Request IR-1:

Regarding the Muskrat Falls delay in completion

(a) Please describe the due diligence process utilized by NSPML to monitor progress and schedule for Muskrat Falls

(b) Please provide all presentations, memoranda, and other materials used to inform NS Power management of the potential scheduling delays for Muskrat Falls

(c) What if any power contracting plans or transactions have changed since NSPML realized that muskrat Falls was delayed?

(d) Please describe the changes in c. above in detail including dates, volumes and counterparties.

(e) If the answer to d. is 'there haven't been' please explain why not?

Response IR-1:

(a) NSPML monitors Muskrat Falls, LIL and LTA construction activity through various means which include attendance at Newfoundland and Labrador Joint Development Committee and Joint Operating Committee meetings, discussions with senior representatives of the Lower Churchill Project (LCP) and review of LCP-related reports issued by Canada's Independent Engineer. In addition, NSPML monitors Newfoundland and Labrador Hydro regulatory filings and other publicly available sources of information including monthly project reports issued by Nalcor and the Newfoundland and Labrador Government Oversight Committee and the report on the LCP issued by

Ernst & Young. NSPML also tracks expenditures of Nalcor to help analyse Muskrat Falls, LTA and LIL progress.

(b) Please refer to NSUARB IR-55 Attachments 1-4 and NSUARB IR-58 Attachment 1 containing presentations, memoranda, and other materials, including press releases, which informed NS Power management of scheduling delays for Muskrat Falls.

(c-d) Since NS Power has been made aware of the delay in the Muskrat Falls Project, it has entered into commercial discussions with Nalcor Energy regarding opportunities to maximize value for customers through the items listed in the NSPML Interim Cost Assessment Application Supplementary Evidence, Confidential Appendix B. NS Power has also continued its examination of opportunities with other existing and potential counterparties, such examination including the impact of the Maritime Link and the projected delay in Muskrat Falls.

(e) Not applicable.

Request IR-2:

Please provide any alternate ratemaking proposals for NSPML other than the interim cost recovery filing considered by NS Power prior to and since the filing? This can including different financial mechanisms to lower revenue requirements, deferred revenue requirement accounting or no interim cost recovery. Please provide any analysis, presentations or memoranda regarding alternatives to this filing?

Response IR-2:

NSPML prepared the proposed interim assessment filing which aligns with the costs included in NS Power's Fuel Stability Plan Application approved by the UARB in 2016. No further proposals were prepared.

Request IR-3:

Section 7.0 Additional Considerations and Conclusion of the NSPML Interim Cost Assessment Application Supplementary Evidence states that the "ML is an integral part of Nova Scotia's plan to meet renewable electricity standards" for 2020 and as far as out as 2050. How will the delay of renewable generation provided by Muskrat Falls impact meeting the 2020 renewable requirements? How will any further delay of Muskrat Falls affect the requirements after 2020?

Response IR-3:

Please refer to Synapse IR-11.

Request IR-4:

Please describe in detail and provide all input assumptions and model output results, including working electronic files with formulas intact, used in the process to determine;

(a) [redacted]

(b) [redacted]

Response IR-4:

(a-b) For system dispatch optimization software input assumptions and output data, please refer to Industrial Group IR-12 Confidential Attachments 1-4. For the net benefit and gross energy value calculations, please refer to CA IR-11 Confidential Attachment 1.

SBA IR-5 has been removed due to confidentiality.

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Request IR-6:

Please indicate the test period for this analysis. More specifically, was this analysis based on a singular year or an annual times series? Did the analysis use future or historical data? Also, confirm that the actual net benefits of the Maritime Link prior to NS Block range [redacted] If not, please provide the correct numbers.

Response IR-6:

The model was based on forward assumptions for pricing, generation availability, load, and so on. The model was run separately for 2018 and 2019 to reflect differing assumptions between the years. The actual net benefits will be subject to a number of uncertain factors; however, the modeling results suggested that the range of [redacted] would be achievable should the assumptions materialize as expected. The apportionment of benefits between NS Power and Nalcor is subject to commercial negotiations between the parties; please refer to SBA IR-005.

