	520,436	-	4/14/2018	613,339	92,902		
2018 ACE Plan	51851	LIN CW Screen Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	10/21/2018	350,534	-	10/31/2018	306,646	(43,887)		
2018 ACE Plan	51402	2018/2019 Sacrificial Anode Installation	Transmission Plant	In-service Complete	1/31/2018	3,023,668	210,000	4/30/2018	3,073,226	49,557		
2018 ACE Plan	51820	TRES Reheat Turbine Valves	Steam Generation Plant	In-service Complete	6/15/2018	450,408	38,066	9/14/2018	549,705	99,297		
2018 ACE Plan	51860	TRES PF Mill Line Replacement	Steam Generation Plant	Complete - Final Costed	7/31/2018	258,761	21,442	9/14/2018	264,575	5,814		
2018 ACE Plan	51836	TRES Mill Refurbishments 2018	Steam Generation Plant	In-service Complete	6/15/2018	409,458	4,394	6/1/2018	479,323	69,865		
2018 ACE Plan	43218	88W-323A Tusket Islands Phase 3	Distribution Plant	Complete - Final Costed	2/28/2019	654,721	46,671	9/30/2019	703,299	48,578		
2018 ACE Plan	51824	LIN3 ID Fan Damper and VIV Refurbishment	Steam Generation Plant	Complete - Final Costed	4/4/2018	443,311	-	4/14/2018	464,603	21,292		
2018 ACE Plan	51849	LIN3 RH Tube Replacement	Steam Generation Plant	Complete - Final Costed	4/21/2018	399,546	-	4/14/2018	499,759	100,213		
2018 ACE Plan	52241	16V-T2 Weymouth Hydro Transformer Replacement	Transmission Plant	Complete - Final Costed	12/31/2018	889,253	67,694	11/30/2018	674,829	(214,424)		
2018 ACE Plan	49033	HYD WRC Tunnel T-2 Intake Replacement	Hydro Generation Plant	Complete - Final Costed	10/31/2018	2,851,582	367,813	11/22/2018	2,759,407	(92,175)		
2018 ACE Plan	52206	20V-311-Bishop Ville Rd	Distribution Plant	Complete - Final Costed	8/31/2018	303,533	17,367	10/31/2018	167,853	(135,680)		
2018 ACE Plan	48533	HYD Lequille Headpond Refurbishment	Hydro Generation Plant	Complete - Final Costed	10/2/2018	4,472,369	537,354	10/30/2018	4,653,541	181,171		
2018 ACE Plan	51863	2018 Tap Changer Replacements	Transmission Plant	Complete - Final Costed	6/30/2018	306,102	14,466	9/30/2018	417,341	111,238		
2018 ACE Plan	C0001802	54C-211 Queen Street Conversion	Distribution Plant	Complete - Final Costed	4/30/2018	705,316	55,296	9/27/2018	953,678	248,363		
2018 ACE Plan	51802	TRES Boiler Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	6/15/2018	1,212,228	46,694	9/14/2018	1,384,485	172,257		
2018 ACE Plan	52208	3S Feeder Exit Cable Replacement Phase 2	Distribution Plant	Complete - Final Costed	12/31/2018	293,228	19,861	8/31/2018	540,984	247,755		
2018 ACE Plan	51850	LIN4 RH Tube Replacement	Steam Generation Plant	Complete - Final Costed	4/21/2018	399,546	-	7/9/2018	522,749	123,203		
2018 ACE Plan	C0001950	New Distribution Rights-of-Way Ph 3	Distribution Plant	Complete - Final Costed	3/30/2018	9,822,493	-	2/1/2018	10,288,858	466,365		
2018 ACE Plan	51852	POT Coal Mill Overhaul 2018	Steam Generation Plant	Complete - Final Costed	11/1/2018	327,267	39,997	8/31/2018	392,517	65,250		
2018 ACE Plan	51818	PHB Boiler Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	9/30/2018	440,315	38,681	7/31/2018	517,202	76,887		
2018 ACE Plan	51806	LIN Mill Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	10/21/2018	673,153	-	10/31/2018	791,432	118,279		
2018 ACE Plan	51857	TRES Burner Refurbishments 2018	Steam Generation Plant	Complete - Final Costed	6/15/2018	332,497	27,571	9/14/2018	214,410	(118,088)		
2018 ACE Plan	49676	TUC2 CEMS Replacement	Steam Generation Plant	Complete - Final Costed	7/30/2018	380,140	-	2/26/2019	411,019	30,878		
2018 ACE Plan	51807	TUC2 Boiler Lower Vestibule Refurbishment	Steam Generation Plant	Complete - Final Costed	6/6/2018	412,872	25,114	6/29/2018	193,683	(219,189)		
2018 ACE Plan	47684	LIN3 - Boiler Refurbishment 2018	Steam Generation Plant	Complete - Final Costed	4/4/2018	739,657	-	4/14/2018	791,058	51,401		
2018 ACE Plan	49898	15N-202 Victoria St Replace Deteriorated Assets	Distribution Plant	Complete - Final Costed	8/31/2018	242,253	11,843	8/31/2018	388,998	146,745	Subsequently approved >\$250 in 2019 for \$394,528.	
2019	52292	TUC Heavy Fuel Oil Tank Dyke Refurbishment	Steam Generation Plant	Complete - Final Costed	11/28/2019	495,317	18,981	11/28/2019	482,963	(12,354)		
2019 ACE Plan	C0009059	LIN - Coal Plant Structural Refurbishment Phase 5	Steam Generation Plant	Complete - Final Costed	9/1/2019	375,902	-	5/31/2019	470,748	94,846		
2019 ACE Plan	C0009080	LIN - CW Screen Refurbishment 2019	Steam Generation Plant	Complete - Final Costed	7/1/2019	354,651	-	5/31/2019	395,892	41,240		
2019 ACE Plan	C0009092	LIN3 - Reheat Tube Replacement 2019	Steam Generation Plant	Complete - Final Costed	4/1/2019	412,548	-	5/31/2019	482,716	70,168		
2019 ACE Plan	C0009099	LIN3 - Boiler Refurbishment 2019	Steam Generation Plant	Complete - Final Costed	6/10/2019	788,176	-	5/31/2019	865,166	76,990		
2019 ACE Plan	C0009079	LIN - CW Pump Refurbishment 2019	Steam Generation Plant	Complete - Final Costed	7/1/2019	522,011	-	4/24/2019	544,550	22,540		
2019 ACE Plan	C0010141	POT - IP-LP Turbine Refurbishment	Steam Generation Plant	In-service Complete	7/31/2019	2,938,990	245,840	6/28/2019	2,956,698	17,708		
2019 ACE Plan	C0010498	POT - Turbine Valve Refurbishment	Steam Generation Plant	In-service Complete	7/5/2019	698,497	59,090	6/28/2019	724,495	25,998		
2019 ACE Plan	C0011076	POT - Boiler Refurbishment 2019	Steam Generation Plant	In-service Complete	5/30/2019	1,388,434	115,014	6/21/2019	1,442,731	54,297		
2019 ACE Plan	C0009082	LIN - Reclaim Feeder Refurbishment Phase 3	Steam Generation Plant	Complete - Final Costed	8/1/2019	542,948	11,500	10/17/2019	586,460	43,512		
2019 ACE Plan	48536	HYD - Wreck Cove Brook Dam D-9 Refurbishment	Hydro Generation Plant	Complete - Final Costed	9/30/2019	597,697	67,330	8/22/2019	618,980	21,283		
2019 ACE Plan	C0009093	LIN4 - Reheat Tube Replacement 2019	Steam Generation Plant	Complete - Final Costed	4/30/2019	412,548	-	7/23/2019	497,095	84,546		
2019 ACE Plan	C0009108	LIN4 - Economizer Header Refurbishment	Steam Generation Plant	Complete - Final Costed	4/30/2019	509,373	38,000	7/23/2019	415,461	(93,913)		
2019 ACE Plan	C0009096	LIN - Mill Refurbishment 2019	Steam Generation Plant	Complete - Final Costed	7/1/2019	677,819	-	4/24/2019	873,091	195,272		
						147,464,478	7,780,713			163,399,681	15,935,203	



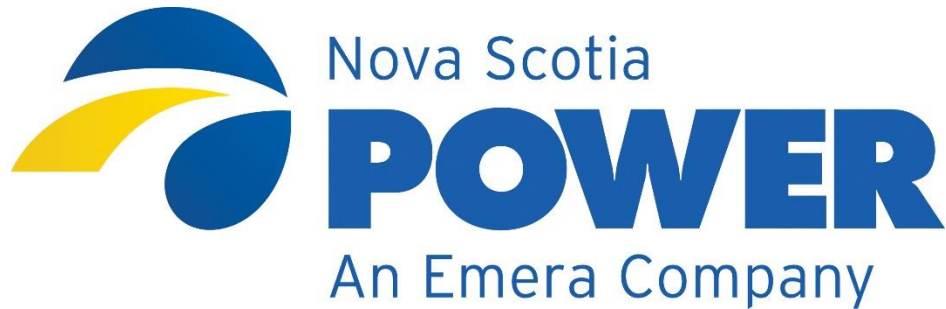
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**EAM User Manual**

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**Nova Scotia Power Inc.**

**Economic Analysis Model**

**User Manual**

November 2020



## EAM User Manual

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### I. EAM Overview

The Economic Analysis Model (EAM) is the standard model used by Nova Scotia Power Inc. (NS Power) to calculate the present value of revenue requirement and economic value of a capital investment. The model takes capital costs, avoided costs, revenue, expenses, and taxes into consideration to calculate a forecast Net Present Value of Revenue Requirement (NPVRR).

The objective of economic analysis at NS Power is to seek the most economic alternative, among a number of technically feasible alternatives that satisfy basic requirements and yields the best value for customers.

In accordance with NS Power's Nova Scotia Utility and Review Board (NSUARB) approved Capital Expenditure Justification Criteria (CEJC), the technically feasible project alternative with the lowest NPVRR is the lowest cost option for customers and should be the chosen alternative.



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## II. Definition and Types of Capital Investments

### A. *Capital Investments Definition*

A capital investment is an investment for the acquisition, replacement, refurbishment, or improvement of an asset. Further information on criteria for eligible capital investments are included in NS Power Accounting Policy 6000- Capitalization of Cost and Accounting Policy 6100- Cost. Expenditures that do not meet the criteria as provided by these accounting policies must be expensed. Any inquiries or requests for clarification concerning eligible capital investment should be directed to NS Power's Manager, Capital Accounting.

### B. *Types of Capital Investments evaluated by the EAM*

Capital investments evaluated through the EAM can be classified into two broad categories: Economically Justified Projects and Essential Projects.

