

NOVA SCOTIA UTILITY AND REVIEW BOARD

IN THE MATTER OF: **The Public Utilities Act**

- and -

IN THE MATTER OF: **Nova Scotia Power Incorporated ("NS Power")**
10 - Year Energy and Demand Forecast
(2023 Load Forecast Report)

NON-CONFIDENTIAL INFORMATION REQUESTS

To: **Mark Peachey**
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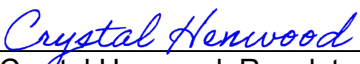
From: **Synapse Energy Economics Inc.**
Board Counsel Consultant

Responses Due: **June 20, 2023**

Copies: 1 electronic copy (PDF searchable)
3 hard copies

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Issued at Halifax, Nova Scotia, this Thursday, May 25, 2023.



Crystal Henwood, Regulatory Affairs Officer/Clerk

Questions regarding the NSPI “2023 Load Forecast Report” of April 28, 2022

Request IR-1:

Report Tables

- a. Please provide in electronic spreadsheet format all tables and graphs with identification of the data source(s) that appear in the load forecast report and appendices, retaining all formulas and calculations.

Request IR-2:

Historical Sales and Energy Data (Figures 1, 3, 39-40, 44, 46-50, 52)

- a. Please provide in electronic spreadsheet format the customer sales data by rate class since 2007, on a monthly basis.
- b. Please provide in electronic spreadsheet format historical usage and customer data for electric space-heat customers since 2007 on a monthly basis.
- c. Please provide in electronic spreadsheet format system hourly load data from January 2007 through December 2022.
- d. Please provide the magnitude of unmetered historical sales by year and by category since 2007.

Request IR-3:

Billed versus Accrued Sales and Regression Period (Section 4.0, p 16)

- a. The report notes that the load forecast uses “billed” sales rather than “accrued” sales. Please identify the quantitative differences between the two for the most recent available year.
- b. The report notes that it uses monthly billed sales data from January 2013 to December 2022 for the residential and commercial energy forecasts, and sales data from January 2013 to December 2022 for Small Industrial, and from January 2006 to December 2022 for Medium Industrial “to improve the fit.” Please quantify the nature of the improved fit.
- c. Please identify the effect if the industrial forecast used the same period as the residential and commercial forecasts (that is, January 2013 to December 2022).

Request IR-4:

Weather Data (Section 4.2, pp 17-26)

- a. Please provide in electronic spreadsheet format the temperature data on a daily basis for January 2007 through December 2022, and the monthly HDD and CDD values used for this forecast identifying the weather station.

- b. Please provide in electronic spreadsheet format the monthly HDD and CDD data for other weather stations in Nova Scotia for the same period.
- c. Please provide the calculations used to construct the data values in Figure 7: HDD Trend from the Historic Annual HDD shown in Figure 6. Please identify the years represented on the x-axis for Figure 7.
- d. Please provide the data and calculations for Figure 8: CDD Trend. Please identify the years represented on the x-axis for Figure 8.
- e. Please provide the data and calculations behind the HDD and CDD forecast in Figure 9.
- f. Please provide the hourly peak loads and temperature data for ten years as referenced on page 23. Please explain why the period was reduced from twenty years used in the previous forecast.
- g. Please identify which years represent the 10-year averages for the bars in Figure 11. Also please provide the data used for these average calculations.
- h. Regarding the weighing of weather station data and the comparisons between the two approaches which is presented as the Mean Absolute Percentage Error (MAPE)? Were other comparison approaches investigated? Why was the MAPE method selected?

Request IR-5:

Economic Information (Section 4.3, pp 26-31)

- a. Please provide in electronic spreadsheet format all economic and provincial statistical data used both in developing the models and the forecasts for the historical analysis and forecast period. Cite the sources of the data. What sources other than Conference Board were considered or used?
- b. Please describe in detail the construction of the work-from-home variable.
- c. Please provide the sources and the assumptions behind the new housing completions variables. To what degree do housing completions represent replacement of existing stock?
- d. Regarding Figure 16 and the historical changes. Please explain the increases in population for 2022, 2023 and 2024 and how that relates to customer numbers and housing completions. What are the comparable changes on a percentage basis? What is the forecast for the population changes during the forecast period?
- e. Please discuss why non-manufacturing gross domestic product and non-manufacturing employment continue to be used for the commercial models. Were other drivers considered? Why were they not chosen?
- f. Please discuss why manufacturing GDP and manufacturing employment were chosen for the industrial models. Were other drivers considered? Why were they not chosen?