Request IR-7:

What are the differences in assumptions between the High and Low cases [redacted] for every specific item evaluated? Please provide a list that denotes the differences for each benefits item. Provide all work papers and assumptions used to determine each of the [redacted] and [redacted] savings in the Table in Appendix B.

Response IR-7:

NS Power did not run separate High and Low cases within the Plexos model, but rather ran base case models separately for 2018 and 2019, and applied its knowledge of the market in a qualitative lens to the results, providing a reasonable range around the model results.

Please refer to Industrial Group IR-12 and CA IR-11 for full details on the modeling assumptions and results.

Request IR-8:

How will changes in commodity prices affect the benefits of this analysis? For example, how [redacted]

Response IR-8:

Changes in commodity prices can be expected to affect the benefits available to customers; however, the direction and magnitude of these impacts is complex and highly dependent on the correlation of price changes between commodities. For example, [redacted] Changes in the price of other commodities would also impact the benefits available to customers.

SBA IR-9 has been removed due to confidentiality.

Request IR-10:

Please refer to page 2 of 6 of the Appendix B – [redacted]

NSPML concludes that [redacted] **Please provide the following assumptions used for this conclusion in spreadsheet format:**

(a) NS Power generation costs for all units utilized to realize the stated benefit

(b) Forward HFO pricing and sources

(c) Assumed Heat rates for all units utilized to realize the stated benefit

(d) O&M parameters for all units utilized to realize the stated benefit

Response IR-10:

(a-d) System dispatch optimization software model input assumptions and results output can be found in Industrial Group IR-12 Confidential Attachments 1-4.

SBA IR-11 has been removed due to confidentiality.

SBA IR-12 has been removed due to confidentiality.

Request IR-13:

Please refer to page 3 of 6 of Appendix B – [redacted]

(a) Please explain whether there is an overlap in the energy storage benefits and other energy related benefits. How did the analysis/software differentiate the benefits between the two? Provide an example if possible.

(b) Page 4 of 6 describes the potential net benefit of recapture energy, [redacted] **Please provide the net benefit for each of the** [redacted] **items individually.**

(c) Please elaborate how the assessment determines the [redacted]

Response IR-13:

(a-b) There is no overlap in these items. Please refer to SBA IR-05(f) for additional detail.

(c) The net benefit was estimated by completing two Plexos runs – one without the opportunities created by the availability of the Maritime Link, and one with these opportunities. The delta between the net fuel costs in these runs represents the total potential benefits. The gross energy value was calculated by comparing the total energy flows in these two model runs and assigning a value to the energy through an estimate of

the cost of the generation produced and the generation displaced. The relative spreads between fuel types and generation sources varies by season and for each specific opportunity evaluated. Industrial Group IR-12 and CA IR-11 provide additional detail on the modeling assumptions and results.

Request IR-14:

Please refer to page 4 of 6 of Appendix B – [redacted]

(a) What is the estimated in service date for the [redacted]

(b) Provide documentation in a spreadsheet format that calculates the estimation of the diversity of supply benefit as it is described by the following on page 4 of 6 [redacted]

Response IR-14:

(a) Both the Labrador-Island Link and Labrador Transmission Assets are scheduled to be in service by Q2 of 2018 at which time the Atlantic Energy Loop will be complete. Please refer to NSUARB IR-55 Attachment 1 for additional detail.

(b) Please refer to CA IR-27.

SBA IR-15 has been removed due to confidentiality.

Request IR-16:

Please refer to page 5 of 6 of Appendix B – [redacted]

What is the reason for the commitment of [redacted]**? Please provide a study or related documentation that confirms the claim** [redacted]

Response IR-16:

Five steam units are committed to the system to provide services that are not technically possible from the significant level of wind generation on the Nova Scotia power system. The NS Power steam units are large synchronous generators (100 – 185 MW) and they provide stability-enhancing features such as inertia, frequency response, high-speed voltage support with reactive overload capability, load-following and regulation (capable of following fluctuations in load and, increasingly, fluctuations in wind generations). Steam units are considered "dispatchable" whereby the system operator can adjust their output on demand to meet forecasted and unscheduled changes in load and system conditions. System inertia is important if NS Power is importing power from other systems via the interconnection with New Brunswick Power. If the single 345 kV line to New Brunswick trips while we are importing more than 100 MW, the NS Power system frequency will decline and load will automatically be shed to balance load with remaining in-province generation. The rate at which frequency declines is a function of the amount of inertia in the Nova Scotia power system at the time. Thermal generators can be thought of as flywheels in this regard, whereas the wind generator technology currently used in Nova Scotia does not have this characteristic. Similarly, as frequency is declining in the example of Nova Scotia separating from New Brunswick, speed governors on synchronous machines automatically react to the decline in frequency and increase their output in a few seconds to arrest frequency decline. The commitment of a minimum number of thermal

