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Nova Scotia POWER
An Emera Company

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June 7, 2018

Doreen Friis
Regulatory Affairs Officer/Clerk
Nova Scotia Utility and Review Board
1601 Lower Water Street, 3rd Floor
P.O. Box 1692, Unit "M"
Halifax, NS B3J 3S3

Re: M08059 – Generation Utilization and Optimization - Comments on Synapse Final Report (May 1, 2018)

Dear Ms. Friis:

On May 1, 2018, Synapse Energy Economics Inc. (Synapse) filed its report entitled, "Nova Scotia Power Inc. Thermal Generation Utilization and Optimization Economic Analysis of Retention of Fossil-Fueled Thermal Fleet To and Beyond 2030 – M08059" (the Synapse Report) with the Nova Scotia Utility and Review Board (Board or UARB). On May 16, 2018, the UARB issued correspondence to Nova Scotia Power Inc. (NS Power or Company) advising that it is seeking comments from NS Power on the Synapse Report and its recommendations by June 7, 2018. Interested parties are invited to provide comments by June 21, 2018 and Synapse is to provide a reply submission by July 9, 2018. The Board advised that parties' submissions are to indicate any further process they consider appropriate regarding this matter.

Please accept these comments on behalf of NS Power. NS Power has not had the opportunity to have discovery of the Synapse Report or its model. NS Power's comments are process focused and intended only to provide the Board with NS Power's perspective on Synapse's recommendations for next steps. In order to provide a substantive assessment for the Board, NS Power would need to have discovery of Synapse's underlying analysis and approach through a hearing process. As noted below, NS Power does not believe that additional process with respect to the Synapse Report is necessary at this time. However, NS Power reserves the right to provide further comment in the event the Board opens a further process in relation to the Synapse Report and its findings and recommendations.

Background

In correspondence dated August 22, 2017, the Board approved the amended Terms of Reference (TOR) submitted by Synapse to address the objective "to determine the extent to which it is cost-effective to ratepayers to retain NSPI's thermal fleet through 2030, and possibly beyond."[1]

On October 23, 2017, Synapse circulated a memorandum entitled "Key Input Assumptions and Modeling Plan for Plexos Optimization Analysis – Draft for Comment" to NS Power and the other stakeholders. In this initial modeling plan, Synapse had proposed modeling 30 scenarios. In comments on November 3, 2017, NS Power encouraged Synapse to narrow its focus in light of the approved objective per the Terms of Reference, and expressed concern about the time required to execute the proposed modeling plan. A copy of NS Power's correspondence to Synapse dated November 3, 2017 is attached at **Appendix A** for the Board's reference.

Following receipt of comments, on December 29, 2017 Synapse issued its "Response to Stakeholder Comments on Key Input Assumptions and Modeling Plan for Plexos Optimization Analysis". Following receipt of NS Power's and other stakeholders' feedback, Synapse reduced the modeling plan from its original proposal of 30 scenarios to 12.

On March 2, 2018, Synapse circulated its Draft Report detailing preliminary findings of the analysis. Subsequently, a Technical Conference was scheduled for March 28, 2018 and presentation materials were provided by Synapse to stakeholders on March 22, 2018. Additional presentation materials were provided by Synapse at the conclusion of the Technical Conference, at which time Synapse confirmed it would receive comments from attendees on the Draft Report and the presentation materials. NS Power provided comments to Synapse on its draft report and the technical conference materials on April 18, 2018. NS Power is aware that Port Hawkesbury Paper LLP (PHP) and EfficiencyOne (E1) also provided comments at that time but is unaware if Synapse received comments from other stakeholders. A copy of NS Power's comments to Synapse dated April 18,

[1] Terms of Reference, Synapse Energy Economics, Inc., August 1, 2017, approved by UARB, August 22, 2017.

2018 is attached as **Appendix B** for the Board's reference.

NS Power General Comments

NS Power's comments to the Board are consistent with those provided by the Company to Synapse in its letter dated April 18, 2018.

The objective of the Generation Utilization and Optimization (GUO) study process was defined on page one of the TOR and is repeated in the first paragraph of the Synapse Report:[2]

> The purpose of the Generation Optimization and Utilization study is to determine the extent to which it is cost-effective to ratepayers to retain Nova Scotia Power Inc.'s (NSPI) thermal (steam) fleet through, and possibly beyond, 2030.

At page two of the Synapse Report, the following is provided:[3]

> Retention of the thermal fleet (all coal units except Lingan 2 and the Tufts Cove units) is indicated through 2030 under scenario 1's parameters, which included: Load levels from NSPI's 2017 load forecast and 2017 sustaining capital forecast; NSPI's indicated wind capacity crediting structure; and an assumption that no more than 100 MW of additional wind is feasible on NSPI's system.