- g. What consideration if any was given to labour shortages or increased automation for the industrial sector?
- h. What would be the effects on the industrial forecast if 10 years were used for the regression?
- i. Please provide the inflation adjustments used to convert to constant dollars.
- j. Regarding economic forecasts, identify the scenario/case used for this analysis and the reasons for choosing it.
- k. Please indicate any other economic forecasts that are available and indicate why they were not chosen. For example, the use of major bank forecasts for the near term.

Request IR-6:

Residential End-Use Intensity Trends (Section 4.4, pp 32-51)

- a. Please provide in electronic spreadsheet format the end-use data in the form of saturations and efficiencies from NRCan and U.S. EIA used for the residential and commercial models.
- b. Please identify specifically which of that data was used in the SAE modeling and any adjustments, transformations, etc. that were made in that process.
- c. Please identify the adjustments that were made “so that the resulting intensities are consistent with NRCan-reported end-use sales and actual average use derived from NS Power billing data.” [page 32, lines 13-15]

Request IR-7:

Residential and Commercial Heating and Heat Pumps (Section 4.4, pp 33-37)

- a. Please provide for all the forecast years:
 - 1. Total number of residential customers,
 - 2. Number of customers using primarily electric resistance heating,
 - 3. Number of customers using supplemental resistance heating,
 - 4. Number of customers using heat pumps for primary heating,
 - 5. Number of customers using heat pumps for supplemental heating,
 - 6. Number of customers using heat pumps for cooling,
 - 7. Number of customers using oil for heating,
 - 8. Number of customers using natural gas or propane for primary heating,
 - 9. Number of customers using other energy sources for primary heating.
- b. Please indicate the number of new customers from 2023 through 2033 and the breakout of their space heating technology.

- c. Please provide supporting evidence for the 40 percent saturation of customers providing their heat via heat pumps in 2023 (p. 33).
- d. Please provide the data sources and the E3 estimates regarding the commercial heat pump saturation forecast.
- e. Please quantify, with underlying calculations, the differences between E3 and the current forecast in regards to peak load impacts as presented in Figure 23.
- f. Please provide the calculations used to obtain the 3922 kWh/year/household estimated heat pump energy impact for 2023.
- g. Please provide documentation of the E3 electrification model, RESHAPE.
- h. Please document the data that the RESHAPE model used for this forecast and its impacts on the forecast.

Request IR-8:

Residential Water Heaters (WH) (Section 4.4, p 37-38)

- a. Are more efficient hot water end-use devices considered in this analysis?
- b. What are the existing or proposed standards for improving hot water efficiency in the province?
- c. Does NSPI or E1 have a plan for promoting HP rather than resistance-based water heaters?
- d. How would the water heating load change if half of the new water heaters were HP based?
- e. Please provide an update of the joint pilot on controlling water heaters directly and looking at potential benefits to the system.
- f. Please describe the drivers for the increase in water heater saturation by 2033 in the current forecast compared to the 2022 forecast.
- g. It appears that the Intensity in Figure 25 represents an average that is increasing because the saturation is increasing. Please confirm if this is the driver. Please provide the intensity per electric water heating household for each year in Figure 25.

Request IR-9:

Residential Electric Vehicles (EV) (Section 4.4, pp 38-43)

- a. Please provide the source data and calculations used to produce the updated 2023 EV sales forecast in Figure 26.
- b. Please provide a detailed explanation of how the updated federal sales targets for EVs have been translated into the 2023 EV sales forecast that is presented in Figure 26.

