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Request IR-1:

With reference to the 2020 Load Forecast Decision Letter (M09707), dated October 20, 2020, the Board directed NS Power to consider the near-term and long-term effects of COVID-19 on future electricity sales. On pages 59-60 of 98 of the application, NS Power states:

> **The COVID-19 variable that was added in 2020 continues to be used, and is reduced in both March and October, 2022 as the work from home impact is expected to further decrease. ... The long-term impact of the COVID-19 pandemic on working habits in Nova Scotia is still unknown, but the assumption in this forecast is that there will be a certain amount of continued work-from-home load, likely through hybrid work models.**

(a) Page 2 of 31 of Appendix B to the application indicates that the COVID-19 variable has been modified. Please confirm if the table below is correct and that NS Power does not intend to apply the COVID-19 variable in future forecasts.

2021 Load Forecast	**2020**	**2021**	**2022**	**2023-2031**
COVID-19 variable	**1**	**0.75**	**0.38**	**0.38**
2022 Load Forecast	**July 2020**	**October 2020**	**March 2022**	**September 2022**
COVID-19 variable	**1**	**0.5**	**0.33**	**0.16**

Response IR-1:

Confirmed, the table is correct. The COVID-19 variable was added to the model to account for the increased sales seen in 2020 and 2021 that were not explained by other variables. Should future models indicate that historic sales are inadequately accounted for by other variables, the COVID-19 variable may continue to be incorporated.

Request IR-2:

With reference to the 2020 Load Forecast Decision Letter, dated October 20, 2020 (M09707), the Board directed NS Power to incorporate additional sources for electric vehicle forecasts for 2021 to improve the breadth of information relied upon. NS Power indicates on page 17 of its application in matter M10109 that "In June 2020 Dunsky Energy Consulting prepared a study of EV adoption in Nova Scotia for the Ecology Action Centre". In response to Board IR-1(c) (M10109), NS Power indicates that two forecasts were evaluated and that the Dunsky report was used because it was the most recent.

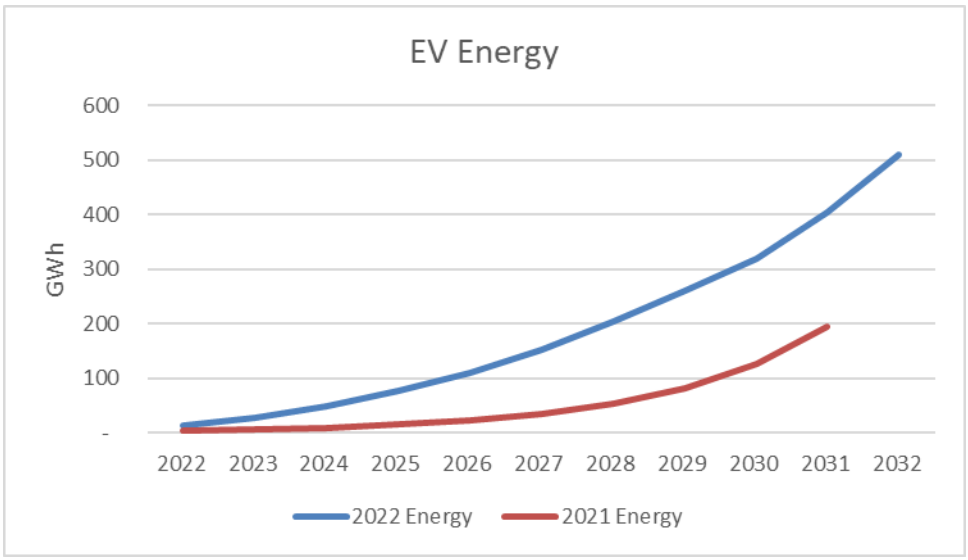
(a) Please identify how the 2020 Dunsky Energy Consulting forecast for EV use compares to E3's forecast for EV use. Please specify the input variables used in each forecast, identifying Nova Scotian or Canadian specific data, and provide a side-by-side comparison of the two forecasts.