units on the system assumes a light load condition as might be encountered overnight, when hydro systems are generally not run (hydro units are also synchronous generators and can provide the characteristics highlighted above if they are on-line, although the total contribution to the system from hydro units is small). The minimum number of thermal units was chosen to manage the probability of losing a thermal unit at any time, which would reduce the number of thermal units to four whilst increasing imports from New Brunswick and further reducing inertia, governor response, load following, and so forth. Unit commitment also recognizes the need to have controllable reactive power sources evenly distributed across the transmission system, as dictated by NERC and NPCC standards. Therefore we have identified the need for two thermal units at Lingan/Pt.Aconi, and two units at Trenton/Point Tupper, with the fifth unit at Tufts Cove, Trenton, or Lingan. The characteristics of the combined cycle unit at Tufts Cove (units 4, 5, and 6) are such that they can be counted as a thermal unit. Under certain conditions, the system can be operated with no thermal units at Tufts Cove.

Many of the characteristics of the Maritime Link will mimic the above referenced characteristics of a synchronous machine without the incremental operating and fuel costs of the thermal unit operating in this mode. The HVdc controls provide a synthesized inertial effect, and the frequency control module reacts to the frequency deviations (increase or decrease in frequency if Nova Scotia separates from New Brunswick) to raise or lower output within design limits. The Voltage Source Inverter technology used in the Maritime Link provides high speed voltage control and reactive power reserves. The technology provides tie-line regulation and load following in accordance with the operating agreements between NS Power and Newfoundland and Labrador Hydro. These characteristics will result in a relaxation of the need for two thermal units operating in the Sydney area, thereby reducing the number of committed thermal units from five to four.

Request IR-17:

Please refer to page 5 of 6 of Appendix B – [redacted]

Please provide a document that describes how resources from neighboring regions can be used to provide regulation in Nova Scotia. Since NS Power has no dispatch access to resources in neighboring regions, how will this arrangement take place?

Response IR-17:

The Maritime Link is a controllable HVdc interconnection between the NS Power and the Newfoundland and Labrador Hydro (NLH) power systems. The HVdc terminal at Woodbine, Nova Scotia, will be connected to the NS Power Supervisory Control and Data Acquisition (SCADA) and the Automatic Generation Control (AGC) software in the same way as those generators in Nova Scotia which are capable of regulating their output on demand. When the Maritime Link is set to operate in AGC mode, it will respond to commands to raise and lower its output within a given range to assist maintaining a balance between load and generation within Nova Scotia. The HVdc terminal at Bottom Brook, Newfoundland, will react to these control signals and draw an equivalent amount of power from the Newfoundland and Labrador Hydro system. This will appear as a varying load on the Newfoundland and Labrador Hydro system and their AGC system will adjust generation to balance their total net load.

Request IR-18:

Please refer to page 5 of 6 of Appendix B – [redacted]

How will the existing reserve sharing agreement between Nova Scotia and neighboring regions be affected by the availability of the Maritime Link? What is the amount of Maritime Link Capacity that will be reserved for the reserve sharing accommodation? How is this reserve capacity modeled in Plexos?

Response IR-18:

The one existing reserve sharing agreement between Nova Scotia and neighbouring regions is the NS Power – NB Power System Operator Reserve Sharing Agreement. It will not be affected by the availability of the Maritime Link.

No Maritime Link capacity will be reserved for reserve sharing accommodation. Subject to available capacity on the Maritime Link, the NS Power System Operator and the Newfoundland and Labrador System Operator agree to share up to 100 MW of reserve.

The particulars of the reserve sharing agreements have not been detailed in the dispatch optimization software model.