In addition, in scenarios studied by Synapse with significant increases to the wind generation and Demand-Side-Management (DSM) components of the Company's resource portfolio and significant increases to the cost of sustaining capital for the thermal generation sources, and a higher capacity value for wind, Synapse's modeling indicated two additional unit retirements before 2030 (beyond the already planned retirement of Lingan 2) – scenario 4 and scenario 16.[4]

[2]Nova Scotia Power Inc. Thermal Generation Utilization and Optimization Economic Analysis of Retention of Fossil-Fueled Thermal Fleet To and Beyond 2030 – M08059, Synapse Energy Economics Inc. (the Synapse Report), May 1, 2018, page 1.
[3]Supra, The Synapse Report, page 2.
[4] The Synapse Report, page 3.

Synapse's results provide a direct answer to the Board's question posed through the approved objective in the Terms of Reference for this work; it is cost effective for rate payers to retain the coal fleet through 2030, and possibly beyond. Synapse confirmed this interpretation of the results at the Technical Conference on March 28, 2018.

NS Power understands this is not a final determination as to the long-term utilization of these generation units and recognizes that uncertainty remains with respect to a major resource planning factor, namely the carbon regime to be implemented in Nova Scotia over the next decade and beyond. A long-term view of the useful lives of these plants will not be firmly established until this regime is established and understood. The Company currently expects this will be resolved by the end of 2018, likely enabling the undertaking of an Integrated Resource Planning (IRP) exercise in 2019, subject to clarity surrounding federal and provincial carbon policy. Central to this will be an updated DSM potential study that provides a foundation for evaluating cost effective DSM programming within an IRP exercise.

The Synapse Report provides comfort that the Company's near-term thermal investment strategy remains cost-effective and, barring a change driven by the new carbon regime, will remain so, for the next decade and beyond. The "planning window" this analysis creates, combined with clarity being achieved on carbon policy, will provide NS Power and stakeholders with an important opportunity over the next year to focus on the development of complete and accurate resource planning assumptions necessary to support the next IRP.

NS Power's comments are not to be taken by the Board or stakeholders as an endorsement of, nor agreement with the various input assumptions and modeling scenarios, nor the approach to modeling itself in certain aspects. In a number of cases, there may be different interpretations as to what conclusions may be taken from the Synapse modelling results, or their technical feasibility (understanding that Synapse did not consider it within its scope to assess operability of its scenarios), or their near-term affordability. However, given the overall objective has been achieved through confirmation of the near-term cost-effectiveness of NS Power's thermal fleet, NS Power believes that the Board can accept the report, with this understanding, and there is no need for additional process in relation to the Synapse Report itself at this time. Instead, NS Power believes all parties are best served by focusing on the next steps reflected in the Synapse Report Recommendations.

NS Power Comments on Synapse Recommendations

Synapse's recommendations commence at section 4.2 of the Synapse Report and provide Synapse's views on areas for further evaluation in light of the limitations and uncertainties associated with Synapse's input assumptions used in its modeling exercise. NS Power provides its comments on each of the Synapse Recommendations below.

Synapse states the following recommendations should be considered as next steps prior to the next Integrated Resource Planning (IRP) Exercise:

Synapse Recommendation	NS Power Response / Position
1. Confirm costs and achievable potential for incremental energy efficiency. As seen, energy efficiency displaces higher cost energy sources in the province (gas, oil, imports) and the IRP must fully reflect this resource option.	NS Power supports this recommendation. NS Power believes that a new DSM potential study should be completed to determine the costs and achievable potential for all future DSM levels and should be vetted through a transparent UARB process prior to the next IRP.
2. Determine costs and achievable potential for peak-load reducing demand response. Construct specific cost and quantity curves to allow for either resource selection (in Plexos) based on specific demand side resources, or scenario analysis utilizing alternative peak load and annual energy projections.	NS Power supports this recommendation.
3. Monitor and comprehensively investigate costs for bulk-scale battery storage of different durations. The Plexos results indicate economic battery builds in different scenarios and reflect the importance of this resource to serve as peaking capacity.	NS Power supports this recommendation. Detailed cost and performance assumptions should be developed for use in the next IRP and continual monitoring will be important for evaluating the optimal timing for any future potential investment in battery storage.
4. Monitor, track and project sustaining capital costs for the thermal fleet. Sustaining capital costs incurred a range of 6.5% to 10.4% of total NPVRR costs in our main scenarios. It is critical to continue to	NS Power supports this recommendation. NS Power does this now and agrees that it is important to continually assess.