- 1 c. How do the daily load shapes for various types of electric vehicles correspond to NS's
2 system load patterns? How does the peak demand pattern for electric vehicles correspond
3 to NS's summer and winter peak demands?
- 4 d. Please provide more details about E3's EV Load Shaping Tool and how it was used to
5 produce the results for this forecast. Specifically, the calculations behind the values in
6 Figure 27.
- 7 e. Please provide an update on the status of the time of use tariffs currently in the pilot stage
8 and the Company's future plans for deploying time of use rates.
- 9 f. The Company assumes that 70 percent of EV charging is managed and 30 percent is
10 unmanaged. Please provide any calculations used to product this assumption, and please
11 explain in detail how the assumptions about EV load management relate to the Company's
12 current and future planned rate offerings.
- 13 g. Please provide the confidential version of the January 2023 Smart Grid Nova Scotia Semi-
14 Annual Report as an attachment.
- 15 h. Please provide the source data and calculations for Figure 28.
- 16 i. Please provide the inputs and the calculations behind the results in Figure 30.

17
18 **Request IR-10:**

19 Solar Generation (PV) (Section 4.4, pp 44-45)

- 20 a. Please provide supporting data for the average capacity and capacity factor for the PV
21 installations used in the forecast.
- 22 b. Have you calculated the impacts of PV on summer peaks over the forecast period? If so,
23 please provide those results.
- 24 c. Please provide the source data and calculations for the values in Figure 31.

25
26
27 **Request IR-11:**

28 New Technologies (Section 4.4, pp 45-47)

- 29 a. Were projected cost declines of home batteries considered in the study? If so, please
30 provide the assumed cost declines.
- 31 b. Please provide the assumptions and calculations behind the values in Figure 32.
- 32 c. Please provide any available calculations evaluating the possible use of electric thermal
33 storage (ETS) to moderate peak load.

34
35 **Request IR-12:**

1 End-Use Intensities (Section 4.4, pp. 47-50)

- 2 a. Please provide the underlying calculations for the residential changes in baseboard
3 heating, heat pump heating, cooling and electric water heating in Figure 33. E.g. changes
4 in customer fractions and base use levels for each category.
- 5 b. Please provide the underlying calculations for the small commercial changes in lighting,
6 heating, and miscellaneous uses in Figure 34.
- 7 c. Please provide the underlying calculations for the general commercial changes in lighting,
8 heating, and miscellaneous uses in Figure 35.
- 9 d. Please explain why the commercial heating intensity increases rather than declining as it
10 has historically in Figure 33.

11
12 **Request IR-13:**

13 Commercial and Industrial Growth (Section 4.4, pp 52-53)

- 14 a. Please provide the detailed calculations behind the values presented in Figure 34.
- 15 b. For the small and medium commercial customers, identify the components of the demand
16 growth in Figure 34. How much is associated with heat pumps for heating, cooling?
- 17 c. How much of the growth represents increases in number or size of customers? How many
18 new customers are included in the forecasts each year?

19
20 **Request IR-14:**

21 Introduction (Section 2.0, citing to Board Decision concerning 2022 Load Forecast)

- 22 a. How has the Company addressed in its 2023 Load Forecast the Board's directive to
23 "evaluate the model's economic inputs, including the COVID-19 variable?" Please
24 explain in detail.
- 25 b. How has the Company addressed in its 2023 Load Forecast the Board's directive to
26 "[e]xamine the elasticity used in the SAE model to exclude elasticities calculated from
27 non-winter peaking utilities or to apply elasticities from Canadian studies of Canadian
28 electric utilities?" Please explain in detail.
- 29 c. How has the Company addressed in its 2023 Load Forecast the Board's directive to
30 "Consider incorporating household size and age of household residents, to determine if
31 a better understanding of demand on load by time of day is achieved?" Please explain in
32 detail.
- 33 d. For each of the bulleted updates to the load forecast listed on page 12 as being "in
34 accordance with the Board's direction," please specifically indicate the specific directive
35 from the Board to which each of these updates is responsive.