#### 1. Economically Justified Projects

An economically justified project is a capital investment that is justified, in whole or in part, on the basis of its economic benefits. The EAM is used to calculate the forecast economic benefits of economically justified projects. These projects are primarily undertaken on the basis of a reduction to NS Power's NPVRR or a reduction to cost for NS Power's customers. Economically justified projects may also be justified on other technical justifications.

#### 2. Essential Projects

Essential Projects are capital investments that must be made to sustain the business, provide service to customers or must be made to satisfy technical, legal, safety, regulatory or





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environmental directives. They include replacements or refurbishment of equipment, investment to meet the requirements of customer growth or investments that are necessary to avoid a regulatory, health, safety or environmental penalty.

In contrast to economically justified projects, essential projects may result in an increase to NS Power's NPVRR. The EAM should be utilized to perform an economic analysis in the case of essential projects so that the least cost option (the option with the lowest NPVRR), meeting all the requirements and constraints specified shall be selected. If there is only one technically feasible option for completion of the capital investment or the alternatives achieve the same result with a significant difference in capital investment, an economic analysis does not add value to the selection of alternatives and is not required.



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### III. Inputs and Economic Analysis

The NPVRR of a project provides a standard for assessing the impact of capital investment on NS Power's revenue requirement or the amount of revenue that must be collected from customers. Calculation of NPVRR allows the comparison of the relative values among a selection of investment opportunities or technically feasible alternatives.

There are two types of inputs that are required for the calculation of NPVRR:

**Form Inputs** - Information that must be inputted by the user.

**Default Information** - Inputs that are updated annually or more frequently as required by the model administrators.

Form Inputs that should be considered for inclusion in the EAM include:

- Direct Capital Cost of the Investment
- Indirect Capital Cost of the Investment (AO and AFUDC)
- Timing of investments
- Project In-service Date
- Expected Useful Life of the Investment
- Additional Capital Investment required as a result of the investment (if applicable)
- Additional or avoided Operating Costs as a result of the investment (if applicable)
- Additional revenues or cost recoveries as a result of the investment (if applicable)
- Avoided Generation Outage or Deration costs resulting from the investment (if applicable)
- Avoided Repair Costs resulting from the investment (if applicable)

Default Information that is reviewed and updated on an annual basis or as required:



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- Current Year
- Debt and Equity Financing Costs
- Accounting Depreciation Rates
- Tax Depreciation Rates (Capital Cost Allowance)
- Forecast Inflation Rate
- Income Tax Rates
- Replacement Energy Cost by Generating Unit or Plant
- Expected Net Capacity Factor by Generating Unit or Plant

### **A. Calculation of Revenue Requirement**

After the input of the capital investment factors is complete, the EAM will provide the NPVRR of each alternative considered in the Summary tab. The revenue requirement associated with each alternative is calculated on an annual basis and discounted to the current year at NS Power's Weighted Average Cost of Capital (WACC).

The impact of a capital investment must result in a forecast reduction to NS Power's NPVRR to be considered an economically justified project. For essential projects, the technically feasible alternative with the lowest NPVRR is the most economic option and should be undertaken, all else being equal.

### **B. Other Economic Indicators**

Beyond NPVRR, the following economic measures are included in the EAM:

#### **1. Internal Rate of Return (IRR)**



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The Internal Rate of Return (IRR) is the discount rate for which the Net Present Value of the cash flows associated with an investment equals zero. When the IRR is greater than the Cost of Capital, the project provides value to shareholders. As IRR is calculated on a trial and error basis, the IRR cannot be calculated for all forecasts as Excel will return an error if the IRR is not calculated within 20 iterations.

### 2. PV of EVA/NPV

The procedure for calculating net present value involves discounting the project's forecasted free cash flow (FCF). Typically, as the initial investment is made, cash flow is negative. As the project's benefits are realized, cash flow becomes positive. Discounting the cash flows to a present value indicates whether the project benefits offset the initial investment and provide value to shareholders.

### 3. Discounted Payback Period

Discounted Payback Period reflects the time required by the project to generate enough cash flow to cover the upfront capital investments. Though the time value of money is incorporated into the calculation, this method ignores the cash flows after the payback period.

***At NS Power, the key criterion for decision-making will be Net Present Value of Revenue Requirement which is the forecast impact to customers of investment in capital projects.***



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### **C. *Other Economic Analysis Considerations***

The following items should be taken into consideration when completing an economic analysis:

#### **1. Forecast on a Consistent Basis**

All costs and benefits must be projected on a consistent basis. Therefore, costs and benefits must be considered using the appropriate discount rate. Forecasts should be expressed in nominal dollars, which include expectations for inflation.

The time period for economic analysis starts with the first project expenditures and extends through the useful life of the project or the most long-lived alternative. The standard time period for evaluation in the EAM is 40 years, as meaningful estimates of cash flows may not be possible past this time period or the impact of these costs on a NPV basis may no longer be material to an economic analysis past this time. If material costs associated with an investment alternative are expected to be incurred, the relevant cost(s) should be inputted in the EAM by discounting the cost back to the last year of economic analysis period and added to the last year of the analysis timeframe.

#### **2. Relevant Costs**

For economic analysis purposes, relevant costs and revenues of one alternative are compared to the relevant costs and revenues of another alternative. Relevant costs are future costs that are different between alternatives. Costs that are the same among all options are considered irrelevant and can be excluded from the economic analysis.



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For example, in an analysis that considers a replacement of an asset against a refurbishment in which the ongoing operating costs will be equivalent, the operating costs are not required to be included in the economic analysis as they are the same. In a decision to reinvest in or decommission a generating plant, the ongoing operating costs of the plant in the case of the reinvestment alternative must be considered.

It is also important to include only applicable avoided costs in the economic evaluation of alternatives. For example, if a capital investment pertains to one unit within a multi-unit thermal plant, the avoided energy costs considered should only be those of the specific unit as opposed to the output of the entire plant. If the same avoided costs are applicable to all alternatives being considered, they are not relevant and should be excluded from the economic analysis.

### 3. Sunk Costs

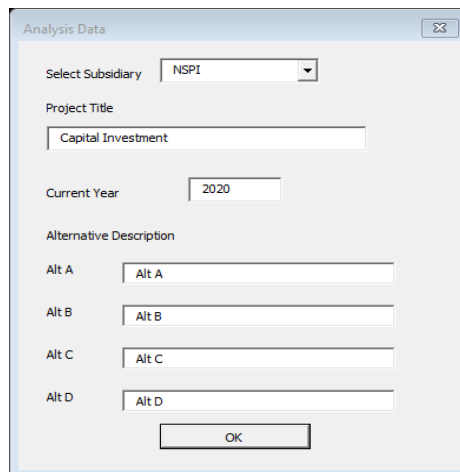
Sunk costs are those costs that have already been committed or incurred and cannot be recovered. As these costs have already been incurred, they will not change regardless of which alternative is chosen. For the purposes of economic decision making, sunk costs should be disregarded. For submission of capital items to the NSUARB or other stakeholders in which the intent is to include all costs associated with a capital investment, it is important that the sunk costs (i.e. preliminary engineering costs required to determine the best alternative for capital investment) are included in each of the alternatives being compared.

## IV. Economic Analysis Model: Structure & Use

### A. Main Menu

When the model is opened, the "Analysis Data" form appears automatically. This allows the user to select the current year, and the descriptions for the project and alternatives. If the model is being used for the first time, the titles and descriptions will be given default names. The model will save the information on the form so that when it is next opened, the saved information will appear.

**Figure 1 - Analysis Data**



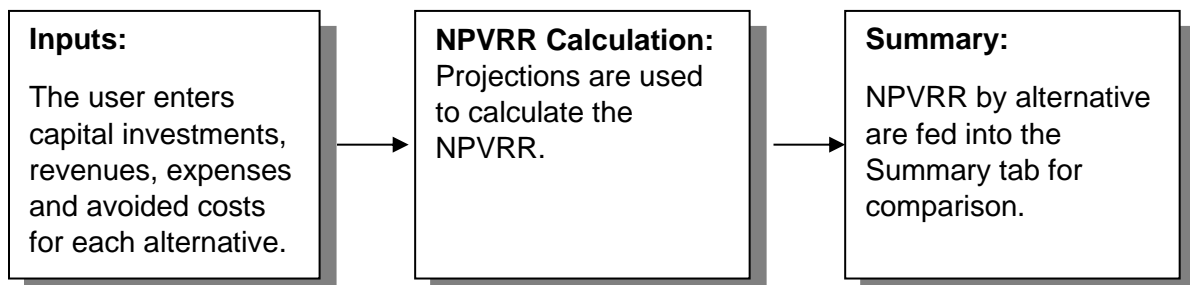
The screenshot shows a window titled "Analysis Data" with a close button in the top right corner. The form contains the following fields:

- Select Subsidiary:** A dropdown menu with "NSPI" selected.
- Project Title:** A text input field containing "Capital Investment".
- Current Year:** A text input field containing "2020".
- Alternative Description:** A section with four rows, each with a label and a text input field:
  - Alt A: Alt A
  - Alt B: Alt B
  - Alt C: Alt C
  - Alt D: Alt D
- OK:** A button at the bottom center of the form.

### B. Model Overview

The model is built of three distinct modules – input alternatives, NPVRR calculation, and the Summary report. Data flows between the modules as follows:

**Figure 2: Data Flow**



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## 1. Data Input Sheets

The model contains four "Data" sheets to input Capital Investments, Revenue, Expense and Working Capital Information. Each Data sheet has hyperlinks at the top of the page that will take the user to the Revenue, Expense, Capital and Net Working Capital sections of the sheet. There are also four buttons to the right of the hyperlinks that handle much of the inputs for the model.

### Figure 3: Data Sheet

<b>Purchase</b> Alt A	<a href="#">Working Capital</a>	Add Operating Item		Add Capital		
	<a href="#">Capital</a> <a href="#">Expenses</a> <a href="#">Revenue</a>	Project Description		Delete Item		
		2002	2003	2004	2005	2006

## Adding Capital Expenditures

Clicking on the *Add Capital* button opens an Excel form that will input the appropriate information into the spreadsheet.

- a. **Install Date:** Type or select by clicking on the down arrow the initial year of the capital investment.
- b. **Life:** Type or select the expected useful life of the investment in years. Note: If there is no salvage value to the investment and the investment will not be repeating, then a useful life does not need to be entered.
- c. **Cost:** Enter the dollar cost of the capital expenditure as a positive number. If the item is a Contribution in Aid of Construction, then enter the cost as a negative.
- d. **Present \$/ Future \$:** If the Present option is selected, which is the default, the Cost will be adjusted by the inflation rate. If the Future option is selected, the value entered in





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the \$/Unit will not be adjusted.