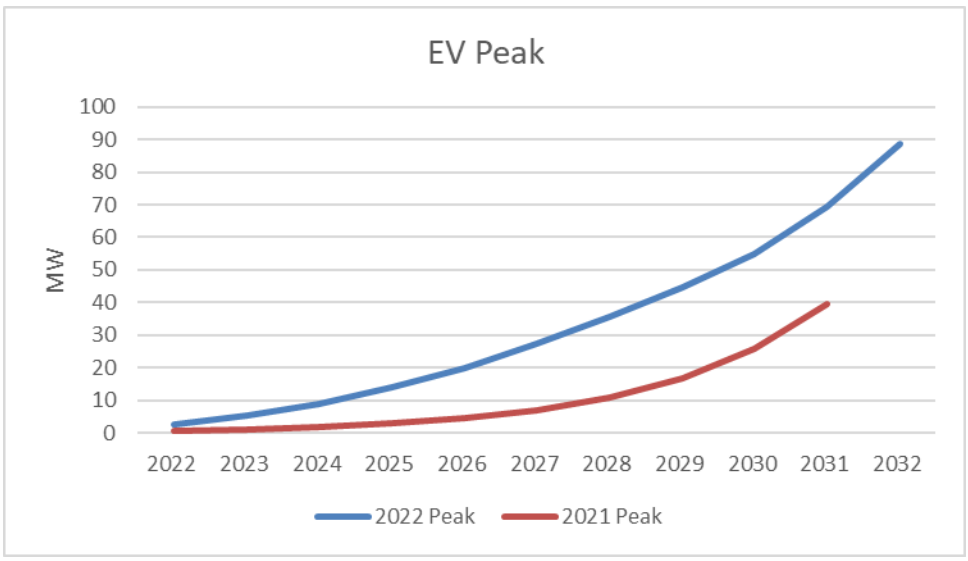
Response IR-2:

(a) The 2021 EV forecast was based on a "provincial incentive" case with no set mandate for EV sales targets, while the 2022 EV forecast is based on the provincial target of 30 percent EV sales by 2030 and a federal target of 100 percent EV sales by 2035.

Please refer to NSUARB IR-16. Attachment 1.

A comparison between the 2021 EV forecast and the 2022 EV forecast is provided in the graphs below:





E3's modeling is based on its PATHWAYS stock rollover model. PATHWAYS is an infrastructure-based model reflecting vehicle lifetimes and relationship of sales to stocks. Inputs and assumptions include the following:

1. EV adoption assumptions for personal light-duty vehicles (LDVs):
   a. E3 assumes 100% LDV EV sales are achieved by 2035, with a sales ramp that achieves 30% EV sales by 2030.

2. EV adoption assumptions for Medium Duty Vehicles (MDVs) and Heavy Duty Vehicles (Buses):
   a. Parcel truck and transit bus adoption assumptions are based on E3's Pathways inputs and modified to reach 2040 Canadian EV sales targets:
   b. Medium Duty Vehicles including parcel trucks: E3 assumes 95% electric MDV sales by 2040.
   c. Buses: E3 assumes 100% electric bus sales by 2030 given faster potential transition for this sector (consistent routes, environmental health benefits, potential for lifetime cost-savings).

3. Adoption by Charger Access Type:
   a. Charging access assumptions (Residential vs. Workplace charging) were developed from 2016 Nova Scotia Dwelling census data (Nova Scotia 2016 Census Data) in combination of use with U.S. EV forecasts including the Bloomberg NEF EV Outlook (https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport), NREL Light-Duty Vehicle Attribute Projections (Years 2015-2030) for the California Energy Commission (https://www.nrel.gov/docs/fy18osti/70455.pdf) and the NREL Electric Vehicle Infrastructure Projection Tool (Electric Vehicle Infrastructure Projection Tool (EVI-Pro) (nrel.gov).

4. Vehicle Trip Data (Personal Travel Behavior):
   a. For LDVs, E3 had used a New England profile within the 2017 National Household Travel Survey (NHTS) for population travel behavior for personal LDVs. E3 believes the New England profile remains representative of Nova Scotian driving patterns, as through its experience with other jurisdictions it notes that the timing of these patterns do not vary significantly between jurisdictions (https://nhts.ornl.gov/).
   b. For MDVs, Parcel Trucks and Buses, E3 had used NREL's Fleet DNA data (https://www.nrel.gov/transportation/fleettest-fleet-dna.html).

5. Vehicle Distance Traveled Data:
   a. E3's assumptions are based on Nova Scotia Data provided within NRCan 2009 Canadian Vehicle Survey Summary Report (2009 Canadian Vehicle Survey Summary Report | Natural Resources Canada (nrcan.gc.ca)

6. EV Range and Battery Size
   a. E3's assumptions are based on data provided in Bloomberg NEF, NREL Adopt and EV Adoption (https://evadoption.com/us-bev-fleet-to-average-300-miles-of-range-by-year-end-2023/).

7. EV Battery Efficiency:
   a. E3's assumptions are based on California Energy Commission (CEC) Plug-In Electric Vehicle Infrastructure Projections: 2017-2025 (https://www.nrel.gov/docs/fy18osti/70893.pdf).

