



Nova Scotia Utility and Review Board

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Dear Mr. Peachey:

M11689 – Nova Scotia Power Inc. - 2024 Load Forecast Report

On April 30, 2024, Nova Scotia Power Inc. (NS Power) filed its 10-Year 2024 Load Forecast Report, as required under the Nova Scotia Wholesale and Renewable to Retail Electricity Market Rules. The Report provides NS Power's estimated energy and peak demand requirements for 2024 to 2034 based on sales, weather, demand side management (DSM) and economic indicators, among other measures.

The Board issued an Order establishing the timeline for a paper hearing process and approved a requested Confidentiality Undertaking for this proceeding on May 6, 2024. Notices of Intervention were received from the Industrial Group (IG), EfficiencyOne (EOne), Eastward Energy (EE), the Small Business Advocate (SBA) and the Consumer Advocate (CA). Synapse Energy Economics Inc. (Synapse) was engaged to review the NS Power filing on behalf of Board Counsel.

On June 19, 2024, NS Power filed responses to Information Requests (IRs) received from the EOne, SBA, CA, Synapse and Board staff.

Evidence was filed by the CA and Synapse and a submission was made by the SBA on July 11, 2024. NS Power filed its Rebuttal Evidence on September 6, 2024.

2024 Load Forecast

NS Power continued using two discrete methods. The first method uses the Statistically Adjusted End-Use (SAE) models to forecast the energy requirements of the residential and commercial rate classes. These models incorporate end-use energy intensity projections into the forecast, which is then combined with an econometric-based industrial forecast as well as customer specific forecasts for large customers. The process produces the Net System Requirement (NSR) forecast,

which is the energy forecast for the province. The second method is the DSM adjustment. The DSM Program projections are subtracted from the SAE forecast values to produce the final forecast.

Three significant forecast changes were found in the 2024 Load Forecast relative to the 2023 forecast. First, NS Power revised the number of customers in the near term to reflect the recent growth in new customers. Second, energy usage increased after adjusting for the exceptional weather events experienced in 2023. These first two changes will increase electricity consumption in the forecast. Third, projected EV sales were modified to reflect the slower adoption of EVs in Nova Scotia. The effect of slower EV adoption on the forecast is lowered electricity demand in the near and mid-term. Another change to the forecast was adding hybrid heating scenarios modeled by E3 Consultants for building heat. Also, the effects of the Renewable to Retail (RtR) provider were moderated to reduce the near-term change in energy requirements. NS Power incorporated some results from its pilot programs and projects, the Smart Grid Nova Scotia (SGNS) and the Demand Response projects. NS Power anticipates that in the long-term, NSR growth will be offset by DSM initiatives, natural energy efficiency improvements and more small-scale solar installations. Between 2025 and 2034, the NSR is forecast to experience an average annual increase of 0.19%.

NS Power forecasts system peak to increase, on average, by 1.4% from 2025 to 2034. The near-term growth of system peak is attributed to increased electrification of heating, whereas the long-term growth has been reduced due to lower EV sales and the adoption of hybrid heating scenarios.

In the 2034 forecast, NSR is 5.1% (564 GWh) greater than the 2023 actual NSR. The projected system peak in 2034 is 11.1% (272 MW) higher than the 2023 actual system peak. Table 1- Annual Forecast versus Actual compares NS Power's forecasted growth in energy and peak demand.

Table 1 - Annual Forecast versus Actual

Report Year	One-year NSR Change ¹		One-year System Peak Demand Change ²	
	Forecast	Actual	Forecast	Actual
2024	3.2%		-3.7%	
2023	1.4%	0.0%	1.8%	10.8%
2022	2.2%	2.1%	10.0%	12.6%
2021	2.9%	1.7%	8.6%	-4.0%
2020	-0.3%	-3.1%	8.9%	-0.5%
2019	0.7%	-1.5%	7.2%	-0.6%

The Load Forecast Report is a foundational part of NS Power's overall planning, budgeting and operating activities, including generation requirements, capital program, fuel forecasts, and customer rates. This makes the reliability of this forecast an essential element of future energy requirements. It is this degree of importance that has prompted the Board to raise concerns about the accuracy and consistency of NS Power's forecasting on previous occasions.