Request IR-15:

Price Data (Section 4.5, pp 52-53)

- a. Please provide the data and calculations used to produce the electricity prices shown in Figure 37.
- b. The report states: "The SAE models are estimated using a -0.15 price elasticity." Please provide supporting data for the use of this elasticity. Please also clarify whether the basis for utilization of this price elasticity value has changed in any way, given that the same value has been used in previous forecasts.
- c. Have any estimates of price elasticity been calculated specifically for Nova Scotia/Canada or for winter peaking systems? If yes, please explain in detail. If not, please explain why not.

Request IR-16:

Demand Side Management (Section 4.6, pp 54-56).

- a. Please provide the source data for the DSM values used in this forecast.
- b. Please provide the DSM values used in the latest IRP.
- c. Please provide the DSM levels as presented in the latest E1 potential study.
- d. Please provide the inputs and calculations used to create Figure 38.
- e. Please identify any changes to the forecast of Annual DSM Savings provide in Figure 38 relative to the same forecast provided in the 2022 Load Forecast Report, and please provide a narrative explanation of any such changes.

Request IR-17:

Demand Side Management Adjustment (Section 4.6, pp 54-56)

- a. Please provide the details of the data and statistical analysis that was used to develop the coefficient for the DSM variable in the Residential SAE Model
- b. Please provide the details of the data and statistical analysis that were used to develop the coefficient for the DSM variable for the Commercial and Industrial forecast.
- c. Please describe any changes in the data and statistical analysis used to develop the coefficient for the DSM variable in the Residential SAE model relative to the data and statistical analysis used to develop coefficient for the DSM variable in the Residential SAE Model for the 2022 Load Forecast Report.

- 1 d. Please describe any changes in the data and statistical analysis used to develop the
2 coefficient for the DSM variable for the Commercial and Industrial forecast relative to the
3 data and statistical analysis used to develop coefficient for the DSM variable for the
4 Commercial and Industrial forecast for the 2022 Load Forecast Report.
- 5 e. Please provide the statistical measures associated with the coefficients referenced in (a)
6 and (b).
- 7 f. Please provide the historical and forecasted annual values of DSM that are used for this
8 forecast for each sector.
9

10 **Request IR-18:**

11 Residential Sector (Section 5)

- 12 a. Please provide the inputs and calculations used to produce the adjustments for residential
13 solar and new customers in the Residential sales forecast.
- 14 b. Please provide the source data and calculations behind the results in Figure 39.
- 15 c. The report states that “The COVID-19 impact to the Residential forecast is approximately
16 +150 GWh in 2023 and beyond.” Please confirm that this means that the modeled effect
17 of COVID-19 in the Residential forecast is a 150 GWh increase in Residential sales, per
18 year. If not confirmed, please explain.
- 19 d. The report states that “The long-term impact of the COVID-19 pandemic on working habits
20 in Nova Scotia is still unknown, but the assumption in this forecast is that there will be a
21 certain amount of continued work-from-home load, potentially through hybrid work
22 models.” Has the Company conducted any analysis on the long-term impact of the COVID-
23 19 pandemic, including analysis of whether the incremental sales attributable to the
24 increase in work-from-home load is apt to decline over time? Please explain.
- 25 e. Please provide the inputs and calculations used to create Figure 41.
- 26 f. Please provide the inputs and calculations used to create Figure 42.
- 27 g. Please provide the inputs and calculations used to create Figure 43.
- 28 h. Are there any proposed regulations under consideration for improved building shell
29 efficiency? If so, please discuss and indicate how they might affect the values in
30 Figures 41 and 43.
- 31 i. Please explain the basis for the assumption that home size will increase.
32

33 **Request IR-19:**

34 End-Use Intensity Trends (Section 4.4)

- 35 a. The report references critical peak pricing (CPP) and TOU rates as currently being piloted.
36 Does the Company assume that the charging behavior of EV owners will be impacted by

1 either of these pricing mechanisms over the forecast period? If yes, please explain what
2 impact is assumed. If not, then please explain why not.

3 b. What is the status of the CPP and TOU pilots referenced in (a)? When will these rates be
4 deployed to all customers?

