NON-CONFIDENTIAL

Request IR-1:

References: Exhibit N-1, pp. 19, 21; Exhibit N-2, CA RIR-1, M11108; and Exhibit N-1, 2024 ACE Plan, M11458, p. 128, referencing "increasing weather risks," including the "number of hours of wind gusts greater than 80 km/h," with the recent period reflecting a 149 percent increase over the 2009-2013 period.

(a) Has NS Power evaluated its long-term load forecast model to consider cloud cover or wind gusts as input weather forecast variables? Please explain.

(b) Please provide forecast trends in average daily wind speed, cloud cover, and hours of wind gusts similar to those presented in Figure 9, if available.

Response IR-1:

(a) No, temperature is the primary driver of long-term energy use. The response in M11108 CA IR-01 cites cloud cover as an input to the operational dispatch model, which requires more granular weather data than that required for a long-term energy forecast model, and cloud cover is not a metric provided by Environment Canada. The reference to M11458 page 128 is discussing damage from storms and related capital expenditures, which would be more impacted by wind gusts than energy consumption in the province.

(b) This analysis was not performed, but daily average windspeed is provided in Synapse IR-4 Attachment 1.

NON-CONFIDENTIAL

Request IR-2:

Reference: Exhibit N-1, pp. 31-35; Exhibit N-2, CA IR-2(c), M11108.

(a) Please provide the analysis that demonstrates that the 2024 residential and commercial load forecasts consider the following impacts.

(i) Continued use of electric resistance heating equipment (not referring to backup electric resistance heating capabilities of heat pumps) on cold days.

(ii) Continued use of fossil fuel or wood heating equipment until failure, then replacement with heat pumps.

(iii) Replacement of existing fossil fuel or wood heating equipment in-kind.

(iv) New construction including fossil fuel or wood heating equipment.

(b) For each program that Efficiency One is implementing to help Nova Scotia residential and commercial customers transition energy end use from fossil fuels to electricity, please explain how the impacts are incorporated into the 2024 Load Forecast Report. If the impacts are not considered in this report, please state what additional data, information, or analysis is required to incorporate the program impacts into future reports.

(c) Please identify any other programs that NS Power anticipates will help Nova Scotia residential and commercial customers transition energy end use from fossil fuels to electricity and explain how the impacts are incorporated into the 2024 Load Forecast Report. If the impacts are not considered in this report, please state what additional data, information, or analysis is required to incorporate the program impacts into future reports.

(d) Please identify any market trends that NS Power anticipates will help Nova Scotia residential and commercial customers transition energy end use from fossil fuels to electricity and explain how the impacts are incorporated into the 2024 Load Forecast Report. If the impacts are not considered in this report, please state what additional data, information, or analysis is required to incorporate the market trends into future reports.

(e) Does NS Power believe that additional market interventions are necessary to achieve the level of electrification indicated in its load forecast? If so, please provide the supporting analysis.

(f) Please summarize the electrification outcomes necessary to achieve federal and provincial policy goals for electrification.

(g) Please provide NS Power's estimate of the gap between (i) existing electrification measures identified in responses to parts (b) and (c) and the market trends identified in response to part (d) and (ii) the electrification outcomes included in its load forecast as necessary to achieve federal and provincial policy goals for electrification.

Response IR-2:

(a) The E3 hybrid scenario used in the forecast assumes that all residential customers and most commercial customers adopt heat pumps for primary heating by 2050, with backup heat supplied by the original heating system, which is replaced in-kind at end of life. The heat pumps are assumed to provide heating for 93 to 95 percent of all hours. For new homes, 90 percent are assumed to be electrically heated.

(b) DSM program impacts are not modeled at the end-use level, they are modeled as class level impacts. Incorporating individual end-use impacts would require development of a full end use model with detailed stock accounting rather than the current SAE model.

(c) No specific programs are included in the model; it is assumed that current electrification trends will continue in the near term and increase in the future, in alignment with government net zero targets, as technology improves and options for non-electric stock are reduced.

(d) NS Power is not aware of any other market trends to move from fossil fuels to electricity other than those discussed in the report.