In the Board decision letter in matter M11108, the Board provided NS Power with direction on enhancements for continuous improvement in the development of the load forecast and

¹ Based on Table A1 in each annual report starting with prior year actual

² Based on Table A2 in 2021, 2022 and 2024 Load Forecast reports and in Table A3 in each annual report from 2015 to 2020 and 2023

encouraged NS Power's continued engagement with stakeholders in advance of the 2024 Load Forecast Report filing. NS Power conducted a virtual stakeholder consultation with the IG, EOne, EE, SBA, CA, Synapse and Board staff on April 11, 2024, and included its presentation material in Appendix E of the Report.

The stakeholder engagement recommendations included:

- Continue to explore all realistic scenarios related to commercial hydrogen production and incorporate them to the extent possible in the model;
- Incorporate the IRP, SGNS, Advanced Metering Infrastructure (AMI) data, Time Varying Pricing (TVP) Pilot's outcomes into the model;
- Review the assumptions about carbon emissions;
- Assess the historical load of survey sales realization to compare the historical load with survey results;
- Evaluate the elasticity used in the SAE model to the TVP Pilot EM&V elasticity; and,
- Evaluate input variables in the residential model and test them over time.

The Board stated in its 2023 decision, that NS Power is expected to explore realistic scenarios related to commercial hydrogen production and incorporate it into the forecast's model where data exists. NS Power modeled energy consumption by commercial hydrogen production in Appendix D-Sensitivity Analysis. The analysis modeled two facilities, assuming that most of the energy needs would be self-supplied with some top-up from NS Power. NS Power indicated it will monitor this sector in future Load Forecast Reports. The Board agrees with this position and directs that NS Power continue monitoring potential commercial hydrogen production in future Load Forecast Reports.

AMI data was incorporated into the forecast in place of the Load Research Sample for estimating peak. NS Power indicated that the AMI data provides more accuracy and smoothness to the analysis. The 2024 residential contribution to peak was calculated using AMI. The forecasting approach remains largely the same but is now enhanced by AMI load factors. The Board considers the addition of AMI as an improvement to the model and directs NS Power to continue to add AMI data into the forecast model.

NS Power applied E3's scenario for hybrid electrification, where some customers who install heat pumps keep their non-electric backup heating system to provide heating on very cold days. This assumption aligns the Load Forecast with NS Power's 2023 Electrification Strategy Report. The load forecast also applied learnings from the Demand Response Pilot and the Smart Grid Nova Scotia project to its peak demand forecast and the end-use intensity trends in the SAE model. The Board finds incorporating this data will enhance the robustness of the forecast and directs NS Power to continue adding findings from SGNS, AMI data and outcomes from the TVP Pilot and others where appropriate.

Previous load forecasts estimated there would be 4,100 battery-electric vehicles and plug-in hybrid electric vehicles in Nova Scotia by the end of 2023. However, based on the findings in the report *Ensuring ZEV Adoption in Nova Scotia: Analysis of Policy Options and Possible Adoption Outcomes*, March 2023, by Dunskey Energy + Climate Advisors for the Ecology Action Centre. NS Power modified its approach to EV adoption estimates to account for the lag in Nova Scotia sales and progressively narrow the gap as the federal sales targets increase to 100% in 2035. NS Power modeled a low and a high adoption scenario. This forecast aligns with the low scenario but is adjusted for sales trends of growth in EV adoption. The Board considers the adjusted EV forecast appropriate and directs NS Power to continue following the modified approach until the lag in EV sales in Nova Scotia disappears.

NS Power compared the previous two forecasts for large customer growth in the Large General class with actual year-over-year changes, following the Board's direction in the 2023 Load Forecast decision. The 2024 forecast has been adjusted to account for an overestimation from the previous reports. The Board considers this adjustment an improvement to the Load Forecast Report's accuracy and encourages NS Power to continue comparing actual year-over-year changes in order to adjust for any over/under-estimations.