5 c. Does the anticipated future deployment of CPP, TOU rates, or other novel rate designs
6 have any impact on the load forecast? Please explain.

7
8
9 **Request IR-20:**

10 Commercial Sector (Section 6.0).

11 a. Please explain and quantify the impacts of COVID on the 2021 and 2022 loads.

12 b. Please explain and quantify the ongoing effects of COVID in the commercial forecast.

13 c. Please explain why the current forecast (Figure 44) remains shows an increase through
14 2033 whereas the previous forecast was fairly level with a final decline.

15
16 **Request IR-21:**

17 Small General Service (Section 6.1).

18 a. Please explain and quantify the specific reasons for the differences from the previous
19 forecast.

20 b. Please identify and quantify in detail the specific components in the forecast model that
21 are causing the increase starting about 2027 as shown in Figure 46.

22
23
24 **Request IR-22:**

25 General Service (Section 6.2).

26 a. Please explain and quantify the specific reasons for the differences from the previous
27 forecast.

28 b. Please quantify separately and explain the derivation of the effects for (1) EV loads,
29 (2) space heating, (3) DSM programs, (4) increased efficiency. These appear to be driven
30 by the XHeat, XCool and XOther model variables used in Appendix B. But what
31 component changes are driving the changes in these model variables? And how do they
32 differ from those used in the previous forecast?

33 c. Please explain in detail the sales drop in 2024 related to sales shifting to the RTR
34 participant.

35 d. Please provide details of the forecast of higher solar generation effects of 50 GWh by
36 2033.

Request IR-23:

Large General Service (Section 6.3).

- a. Please explain and quantify the specific reasons for the differences from the previous forecast.
- b. Please quantify how much of the increase is associated with expansion of institutional facilities and how much from other factors.

Request IR-24:

Small Industrial (Section 7.1).

- a. Please explain and quantify the specific reasons for the differences from the previous forecast.
- b. Please explain why the sales forecast increases to about 2026 and remains level thereafter.

Request IR-25:

Medium Industrial (Section 7.2).

- a. Please explain and quantify the specific reasons for the differences from the previous forecast.
- b. Please explain and quantify the factors behind the 0.1 percent growth rate.

Request IR-26:

Other Industrial (Section 7.3).

- a. Please explain and quantify the specific reasons for the differences from the previous forecast.
- b. Of the twenty-four responses that were received from the annual survey what fraction of the sector load does that represent?
- c. What is the aggregate percentage load change from those responses?
- d. Based on past experience how reliable are the new project values given in Figure 51?

Request IR-27:

Municipal (Section 7.4).

- a. Please provide the total municipal loads in GWh and MW over the forecast period.
- b. What changes if any are anticipated with the municipal supply in the forecast period?

Request IR-28:

System Losses and Unbilled Sales (Section 8).

- a. Please provide the system losses and unbilled sales for each year of the last five years.
- b. Please provide information about how system losses vary over a typical year.
- c. Please identify and discuss the reasons for any significant changes either in the historical or forecast values of the system losses or unbilled sales.
- d. How are unmetered sales represented in the forecast?

Request IR-29:

Net System Requirement (Section 9).

- a. Please provide the source data and the calculations used to produce the values in Figure 53.
- b. Please provide the source data and the calculations used to produce the values in Figures 54 and 55.

Request IR-30:

Peak Demand (Section 10)

- a. Please provide details about the Demand Response (DR) resources modeled in this analysis. What sectors are represented and what are the potentials in each sector?
- b. Please provide the basis for the ELCC of 48 percent that is used in the forecast.
- c. Please provide the calculations and assumptions used to produce the DR savings in Figure 56.
- d. Please explain why the demand response total declines after 2027.
- e. What period was used to calibrate the peak model? Please provide in electronic format the data used for that calibration.
- f. Please provide the sources and the derivations of the values in Figure 65. Please also provide the values for the intervening years between 2022 and 2033.
- g. Please provide further information about the Unexplained values in Figure 66.
- h. Please provide the data and calculations behind the peak share values in Figures 68 and 69 including the actual load values as well as the percentages. Please provide the same data and calculations for 2033.