- e. **Repeating:** Select the Repeating box if the capital expenditure will recur during the life of the project. The repeating expenditures stop after a 40-year period. (Note: A number must be entered for the useful life in order for the Repeating feature to work.)
- f. **Salvage:** Enter the salvage value in dollars or as a percentage of the original cost. The sign (+, -) for the salvage should be the same as the sign for the original cost. If a Salvage value is entered, then a Life should also be entered.
- g. **\$/ Percent:** Select Percent for the model to calculate the salvage value as a percent of the expenditure. The default is that the Salvage value will be entered as a dollar amount. If Present \$ is selected, then the Salvage value will be adjusted by the escalation rate for the number of years until salvage occurs. The user should check the inputs to ensure that any salvage amount cash flows have been including according to their expectations.
- h. **Tax Asset Group:** Select the Tax Asset classification that is appropriate for the expenditure. This will affect the tax depreciation. If you are uncertain as to the appropriate tax asset group, please consult Capital Accounting.
- i. **Book Group:** Select the Asset Functional Class that is appropriate for the expenditure (ie. Steam, Hydro, Distribution, etc.). This will affect the options for book sub-group available to be chosen.
- j. **Book Sub-Group:** Select the Asset Pool that is appropriate for the expenditure. This will affect the book depreciation. Note: The Sub-Groups available will change based upon

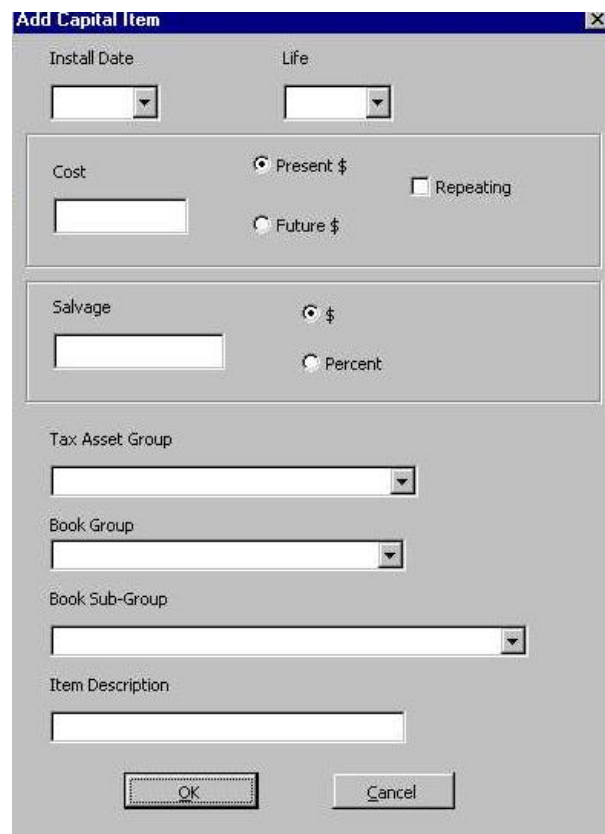
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which Book Group is selected.

- k. **Item Description:** Enter the description for this capital expenditure item.
- l. **OK/Cancel:** The OK button will input the data entered into the first available row in the appropriate area of the sheet. Note: Clicking the "X" in the upper-right hand corner has the same effect as clicking the "Cancel" button

Instead of using the Add Capital function, information can be directly input or changed in the appropriate section of the sheet. Data that was already entered may also be changed by editing the cell directly that contains the data.

**Figure 4: Add Capital Form**





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### Adding Revenues or Expenses

Clicking on the *Add Operating Item* button opens an Excel form that will input the appropriate information into the spreadsheet.

- a. **First Year:** Type or select by clicking on the down arrow the initial year of revenue or expenses.
- b. **Last Year:** Type or select the last year of the revenues or expenses.
- c. **Interval (Years):** Type or select the number of years between revenue or expense recognition. The default value is 1, indicating that the revenue or expense will occur annually.
- d. **\$/ Unit and Volume:** Enter the cash flow per unit and volume of this item, regardless of whether it is an expense or a revenue. If an expense is incurred (reduced), enter the value as a positive (negative) number. If revenue is recognized (reduced), enter the value as a positive (negative) number. The default Volume is 1. If the item does not occur on a per-unit basis, then enter the full amount in the \$/Unit box and leave Volume set to 1.
- e. **Present \$/ Future \$:** If the Present option is selected, which is the default, the \$/Unit will be adjusted by the inflation rate. If the Future option is selected, the value entered in the \$/Unit will not be adjusted.
- f. **Same \$ Every Year, Yearly \$ Increase, Yearly % Increase:** Same \$ Every Year, the default, will enter the same amount of Cost/ Unit for every year that the cash flow occurs. Selecting Yearly \$ or % Increase will adjust the cash flows annually by the amount entered in the corresponding boxes. \$ Increase adds the amount entered to the previous year's cash flow. % Increase increases the previous year's cash flows by the percentage input.



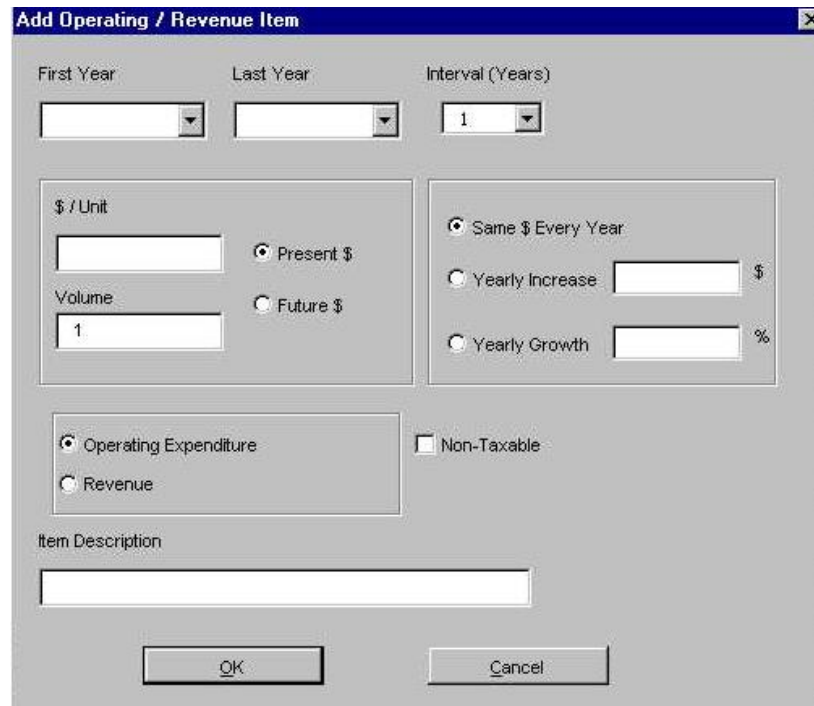
## EAM User Manual

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- g. **Operating Expenditure/ Revenue:** Select if the cash flows are expenditures or revenues. The default is expenditure.
- h. **Non-Taxable:** The check box is specifically used for revenue items that are not subject to income taxation. The default is for this option to be un-checked. Users must consult with Capital Accounting if they believe this is applicable to their project.
- i. **Item Description:** Enter the description for this revenue or expense item.
- j. **OK/Cancel:** The OK button will input the data entered into the first available row in the appropriate area of the sheet. Note: Clicking the "X" in the upper-right hand corner has the effect as clicking the "Cancel" button.

Instead of using the Add Operating function, information can be directly input into the appropriate section of the sheet. Data that was already entered may also be changed by editing the cell that contains the data directly.

**Figure 5: Add Revenue/Expense Form**



**Add Operating / Revenue Item**

First Year: [ ] Last Year: [ ] Interval (Years): [ 1 ]

\$ / Unit: [ ] Volume: [ 1 ]

☒ Present \$ ☐ Future \$

☒ Same \$ Every Year  
☐ Yearly Increase [ ] \$  
☐ Yearly Growth [ ] %

☒ Operating Expenditure ☐ Revenue

☐ Non-Taxable

Item Description: [ ]

OK Cancel

### Add Net Working Capital

The users enter Current Assets and Current Liabilities as a percentage of revenues at the bottom of each of the Data sheets. The two net to determine the annual working capital requirements for each alternative.

### Changing and Deleting Items

Data may be deleted in two ways: directly in the cells or using the Delete Item button. The Delete Item button will delete all data associated with the item. For a capital expenditure, the Description, Amount and Book and Tax depreciation information will be deleted. The item number (1-30) in either the Capital Invested, Revenue or Expense category must be selected in order for the item to be deleted.



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If a capital expenditure has already been entered into the EAM and only the Amount needs to be changed, then the change can be made directly to the cell under the year that the expenditure occurs. If additional changes need to be made then the Delete Item button should be used.

If a Revenue or Expense item needs to be changed, the value may be edited directly in the appropriate cell.

### Calculating Avoided Expenses

Avoided expenses resulting from capital investment are a key input in evaluating the economic impact. Investment in generating units may be economic as a result of avoiding forecast replacement energy and repair costs as a result of unit outages that may occur if an investment is not made. When comparing the alternative of reinvestment in a generating unit or plant against decommissioning, it is important to ensure that the replacement energy cost avoided as a result of the reinvestment is included in the analysis to fully compare the economic impacts of the alternatives.

Only avoided costs associated with an investment should be considered. If a capital investment pertains to one unit within a multi-unit thermal plant, only the replacement energy cost (REC) associated with the specific unit being invested in should be considered.

### Avoided Expense Calculator

The avoided expense calculator is used to calculate forecast avoided REC and avoided repair costs resulting from the proposed capital investment. Assumptions related to forecast avoided expenses associated with the alternatives being evaluated should be noted in the description field for each alternative on the Summary tab of the EAM.



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The inputs and functionality of the avoided expense calculator are described below:

**Incremental replacement energy costs (\$/MWh):** The incremental REC for each MWh of energy from the plant or unit for which the investment is being evaluated. REC accounts for the cost of the energy generated by the unit and where the replacement energy will be sourced. RECs for thermal units will be significantly lower than for NS Power owned renewable energy, which have no fuel cost component. The REC is forecast for the first five years using the outputs from the most recent ten-year system outlook forecast. For each year thereafter the forecast for the fifth year is escalated at inflation. The generating plant or unit that is being invested in must be selected in the Add Capital Form on the Data tab for the incremental REC to be populated in the avoided expense calculator.

**Unit Capacity Factor (%):** The forecast unit capacity factor is forecast for five years and the forecast for the fifth year is held constant from year six onward. Changes to unit capacity factor can be directly input into the cells in the avoided expense calculator. The generating plant or unit that is being invested in must be selected in the Add Capital Form on the Data tab for the forecast unit capacity factor to be populated in the avoided expense calculator.

**Number of Events per Year:** This is the number of predicted annual events that lead to unit failure, derating or repair costs that would occur if the capital project is not executed. If the unit is not expected to be returned to service once it fails, the number of events per year should not exceed one. This field must be input by the user.