8. Vehicle lifetime:
   a. E3 assumes 12 years as per the US Department of Transportation (Bureau of Transportation Studies) Average Age of Automobiles and Trucks in Operation in the United States data (https://www.bts.gov/content/average-age-automobiles-and-trucks-operation-united-states).

9. Number of Charging Ports:
   a. E3 scales up outputs from the US Department of Energy's EVI-pro online tool to estimate the total number of chargers based on EV adoption. E3 uses a ratio of vehicles to chargers (https://afdc.energy.gov/evi-pro-lite).

10. Charger power and efficiency:
    a. E3 assumes Level 1 and Level 2 chargers 90% efficient, and DC Fast Chargers are 85% efficient consistent with CEC Plug-In Electric Vehicle Infrastructure Projections: 2017-2025.

11. Tariffs:
    a. E3 assumes a mix of flat rate (residential and small commercial) and Time-of-Day Rate Pilot Program pricing (TOU residential and small commercial TOU pricing)
    b. E3 assumes 100% access to public chargers, 77% access to residential chargers. 70% TOU participation all managed through Vehicle Grid Integration (VGI) aggregation.
    c. For public charging, E3 assumes the following charging costs: Level 2: $1.50/hr, DCFC: $15/hr (NS Power networked charging costs)

A description of Dunsky's modeling approach is provided on page 3 of its report[1] which is excerpted below:

> The following approach was used in the study to forecast EV adoption in Nova Scotia:
>
> 1. Market Segmentation and Characterization: The LDV market was broken down into three representative light-duty vehicle segments (cars, SUVs, and trucks) that capture differences in vehicle costs, usage patterns, and EV model availability, among other factors.
>
> 2. Model Calibration: Using historical data on vehicle sales, costs and other parameters, EVA was benchmarked to historical EV sales in Nova Scotia (2012 – 2019), and key model parameters were calibrated to capture local market characteristics.
>
> 3. Key inputs and assumptions: For each vehicle segment, assumptions on average vehicle characteristics (fuel consumption, powertrain size, battery size, etc.) are used to develop a representative model of vehicles within the segment. Additional assumptions on utilization (e.g. distance traveled) and operational costs were also compiled and used to calculate a bottom-up vehicle cost and TCO for the different powertrains within each vehicle segment.
>
> The following sources were used for Nova Scotia-specific inputs:

[1] Provided in 2021 Load Forecast Report Synapse IR-9 Attachment 1

• Statistics Canada: population, area of population centers, and housing composition.

• Nova Scotia Power Inc.: electricity rates

• NRCan Comprehensive Energy Use Database: number of vehicles and annual vehicle sales,

and fuel prices.

• NRCan Electric Charging and Alternative Fueling Stations Locator: charging station

deployment.

4. Vehicle Cost: For each vehicle class (i.e. car, truck, SUV) and drivetrain (i.e. ICE, BEV, PHEV) combination, the model develops a representative vehicle archetype to forecast EV adoption. A bottom-up vehicle cost is calculated for each vehicle type using data from Dunsky's internal database on typical vehicle characteristics for each segment (baseline vehicle cost, powertrain size and cost, vehicle efficiency, battery size and cost, etc.). The bottom-up estimates are then compared to actual vehicle models of similar characteristics on the market to validate accuracy on estimates. Future vehicle costs are calculated using the same approach by varying battery costs and other key time-dependent factors.

5. Vehicle Availability: Using Dunsky's proprietary tool, we scanned the local availability of EV models across dealerships in Nova Scotia. The compiled data is used to determine the achievable market potential based on data from other jurisdictions with different levels of supply constraints. This is then used to forecast EV adoption in Nova Scotia under current constraints as well as considering increased availability in dealerships under natural market evolution and supply-side policies.

6. Scenario Analysis: Using Nova Scotia-specific data complemented with national data and other assumptions based on Dunsky's professional judgment and experience from other jurisdictions, we use the calibrated model to forecast future EV adoption in Nova Scotia. Specifically, the analysis considers adoption under various scenarios reflecting different interventions and policies (e.g. purchase incentives, ZEV mandates) as well as market and technology uncertainties (e.g. electricity rates, battery costs, etc.).

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Request IR-3:

With reference to Section 4.3 Economic Information, page 29 of 98. The application notes that "Economic and other provincial statistics used in the load forecast are from the Conference Board of Canada's 20-year forecast".

(a) Please provide a copy of the data tables from the Conference Board of Canada's 20-year Outlook used in the 2022 Load Forecast.