(e) Additional market interventions may not be necessary to achieve the level of electrification indicated in its Load Forecast Report. However, additional market interventions would be useful in supporting and accelerating electrification of energy end used in place of fossil sources. Provincial and Federal policies will continue to drive electrification in Nova Scotia as it pertains to achieving various decarbonization and environmental mandates.

(f) To achieve net zero 2050, energy end uses in NS must be emissions free which may be accomplished through a combination of electrification, where economic, and the use of hydrogen or biofuel where those options are more economical. NS Power has not pre-determined or conducted a study as to the economically optimal level of electrification, as this is largely contingent on government policy and market forces. NS Power will support electrification initiatives where applicable.

(g) The forecast does not assess gaps in policy and programs to achieve carbon reduction targets but assumes that policy and programs will be put in place as needed to achieve provincial and federal goals.

Request IR-3:

Reference: Board Decision, Matter No. M11307, noting that, "The Consumer Advocate, E1 and Eastward Energy supported continued study about the value of the Hybrid Peak Mitigation electrification profile, particularly about the potential costs of this strategy. While NS Power noted that future assessment of the strategy is included in Action Plan Item 4b, the Utility stated the study should be led by an external 3rd party to coordinate a multi-stakeholder study process." (p. 4) Also noting that, "NS Power must not delay or defer any part of the Evergreen IRP process in anticipation that the IRP responsibilities will be assumed by the new IESO at some point in the future. Given the impending 2030 deadline, it is essential that the Evergreen IRP process continue uninterrupted, and the Evergreen IRP Updated Action Plan and Roadmap be diligently executed." (p. 5)

Please describe the steps that NS Power has taken to further assess the Hybrid Peak Mitigation electrification profile and those steps that NS Power is aware that others have taken. In your response, please specifically address the "multi-stakeholder study process" and other relevant components of Action Plan Item 4b. Also please identify any obstacles to completing these activities that NS Power believes the Board might be able to usefully assist in overcoming.

Response IR-3:

NS Power is currently in discussions with the Province of Nova Scotia to understand their preferred approach to complete the referenced Hybrid Peak study. As noted in Figure 7 of the Path to 2030[1] document submitted to the UARB as part of the 2024 ACE Plan, the Provincial 2030 Clean Power Plan incorporates a load management plan that is consistent with the hybrid peak approach modeled in the Evergreen IRP and identifies the Province of Nova Scotia as accountable for the assessment and implementation of the program.

[1] The Path to 2030, M11017, December 22, 2023.

Request IR-4:

Reference: Exhibit N-1, p. 39, lines 21-22.

(a) Please confirm that the 1.6 kW/vehicle "sensitivity" was used as the basis for the 2024 load forecast. If not confirmed, please explain and provide any further supporting calculations.

(b) Please provide the system-coincident unmanaged peak impact per vehicle for 2023 in the same format as the response in Exh. N-2, Matter M11108, CA RIR-3.

(c) Please provide system-coincident peak impact per vehicle data from the SGNS Project (M11621).

Response IR-4:

(a) Not confirmed. As described in Section 4.4 of the report, the managed peak impact of 0.9 kW/vehicle is used in the forecast.

(b) Unmanaged peak impact is presented as a counterfactual calculation of the charging power, as all measured values were considered managed during this period. Further description of counterfactual calculations are presented in the Appendix A to the Smart Grid Nova Scotia Final Report (M11621) submitted to the UARB on March 25, 2024.

Table 1 System-coincident unmanaged peak impact per vehicle for 2023.

Date/time	Month	Day	Time	Load [MW]	Total Counterfactual EV Power [kW]	Vehicles Enrolled
2023-02-04 12:00	2	4	12	2455.00	37.14	167
2023-02-04 11:00	2	4	11	2451.38	29.85	167

2023-02-04 13:00	2	4	13	2450.35	35.36	167
2023-02-04 19:00	2	4	19	2431.23	134.70	167
2023-02-04 18:00	2	4	18	2425.20	112.76	167
2023-02-04 10:00	2	4	10	2418.41	20.19	167
2023-02-04 14:00	2	4	14	2418.24	39.64	167
2023-02-04 20:00	2	4	20	2382.40	111.29	167
2023-02-04 17:00	2	4	17	2373.13	93.94	167
2023-02-04 15:00	2	4	15	2360.88	95.05	167

(c) On February 4, 2023 at 12:00 (the system-coincident peak for 2023), the measured contribution to peak was 39.44 kW with 167 vehicles enrolled, or 0.24kW/vehicle enrolled.