Synapse Recommendation	NS Power Response / Position
assess the pattern of these costs and project future costs.	
5. Establish requirements to allow increased levels of wind on NSPI system. Two threshold criteria to allow increased levels of cost-effective wind resources are completion of a second 345 kV intertie to New Brunswick, and assessment of NSPI's Provincial transmission system and related support services (to maintain stability and voltage criteria). NSPI should determine, with specificity, the set of technical improvements required to allow different increments of additional wind on their system. This should include the effect of additional transmission capacity to New Brunswick, the presence of the Maritime Link, and the ability to further increase wind penetration through transmission grid reinforcement. This should also recognize that the introduction of bulk scale battery storage as a possible capacity resource that can provide co-benefits associated with stability and voltage support.	NS Power supports this recommendation.
6. Continue joint dispatch efforts and investigate increased planning, unit commitment and reserve sharing opportunities with New Brunswick, Newfoundland and Prince Edward Island. Increased coordination among the Maritime Provinces is likely required to maintain reliability with increased wind resource utilization.	NS Power supports this recommendation.
7. Determine the capacity and unit commitment requirements needed in association with the TUC units, to allow appropriate parametrization in Plexos to enable possible economic retirement	NS Power supports this recommendation. NS Power does this now and agrees that it is important to continually assess.

Synapse recommends the following 'Ongoing' activities:

8. Identify candidates for the "next" coal retirement alternative after Lingan 2. Consider "rank ordering" the units to establish a priority order reflecting best-to-worst economic performers across the thermal fleet. While projecting sustainable capital needs is an uncertain exercise, the potential to avoid significant major expenses at different points in time over the next decade illustrates the importance of establishing such a ranking.	NS Power supports this recommendation. There may be other factors that may need to be considered beyond just an ordering based on 'best-to-worst economic performers', in making these ranking decisions. The uncertainties alluded to also highlight the possible need for flexibility in unit rankings as unforeseeable issues present. Any ranking decisions should be made in the best interests of customers.
9. Monitor natural gas price and availability trends in the Maritimes.	NS Power supports this recommendation. NS Power does this now and agrees it is important to continually assess. NS Power provides annual reports to the UARB respecting these issues.

Conclusion

The Synapse Report confirms that it is cost-effective to customers to retain NS Power's thermal fleet through 2030, and possibly beyond.

As stated above, NS Power's comments are not to be taken as an endorsement of or agreement with the various input assumptions and modeling scenarios, nor the approach to modeling itself in certain aspects. Substantive assessment of these issues would require discovery of Synapse's underlying analysis and approach through a hearing process.

In NS Power's view, the Synapse Report addresses the Board's original questions and the objective set out in the Terms of Reference and a further process is not required at this time. NS Power's comments are focused on the Board's objective as stated in the Terms of Reference for this study. Beyond this, further discovery would be needed to take a position. While NS Power and other parties may disagree with certain items in Synapse's input assumptions, its modeling scenarios, its modeling plan, and even certain conclusions and comments offered in the narrative of its report, NS Power is of the view

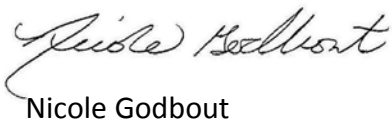
that the Board and customers are best served by focusing on next steps and preparing for a future IRP; not a hearing process surrounding the Synapse Report. The forum for determination of issues such as the appropriate levels of DSM to assume going forward, consideration of the cost and technical feasibility of new technologies such as battery storage, and the amount of new wind that can be economically and reliably added to the system, and at what capacity value, is not through a hearing process on the Synapse Report.

NS Power agrees that the proper focus going forward should be on the above-noted nine Recommendations identified at the end of the Synapse Report.

The long-term view for NS Power's thermal units will not be fully understood until the Province's carbon regime is established, and the implications of this for the Company's resource portfolio are examined as part of a comprehensive IRP. It currently appears that this work may be best undertaken in 2019 as it is currently expected that that there should be better clarity on the carbon regime and its implications at that time.

NS Power appreciates this opportunity to provide these comments on the Synapse Report.

Yours truly,



Nicole Godbout
Director, Regulatory Affairs

cc: Mark Sidebottom, Chief Operating Officer
Judith Ferguson, EVP Regulatory, Legal and Business Planning
Brian Curry, Senior Regulatory Counsel

Encl.

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November 3, 2017

Bob Fagan
Synapse Energy Economics, Inc.
485 Massachusetts Avenue
Suite 2
Cambridge MA 02139

Re: Key Input Assumptions & Modeling Plan for Plexos Optimization Analysis

Dear Mr. Fagan:

In correspondence dated August 22, 2017, the Nova Scotia Utility and Review Board (UARB, Board) approved the amended Terms of Reference (TOR) filed by Synapse Energy Economics Inc. (Synapse) on August 1, 2017. On October 23, 2017, Synapse circulated a memorandum outlining the modeling plan and input assumptions Synapse proposed to use in the Generation Utilization and Optimization Analysis of the Nova Scotia Power (NS Power, the Company) generation fleet and invited stakeholder comments by November 7, 2017. NS Power appreciates the opportunity to provide these comments for Synapse's consideration.

On page 1 of the approved TOR, the following is provided:

> The main objective of the analysis will be to determine the extent to which it is cost-effective to ratepayers to retain NSPI's thermal fleet through 2030, and possibly beyond.