NS Power reviewed price elasticity comparing the value used in the forecast to the elasticities identified in the TVP Pilot. NS Power identified that the daily price elasticity for the Time of Use rate is higher, and the Critical Peak Pricing is much lower than the load forecast. The non-winter elasticity values for both TOU and CPP are close to the load forecast. The elasticities were tested on estimated sales in the forecast and the differences in the results were insignificant.

In the 2023 decision, the Board was not in agreement with NS Power's attribution of the COVID-19 pandemic and heat pump installations as the reason for the large variance between forecast and actual NSR in 2022. The Board directed NS Power to re-evaluate the cause of the variance and report on this topic in the 2024 Load Forecast Report. NS Power tested its load forecast and reported that the variance is likely the result of an increase in heating intensity from more heating load served by heat pumps and higher equipment intensity. This premise was supported by the Consumer Advocate's consultant John Wilson, Resource Insight Inc., noting that federal carbon emissions reduction measures increased the cost of fossil fuel-based heating, incentivizing customers to increase the use of electric resistance heating or heat pumps. NS Power significantly increased the residential class heating intensity in the SAE model which has reduced the unallocated variance by 33 GWh. NS Power assumes the adjusted heating intensities will reduce the unexplained variances in future forecasts for the residential class. The Board accepts that more heating load served by heat pumps is a contributing factor, however the 2023 unexplained variance continues to demonstrate that NS Power is underestimating the demands from its residential customers. The Board directs NS Power to continue to revisit the unexplained variance and report on its findings in the 2025 Load Forecast Report.

Intervenor Comments

As in previous Load Forecast Reports, intervenors were complimentary of NS Power's efforts to continuously improve the Load Forecast Report and engage with stakeholders. As in previous years, intervenors focused on continued improvement, rather than objecting to the load forecast filed for 2024. The intervenors' primary concerns are that NS Power continue investigating the unexplained variance between forecast and actual NSR, using the best inputs available and adding the findings from the Smart Grid Project to the SAE model.

Consumer Advocate

The CA filed evidence prepared by John Wilson. Mr. Wilson recommended that NS Power continue investigating the unexplained variance between forecast and actual NSR for the residential class, using AMI data. He considers that the outcome of this investigation could change the forecast and should be an input for distribution capital planning. Mr. Wilson recommended that NS Power investigate the effects of other weather trends on the SAE model because the relationship between changing weather patterns and electricity usage could be significant. If statistically valid, these effects could be added to the forecast.

Mr. Wilson recommended two changes to the Load Forecast. First, he considered that the TVP peak reduction benefits of 4 MW should be removed because the Pilot only managed to reduce

load by 943 watts in winter 2022-23; therefore, reaching its target is unlikely. Second, Mr. Willson suggested that the EV charging forecast should use 0.45 kW/vehicle instead of 0.9 kW/vehicle.

Mr. Wilson compared the 2024 Load Forecast Report to NS Power's distribution planning forecast and said that there were inconsistencies, citing growth of 7,021 new customers in the Load Forecast but only 4,374 new customers for distribution planning purposes. He also noted that neither forecast accounts for the Housing Accelerator Fund. Mr. Wilson calls attention to the Electrification Strategy Report³ that recommends NS Power support cost-effective grid modernization and panel upgrades to ensure NS Power itself does not impede electrification. Mr. Wilson recommended that NS Power revise its load forecast and distribution planning forecasts to rely on consistent assumptions about customer growth and electrification, and that it submit an interim report indicating the steps and timeline for making these changes in the 2025 ACE Plan.

Small Business Advocate

The SBA filed a submission seeking three areas of improvement. The SBA suggested findings from the Smart Grid Nova Scotia Pilot be incorporated into the forecast model. The SBA said NS Power should continue to focus its recruitment of small business customers to its Load Shifting Pilot. The SBA proposed NS Power add electrification and the effects from the net-zero energy ready building codes for new construction by 2030. The SBA suggested that NS Power provide updates on this process in the annual Load Forecast Report.