**Annual Probability of Events Taking Place (%):** This is the forecast probability of an outage event taking place by year in absence of the capital investment alternative being evaluated. The probability should not exceed 100%. This field must be input by the user.



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**Annual Total Probability of Events Taking Place (%):** This is a calculated field which takes the product of the Number of Events per Year and the Annual Probability of Events Taking Place to determine the resultant total annual probability of an outage or deration taking place.

**Labour Hours to Restore Asset:** This is the expected number of labour hours required to return the unit to service upon an outage or deration event. If the unit is not expected to be returned to service once it fails, this field should be left blank. The number of hours are assumed to stay the same over the life of the project unless manually overwritten by placing a value in Escalation in Labour Hours field. This field must be input by the user.

**Escalation in Labour Hours (%/year):** This represents the increase in the hours required to return the asset to service after an event each year (i.e. if the Event occurs next year, it will be of greater significance and require more labour hours to repair than if the event occurred this year). The default is no increase. This field must be input by the user.

**Estimated labour rate (\$/hr):** This is the estimated or average labour rate for the work that needs to be completed. This field must be input by the user.

**Estimated Material Cost (\$):** This represents the material costs incurred to return an asset to service after a failure event has taken place, assuming the Capital Investment has not been executed. This field must be input by the user.

**Escalation in Material Cost (%):** This represents the percentage increase to material costs included in Estimated Material Cost each year. The default is the forecast inflation rate but this can be updated by the user.





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**Escalation in Material (%):** This cell captures increased amounts of material needed to restore the asset as time goes on. It is assumed to increase at the same rate as labour hours unless manually overwritten by the user.

**Estimated Duration of Outage or De-Rating (hr):** This field represents how long the generating unit will be off-line or de-rated if the unit fails as a result of the Capital Investment not being executed.

**Estimated Unit De-Rate (MW):** It is the estimated unit de-rating if a failure event occurs and the Capital Investment has not been executed. This field must be input by the user.

Using the factors above, the EAM will calculate the following avoided expenses:

**Total Estimated Labour Cost Subtotal (\$):** The total labour cost required to return the asset to service. It is calculated by multiplying the Annual Total Probability of Events Taking Place by the estimated Labour Hours to restore the asset and the Labour Cost per hour.

**Total Estimated Material Cost Subtotal (\$):** The total labour cost required to return the asset to service. This is calculated by multiplying the Annual Total Probability of Events Taking Place by estimated material cost to return the asset to service.

**Total Repair Cost (\$):** The sum of Total Estimated Labour Cost Subtotal and Total Estimated Material Cost Subtotal.

**Total Replacement Energy Cost (\$):** The product of the forecast Capacity Factor, Incremental Replacement Energy Cost, Estimated Duration of Outage or De-Rating, Estimated Unit De-Rate and Annual Total Probability of Events Taking Place.



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**Total Avoided Cost (\$):** The total of the forecast avoided expense as a result of the capital investment being considered. This is the sum of the Total Repair Cost (\$) and Total Replacement Energy Cost (\$). The annual avoided expenses are used in the calculation of the annual revenue requirement calculations that are discounted to calculate NPVRR.

### 2. Valuation of Alternatives

After the data is entered into the Data sheets and avoided expense calculator as required, the NPVRR calculations occur in the corresponding Alternative tabs. All the relevant data from the Data sheets are aggregated into their appropriate accounts so that all Invested Capital, Revenues and Expenses are shown as annual totals. The annual revenue requirement amounts calculated are discounted at NS Power's WACC to calculate the NPVRR.

### 3. Summary

Once the input of the capital investment factors in the Data and Avoided Expense Calculator tabs has been completed as required and the NPVRR has been calculated, the information is output to a number of summary tabs:

#### Summary

The Summary tab consolidates relevant information into one sheet for a high-level overview of the alternatives and the accompanying recommendations.

The user may fill in the appropriate Division, Department, Date, CI Number and Project Numbers. The alternatives are each listed with their NPVRR, PV of EVA/NPV, Rank (on the basis of NPVRR) and Discounted Payback Period.



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The alternatives are ranked from one to four based on the lowest NPVRR as the alternative with the lowest NPVRR is the preferred option from an economic analysis standpoint. In cases where Essential Projects are being evaluated with less than four alternatives and the alternatives being considered increase the NPVRR, the ranking for the evaluated options will show as less preferable than the alternatives that were not being utilized. In this case, the lowest ranking alternative of those that are being utilized is the preferred alternative from an economic analysis standpoint.

A Recommendation section is available for the user to enter additional information concerning the recommended option. Additionally, comments specific to the description and assumptions related to each of the evaluated alternatives may also be entered under the appropriate heading in the sheet.

### Variance Summary

The variance summary lists the alternatives with their NPVRR, PV of EVA/NPV, Rank (on the basis of NPVRR) and Discounted Payback Period. In addition, this tab shows the change in these economic indicators if the forecast capital investment was to increase by 10% and separately if the forecast avoided costs as a result of the capital investment were to decrease by 10%.

The final table on this tab considers the change in NPVRR if the capital investment were to be delayed by 1, 2 or 3 years. If this table shows that an Economically Justified Project should be delayed, the timing of the investment should be investigated to determine if value can be maximized by delaying the investment. In the case of Essential Projects that increase the NPVRR, this table will always indicate that the investment should be delayed and should be disregarded.

### Avoided Cost Summary

The avoided cost summary tab provides an annual summary for the subsequent two years of the avoided expense calculations, if applicable. The factors included in the calculation are



## EAM User Manual

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shown to demonstrate the calculation of the avoided REC, avoided costs to return the asset to service and total avoided costs by alternative.

### Cash Summary

The cash summary tab is a summary of cash inflows and outflows by year and the net present value of these amounts associated with each alternative being evaluated. This tab provides an annual amount for the cash flow before tax (CFBT), cash flow after tax (CFAT), the present value of cash flow by year (PV of CF) and the cumulative net present value of cash flows (CNPV).

### Cumulative NPVRR

The cumulative NPVRR tab includes a graphical display of the cumulative NPVRR by alternative. The present value of the revenue requirement in a specific year is added to the cumulative present value of revenue requirement from prior years to obtain the value for any given year. This provides insight into the present value of revenue requirement impact of the capital investment by year. The NPVRR for all alternatives are charted on the same graph for comparison purposes.

### Review Process

Prior to finalizing an economic analysis, the completed EAM must be forwarded for review to Capital Accounting. The review process will include such items as ensuring that the EAM includes the correct default inputs (financial and REC inputs), the correct tax and accounting depreciation rates were chosen and the tax impact of the investment is being calculated correctly. Review comments from Capital Accounting should be addressed prior to finalization of an EAM.



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### V. Updates

The model administrator(s) will update the Model. The Model will be updated at least annually. Please refer to the listing of Default Information under Inputs and Economic Analysis for inputs that should be updated by the model administrators.

The updated version of the EAM and User Manual should be made available to all NS Power employees under the Capital Accounting section of The Grid.

# Nova Scotia Power Inc.

## Non-Binding Contingency Guidelines

August 31, 2020

Date Revised: November 20, 2020

NS Power Non-Binding Contingency Guidelines

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NS Power Non-Binding Contingency Guidelines

**1.0 2020 ACE DIRECTIVE**

The Nova Scotia Utility and Review Board's (NSUARB, Board) 2020 ACE Plan Order Directive 7 provided as follows:

NS Power is directed to develop non-binding guidelines describing how it determines when a capital cost estimate contingency amount is merited and at what level, and to submit the draft version of the guidelines to stakeholders by August 31, 2020.

**2.0 INTRODUCTION**

NS Power's non-binding contingency guidelines define the general principles of practice used for estimating contingency, Project Management Reserves and Risk budgets on capital projects presented to the NSUARB for approval. Contingency is 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.

These guidelines are intended to provide a high level framework for contingency estimating considered good industry practice. NS Power utilizes this framework for selecting contingency amounts, subject to unique considerations determined on a case by case basis.

When establishing project budget and contingency, NS Power follows recommended practices (RP) from recognized industry sources such as the Project Management Institute (PMI), American Association of Cost Engineers (AACE), Construction Management Association of America (CMAA) and third-party consultants. While NS Power uses PMI and CMAA to support project management and execution processes, which support the development of project budget estimation and hence contingency, AACE has detailed, industry specific RPs which are created and maintained to support the advancement of cost estimation. Therefore, for the purpose of these guidelines, NS Power relies on the AACE RP



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for guidance in determining the appropriate contingency level for various projects based on the project maturity and Risk Profile.

It is understood in the project management industry that there are many Risk elements to consider and there is no one best way to quantify Risks or to estimate contingency. The NS Power capital program encompasses many different types of projects with varying degrees of Uncertainty and Risk exposure. Therefore, the method of determining the appropriate amount of contingency is based on the following factors: the maturity level of the estimate, the type of project being executed, the duration of the project, and the Risk exposure facing the project.

NS Power references the AACE RP to help in determining the maturity level and quality of a project definition and the associated budget estimate. The AACE RPs are primarily related to physical asset projects. With respect to IT asset projects and determination of contingency, NS Power follows the principles of the AACE RPs primarily via a decision gate methodology previously submitted to the NSUARB in the 2017 ACE Plan Stakeholder Engagement Report (M07745).

The AACE RP establishes a range of possible contingency based on the maturity of the project definition which NS Power uses to form the basis for understanding how much contingency may be required on a project. Once the range of possible contingencies is established, NS Power uses the judgment of internal and/or external experts to assess the type of project being executed to establish the appropriate contingency within the range initially set from the AACE RP. Once the contingency value is established, the internal and/or external experts assess the Risk exposure to the project. Depending on the level of Risk identified, additional analysis may be carried out using simulation methods or additional contingency applied. In most cases, a review of the Risks associated with a project result in a contingency amount being included in the estimated cost of the project.

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**3.0 METHODS FOR DETERMINING CONTINGENCY**

Methods for determining contingency are based on AACE RP 40R-08 – Contingency Estimating – General Principles which is reproduced with permission as follows:

The definition of contingency and how to estimate it are among the most controversial topics in cost engineering. While there is consensus among cost engineers on what contingency is, there is much less consensus on how to estimate it. In general, there are four classes of methods used to estimate risk cost/time that can respect the basic principles. These include:

- Expert Judgment
- Predetermined Guidelines (with varying degrees of judgment and empiricism used)
- Simulation Analysis (primarily expert judgment incorporated in a simulation)
- Range Estimating
- Expected Value
- Parametric Modeling (empirically-based algorithm, usually derived through regression analysis, with varying degrees of judgment used)

Hybrid methods that combine several or all of the above classes are also common.

//

The following briefly discusses each of the classes of methods; however, specific methods are intended to be described in other AACE Recommended Practices.