The assumptions memo further expands on the purpose of the analysis as follows:

> Primarily, we are attempting to gauge the overall longer-term costs of retention versus the costs of alternative resource plans that use a different mix of resources to meet capacity needs. Our aim is to provide a modeling analysis that shows the costs of retention versus the costs of alternative resource plans that use a different mix of resources to meet capacity needs.

The assessment of the economics of retention of the coal fleet is the main issue under

examination in this process, as contemplated by the objective of the TOR. The Company suggests that in developing and executing the study framework, particular attention be paid to scenarios and assumptions that have the potential to affect the Company's investment in its thermal fleet over the next 5-10 years. It is this spending and the associated requirement for the energy and capacity of individual thermal units over this period that the Company understands was of primary interest to the Board in directing this work be undertaken. The proposed methodology of analyzing 30 or more scenarios, with corresponding resource portfolios, long-term revenue requirement and near-term production costs, may not provide direct insight for assessing the merits of further investment in the coal fleet. NS Power submits that the objective of the process could be accomplished using a narrowed, less intensive modeling approach.

NS Power acknowledges the value of long term integrated resource planning and anticipates an Integrated Resource Plan will be needed to be undertaken before the end of this decade. By that time there will be better certainty on a number of factors including carbon reduction requirements, federal equivalency and the operation of the Maritime Link.

With regard to the study framework proposed by Synapse, the Company suggests consideration of the following:

- Whether the period of study needs to be 25 years?
- Whether resources that are not expected to be available before 2025 (e.g. NB transmission) require consideration?
- Whether resources with high uncertainty regarding technical and economical viability before 2025 (e.g. battery storage) require consideration?
- Whether there are opportunities to streamline the analysis where potential overlap in the planning effect of assumptions may unnecessarily add to the volume of modeling work?
- Current uncertainties with regard to new federal/provincial environmental requirements.
- Whether alternative DSM programs are required to be developed as part of this exercise and/or will be informative to the process at the high level proposed by Synapse? The Company notes that the Board intends to convene a hearing on

DSM in 2018 and expects that if significantly different longer-term DSM programs are determined appropriate, these will be brought forward at that time, with well-supported cost profiles and energy and demand savings forecasts.

NS Power notes the memo does not articulate the selection criteria for a reference plan. The Company suggests clarity should be provided on what information will be used to determine what is "cost-effective to ratepayers". Consistent with the foregoing, the Company submits that the criteria should reflect that:

i. The selected reference plan should favour near-term certainty versus longer-term assumptions, in alignment with the mandate to focus on the economics of the near-term sustaining capital of individual coal units;

ii. The selected reference plan should give due consideration to the demonstrated effectiveness of existing assets in meeting operating requirements in compliance with industry reliability standards compared to untested or emerging options; and,

iii. Near-term affordability (customer rate impact) should be considered as a key metric in the reference plan selection. NS Power suggests that in accordance with the mandate of assessing the value of coal unit retention to 2030, a shorter term net present value, and potentially a shorter term modeling period, would be appropriate for achieving the stated objective.

In addition to the comments above, in Appendix A NS Power offers suggestions and updates on the proposed approach and assumptions for Synapse's consideration.

NS Power thanks Synapse for the opportunity to provide these comments for its consideration on the analysis plan and assumptions. The Company is pleased to discuss any of this at Synapse's convenience.

Yours truly,

Nicole Godbout
Director, Regulatory Affairs

Appendix A

Figure 1: Comments on Analysis Plan & Assumptions

Analysis Plan	
1. Selection Criteria	i) As noted in its letter, the Company suggests clarity should be provided on the selection criteria for the reference plan, in order to establish how recommendations relative to the objective of the process will be delivered.
2. Volume of Scenarios	i) The large volume of scenarios proposed represents a significant amount of modeling, with extensive execution time. Parameters being varied as inputs in the scenarios include a mix of new resource options, which could instead be provided to the model as new resource options to reduce the number of pre-specified scenarios. In order to reduce the number of scenarios for modeling, NS Power recommends that the New Brunswick transmission interconnection, DSM and Demand Response be provided as resource option inputs to the Long Term (LT) module. An additional benefit of this approach is that it will also allow the model to optimize the in-service year of new DSM and transmission resources. ii) The "WindCapCredit" scenarios may be redundant, as they effectively represent the capacity requirements of NS Power reduced by the amount of additional capacity credited to wind (i.e. a slightly less expensive resource plan). The capacity value of wind is an input to a resource optimization model, not an adjustable variable or scenario driver. The capacity contribution of existing wind resources cannot be increased by investment or specific action; it is a calculated system characteristic representing the statistical likelihood of wind correlating to peak load. Should Synapse wish to study wind capacity contribution in Nova Scotia, a Loss of Load Expectation Study should be conducted. NS Power suggests that Synapse use a consistent capacity credit for existing wind in all scenarios.
3. Production Cost Modeling	i) With regards to Scenarios 25 to 30, which reflect the proposed Retirement Paths 1 and 2, NS Power notes that in order to assess the production costs for these scenarios, the Short Term (ST) module would need to be run in each year of the period over which existing units are retired, as accurate interpolation will not be possible for these step changes. ii) NS Power suggests that rather than interpolating, the MT/ST modules simply be executed for a continuous period (e.g. 2020 – 2040) for all scenarios. If the interpolation method is selected, clarity should be provided on how the results will be interpolated between years.