Request IR-31:

Peak Demand (Section 10 Coincident Peak Demand Research, pp 90-94)

- a. Please provide more details about the use of interval data to understand peak loads at the class level.
- b. Please indicate specifically how many more years of data collection will be needed before the results can be applied to the forecast.
- c. What are the current levels of AMI coverage for the customer classes?
- d. Please specify by name the rate classes shown in Figures 70 and 71.
- e. What were the loss levels (absolute and percentage) on the 2022 peak day by hour as shown in Figure 70?
- f. What are the monthly loss levels as shown in Figure 71?
- g. Please quantify and explain the differences in Figure 72 between the Residential coincidental peak load with and without DSM, and please also explain the relationship between these differences and the DSM values in Figure 38 and the demand response values in Figure 56.
- h. What is the schedule for using the smart meter data in future forecasts to test the accuracy of the model?

Request IR-32:

Sensitivity Analysis (Section 11 and Appendix D)

- a. Please provide in electronic format the data and calculations used to create Figures 74, and 75.
- b. Please explain the reasons that these specific weather and economic variables were selected for the sensitivity analysis.
- c. Please provide the actual statistical distributions used for those variables and how they were determined.
- d. What other variables were considered but not chosen? Please discuss and explain.

Request IR-33:

Sensitivity Analysis (Section 11, 2020 IRP Comparison, pp 97-98)

- a. Please provide information about how the evergreen IRP analysis might affect future loads.
- b. For comparison with the previous forecast please provide values for 2032 in Figure 68.

Request IR-34:

1 Appendix A: Forecast

- 2 a. Please provide in electronic format the specific calculations used to create the values in
3 Tables A1, and A2.
4 b. Please explain the historical changes in the Interruptible Contribution to Peak values and
5 the future year values used in the forecast.
6

7 **Request IR-35:**

8 Appendix B: Residential Model (pp 1-8)

- 9 a. Please provide in electronic spreadsheet format the data and the statistical model
10 parameters and the full data and results used to produce the residential model coefficients
11 and statistics tables.
12 b. Please provide in electronic format the detailed end-use intensity data and its derivation.
13 c. Please provide in electronic spreadsheet format the source and calculations of the values
14 in the tables on pages 6, 7, and 8.
15 d. Please provide the data and calculations associated with electric space heat and electric
16 hot water usage.
17 e. For the XHeat variable please provide the underlying factors (penetration, usage, etc.)
18 driving the change of percentage for HP Heat.
19 f. For the XCool variable please provide the underlying factors (penetration, usage, etc.)
20 driving the change of percentage for HP Cool.
21 g. For the XOther variable please provide the underlying factors (penetration, usage, etc.)
22 driving the change of percentage for Other.
23 h. Has NSPI collaborated with E1 in developing common assumptions for the end-use
24 components? If so, please describe the results of that collaboration.
25

26 **Request IR-36:**

27 Appendix B: Small General Service Model (pp 9-14)

- 28 a. Please provide in electronic spreadsheet format the data and the statistical model
29 parameters and the full results used to produce the commercial model coefficients and
30 statistics tables.
31 b. Please provide in electronic spreadsheet format the calculation of the XHeat, XCool and
32 XOther variables.
33 c. Please provide in electronic spreadsheet format the calculations used to produce the
34 commercial sales forecast.
35 d. For the XHeat variable please provide the underlying factors (penetration, usage, etc.)
36 driving the increase of 19.1% for Heating Intensity.