**Expert Judgment**

This method is largely self explanatory. The term “expert” means that the judgment must have a strong basis in experience and be backed up by competency in risk management and analysis. The results of all methods are improved to the extent that expertise and good judgment is brought to bear (i.e., most methods are to some extent hybrid combinations employing expert judgment). However, this method is highly subject to imposing iatrogenic risk when the judgment is inconsistent or biased. Bias can be minimized by

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obtaining the consensus of multiple experts or an experienced team, provided there is varied, independent opinion (i.e., avoid “group-think”).

Predetermined Guidelines

This method may be as simple as providing a single contingency or float value (e.g., percentage of base cost or duration) for use on all estimates or schedules of a certain type to complex tables or scoring mechanisms that employ elements of parametric modeling. A common approach is to establish a table of contingency values and ranges for each of AACE’s estimate or schedule classes with alternate values and ranges provided for common risks such as the use of new technology.

Advantages of the method are that it is simple, understandable, and consistent, and as such, it is easy to get management buy-in. The results of guidelines are improved to the extent that empiricism, expertise and good judgment are brought to bear in development of the guidelines. Because the method is “simple,” it is often used by inexperienced people; therefore, the guidelines must be clearly described and documented and supported by training.

A disadvantage is that it cannot effectively address risks that are unique to a specific project, or risks that are common, but may have inordinate impacts on a given project. For that reason it is most useful for early estimates when systemic (i.e., non project-specific) risks such as the level of scope definition are dominant. In all cases, outcomes must be tempered with expert judgment.

Simulation Analysis

This method combines expert judgment with an analytical model that is then used in a simulation routine to provide probabilistic output.

An advantage of modeling and simulation analysis is that it facilitates including the analyst’s and team’s experience and input; this makes is particularly well suited for project-specific risks. It also directly provides probabilistic output.

A disadvantage is the method’s complexity which requires expertise in application (which also makes it subject to manipulation), and the outcomes are not highly consistent (being highly dependent on the analyst and team input). Also, because the methods are not empirically-based, they can sometimes be more challenging to apply effectively for systemic risks which are predominant for early estimates. Finally, the model requires consideration

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of alternate estimates or schedules (to estimate the impact if a risk happens) which requires estimating and schedule expertise throughout the exercise.

The most common methods in use are range estimating and expected value; both of which use Monte-Carlo or similar simulation routines. These methods are described below.

#### Range Estimating

In range estimating for a cost estimate, the cost model is usually a summary of estimated costs at some level of detail. Simplistic approaches may use a project's work breakdown and cost account structure as it is (e.g., civil construction costs for process unit X). More refined approaches to avoid iatrogenic risk may focus on the cost estimate's critical elements which are identified using a process that considers each cost element's significance to the total project cost. Each cost element in the model is then assessed with a range and distribution that is assigned by the team based on their understanding of the risks. Also, at that time significant correlations amongst cost elements are incorporated into the analysis. Then a Monte-Carlo or similar simulation program is run that uses these cost item ranges and distributions as its input. The simulation's output is a total cost distribution along with other data designed to support the decision making process.

For scheduling, the model is usually a critical path network schedule. For each activity, the duration is replaced by a duration distribution assigned by the team. Then a Monte-Carlo simulation program is run that uses these duration distributions as its input. The simulation's output is a total duration distribution.

#### Expected Value

The expected value method directly estimates the cost or schedule impact of each significant identified risk. The model starts with a list of risks. The probability of occurrence of each risk is estimated. Then the cost or schedule impact, if the risk happens, is estimated. The cost or schedule duration times the probability of occurrence is the "expected value." The probability and cost or schedule estimates are replaced by distributions that are assigned by the team based on their understanding of the risks. Also, at that time significant correlations amongst risks and cost or schedule activities are incorporated into the analysis. Then a Monte-Carlo or similar simulation program is run that uses these probability and cost distributions as its input. The simulation's output is a total cost or schedule distribution along with other data designed to support the decision making process.

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The above are simplistic, generic descriptions for complex methods that if executed poorly can increase iatrogenic risks. This complexity mandates that practitioners refer to the specific Recommended Practices for each of these methods for more information on best practices.

### Parametric Modeling

A parametric model is generally an algorithm that is derived from multi-variable regression analysis of quantified risk drivers versus cost growth or schedule slip outcomes for historical projects. For example, a risk driver such as the level of project scope definition can be given a score for each project in a dataset. This score can be regressed against the actual cost growth for those projects. The regression will provide not only an algorithm, but also statistical information about the range.

Advantages of parametric modeling include, like predetermined guidelines, being simple to use, understandable, and consistent. Further, it is empirical by nature.

A disadvantage is the complexity of developing the parametric model which requires statistical skills and historical data with a range of risks and outcomes. Fortunately, industry research of common risks and outcomes is sometimes available for use. The method also cannot effectively address risks that are unique to a specific project, or risks that are common, but may have inordinate or unusual impacts on a given project. For that reason it is most useful for early estimates when systemic (i.e., non project-specific) risks such as the level of scope definition are dominant. In all cases, outcomes must be tempered with expert judgment.

### Hybrid Methods

Each of the classes of methods described above has advantages and disadvantages. Therefore, the best approach is sometimes to use two or more methods to estimate risk cost/time. The most common combination is to use expert judgment with any other method. Another combination is to use a parametric model for systemic risks and simulation analysis for project-specific risks. Parametric models may also provide the raw material used to develop pre-determined guidelines.<sup>1</sup>

<sup>1</sup> AACE International Recommended Practice 40R-08 – Contingency Estimating – General Principles, Rev. June 25, 2008.

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Figure 1 provides a listing of NS Power project types matched with suggested possible methodologies for determining contingency values. As stated previously, regardless of the asset type, projects are evaluated on a case by case basis and are subject to the judgment of internal NS Power project management on the best method of determining contingency.

**Figure 1: NS Power Project Types and Contingency Methodologies**

Types of NS Power Project	Classes of Contingency Estimating Methods				
	Expert Judgment	Predetermined Guidelines	Simulation Analysis	Range Estimation	Expected Value
Facilities New Build Construction	X	X		X	X
Facilities Renovations/Refurbishment/Upgrades	X	X			
T&D Replacements/Refurbishments/Upgrades	X	X			
Generation Replacement/Refurbishments/Upgrades	X	X			X
New Transmission Line Builds	X	X		X	X
New Substation Build	X	X			
New Hydro Build	X	X	X	X	X
Dam Refurbishments/Upgrades	X	X			
Bridge Replacements	X	X			X
IT	X	X		X	X

The nature of certain types of projects require an additional level of assessment to determine Risk exposure and contingency. Some projects (e.g. T&D and Generation Replacements/Refurbishments/Upgrades) have a smaller Risk Profile; therefore, the level of scrutiny surrounding contingency estimation is not as significant as larger projects with longer duration and greater exposure to external stakeholder concerns (e.g. Facilities New Build Construction or New Hydro builds). The methodologies used by NS Power for determining the

NS Power Non-Binding Contingency Guidelines

appropriate amount of contingency for a project are outlined in Figure 1, and are further explained in section 3.1 through 3.3.<sup>2</sup>

### 3.1 PREDETERMINED CONTINGENCY GUIDELINES

For projects where the Risks are well known, NS Power uses a combination of Expert Judgment and Predetermined Guidelines which have been gained over many years.

Following the AACE RP 17R-97 “Cost Estimate Classification System” NS Power identifies six (6) levels of project estimate classes where the maturity level of the scope definition defines an expected estimate accuracy range.

NS Power recognizes that AACE makes no correlation between the contingency and the upper limits of the estimate accuracy, however, the level of a project maturity and hence the estimate class is directly related to the level of Uncertainty inherent in the project budget estimate; as a result, there are varying levels of contingency that can be applied and NS Power uses the upper limits of the estimate accuracy range to establish the range for the probable contingency.

Once the range of probable contingency is understood, the NS Power project team carries out an assessment of the Uncertainty and Risk associated with the project. Depending on the amount of Uncertainty and Risk associated with the project, contingency is either applied to the entire project as a whole or to the Level 1 Work Breakdown Structure (WBS). If the project is significant enough in size, scope, Uncertainty and Risk, the contingency is applied to each Level 1 WBS line and then summed to represent the contingency for the entire project. The typical Level 1 WBS includes labour, engineering, material, and construction contracts.

<sup>2</sup> Simulation Analysis is a combination of Expert Judgment and one of the other modelling analyses therefore it is not expanded upon. Parametric Modelling is not commonly used by NS Power in the determination of contingency and is therefore also not expanded upon.

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1 The Uncertainty and Risk analysis identifies the Known-unknown conditions to which the project  
2 is exposed to and applies either a budget line item and/or contingency to address these  
3 conditions.

4  
5 Depending on the scope, size, duration, identified Uncertainty, and Risk to the project, it is then  
6 determined if additional analysis is required to address Unknown-unknown conditions and  
7 identify whether additional contingency is needed to address these concerns based on expert  
8 judgment.

9  
10 Figure 2 outlines the Estimate Class and the range of contingency applied. While the table  
11 identifies six levels of estimate class, NS Power strives for capital projects to be at a Class 3 level  
12 or lower when presented for approval. Class 4 and 5 levels are used in the early planning stages  
13 of a project, and are identified for reference only.



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1 Figure 2: Estimate Class Definitions<sup>3</sup>

Estimate Class	Project Maturity	End Usage	Expected Accuracy Range	Contingency Range	Application of Contingency
5	Based on very limited information. Conceptual design, concept definition document, or concept screening completed. General arrangement diagram/sketch that define the project location and statement of objectives agreed by key internal stakeholders and project sponsor. 0% to 2% of full project definition	Internal. Strategic business planning such as but not limited to assessment of initial viability, evaluation of alternatives, project screening, project location selection studies, high level budgeting, long range capital planning.	L: -20% to -50% H: +30% to +100%	N/A	Entire Project

<sup>3</sup> This table is a consolidated summary of information from various AACE International Recommended Practices © for Engineering Procurement and Construction for different industries; mainly Transmission, Hydro, Building and General Construction.