	iii) NS Power notes that the detailed production cost modelling may exhibit results showing a different relative plan cost ranking than the LT optimization runs due to the more granular optimization parameters. Further to item 1(i) above, clarification on how these calculations will be considered should be provided.
Assumptions	
4. DSM & DR	i) The underlying Demand Side Management (DSM) input assumptions for energy, demand and cost have the potential to significantly affect the modeling exercise, particularly when modeling DSM as a load modifier, as it will directly determine the amount of investment required for capacity resources. Any resource plan serving lower load than another will have a lower NPV in comparison if the costs of the DSM program are excluded. This may cause difficulty in the ability to directly compare plans with varying levels of DSM, particularly without defined costs included for the programs. For example, the proposed "High DSM Case" includes nearly 900 MW of peak reduction (approximately the capacity of 6 coal units), but provides no specific details on the cost or deliverability of this capacity. NS Power submits that it is critical to develop and vet the assumed costs and achievability of the proposed DSM programs prior to evaluating scenario resource portfolios; otherwise, the actual cost comparison will not be possible. The Company suggests that the estimated energy and capacity costs of the proposed DSM programs, as well as the specifics of the "feasible increments to energy efficiency implementation in Nova Scotia, and measures to reduce system firm peak", be provided in the updated assumptions memo prior to the commencement of modeling. ii) As noted in item 2(i), NS Power recommends that Demand Side Management and Demand Response be provided as resource option inputs to the LT Module. iii) NS Power notes that the "Medium DSM" case proposed includes PHP Mill load in the calculated 2% energy savings per year. The Company suggests PHP load should be removed from the calculation for this element as the forecasted PHP load is based on historical requirements of the mill and would not be included in any correlating demand reduction associated with this DSM amount. iv) NS Power notes there is an inconsistency with the cumulative peak DSM total across the plans in the first year of the study.
5. Load Forecast	i) NS Power submits that a load forecast examining load growth, such as that due to electrification, should be considered in a scenario.
6. Fuel Prices	i) NS Power notes that the natural gas price forecasts provided to Synapse

	are for existing "opportunistic gas" which is limited to [redacted] MMBtu/day in the winter and [redacted] MMBtu/day in the summer. Confidential Figure 2 provides the price forecast for additional natural gas above these volumes. ii) The solid fuel prices have been updated since provision of the Plexos model to Synapse in July. Confidential Figure 3 provides the updated coal price forecast. NS Power can provide this updated price information in the appropriate format for the Plexos model directly to Synapse.
6. New Resource Costs & Performance	i) NS Power has been updating its cost and performance assumptions for new resource options using internal and 3rd party experts. NS Power had advised that it would provide more up to date information as it completed this work. The most recent update to this information is provided below in Figure 4. ii) NS Power notes that some of the proposed cost escalation rates (e.g. -9%/year for batteries) are likely unrealistic to apply year-over-year for a span of 25 years. An appropriate cost trend curve should be applied. iii) NS Power notes that the costs for storage quoted from the Lazard 2.0 Study appear to be to the average Levelized Costs of Storage metric (converted to $CAD). This would be a highly specific calculation for each utility, including its capital structure and assume lifetime energy profile. The Company recommends the assumptions should be updated to use the "Total Installed Cost", along with the related operating parameters (such as fixed, variable, and sustaining costs), for Plexos modeling purposes.

Confidential Figure 2 (Updated gas forecast)

Confidential Figure 3: Updated Coal Price Forecast

Figure 4: Updated Costs & Trends for New Resources

Resource Type	(2017) Capital Cost ($/kW)	(2017) Fixed Cost ($/kW-yr)	Percent Change 2017-2030
Onshore Wind	$2,200		-17%
Solar PV – Fix Tilt	$2,500		-12%
Solar PV – Tracking	$2,600		-12%
Battery – 1 hour	$1,400	$372.58	-50%
Battery – 4 hour	$3,500	$562.72	-50%
Combined Cycle	$1,690		-
Combustion Turbine	$1,240		-
Reciprocating Engine	$1,560		-
Pumped Storage	$3,100	$270.03	-

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April 18, 2018

Bob Fagan
Principal Associate
Synapse Energy Economics, Inc.
485 Massachusetts Avenue, Suite