- 1 e. Please quantify the adjustments done outside the model for other growth programs PV,
2 EV and DSM and their derivations (p12).
3 f. Please provide in electronic spreadsheet format the source and calculations of the values
4 in the tables on pages 12-13.
5

6 **Request IR-37:**

7 Appendix B: General Service Model (pp 15-20)

- 8 a. Please provide in electronic spreadsheet format the data and the statistical model
9 parameters and the full results used to produce the commercial model coefficients and
10 statistics tables.
11 b. Please provide in electronic spreadsheet format the detailed end-use intensity data and
12 cite its derivation.
13 c. Please provide in electronic spreadsheet format the calculation of the XHeat, XCool and
14 XOther variables.
15 d. For the XCool variable please provide the underlying factors (penetration, usage, etc.)
16 driving the increase of 20.4% for the CoolUse Variable.
17 e. Please provide in electronic spreadsheet format the source and calculations of the values
18 in the tables on pages 17-18.
19

20 **Request IR-38:**

21 Appendix B: Small Industrial Model (pp 21-23)

- 22 a. Please provide in electronic spreadsheet format the data and the statistical model
23 parameters and the full results used to produce the model coefficients and statistics tables.
24 b. Please explain why "ManGDP" was chosen as the long-term driver for this forecast,
25 whether any other variables were considered such as employment, and why they were
26 rejected.
27

28 **Request IR-39:**

29 Appendix B: Medium Industrial Model (pp 24-26)

- 30 a. Please provide in electronic spreadsheet format the data and the statistical model
31 parameters and the full results used to produce the model coefficients and statistics tables.
32 b. Please explain why Manufacturing Employment was chosen as the long-term driver for
33 this forecast, whether any other variables were considered, and why they were rejected.
34

35 **Request IR-40:**

Appendix B: Combined Model for Commercial and Industrial DSM Coefficient (pp 27-28)

- a. Please provide in electronic spreadsheet format the data and the statistical model parameters and the full results used to produce the model coefficients and statistics tables.
- b. Please describe the method and data used to weigh the X variable.
- c. Please explain why the X variables from the General Service model were used to represent both commercial and industrial customers?
- d. Were other alternatives considered? If so, please describe and indicate why this approach was preferred.

Request IR-41:

Appendix B: Peak Forecast (pp 29-33)

- a. Please provide in electronic spreadsheet format the data and the statistical model parameters and the full results used to produce the model coefficients and statistics tables.
- b. Please provide the customer load values used to construct the aggregate HeatVar, CoolVar, and BaseVar values both for the model development and the forecast.
- c. Please provide the details of the large customer class's energy and coincident load factors. Please provide also the historical coincident peak load factors associated with this load.

Request IR-42:

Appendix C: Forecast Comparison and Accuracy

- a. Is the data in this appendix weather normalized? If so, please provide the raw data and the normalization factors used.

Request IR-43:

Appendix D: Forecast Sensitivity Analysis

- a. Please provide the model outputs in electronic form.
- b. Please provide the full set of Oracle input data in electronic format so that it can be replicated.
- c. Please provide the historical data and forecasts used to develop the probability distributions for each variable used in the Monte Carlo analysis.
- d. Please provide the source data and calculations for Figure D8.

Request IR-44:

Nova Scotia Power Electrification Support Overview by E3

- a. Please provide the full report produced by E3 on this issue.

b. Please provide any supplemental materials produced by E3 in developing these results.

Request IR-45:

General Forecast Report Improvements – The Board Decision of October 31, 2022 notes that NS Power agreed to the following changes in the 2023 forecast report (p 4):

In its Reply, NS Power addressed the concerns raised by the intervenors. NS Power agreed to include analysis of the impact of multi-hour temperature averages and windspeed on the peak in the next forecast. As well, it agreed to investigate multi-station weather for peak load forecasting and to review the methods for integrating weather data with stakeholders before filing the next forecast. NS Power will incorporate water heating load control and provide a peak sensitivity analysis in the 2023 report that is similar to the sensitivity analysis in Appendix D.

NS Power intends to refine the impact of electrification through examining existing measures and trends to achieve government electrification goals. It will investigate and include commercial and industrial electrification impacts after 2027. NS Power will evaluate the findings from the recent Itron Report on the impact of heat pumps. Information from the SGNS project and water heating load control will be incorporated in the next report. EV adoption rates will be updated in the forecast and more details on the EV high and low cases will be provided. NS Power will review how an ELCC adjustment could be applied to EV load shapes.