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Estimate Class	Project Maturity	End Usage	Expected Accuracy Range	Contingency Range	Application of Contingency
4	Based on limited information. Screening and feasibility study completed along with some preliminary design. Typically, engineering is from 1% to 15% complete and would include feasibility design for several alternative layout to include design criteria, generation capacity, feasibility level drawings, preliminary one-line diagrams and comprehensive user requirements.	Internal. Detailed strategy planning, business case development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, selection of a feasible alternative and preliminary budget approval to proceed to next stage of project	L:-15% to -30% H: +20% to +50%	N/A	Entire Project

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Estimate Class	Project Maturity	End Usage	Expected Accuracy Range	Contingency Range	Application of Contingency
3	Engineering is between 10% and 40% complete and includes preliminary general arrangement drawings, layout drawings and specifications, essentially complete geotechnical investigations and studies, preliminary earth work drawings, completed one-line drawings, equipment performance specifications, procurement strategy identifying long lead items of equipment	NSUARB approval.	L: -10% to -20% H: +10% to +30%	+10% to +30%	Entire Project/ Different Elements

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Estimate Class	Project Maturity	End Usage	Expected Accuracy Range	Contingency Range	Application of Contingency
2	Engineering is from 30% to 75% complete and includes final geotechnical investigations and studies, professional engineer sealed drawings and specifications for general arrangement, major equipment, auxiliary systems, one-line diagrams, telecom systems and permanent and temporary infrastructure. Vendor quotations, detailed project execution plans, procurement strategy identifying all major items of equipment, resourcing and work force plans.	NSUARB approval.	L: -5% to -15% H: +5% to +20%	+5% to +20%	Different Elements

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Estimate Class	Project Maturity	End Usage	Expected Accuracy Range	Contingency Range	Application of Contingency
1	Engineering is from 65% to 100% complete, and comprises the complete engineering and design documentation for the project and complete project execution and commissioning plans.	NSUARB approval, bid checks to support vendor/contract negotiations.	L: -3% to -10% H: +3% to +15%	+3% to 15%	Different Elements
0 <sup>4</sup>	Execution underway or Project Complete	NSUARB approval (i.e. a U&U project).	0% - 15%	0% to 15%	Different Elements

While AACE does not provide guidelines for Information Technology (IT) projects, industry best practices such as PMI's Practice Standard for Project Estimating recommend IT projects follow a Risk based work cycle like a Decision Gate (DG) process where the project scope, schedule and budget are continuously defined over a series of decision gates.

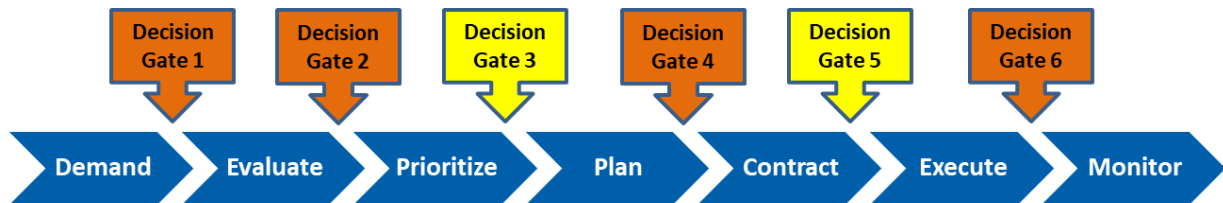
Figure 3 outlines the DG process which IT projects follow. NS Power typically files a project for NSUARB approval at the DG3 or DG5 stage of the project. If a project is filed for approval at DG3,

<sup>4</sup> NS Power specific classification to capture U&U projects which may have already been completed or are well into the execution phase of the project at the time of ACE or project filing. Contingency could be applied to address uncertainty or risk that could be realized in the construction phase of the project; it is not based on a specific AACE RP.

# NS Power Non-Binding Contingency Guidelines

the contingency range is 0-50 percent. If the project is filed at DG5, the contingency range is 0-20 percent.

**Figure 3: IT Projects Decision Gate Process<sup>5</sup>**



## 3.2 RANGE ESTIMATE CONTINGENCY

For projects with elevated levels of Uncertainty or Risk, an additional analysis is carried out to determine if enough contingency is applied to the project to address Known-unknowns and Unknown-unknowns. Project items with the potential to introduce greater Uncertainty include but are not limited to:

- Multi-year project where material purchase(s) in future years are subject to escalation related to commodity price fluctuations, labor rate fluctuations and inflation.
- Uncertainty in subsurface condition where geotechnical information does not provide high level of confidence.
- Project being executed in areas of high archeological concerns.
- Projects with evolving Stakeholder concerns (such as archeology, capacity, and environment, for example).
- Project where new technology is being applied.

<sup>5</sup> Nova Scotia Power Inc. (NSPI) 2017 ACE Plan Stakeholder Engagement Report - M07745, Attachment 8, Sept 5, 2017

NS Power Non-Binding Contingency Guidelines

- Unique/remote nature of project location and conditions and the availability of reference data for those.

For these projects, NS Power uses Expert Judgment from internal Subject Matter Experts (SMEs) and third-party consultants to identify high, medium, and low probability costs (P90, P50, and P10) for each Level 1/2 WBS task in the project budget. The costs are analyzed in a Monte Carlo simulation to determine expected cost and potential high cost at other degree of probability. The variation between the expected cost and the potential high cost will form the estimated contingency.

### 3.3 EXPECTED VALUE

For larger, long duration, complex projects with increased levels of Risk and Uncertainty, where containment costs are identified, similar analyses used for Range Estimate is carried out. A Risk Register is developed, identifying project Risk based on probability of the Risk to be realized and the impact of the Risk on the project. A mitigation and associated cost for the mitigation is identified and forms part of the project budget and contingency. For these projects, NS Power uses Expert Judgment from internal SMEs and third-party consultants to identify high, medium, and low probability costs (P90, P50, and P10). The costs may be analyzed in a Monte Carlo simulation to determine expected cost and potential high cost. The variation between the expected cost and the potential high cost will form the estimated contingency.

### 4.0 PROJECT MANAGEMENT RESERVE

Project Management Reserve is not applied to every project and when applied it exceeds the traditional contingency. Project Management Reserve is applied to address strategic project Risk or scope items not yet identified. The value of the Project Management Reserve is applied to specific project items or reserved for Known-unknown or Unknown-unknown conditions. These

NS Power Non-Binding Contingency Guidelines

conditions are impacted by social, financial market, and political considerations such as the following types of examples:

- During a generator or turbine overhaul the full scope of the work is unknown until the unit has been disassembled. Project Management Reserve can be set aside to address the Known-unknown scope of supply. In these instances, the Project Management Reserve is determined based on expert judgment and historical cost from past projects.
- During the renegotiation of the North American Free Trade Agreement there was Uncertainty related to the value of steel tariffs between the United States of America (USA) and Canada. During the development of the project budget for a bridge project where it was identified that the supply chain for steel initiated in the USA, NS Power identified Project Management Reserve to account for this Known-unknown condition. The estimate was provided by third party consultants based on their assessment of potential cost. The Project Management Reserve was set aside for the steel supply portion of the project only.

## 5.0 CONCLUSION

This non-binding guideline provides a high-level framework for contingency estimating and when contingency is applied to NS Power's projects.

When NS Power determines contingency for a project, a combination of methods may be used. Based on the type of and Risk exposure for a given project executed by NS Power, the most common methods used are Predetermined Guidelines with Expert Judgment. The use of Predetermined Guidelines is based on the level of maturity of the given scope definition. When using Predetermined Guidelines, it is common for contingency values to be used from different



**NS Power Non-Binding Contingency Guidelines**

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1 estimate classes (for example, using Class 3 analysis for construction contracts while using Class  
2 2 analysis for material).

3  
4 When the complexity or Risk exposure of a project increases, additional analyses are carried out  
5 to ensure appropriate budget and contingency are identified. In the additional analyses, NS  
6 Power supplements Predetermined Guidelines and Expert Judgment with a combination of  
7 Simulation Analysis, Range Estimates and/or Expected values.

8  
9 Where there are Known-unknown or Unknown-unknown scopes of work that introduce  
10 additional Risk exposure to the project, additional levels of contingency, such as Project  
11 Management Reserve, can be identified. These contingencies are identified for specific scope and  
12 are identified with additional justification to support the request.

13  
14 NS Power utilizes the framework described in these guidelines for determining when to apply  
15 contingency to its projects and selecting contingency amounts. Contingency amounts are  
16 determined on a case by case basis.

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**APPENDIX A: DEFINITIONS**

The definitions identified below are based on from the American Association of Cost Engineers Recommended Practice 10S-90, Cost Engineering Terminologies.<sup>6</sup> The terminologies are used to explain how NS Power applies industry best practices to determine project contingency estimates.

*Budget Estimate:* An estimate generally prepared to form the basis for authorization and/or funds.

*Concept Definition Document:* A document describing the concept selected for development and the results of investigating alternative system concepts. It is used to derive the system specifications and the statement of work.

*Conceptual Estimate:* An estimate generally prepared based on very limited information.

*Containments:* Cost elements in the estimate related to measures included to prevent and/or mitigate the identified Risks. The activities are identified in the Risk analysis report. These may impact not only cost but also duration.

*Contingency (Traditional):* 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. Typically estimated using statistical analysis or judgment based on past asset or project experience. Some of the items, conditions, or events for which the state, occurrence, and/or effect is uncertain include, but are not limited to, planning and estimating errors and omissions, minor price fluctuations (other than general escalation), design developments and changes within the scope, and variations in market and

<sup>6</sup> AACE International Recommended Practice 10S-90, Cost Engineering Terminology (©, latest revision October 10, 2019, all rights reserved), AACE International, Morgantown, WV

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environmental conditions. Contingency is generally included in most estimates and is expected to be expended.

Depending on the inherent Risk, complexity and size of a project contingency usually excludes:

- Major scope changes such as changes in end-product specification, capacities, building sizes, and location of the asset or project
- Extraordinary events such as major strikes and natural disasters
- Project Management Reserves
- Some escalation cost

*Cost Estimating:* The predictive process used to quantify, cost, and price the resources required by the scope of an investment option, activity, or project. Cost estimating is a process used to predict uncertain future costs. In that regard, a goal of cost estimating is to minimize the Uncertainty of the estimate given the level and quality of scope definition. The outcome of cost estimating ideally includes both an expected cost and a probabilistic cost distribution. As a predictive process, historical reference cost data (where applicable) improve the reliability of cost estimating. Cost estimating, by providing the basis for budgets, also shares a goal with cost control of maximizing the probability of the actual cost outcome being the same as predicted.

*Exposure:* In Risk management, refers to the potential or actual impact of one or more Risk events or conditions.

*Guideline:* A recommended or customary method of working to accomplish an objective. A guideline is not enforced but is generally followed.

NS Power Non-Binding Contingency Guidelines

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*Latrogenic Risk:* A phenomenon in cost estimating where the attempt to reduce Risk inadvertently adds more Risk by concluding the Risk is less than its true value, thereby leading management to select a contingency which is too low.

*Known-unknown:* An identifiable quantity or value having variability or an identifiable condition lacking certainty.

*Project Management Reserve:* An amount added to an estimate to allow for discretionary project management purposes outside of the defined scope of the project, as otherwise estimated. May include amounts that are within the defined scope, but for which project management does not want to fund as contingency or that cannot be effectively managed using contingency. If the project needs to provide an allowance for anticipated changes in scope, or to cover the costs for items that may be required but have not yet been specifically identified as being included in the current project scope, then that amount of cost, typically referred to as Project Management Reserve, should be identified here.