Re: **M08059 – Generation Utilization and Optimization study – Comments on Synapse Draft Report dated March 2, 2018 and slides entitled "Results of Plexos Modeling and Discussion" dated March 28, 2018 and "Results of Plexos Modeling and Discussion – Supplemental Slides" dated March 28, 2018**

Dear Mr. Fagan:

In correspondence dated August 22, 2017, the Nova Scotia Utility and Review Board (UARB, Board) approved the amended Terms of Reference (TOR) submitted by Synapse Energy Economics Inc. (Synapse) to address the objective "to determine the extent to which it is cost-effective to ratepayers to retain NSPI's thermal fleet through 2030, and possibly beyond."[1]

On October 23, 2017, Synapse circulated[2] a memorandum entitled "Key Input Assumptions and Modeling Plan for Plexos Optimization Analysis – Draft for Comment". On November 7, 2017, comments were provided to Synapse on its memo by Nova Scotia Power Inc. (NS Power), the Consumer Advocate (CA), the Small Business Advocate (SBA),

[1] Terms of Reference, Synapse Energy Economics, Inc., August 1, 2017, approved by UARB, August 22, 2017.
[2] There has been no process yet for the filing of interventions and a participant's list has not been created. NS Power assumes this will follow the filing of Synapse's final report. Following the approval of the Terms of Reference in August 2017, this engagement has been conducted outside of the Board's record. The Board's letter of May 22, 2017 initiating this process indicated that it was copied to Technical Conference Participants. The referenced NS Power Technical Conference had invited participants of proceeding M07540 (2016 10-Year System Outlook), M07611 (2014-2015 FAM Audit) and M07745 (2017 ACE Plan). Synapse's communications to date have blind copied the circulation list, but indicate that they are copied to participants in matter M08059. Given there hasn't yet been a participant's list established in M08059, NS Power assumes that Synapse has been circulating to participants who attended the Technical Conference at NS Power on April 13, 2017.

the Industrial Group (IG), Port Hawkesbury Paper Limited Partnership (PHP) and EfficiencyOne (E1). On December 29, 2017, Synapse issued its "Response to Stakeholder Comments on Key Input Assumptions and Modeling Plan for Plexos Optimization Analysis".

On March 2, 2018, Synapse circulated its Draft Report detailing preliminary findings of the analysis. Subsequently, a Technical Conference was scheduled for March 28, 2018 and presentation materials were provided by Synapse to parties on March 22, 2018. Additional presentation materials were provided by Synapse at the conclusion of the Technical Conference, at which time Synapse confirmed it would receive comments from attendees on the Draft Report and the presentation materials.

NS Power appreciates the opportunity to provide the following comments for Synapse's consideration prior to the preparation and release of the Final Report in this process. As of the date of submitting these comments, NS Power has also had the opportunity to review comments submitted by PHP and E1 to Synapse, and copied to NS Power and other parties.

NS Power Comments

The objective of the Generation Utilization and Optimization (GUO) study process was defined on page one of the TOR and is repeated in the first paragraph of the Synapse Draft Report:

> The purpose of the Generation Optimization and Utilization study is to determine the extent to which it is cost-effective to ratepayers to retain NSPI's thermal (steam) fleet through, and possibly beyond, 2030.

At page two of the Draft Report the following is provided:

> Using reference scenario load levels from NSPI's 2017 load forecast and their 2017 sustaining capital forecast, without changing NSPI's indicated wind capacity crediting structure, and assuming no more than 100 MW of additional wind is feasible on NSPI's system (which is economically selected by Plexos in all scenarios), retention of the thermal fleet (all coal units except Lingan 2 and all Tufts Cove units) is indicated through 2030

(scenario 1).

In addition, in scenarios studied by Synapse with significant increases to the wind generation and Demand-Side-Management (DSM) components of the Company's resource portfolio and significant increases to the cost of sustaining capital for the thermal generation sources, Synapse's modeling indicated only a single additional unit retirement before 2030 (beyond the already planned retirement of Lingan 2).

Synapse's results provide a direct answer to the Board's question posed through the approved Objective in the Terms of Reference for this work; the most cost-effective option for rate payers is the retention of the coal fleet through 2030, and possibly beyond. Synapse confirmed this interpretation of the results at the Technical Conference on March 28, 2018.

The Draft Report circulated on March 2, 2018, does not provide a conclusion in relation to the stated Objective in the Board-approved Terms of Reference. NS Power expects that Synapse's Final Report will address this by responding to the stated Objective and confirming that its analysis has determined that maintenance of the thermal fleet is the lowest cost option compared to available supply and demand-side alternatives and as such, the Company's continued maintenance of these units and investment in sustaining capital has been confirmed to be cost-effective, and therefore in the best interest of customers.