NON-CONFIDENTIAL

Request IR-5:

References: Exhibit N-1, 2024 ACE Plan, M11458, p. 70, lines 9-20, stating that:

> **although the Load Forecast provides justification for specific capital projects, it does not directly correlate with or support the budgeting for new customer routines (D004, D061 and D062). … the Load Forecast is a forecast of new housing starts only, and as such, differs from new customers that may require a capital upgrade. For example, a request to connect an existing building as a dedicated service, such as a detached garage would not be counted as a housing start but would be counted as a new customer, and require work to be completed under the new customer routine. As such, it would not be beneficial for cost budgeting and procurement purposes to base the forecast units under D061, D062 and D004 distribution routines on the units included in the Load Forecast Report, as this could result in large variances to budget. Rather, NS Power continues to monitor trends, and will modify its approach to forecasting new customer-driven work volumes by incorporating more recent trends (i.e. including shorter periods in its forecast), as required.**

Exhibit N-5, CA RIR-2(a), M11458, stating that: "Detached garages and other similar new customer claims … [and] Unmetered services (such as streetlights and area lights) and large renovations" are the source of the variance between the 2024 Load Forecast Report and the D061 forecast.

(a) Please explain how the Load Forecast accounts for additional energy and peak demand from requests "to connect an existing building as a dedicated service," "large renovations," and other new loads that require a distribution capital upgrade but are not included in forecast new housing starts.

(b) Please summarize the load forecast for unmetered services and explain how it contributes to the source of the variance between the two forecasts.

Response IR-5:

(a) Additional energy and peak load other than from new housing starts would be accounted for in changes to the underlying average use that is used in the regression model. All else being equal, large renovations would lead to a higher average use in the historic data set.

(b) Unmetered service is forecast as its own class within the commercial sector and stays stable throughout the forecast period.

Request IR-6:

References: Exhibit N-12, NSUARB RIR-79(c), M11458, stating that NS Power's residential load forecast for 2024 includes 2,017 new single-family units and 3,765 new multi-family units, while the D061 forecast is 4,374 new customer installs.

Please explain how NS Power forecasts the 4,374 customer installs in the D061 routine capital budget forecast and why it is reasonable for this number to differ from the 2024 residential load forecast.

Response IR-6:

Please refer to 2024 ACE Plan Undertaking 5 (M11458), filed with the NSUARB May 2, 2024.

Request IR-7:

Reference: Exhibit N-5, CA RIR-2(b), M11458; Exhibit N-9, NSUARB RIR-72(g), M11458. Exhibit N-2, CA RIR-4, M11108; and Exhibit N-1, 2024 Load Forecast Report, pp. 32-33, 36-43.

(a) Please confirm that NS Power lacks accurate data on the number of housing units connected, by type (e.g., single-family vs multi-family) and level of service (e.g., ampere rating). If not confirmed, please provide the relevant data for these factors for the past five years.

(b) Please provide a summary of the plans to use advanced metering infrastructure data to enhance modeling and forecasting via incorporation into NS Power's distribution planning modeling software. Where available, please provide the specific scope of work for the modeling and forecasting changes referenced in your response.

(c) Please explain how the forecast increase in EV charging, commercial electrification of heating, and solar generation is being considered in distribution facilities planning.

(d) Please identify the additional data and analysis required by NS Power before extrapolating the results from the SGNS Project and any other recently-completed or research/pilots currently underway to provide province-wide estimated impacts of (i) EV charging, (ii) residential heating electrification, (iii) commercial heating electrification, and (iv) solar generation.

Response IR-7:

(a) NS Power does not track this data by the categories listed.

(b) Distribution software is not used to prepare the load forecast. Updates to the distribution planning process are being discussed in the ongoing Cost of Service Study. AMI data is currently being used in CYME distribution analysis software to perform studies related to area capacity planning, load impact, and generator impact. It is also used to develop calculations for the Solar PV Hosting Capacity Map per M10872 Commercial Net Metering.