(b) Please describe where any adjustments have been made to the Conference Board's data.

(c) Please confirm that the Conference Board of Canada's forecast has been compared against the major Canadian Banks' provincial economic outlooks for significant discrepancies in short-term projections.

(d) Please define "Household Compensation" as used in Figure 17: Residential Economic Drivers.

(i) Please elaborate on the composition of the Household Compensation metric. Does it represent a total per household, or a total of all households receiving income from all sources (including labour earnings and government transfers) or something else?

(ii) Please explain why median household income/compensation, which tempers the impact of outliers, has not been considered?

Response IR-3:

(a) Please refer to Attachment 1.

(b) All data and calculations are included in Attachment 1. The economic data used in the forecast is based on the 20-year forecast from the Conference Board of Canada (released in January 2022), but was updated to incorporate the Conference Board's 5 year forecast that was released in February to include the most recent data. Beyond 2026 the values for each indicator are increased at the same year over year rate as the 20-year forecast. Calculated values include housing completions (sum of single and multifamily completions), non-manufacturing GDP and employment (net of total GDP and employment less manufacturing GDP and employment) and household compensation (divided by CPI to convert to real dollars).

(c) Yes, the Conference Board forecasts are compared to the bank forecasts in the near term. Given the uncertainty around inflation and growth in the near term, no adjustments were made for the 2022 Load Forecast.

	GDP			**Employment**			
Source	**2021**	**2022**	**2023**	**2021**	**2022**	**2023**	**Date of Forecast**
CBoC	4.8%	1.8%	2.2%	5.4%	1.6%	0.6%	Feb-22
National Bank	3.4%	2.7%	2.1%	5.4%	2.4%	1.6%	Jan-22
RBC	4.0%	2.5%	1.6%	5.3%	2.0%	1.0%	Dec-21
TD	3.5%	2.4%	1.6%	5.4%	2.2%	0.8%	Dec-21
BMO	3.2%	2.5%	1.8%	5.2%	1.4%	1.0%	Dec-21
Scotiabank	3.6%	2.6%	2.1%	5.4%	2.9%	1.8%	Jan-22

(d) (i) Household compensation can be found in StatCan table 36-10-0224-01 (formerly CANSIM 384-0040), and is compensation of employees of all residential households. Stats Can does not provide a breakdown of the underlying components, but in the table

referenced above other revenue components are added to household compensation such as "net mixed income", "net property income" to get "primary household income", with "current transfers received" (including government benefits) listed as components that would be added to produce "household disposable income". Given the separate components listed, it is assumed that "household income" consists primarily of household employment income.

(ii) Median household income was not considered as it is not a variable included in the Conference Board's forecast.