*Preliminary Engineering:* Includes all design-related services during the evaluation and definition phases of a project.

*Project Definition:* Process of exploring thoroughly all aspects of proposed project and to explore relations between required performance, development time and cost.

*Risk Profile:* A general term that refers to either qualitative or quantitative measures or indicators that describe the Risk exposure.

*Risk Register:* A formal record of identified Risk, typically including additional summary information as regards assessment, treatment and control of the Risk. The content may be qualitative, quantitative or both.

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*Uncertainty*: A term that may have various meanings for which the convention used in any specific application should be clearly stated to avoid misunderstanding. It can mean any of the following:

- A synonym for all Risk, including all events both positive and negative whose probabilities of occurrence are neither 0% nor 100%
- The total range of events that may happen and produce Risk (including both threats and opportunities) affecting a project.
- Background variability, distinct from the variation caused by identifiable Risk, that is caused by at least three commonly found factors in projects;
  - Inherent variability of the work not caused by identified Risk
  - Estimating error or error of prediction, and
  - Bias in estimating or prediction

*Unknown-unknown*: A quantity, value or condition that cannot be identified or foreseen, otherwise referred to as unknowable.

*Work Breakdown Structure (WBS)*: A summary WBS tailored by project management to the specific project and identifying the elements unique to the project.

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1 **APPENDIX B: RESOURCES**

- 2
- 3 1. The AACE International Recommended Practices cited or referenced within this
- 4 document are reprinted with the permission of AACE International, 1265 Suncrest Towne
- 5 Centre Dr., Morgantown, WV 26505 USA. Phone 304-296-8444. Internet:
- 6 <http://web.aacei.org> E-mail: [info@aacei.org](mailto:info@aacei.org) Copyright © 2008 by AACE International; all
- 7 rights reserved.

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
<b>Lingan Generating Station</b>				
<b>Lingan Unit 1</b>				
C0028502	LIN1 - Boiler Refurbishment 2021	719,327	719,327	Less than \$1M
C0020744	LIN1 - Boiler Erosion Reduction System Refurbishment	428,510	429,506	Less than \$1M
C0028842	LIN1 Turbine Valve Refurbishment	353,733	353,733	Less than \$1M
C0019499	LIN1 RH Tube Replacement 2020	345,096	346,779	Less than \$1M
C0028482	LIN1 Miscellaneous Valve Refurbishment 2021	161,635	161,635	Less than \$1M
C0028686	LIN1 Steam Drum Level Controls Upgrade	122,081	122,081	Less than \$1M
C0028645	LIN1 Auxiliary Air Upgrades	98,472	98,472	Less than \$1M
C0026862	LIN1 CW Pipe Refurbishment	16,336	34,920	Carryover
<b>Lingan Unit 3</b>				
C0028546	LIN3 - Boiler Refurbishment 2021	702,741	702,741	Less than \$1M
C0010942	AMO LIN3 Enhanced Monitoring	161,808	169,315	Carryover
C0028562	LIN3 Miscellaneous Valve Refurbishment 2021	151,697	151,697	Less than \$1M
C0020184	LIN3 Auxiliary Air Upgrades	99,208	141,346	Carryover
49447	LIN3 Steam Drum Level Controls Upgrade	137,337	137,337	Less than \$1M
<b>Lingan Unit 4</b>				
C0028503	LIN4 - Boiler Refurbishment 2021	608,431	608,431	Less than \$1M
C0010981	LIN Precipitator Door Refurbishment	402,165	402,525	Carryover
C0029643	LIN4 ID Fan VIV Refurbishment	253,856	253,856	Less than \$1M
C0010944	AMO LIN4 Enhanced Monitoring	177,598	195,545	Carryover
C0028524	LIN4 Miscellaneous Valve Refurbishment 2021	125,188	125,188	Less than \$1M
C0029222	LIN3/4 Sodium & Phosphate Meter Replacement	101,139	101,139	Less than \$1M
<b>Lingan Common</b>				
C0020385	LIN Heavy Oil Tank Refurbishment	3,193,137	3,268,105	Carryover
C0028242	LIN - Mill Refurbishment 2021	703,702	703,702	Less than \$1M
C0030605	LIN RO System Replacement	535,796	535,796	Less than \$1M
47871	LIN Stack Re-Coating	451,980	456,573	Carryover
10626	LIN - Routine Equipment Replacements	393,545	393,545	Routine

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0028302	LIN - CW Screen Refurbishment 2021	380,526	380,526	Less than \$1M
C0009090	LIN4 ACW Strainer Replacement	306,874	359,513	Carryover
C0018920	LIN Coal Plant Structural Refurbishment Phase 6	57,129	304,552	Carryover
C0029902	LIN Coal Crusher Replacement	272,830	272,830	Less than \$1M
C0030204	LIN WTP Chemical Pump Skid Replacement	241,704	241,704	Less than \$1M
C0019119	LIN Fly Ash System Refurbishment 2020	116,766	240,060	Carryover
C0030162	LIN Coal Amenities Building Replacement	239,677	239,677	Less than \$1M
51394	LIN3/4 Operator Control Panel Button Upgrade	229,296	230,609	Carryover
49429	LIN Coal Pile Run Off Pond Expansion	205,701	215,895	Carryover
C0020263	LIN Coal Stacker MCC Upgrade	213,327	213,327	Less than \$1M
C0030622	LIN Wastewater Piping Replacement	212,090	212,090	Less than \$1M
C0029802	LIN Ash Site Lagoon Refurbishment 2021	205,667	205,667	Less than \$1M
C0030223	LIN Precipitator Refurbishment	201,639	201,639	Less than \$1M
C0030362	LIN Coal Stacker Refurbishment	201,545	201,545	Less than \$1M
C0030006	LIN WTP Resin Replacement	199,852	199,852	Less than \$1M
C0029642	LIN Fire System Refurbishment 2021	164,615	164,615	Less than \$1M
27857	LIN-ROOFING ROUTINE	162,100	162,100	Routine
C0031742	LIN HFO/LFO Line Refurbishment	155,542	155,542	Less than \$1M
C0028303	LIN Facilities Upgrades 2021	152,441	152,441	Less than \$1M
C0028322	LIN Siding Refurbishment 2021	146,757	146,757	Less than \$1M
C0028422	LIN Ash Site Winter Cover 2021	131,299	131,299	Less than \$1M
C0028324	LIN Plant Lighting Upgrade 2021	127,389	127,389	Less than \$1M
C0028647	LIN Electric Actuator Upgrade	121,306	121,306	Less than \$1M
C0028483	LIN Coal Plant Structural Refurbishment 2021	116,239	116,239	Less than \$1M
C0021882	LIN CW Control Panel Upgrades	109,151	110,405	Carryover
C0029182	LIN Fan Positioner Upgrade 2021	103,698	103,698	Less than \$1M
C0028342	LIN 4160 600V Breaker Refurbishment 2021	100,111	100,111	Less than \$1M
C0028402	LIN Grating Refurbishment 2021	98,449	98,449	Less than \$1M
33863	LIN - Heat Rate Routine	94,206	94,206	Routine
C0028648	LIN GSCW Small Bore Piping Refurbishment	87,373	87,373	Less than \$1M
C0030482	LIN Wastewater System Instrumentation Replacement	81,407	81,407	Less than \$1M
C0019540	LIN Plant Exterior Piping Heat Tracing Refurbishment	8,293	67,805	Carryover



<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0029962	LIN Nitrogen Generator	60,697	60,697	Less than \$1M
<b>Point Tupper Generating Station</b>				
<b>Point Tupper Unit 2</b>				
C0030862	POT - Coal Mill Refurbishment 2021	852,405	852,405	Less than \$1M
C0032864	POT - Main Turbine Valve Replacement	694,233	694,233	Less than \$1M
C0030942	POT - Boiler Refurbishment 2021	503,357	503,357	Less than \$1M
C0020842	POT Turbine Generator Fire Protection	452,006	452,006	Less than \$1M
C0020843	POT Burner Automation System and Soot blower Controls Upgrad	156,348	374,425	Carryover
C0008559	POT - Diesel Generator and Essential Services Switchgear Replace	64,019	357,585	Carryover
C0030887	POT - Hydrogen Degas Panel Phase 2	256,345	256,345	Less than \$1M
C0030844	POT - Asbestos Abatement 2021	235,214	235,214	Less than \$1M
10645	POT - Routine Equipment Replacements	215,988	215,988	Routine
C0030905	POT - GSCW Pump & Motor Replacement	199,284	199,284	Less than \$1M
C0031266	POT - Miscellaneous Valve Refurbishment 2021	147,895	147,895	Less than \$1M
C0031106	POT - Lighting Upgrades 2021	123,050	123,050	Less than \$1M
C0031126	POT - Facility Upgrades 2021	119,695	119,695	Less than \$1M
27855	POT-ROOFING ROUTINE	110,223	110,223	Routine
33867	POT - Heat Rate Routine	102,452	102,452	Routine
C0030922	POT - Coal Chute Refurbishment	99,462	99,462	Less than \$1M
C0030962	POT - Bunker C Pump Replacement	98,494	98,494	Less than \$1M
C0030886	POT - Polisher Valves & Solenoid Panel	94,075	94,075	Less than \$1M
C0031264	POT - 2021 Breaker Replacement	91,035	91,035	Less than \$1M
C0030903	POT - Sternson Resin Replacement	49,511	49,511	Less than \$1M
C0031111	POT - Boiler Fill Pump Replacement 2021	49,462	49,462	Less than \$1M
C0031115	POT - Lube Oil Piping Replacement 2021	49,425	49,425	Less than \$1M
C0031124	POT - Condenser Door Replacement 2021	48,385	48,385	Less than \$1M
<b>Point Tupper Common</b>				
49897	POT - Fire System Upgrades 2017	336,753	586,260	Carryover
<b>Port Hawkesbury Biomass</b>				
C0031202	PHB - Boiler Refurbishment 2021	484,514	484,514	Less than \$1M