NS Power understands this is not a final determination as to the long-term utilization of these generation units and recognizes that uncertainty remains with respect to a major resource planning factor, the carbon regime to be implemented in Nova Scotia over the next decade and beyond. A long-term view of the useful lives of these plants will not be firmly established until this regime is established and understood. The Company currently expects this will be resolved by the end of 2018, likely enabling the undertaking of a comprehensive Integrated Resource Planning (IRP) exercise in 2019, subject to clarity surrounding federal and provincial carbon policy. This was addressed in the Company's Reply to Closing Submissions filed by NS Power March 28, 2018, in the 2018 Annual Capital Expenditure Plan (M08350):

Both the CA and the SBA comment in their respective Closing Submissions that a new Integrated Resource Plan (IRP) is required. The CA notes, "An updated IRP would yield data that would be highly valuable in a number of important areas including capital expenditures and DSM."

NS Power does not question the value of conducting another IRP in the near future. However, it would be premature to embark on such an exercise in 2018. A decision regarding the timing of the next IRP should be deferred until after the Board has concluded its Generation Utilization and Optimization proceeding (M08059), which will provide stakeholders with a better understanding of the future of the Company's thermal fleet and is likely to identify areas of priority for further consideration. In addition, at that time there will be greater clarity on the Federal emissions requirements and the incoming Provincial cap and trade regime. As noted by Mr. Sidebottom in response to a question on this issue from the Board panel:

> … Is it time to look at another Integrated Resource Plan?
>
> **A.** (Sidebottom) I think you took the words right out of my mouth, Mr. Doehler. I think when we look at 2019 we've always said that, yeah, we'll have a better framework for what's happening federally, what's happening provincially. We'll be informed on at least the latest round of legislative agenda. And we always thought this was a good moment in time with that clarity, and you know, something in that timeframe, you know that time or sometime not far from there, I think is useful.[3]

Based on its draft Report and the information provided at the Technical Conference, Synapse appears to be in a position to complete the GUO Study engagement and file its Final Report. While as discussed below, Synapse has suggested it intends to undertake additional modelling, this does not appear to be required to reach a conclusion with respect to the stated Objective in the Board-approved Terms of Reference.

The GUO provides comfort that the Company's near-term thermal investment strategy remains cost-effective and, barring a change driven by the new carbon regime, will

[3] M08350, NS Power ACE Plan Reply to Closing Submission, March 28, 2018, page 1-2.

remain so, for the next decade and beyond. The "planning window" this analysis creates, continued with clarity being achieved on the carbon assumptions, will provide NS Power and stakeholders with an important opportunity over the next year to focus on the development of complete and accurate resource planning information sources necessary to support the next IRP. Likely areas of focus in preparation for this IRP would be:

- Update to renewable and non-renewable generation cost and operating characteristic assumptions.
- Research on cost and operational characteristics of emerging supply-side resources.
- Research on natural gas availability and supply security opportunities.
- Research on cost and operational characteristics of emerging battery technologies.
- Development of a current DSM potential study reflective of the Nova Scotia environment and the efforts of E1 and stakeholders to date.
- Research on environmental constraint trends, carbon and otherwise.

In addition to the foregoing, the Company offers the following for Synapse's consideration for incorporation within the Final Report.

Plant Retirements

Synapse has recommended in its technical conference presentation slides that NS Power should prepare for retirement of a second unit. This recommendation seems to be based on sensitivity runs with forced retirements of Tufts Cove (TUC) 3 and/or Trenton 5 (slide 22 of Technical Conference slides). Note the differences in the 25 year Net Present Values are less than one percent when compared to Scenario 1 of the analysis. This difference is within a reasonable range of model uncertainty relative to the no retirement plan, rather than cause for conclusion.

Demand-Side Management

Synapse's conclusions identify the need to study further DSM penetration levels and understand potential and cost of capacity reduction. E1 has provided a high-level update of its 2013 Potential Study but confirms it has not undertaken a complete new Potential

Study. NS Power suggests that this is the appropriate time to initiate a Potential Study, which should be completed in full prior to the commencement of the next IRP, in order to properly evaluate all options. If initiated, NS Power is of the opinion that this should be a transparent and collaborative process, overseen by the Board.

Natural Gas

In its correspondence to the UARB dated April 28, 2017 on NS Power's Technical Conference on Future Plan for Thermal Resources held on April 13, 2017, Synapse stated:

> Supply-side assessment for future years must consider the likely availability and cost of winter gas, sourced from New England. All New England states have stringent requirements or targets for greenhouse gas reduction that would lead to significant reduction in natural gas use for energy generation, making its availability and price for winter use in the Maritimes potentially more economical than is currently considered.

The future availability and security of natural gas supply is a significant uncertainty in Nova Scotia, with substantial implications for long-term planning. Even if winter gas availability in New England increases as previously suggested by Synapse, there is insufficient pipeline capacity for NS Power to utilize the supply, particularly during the winter months. NS Power suggests that assumptions around natural gas availability and supply security options, such as storage, dual fuel capability, or LNG usage will require development as part of the next IRP.