(c) Data from the load forecast is considered in the analysis for area capacity studies, including estimated peak load from electrification of heating systems and EVs.

(d) For clarification, typically pilot projects such as Smart Grid Nova Scotia are not required to inform the assumptions and inputs related to the Load Forecast. Instead, where pilot projects include analysis of end uses and their data and learnings are available, they can be used to augment load forecasting and verify assumptions where applicable. In most cases, load forecasting is informed by pre-existing data sets and information from either internal or external sources.

(i) Data from a larger pool of customers with EVs is needed to extrapolate province wide.

(ii) Residential heating electrification is already modeled in the forecast. More granular forecasting would require more detailed end use data specific to Nova Scotia.

(iii) Commercial heating electrification is already modeled in the forecast. More granular forecasting would require more detailed end use data specific to Nova Scotia.

(iv) Solar generation is already modeled in the forecast.

Request IR-8:

Reference: Exh. N-10, NS Power Rebuttal Evidence, 2023 Load Forecast Report, M11108, p. 21.

(a) Please provide the factors used to determine transformer sizing, in the transformer sizing charts and in practice for specific transformers.

(b) Please provide the formula or method used for the transformer sizing charts, including identifying the sources of data for the relevant factors, including but not limited to the number of customers connected, panel sizes, and special loads such as EVs.

(c) Please provide the formula or method used for transformer sizing decisions for specific transformers (both new and replacement units), including identifying the sources of data for the relevant factors, including but not limited to the number of customers connected, panel sizes, and special loads such as EVs.

(d) Are transformer sizing decisions ever influenced by available transformers in NS Power's inventory or anticipated delivery schedule? If so, please explain the circumstances and the frequency of such events.

Response IR-8:

Transformer sizing is not part of the Load Forecast report. In general, the load forecast is not used in transformer sizing; rather, transformer sizing is particular to the site in question. System level electrification forecasting is not relevant to transformer size selection charts as the diversification factors of the loading are much different.

(a) The transformer sizing charts provided in the NS Power Overhead Standards manual are based on the quantity and size of the loads being supplied by the transformer. The different types of loads covered by the transformer sizing charts include Domestic Services, Electric Thermal Storage (ETS), Electric Vehicle (EV) Chargers (level 2 and 3) and special loads. Special loads include but are not limited to mini split heat pumps, central heat pumps and tankless hot water heaters.

(b) NS Power field employees utilize a field review, including a meter check to determine the type of loads to be served from a transformer. If a customer requests a service upgrade, the planner will re-evaluate the transformer sizing at that time. The transformer sizing charts are based on the total quantity of each type of load. The formula below is used for calculating the estimated loads:

$$Domestic\ Service(s) = N_{Service} * I_{Service} * DF * CF * V_{Service}$$

$$Domestic\ Service\ with\ ETS = \{(N_{Service} * I_{Service} * DF_{off-peak} * CF) + (N_{ETS} * I_{ETS})\} * V_{Service}$$

$$Special\ Load = I_{Fuse} * 80\% * N_{Special} * V_{Service}$$

$$EV\ Charger\ Load = \left\{\left(N_{EV_2} * I_{EV_2}\right) + \left(N_{EV_3} * I_{EV_3}\right)\right\} * V_{Service}$$

Where:

$N_{Service} = Number\ of\ Domestic\ Services$

$I_{Service} = Service\ Size$

$DF = Demand\ Factor\ for\ Domestic\ Services$

$CF = Coincidence\ Factor\ for\ Domestic\ Services$

$V_{Service} = Nominal\ Service\ Voltage$

$DF_{off-peak} = Demand\ Factor\ for\ Off\ Peak\ Domestic\ Services$

$N_{ETS} = NUmber\ of\ ETS\ Units$

$I_{ETS} = ETS\ Rated\ Current$

$I_{Fuse} = Fuse\ Size$

$N_{Special} = Number\ of\ Special\ Load\ Units$

$N_{EV_2} = Number\ of\ Level\ 2\ Chargers$

$N_{EV_3} = Number\ of\ Level\ 3\ Chargers$

$I_{EV_2} = \ Level\ 2\ EV\ Charger\ Current\ Rating$

$I_{EV_3} = Level\ 3\ EV\ Charger\ Current\ Rating$

The total capacity of the transformer is determined by applying a transformer overload factor to the sum of the Domestic Service Loads, ETS Loads, EV Charger Loads and Special Loads supplied by the transformer.