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0031223	PHB - Precipitator Refurbishment 2021	446,126	446,126	Less than \$1M
C0031209	PHB - Air Heater Refurbishment 2021	250,142	250,142	Less than \$1M
C0031243	PHB - Turbine Block Valve #30	200,581	200,581	Less than \$1M
C0031242	PHB - Conveyors & Handling Systems 2021	199,835	199,835	Less than \$1M
43646	PHB - Routine Equipment Replacements	195,808	195,808	Routine
C0031204	PHB - Trancel Screw Refurbishment 2021	100,675	100,675	Less than \$1M
<b>Trenton Generating Station</b>				
<b>Trenton Unit 5</b>				
C0010321	TRE5 Parallel Slide Valve Replacement	639,450	639,450	Less than \$1M
43429	TRE5 Turbine Lube Oil Cooler Refurbishment	50,052	467,965	Carryover
C0020364	TRE5 Stack Access	201,292	201,292	Less than \$1M
C0020340	TRE5 Mill Platform Phase 2	80,200	80,200	Less than \$1M
C0020323	TRE5 Miscellaneous Valve Replacements 2020	53,824	73,897	Carryover
C0031163	TRE5 Conveyor Refurbishments 2021	39,405	39,405	Less than \$1M
<b>Trenton Unit 6</b>				
C0031177	TRE6 Mill Refurbishment 2021	783,899	783,899	Less than \$1M
C0031184	TRE6 Waterwall Panel Replacement 2021	772,605	772,605	Less than \$1M
C0026106	TRE6 U&U 6A CW Screen Replacement	686,866	686,866	Less than \$1M
C0023682	TRE6 Mill Bullgear and Pinions	663,253	663,253	Less than \$1M
C0031187	TRE6 - Boiler Refurbishment 2021	552,543	552,543	Less than \$1M
C0031189	TRE6 Main Feedwater Valve Replacement	150,666	150,666	Less than \$1M
C0010333	TRE6 Air Heater Expansion Joint Refurbishment	150,149	150,149	Less than \$1M
C0031190	TRE6 Conveyor Refurbishments 2021	101,304	101,304	Less than \$1M
C0031205	TRE6 Acid Pump Skid Replacement	101,271	101,271	Less than \$1M
C0031207	TRE6 Sootblowers Refurbishment 2021	84,336	84,336	Less than \$1M
C0031208	TRE6 Miscellaneous Valves 2021	81,649	81,649	Less than \$1M
C0031206	TRE6 HP Dose Pump Replacement	31,293	31,293	Less than \$1M
<b>Trenton Common</b>				
44267	TRE Ash Lagoon Site Closure	1,571,655	8,744,266	Carryover
C0026285	TRE Heavy Fuel Oil Tank Refurbishment	1,644,255	1,732,921	Subsequent Submittal

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0030982	TRE Asbestos Abatement 2021	599,392	599,392	Less than \$1M
C0025963	TRE CW Fish Barrier Cleaning System	442,732	442,732	Less than \$1M
10673	TRE - Routine Equipment Replacements	385,291	385,291	Routine
C0031063	TRE Ash Site Management 2021	172,852	172,852	Less than \$1M
C0031067	TRE 4160 & 600V Breaker Refurbishment 2021	118,770	118,770	Less than \$1M
33869	TRE - Heat Rate Routine	85,173	85,173	Routine
27856	TRE-ROOFING ROUTINE	82,017	82,017	Routine
C0031084	TRE Floor Plates 2021	75,520	75,520	Less than \$1M
C0031104	TRE LED Lighting Upgrades 2021	75,331	75,331	Less than \$1M
C0031086	TRE TAMS Toe Buttress Habitat Restoration	35,207	35,207	Less than \$1M
<b>Tufts Cove Generating Station</b>				
<b>Tufts Cove Unit 1</b>				
49670	TUC1 4kv/600V Breaker Replacement 2021	97,915	97,915	Less than \$1M
C0021470	TUC1 Natural Gas Valves Refurbishment	46,676	46,676	Less than \$1M
<b>Tufts Cove Unit 2</b>				
C0030524	TUC2 Turbine Controls PLC Upgrade	53,769	156,628	Less than \$1M
C0021567	TUC2 North CW Pump Refurbishment	119,390	127,091	Carryover
C0030372	TUC2 4kv/600V Breaker Replacement 2021	98,753	98,753	Less than \$1M
C0030370	TUC2 West Condensate Extraction Pump Refurbishment	89,723	89,723	Less than \$1M
C0033666	TUC2 Turbine Turning Gear Refurbishment	75,089	76,956	Less than \$1M
C0030373	TUC2 Natural Gas Valves Refurbishment 2021	50,431	50,431	Less than \$1M
<b>Tufts Cove Unit 3</b>				
C0030528	TUC3 HP Turbine Refurbishment	2,085,088	2,085,094	Request Approval
C0021584	TUC3 Turbine Valves Refurbishments	924,168	1,032,615	Carryover
C0030529	TUC3 Generator Refurbishment	706,226	706,226	Less than \$1M
C0021587	TUC3 - North Boiler Feedwater Pump Refurbishment	669,030	676,865	Carryover
C0011216	TUC3 Data Acquisition System Replacement	451,864	498,463	Carryover
C0030488	TUC3 - Boiler Refurbishment 2021	474,419	474,419	Less than \$1M
C0021586	TUC3 Elevator Modernization Upgrades	184,022	237,752	Carryover
52234	TUC3 Low Load Operation Upgrades	50,995	131,376	Carryover

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0020644	AMO TUC3 Turbine Supervisory System Upgrade	118,349	118,349	Less than \$1M
C0030484	TUC3 4kv/600V Breaker Replacement 2021	99,617	99,617	Less than \$1M
C0030485	TUC3 Natural Gas Valves Refurbishment 2021	90,842	90,842	Less than \$1M
C0023683	TUC3 Precipitator Inlet Expansion Joint Refurbishment	54,454	85,343	Carryover
C0011214	TUC3 Aquarian Level Detection Replacement	72,031	73,999	Carryover
C0033565	TUC3 Turbine Speeder Assembly Refurbishment	72,339	72,339	Less than \$1M
C0030525	TUC3 GSCW Coolers Refurbishment	57,136	57,136	Less than \$1M
C0030487	TUC3 Lube Oil Refurbishment	44,248	44,248	Less than \$1M
C0030493	TUC3 Lube Oil Coolers Refurbishment	40,485	40,485	Less than \$1M
<b>Tufts Cove Unit 6</b>				
C0030490	TUC6 Breaker Refurbishment	53,825	53,825	Less than \$1M
C0033906	TUC6 Battery Bank U6A Replacement	52,627	52,627	Less than \$1M
C0030489	TUC6 - HP Boiler Tube Replacement	45,199	45,199	Less than \$1M
C0030491	TUC6 Replace Electrical Heat Trace Panel	36,475	36,475	Less than \$1M
C0030492	TUC6 Vacuum Pump Replacement	31,448	31,448	Less than \$1M
<b>Tufts Cove Common</b>				
C0011063	TUC HFO Ship Unloading Hose Installation	86,094	259,849	Carryover
10621	TUC - Routine Equipment Replacements	252,329	252,329	Routine
C0026547	TUC Process Drain Upgrade	247,850	247,850	Less than \$1M
C0030371	TUC DCS HMI Upgrade 2021	218,475	218,475	Less than \$1M
C0021423	TUC - Auxiliary Boiler PLC/DCS Upgrades	174,334	174,334	Less than \$1M
C0030364	TUC Handrail Program 2021	152,780	152,780	Less than \$1M
C0021602	TUC Telehandler Forklift	140,035	140,035	Less than \$1M
C0030368	TUC North Service Air Compressor Replacement	114,068	114,068	Less than \$1M
C0021422	TUC Plant Security Upgrades Phase 2	98,568	109,023	Carryover
C0030363	TUC WTP Resin Replacements	100,952	100,952	Less than \$1M
C0030366	TUC Lighting Program 2021	98,689	98,689	Less than \$1M
C0021402	TUC Oil Tanks Levels and Pump House Controls Upgrade	72,861	72,861	Less than \$1M
C0021466	TUC Underground Water Lines Replacement	52,446	71,331	Carryover
49657	TUC Sequence of Events Recorder Upgrade	44,099	69,371	Carryover
27854	TUC-ROOFING ROUTINE	61,295	61,295	Routine

<b>CI#</b>	<b>Project Title</b>	<b>2021 Budget (\$)</b>	<b>Project Total (\$)</b>	<b>ACE Filing Type</b>
C0021605	TUC Electrical Rooms Underground Upgrade	58,051	58,051	Less than \$1M
33871	TUC - Heat Rate Routine	50,104	50,104	Routine
C0030365	TUC WTP Acid Pumping Upgrade	50,067	50,067	Less than \$1M
C0030369	TUC Electric Valve Actuator Replacements	49,604	49,604	Less than \$1M

Thermal Generating Unit	2016	2017	2018	2019	2020 Q3F	2021 ACE
Lingan Unit 1	142,058	3,143,922	2,888,036	93,586	1,026,593	2,245,189
Lingan Unit 2	75,990	266,223	329,243	845,831	19,333	-
Lingan Unit 3	65,791	74,005	4,063,569	2,393,504	1,258,124	1,252,792
Lingan Unit 4	18,875,192	407,584	2,580,326	2,610,740	2,643,999	1,668,376
Lingan Common	6,825,032	8,309,118	7,203,153	10,293,276	6,361,049	10,583,855
<b>Lingan Generating Station Total</b>	<b>25,984,063</b>	<b>12,200,851</b>	<b>17,064,327</b>	<b>16,236,937</b>	<b>11,309,097</b>	<b>15,750,212</b>
Point Tupper Unit 2	909,745	2,334,845	2,476,798	15,659,930	2,721,865	4,812,362
Point Tupper Common	3,704,840	4,516,505	2,365,764	113,169	504,085	336,753
<b>Point Tupper Generating Station Total</b>	<b>4,614,586</b>	<b>6,851,350</b>	<b>4,842,562</b>	<b>15,773,099</b>	<b>3,225,950</b>	<b>5,149,115</b>
<b>Port Hawkesbury Biomass Total</b>	<b>1,099,030</b>	<b>1,119,622</b>	<b>1,347,239</b>	<b>1,140,780</b>	<b>2,041,482</b>	<b>1,877,682</b>
Trenton Unit 5	6,062,894	4,065,216	5,905,699	6,873,256	1,384,611	1,064,224
Trenton Unit 6	2,157,402	17,521,272	1,825,757	8,853,263	2,493,918	4,159,833
Trenton Common	9,852,398	3,811,869	2,656,078	7,996,128	4,099,850	5,288,193
<b>Trenton Generating Station Total</b>	<b>18,072,694</b>	<b>25,398,357</b>	<b>10,387,533</b>	<b>23,722,648</b>	<b>7,978,379</b>	<b>10,512,250</b>
Tufts Cove Unit 1	4,022,584	178,212	1,302,853	3,480,767	614,859	144,590
Tufts Cove Unit 2	981,871	4,220,510	3,168,632	2,886,909	1,480,119	487,156
Tufts Cove Unit 3	174,728	7,543,438	1,112,705	729,566	951,114	6,195,312
Tufts Cove Unit 6	425,728	106,686	1,508,568	411,526	209,048	219,575
Tufts Cove Common	6,102,734	2,565,599	4,940,016	4,609,595	2,485,832	2,122,699
<b>Tufts Cove Generating Station Total</b>	<b>11,707,645</b>	<b>14,614,444</b>	<b>12,032,774</b>	<b>12,118,362</b>	<b>5,740,971</b>	<b>9,169,333</b>