Synapse

Synapse noted NS Power's continued improvement to the Load Forecast Report. However, Synapse also remarked on several aspects, suggesting revisions. These included:

- modeling heat-pump-based hot water heating, examining the peak effects of heat pumps and providing hybrid heating in the model rather than making adjustments;
- investigating increasing the levels of DSM and the associated adjustment factors should be revised upwards if needed;
- forecasting the effects of solar power generation on the large general service and developing scenarios for varying adoption rates of heat pumps, EVs, DSM and demand response;
- monitoring the adoption of EVs, updating the model as needed, and examining the effects of EVs on peak from managed charging and reflecting the results of the managed charging in future forecasts;
- providing a sensitivity analysis for EV adoption, solar penetration, RtR take up and hybrid heating;
- quantifying the electrification and EV impacts in the commercial sector and examining how these can be moderated;
- validating the use of new home construction as a proxy for customer growth, addressing concerns about the shortcomings of this variable and monitoring trends to make needed changes in the next forecast;
- investigating the effects of expanding solar generation by commercial customers; and,
- reviewing the peak forecasting methodology and evaluate the potential for a higher than forecasted peak.

³ Slide 5, https://www.nspower.ca/docs/default-source/irp/electrification-strategy-report-february-2-2024-engagement-session-material.pdf?sfvrsn=4d233583_1

Rebuttal Evidence - NS Power

NS Power addressed the concerns raised by the intervenors in its Rebuttal evidence. As a response to the intervenors' recommendations to incorporate findings from programs that are still in pilot, NS Power said that it is not prepared to include these in the forecast until they become more comprehensive programs to ensure they are accurate inputs. However, NS Power noted that AMI data will be used to better understand the variance between forecast and actual in future reports. In response to the request for increasing the level of DSM load reduction, NS Power cited Bill 228 that amended the *Public Utilities Act* which removed the requirement for EOne to jointly file a DSM application with NS Power. Therefore, DSM activities are not the responsibility of NS Power and planning for their addition to the forecast will depend on activities undertaken by EOne.

Like previous Load Forecast Report matters, NS Power was agreeable to many of the intervenors' recommendations. NS Power agreed to investigate trends in increasing average temperature and cloud cover, the energy and peak load effects of heat pumps and validate assumptions about fossil fuel displacement and customer use of secondary heating, as well as to model hybrid electric heating. NS Power agreed to monitor several of the model's inputs, including EV adoption, solar generation, battery storage deployment and bi-directional EV charging, and the associated load impacts for each.

NS Power agreed to review pricing innovations and include an analysis of commercial class customer-use profiles and review system planning, including avoiding costs and effective load carrying capability, related to the TVP Pilot. NS Power also agreed with recommendations to update DSM Program savings as appropriate and update the Capacity Value Study for demand response, and to review adjustments to the efficiency of water heaters and stovetops in the next Load Forecast Report.

NS Power did not agree with some recommendations the intervenors made. NS Power disagreed with the CA's recommendation to remove the TVP benefits from the forecasted peak because the Pilot will continue to increase its enrollment in 2024/25. NS Power considers that reducing EV peak values to 0.45 kW/vehicle is not supported in the Smart Grid Nova Scotia Pilot, which shows a range of EV loads between 0.2 kW/vehicle to 2.3 kW/vehicle in the winter months. The CA suggested the residential SAE model add weather trends, Cooling Degree Days and wind gusts over 80 km/hr. NS Power disagreed because Cooling Degree Days and minimum daily temperatures are reflected in the SAE model. It considers wind gusts to be associated with reliability rather than consumption and wind speed is factored into the peak forecast model. However, NS Power did agree with the recommendation to investigate trends in increasing maximum average temperature and cloud cover.

The CA suggested NS Power revise the load forecast and distribution planning forecasts to use the same assumptions for customer growth, electrification and other matters and, by the Fall of 2024, provide an interim report on the steps and timeframe when these changes will be added to the 2025 ACE Plan. However, NS Power noted the 2024 ACE Plan decision which indicated that NS Power would review the methodology for forecasting distribution routine budgeting in the 2025 ACE Plan and therefore an interim report is not necessary.