This has implications for gas generation options as any new gas generation in Nova Scotia would require supply infrastructure improvements to ensure firm capacity provision. NS Power suggests this be explicitly recognized in Synapse's Final Report.

Additional Wind Generation

NS Power notes that any additional wind on the system, including the incremental 100 MW Synapse assumes is available with no upgrades, would require additional investment for system stability and reliability, as identified in the 2014 IRP assumptions. Specifically, this 100MW increment of wind would require load following capability, reactive power

support, as well as functionality in the wind turbines themselves for reserve, Automated Generation Control (AGC), and inertial response capability (which NS Power notes would add to the capital cost of the resources). Synapse should ensure this requirement is explicitly recognized in its Final Report.

As well, additional wind on the system will make a declining contribution to capacity value when compared to existing wind, as the capacity contribution of variable resources decreases as penetration increases. This is not reflected in Synapse's assumptions and should be explicitly recognized in the Final Report.

Additional Modelling

As described above, based on the information presented in the Draft Report and the Technical Conference, the Company submits that Synapse should be in position to file its Final Report and conclude this process.

At the technical conference, Synapse indicated that it intended to do additional modelling runs before completing its Final Report. Synapse stated that it wished to receive input from attendees of the Technical Conference on suggested additional runs. If additional modelling is undertaken NS Power anticipates that stakeholders will be provided with the opportunity to review and provide comment on those additional analyses before they are included in a Final Report. Should Synapse determine it is necessary to do this analysis, the Company provides the following for Synapse's consideration.

- The Province asked if Synapse had considered focusing on Demand Response in its modeling as opposed to energy focused DSM. The Province indicated that this should be a focus of Synapse's additional proposed runs. Synapse advised that it had not done this yet, but that this was something that could be considered.

  As Synapse noted during the Technical Conference, energy provision is not the supply constraint NS Power faces; rather, provision of lowest cost capacity is the main factor supporting the retention of the full existing thermal fleet. If Synapse is to undertake additional modelling, NS Power agrees with the Province that this should focus on demand-reduction DSM programming rather than energy-

targeted DSM with demand side effects as has been examined by Synapse to date.

- It was also suggested that an electrification load assumption case be modelled. If additional modelling is to be undertaken, NS Power supports this suggestion.

- E1 advised at the technical conference that it had updated its DSM Potential Study associated with incremental DSM over current levels, reflecting DSM targeting opportunities 'in a post-lighting world'. E1 advised that it was prepared to circulate this new information to Synapse and all interested parties. Synapse agreed that it would update its runs that used the incremental DSM assumption with the new information to be provided by E1. At one point, Synapse suggested this might be done by sensitivity analysis.

  In its comments circulated on April 9, 2018, E1 provided its updated cost information for the High, Mid, Base and Low cases for DSM. E1 confirmed that "The updated High Case possesses a first-year energy unit cost of $0.60 per kWh, averaged over the study period"[4] and that "given the amount of incremental energy efficiency being considered in this proceeding (i.e. 2% of retail sales total), EfficiencyOne believes the High Case of the updated analysis is most relevant."[5] NS Power agrees that, if additional modelling is to be undertaken, Synapse's modeling should be updated with current "High" DSM cost assumptions from E1 before finalization of the Final Report. A sensitivity analysis would not be appropriate as there has not been an opportunity to test E1's new information. These updated costs should be used in all cases testing the increased levels of DSM to properly evaluate the impact of the programs.

Conclusion

Based on the Draft Report results and discussion in the Technical Conference it appears Synapse has confirmed that it is cost-effective to customers to retain NS Power's thermal

[4] M08059, Generation Utilization and Optimization, E1 Comments – Technical Conference, April 9, 2018, page 2.
[5] M08059, Generation Utilization and Optimization, E1 Comments – Technical Conference, April 9, 2018, page 2.

fleet through 2030, and possibly beyond. A clear statement confirming this in the Final Report will meet the purpose of this proceeding as established in the Board's Terms of Reference. In addition to this, Synapse's comment on the potential of gas-fired generation, the implications of additional wind for future resource planning efforts and longer-term modelling of DSM should also be included in the Final Report.

While providing comfort that NS Power's investment in its thermal fleet continues to be cost-effective, the long-term view for these units will not be fully understood until the Province's carbon regime is established, and the implications of this for the Company's resource portfolio are examined as part of a comprehensive IRP. It currently appears that this work may be best undertaken in 2019 as it is currently expected that that there should be better clarity on the carbon regime and its implications at that time.

In support of this, Synapse comments in the Final Report as to areas of focus for NS Power and stakeholders with regard to the future IRP will be welcome. Items identified by NS Power to date are listed above.

NS Power appreciates this opportunity to provide these comments on the Draft Report and the additional material presented at the Technical conference.

Yours truly,

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Participants M07540 (2016 10-Year System Outlook), M07611 (2014-2015 FAM Audit) and M07745 (2017 ACE Plan)