Total kVA = (Estimated Service Load (kVA) + Special Loads)/overload factor

(c) Sizing a transformer for a service that is not covered by the transformer loading charts, such as a larger commercial service, is done using the formula below:

$$kVA_{Demand} = LF * I_{Switch} * V_{Service}$$

$LF = Load\ Factor$

$I_{Switch} = \ Switch\ Size$

$V_{Service} = Nominal\ Service\ Voltage$

(d) NS Power transformer inventory is managed such that overhead transformer inventory is available in stock at NS Power depots when required for installation. For services requiring transformers with long-lead times, such as padmount transformers, large commercial customers are asked to provide notice of intent to connect one year in advance.

NON-CONFIDENTIAL

Request IR-9:

Reference: Exhibit N-1, Section 10.0.

(a) Please provide the quantified reduction in system peak as a result of time-varying pricing (TVP) rate offerings in the 2024 Load Forecast Report.

(b) Please provide NS Power's forecast for when it will fulfill the commitment that its investment in AMI technology would result in a reduction in system peak demand, and thus reduce the amount of necessary system peaking capacity.

(c) Considering the top ten peak event periods during the 2023-2024 winter, where an event is defined as a morning, mid-day, evening, or full-day period: please identify the peak hour associated with each event period and whether that hour occurred on a weekday or weekend and during a peak TOU period or not.

(d) Please provide the projected reduction in system peak associated with TVP rates, the number of customers required to achieve those savings, and the associated peak impact per customer. In your response, please provide support for all data and assumptions.

(e) Please identify what additional data and analysis is required by NS Power before extrapolating the results from its TVP pilot to province-wide estimated impacts, if any.

Response IR-9:

(a) The peak reduction associated with TVP rates is provided in Figure 56 of the 2024 Load Forecast report.

(b) NS Power forecasts that the Advanced Metering Infrastructure (AMI) related peak savings forecast in the AMI capital application will be realized by 2028/2029, recognizing that the composition of components leading to a total 35 MW of savings (as presented in the Company's 2018 AMI Application) may vary in its implementation.

(c) See table below which includes the top ten "events" organized as requested. TOU peaks occurred during 8/10 peak hours, CPP events occurred on 2/10 peak hours, with potential CPP events being available during 10/10 peak hours. A potential event is defined here as a period in which a CPP event could have occurred based on tariff structure, but it did not.

Date	Period	Peak Hour	TOU Peak	CPP Event
2/21/2024	Weekday Morning	7:00 – 8:00	Yes	Yes
12/22/2023	Weekday Evening	17:00 – 18:00	Yes	Potential
2/20/2024	Weekday Morning	7:00 – 8:00	Yes	Potential
1/29/2024	Weekday Evening	17:00 – 18:00	Yes	Potential
3/1/2024	Weekday Morning	7:00 – 8:00	Yes	Potential
1/24/2024	Weekday Morning	8:00 – 9:00	Yes	Yes
1/8/2024	Weekday Evening	17:00 – 18:00	Yes	Potential
1/6/2024	Weekend Evening	17:00 – 18:00	No	Potential
1/18/2024	Weekday Evening	17:00 – 18:00	Yes	Potential
1/7/2024	Weekend Evening	17:00 – 18:00	No	Potential

(d) (d)NS Power is currently engaged with stakeholders to develop the longer-term plan for the TVP Tariffs. Please refer to Synapse IR-09 for details. The Company anticipates

reviewing the number of customers required to achieve the projected reduction in system peak as part of Technical Session 4.

(e) Sufficient data has been collected to estimate the effects of TVP at scale. This dataset will be enhanced by the findings of the Time Varying Pricing Pilot Year Three Report, once complete. TVP Pilot Year 1 and Year 2 results are currently under review with TVP stakeholders, including the consultant to the CA, to determine the plan for Year 4 of the TVP Pilot and the longer-term plan for TVP tariff deployment.