Changes to the DR estimates in the IRP Action Plan will be incorporated into the forecast. NS Power will consider hybrid scenarios where customers keep their existing non-electric heating as backup, through the 2022 IRP Evergreen process, as well as a scenario analysis for ETS to moderate peak load. It will monitor growth in heating load for commercial customers and work with EOne on possible firm peak mitigation strategies.

NS Power confirmed that the model used a COP of 2.3 at -15°C for new heat pumps. It clarified that an analysis removing lock-out temperature is in the IRP Action Plan. NS Power will continue consulting with EOne and other stakeholders on DR implementation. NS Power confirmed that about 15 percent of the commercial and industrial DSM effects are allocated to the industrial class and 85 percent are allocated to the commercial class. It also confirmed that the DSM coefficients vary each year and the change to the commercial and industrial adjustment is the result of underlying end-use data, particularly the commercial lighting efficiency and intensity.

NS Power's reply submission did not agree with a few of the intervenors' requests. NS Power does not consider the line loss determination model as a tool for load planning and said a report on this topic is not required. NS Power considers an ELCC factor is not needed for the Large Industrial Interruptible Rider (LIIR) because these customers do not contribute to peak demand needs; however, it will consider applying an ELCC adjustment to EV load shapes. A request for the information on the benefits and costs of commercial electrification programs was denied as NS Power has not performed such an analysis.

a. Please indicate how this report incorporates each of these agreed changes.

1 **Request IR-46:**

2 General Forecast Report Improvements – The Board Decision of October 31, 2022 Includes the
3 following findings (pp 5-6):

4 *The Board notes that NS Power has agreed to many of the intervenors’*
5 *recommendations and acknowledges this commitment as a positive step toward*
6 *continuous improvement of the Load Forecast. The Board directs NS Power to proceed*
7 *with implementing the recommendations it has agreed to in the next Load Forecast*
8 *report, including providing greater details and investigation of the impact to energy and*
9 *peak from electrification as well as from new technologies, especially findings from pilot*
10 *projects. Further, NS Power is directed to continue evaluating and implementing*
11 *improvements to the calculation of weather-normalized values for energy and peak as*
12 *recommended by intervenors.*

13
14 *The Board directs NS Power to evaluate the model’s economic inputs, including the*
15 *COVID-19 variable and the assumptions and calculations used to assess the impact of*
16 *DSM, Solar PV, EVs, battery storage, and weather.*

17
18 *The Board acknowledges the intervenors’ participation in examining changes to the*
19 *Load Forecast. The Board directs NS Power to continue to actively engage with*
20 *intervenors as well as other stakeholders and their consultants well in advance of filing*
21 *its 2023 Load Forecast Report. As many of the recommendations made by intervenors*
22 *are important to discuss in the initial stakeholder meeting, it is prudent that NS Power*
23 *share how potential impacts were evaluated and what was incorporated into the forecast*
24 *early in the process.*

25
26 *In addition to the above directives, the Board encourages NS Power to include*
27 *information on each of the following in future load forecasts:*

28 *- Examine the elasticity used in the SAE model to exclude elasticities calculated*
29 *from non-winter peaking utilities or to apply elasticities from Canadian studies of*
30 *Canadian electric utilities;*

31
32 *- Evaluate the input variables in the residential model and test, over a period of*
33 *time, if alternative inputs make the residential model more robust, considering the*
34 *following:*

35
36 *○ Given the continued population growth in Nova Scotia and ongoing housing*
37 *shortage in the province, re-evaluate the use of housing completions for the*
38 *near-term;*

39
40 *○ Given the current inflationary environment, evaluate the use of Median*
41 *Household Income in place of Total Household Income, as it is biased by*
42 *outliers. Should the Conference Board of Canada be unable to provide the*
43 *Median, NS Power could use data published by Statistics Canada and apply the*
44 *Conference Board of Canada’s annual growth rate to estimate the long-term*
45 *Median Household Income;*

46
47 *○ Consider incorporating household size and age of household residents, to*
48 *determine if a better understanding of demand on load by time of day is*
49 *achieved.*

50
51 a. Please indicate how this report incorporates each of these directives.