NS Power submitted that Synapse's recommendations to validate the use of new home construction as a proxy for customer growth and to include household size as an input were unnecessary because those factors were likely to be insignificant. NS Power also disagreed with Synapse's request to provide analysis for EV adoption, solar installations and the impacts of RtR take-up and hybrid heating, within the forecast because they are outside of the scope of the Load

Forecast Report and add complexity and use resources without a clear benefit. Synapse requested evidence of the potential electrification in the Industrial Class beyond projects identified in the survey, which NS Power rejected because it does not have an alternate source of this information other than survey data. NS Power disagreed with the recommendation to reassess its modeling of COVID-19, or trends in work from home, impacts on the Residential Class claiming there is no known data to provide more detailed information on work from home. NS Power did agree to reassess the validity of the work from home variable in the next forecast.

NS Power provided clarification on new technologies being omitted from the model, such as thermal storage, heat pump hot water heaters and home batteries because adoption has been lower than anticipated and therefore, further investigation into these is not needed.

The CA recommended that the Board conduct a hearing to understand how the utilities will meet future winter peak heating demand in the province with testimony from NS Power, Eastward Energy and other key stakeholders. NS Power does not agree and indicated this information is in The Path to 2030 and noted that there is a corresponding process that has been initiated by the Provincial Government.

The SBA requested NS Power include new energy standards for building construction, however, NS Power considers these are already captured in the model through efficient heating and cooling, and energy efficient appliances. NS Power agreed that new building code requirements could increase efficiency improvements, but for the most part these are in the model.

Board Findings

As in previous Board decisions for the Load Forecast Reports, the Board encourages NS Power to pursue additional review with the aim of improving the forecast, specifically:

- Evaluate the input variables in the residential model and test, over a period of time, if alternative inputs make the residential model more robust, considering the following:
 - given the Provincial Government's population growth targets, changes to building permitting and funding such as the Housing Accelerator, re-evaluate the use of housing completions for the near-term;
 - continue to provide a comparison of the short-term economic inputs provided by the Conference Board of Canada to ensure the data is close to what is used in the forecast of Canada's Big Five Banks;
 - revisit the model's EV adoption rates to ensure the model's input aligns with the data reported by Statistics Canada and Nova Scotia Open data⁴; and
 - continue to test the TVP elasticity in the load forecast as the elasticity changes over the course of the TVP Pilot.

While not identified as an issue in this proceeding, NS Power is directed to investigate if adjustments are needed in the 10-Year Forecast Classes to account for the Canadian Mortgage and Housing Corporation's (CMHC) housing completions data limitations. The CMHC housing completions data is restricted to population centres of 10,000+, whereas population centres below 10,000 are estimated on a sample basis in the last month of each quarter.

The Board acknowledges the intervenors' participation in examining changes to the Load Forecast. In keeping with the directives from the 2023 Load Forecast Report, the Board directs NS Power to continue to actively engage with intervenors, as well as other stakeholders and their

⁴ Registration: Statistics Canada. Table 20-10-0025-01 New zero-emission vehicle registrations, quarterly and <https://data.novascotia.ca/Permits-and-Licensing/Electric-Vehicle-Registration-Data/avxy-ifhs/data>

consultants, in advance of filing its 2025 Load Forecast Report. It is helpful when NS Power shares how potential impacts were considered and what elements of the model or inputs to the model were revised in the forecast early in the process, rather than after filing the report.

The Board acknowledges that NS Power has agreed to many of the intervenors' recommendations and that this approach reflects the Utility's commitment to continuous improvement of the forecast. The Board directs NS Power to proceed with implementing the recommendations it has agreed to in the next Load Forecast Report, including:

- to reassess the validity of the work from home variable;
- investigate trends in increasing maximum average temperature and cloud cover;
- update the Capacity Value Study for demand response before the next IRP analysis; and,
- continue to investigate the unexplained variance between forecast and actual NSR for the residential sector.

The Board directs NS Power to report, in the 2025 Load Forecast Report, on the findings of its continued investigation into the 2023 unexplained variance.

Yours very truly,



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Member



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c. William Mahody K.C., Board Counsel
Interested Parties