	CBoC 20 Year Forecast								CBoC 5 Year Forecast (Feb) + 20 year forecast								Calculated			
CBoC Description	(Average Aggregation) Housing Completions, Singles, Nova Scotia (Thousands ('000s))	(Average Aggregation) Housing Completions, Multiples, Nova Scotia (Thousands ('000s))	(Average Aggregation) Current accounts - Households, Compensation of employees; Nova Scotia (Millions $)	(Average Aggregation) Real Gross Domestic Product (GDP) at Basic Prices by Industry, All Industries, Nova Scotia (Millions, Chained $ 2012)	(Average Aggregation) Real Gross Domestic Product (GDP) at Basic Prices by Industry, Manufacturing, Nova Scotia (Millions, Chained $ 2012)	(Average Aggregation) Employment, Total, Nova Scotia (Thousands ('000s))	(Average Aggregation) Employment, Nova Scotia, Manufacturing (Thousands ('000s))	(Average Aggregation) Provincial Consumer Price Index, Nova Scotia (2002=1.0)	(Average Aggregation) Housing Completions, Singles, Nova Scotia (Thousands ('000s))	(Average Aggregation) Housing Completions, Multiples, Nova Scotia (Thousands ('000s))	(Average Aggregation) Current accounts - Households, Compensation of employees; Nova Scotia (Millions $)	(Average Aggregation) Real Gross Domestic Product (GDP) at Basic Prices by Industry, All Industries, Nova Scotia (Millions, Chained $ 2012)	(Average Aggregation) Real Gross Domestic Product (GDP) at Basic Prices by Industry, Manufacturing, Nova Scotia (Millions, Chained $ 2012)	(Average Aggregation) Employment, Total, Nova Scotia (Thousands ('000s))	(Average Aggregation) Employment, Nova Scotia, Manufacturing (Thousands ('000s))	(Average Aggregation) Provincial Consumer Price Index, Nova Scotia (2002=1.0)	New Construcion	Non-manufacturing GDP	Non-manufacturing Employment	Household Compensation - real ($2002)
Mnemonic	RIHSCS	RIHMCS	RYHCMPS	RQTOS	RQMANS	RLEMS	RLEMMANS	RPCPIS	RIHSCS	RIHMCS	RYHCMPS	RQTOS	RQMANS	RLEMS	RLEMMANS	RPCPIS				
2006					2637.9		39.1						2637.9		39.1					
2007					2596.0		41.2						2596.0		41.2					
2008					2621.1		39.9						2621.1		39.9					
2009					2432.2		35.6						2432.2		35.6					
2010					2641.4		32.6						2641.4		32.6					
2011					2697.6		32.7						2697.6		32.7					
2012	2.0	1.9	20910.0	34477.9	2588.4	454.1	32.7	1.3	2.0	1.9	20910.0	34477.9	2588.4	454.1	32.7	1.3	3955	31890	421	16717
2013	2.0	2.7	21706.0	34383.8	2503.8	448.9	31.0	1.3	2.0	2.7	21706.0	34383.8	2503.8	448.9	31.0	1.3	4660	31880	418	17150
2014	1.5	1.8	22219.0	34747.2	2397.2	442.3	30.0	1.3	1.5	1.8	22219.0	34747.2	2397.2	442.3	30.0	1.3	3263	32350	412	17254
2015	1.4	1.8	22616.0	35013.4	2442.5	439.3	28.6	1.3	1.4	1.8	22616.0	35013.4	2442.5	439.3	28.6	1.3	3185	32571	411	17488
2016	1.4	1.9	22405.0	35489.1	2461.7	439.3	29.4	1.3	1.4	1.9	22405.0	35489.1	2461.7	439.3	29.4	1.3	3330	33027	410	17118
2017	1.6	2.1	23189.0	36213.8	2490.4	442.7	30.5	1.3	1.6	2.1	23189.0	36213.8	2490.4	442.7	30.5	1.3	3699	33723	412	17517
2018	1.8	2.2	24406.0	36899.5	2651.2	450.9	31.7	1.4	1.8	2.2	24407.0	36841.3	2577.3	450.9	31.7	1.4	4029	34264	419	18036
2019	1.6	2.6	25132.0	37808.1	2796.7	461.3	31.8	1.4	1.6	2.6	24830.0	37907.0	2736.6	461.3	31.8	1.4	4227	35170	429	18061
2020	1.8	2.4	25161.3	36591.0	2648.5	439.8	31.8	1.4	1.8	2.4	24895.0	36950.1	2649.5	439.8	31.8	1.4	4269	34301	408	18052
2021	1.9	2.6	27127.9	38548.1	2782.2	463.1	32.3	1.4	2.1	2.6	26708.4	38723.1	2649.2	463.5	32.6	1.4	4620	36074	431	18606
2022	1.7	2.5	28355.9	39433.7	2905.7	472.2	31.2	1.5	2.1	2.1	27988.9	39438.1	2748.2	470.9	32.5	1.5	4270	36690	438	18637
2023	1.6	2.4	29241.9	39820.6	2945.0	474.8	31.0	1.5	1.5	2.4	28813.8	40316.8	2879.1	473.8	32.3	1.5	3935	37438	441	18747
2024	1.4	2.2	30104.2	40249.3	3021.8	476.2	31.2	1.5	1.3	2.3	29700.1	40659.3	2949.1	476.0	32.6	1.6	3576	37710	443	18941
2025	1.2	2.0	31058.8	40763.9	3102.6	478.1	31.5	1.6	1.1	2.1	30691.3	41066.4	3019.7	478.2	32.9	1.6	3221	38047	445	19184
2026	1.1	1.7	31917.7	41266.7	3179.4	479.9	31.7	1.6	1.0	1.9	31578.4	41492.2	3092.8	480.4	33.2	1.6	2874	38399	447	19346
2027	0.9	1.4	32830.3	41750.5	3246.8	481.4	31.9	1.6	0.9	1.4	32481.3	41978.6	3158.4	481.9	33.3	1.7	2335	38820	449	19507
2028	0.8	1.3	33627.9	42202.3	3296.0	482.5	32.0	1.7	0.8	1.3	33270.5	42432.9	3206.3	483.1	33.5	1.7	2114	39227	450	19588
2029	0.8	1.2	34460.2	42648.5	3332.1	483.3	32.2	1.7	0.8	1.2	34093.9	42881.5	3241.4	483.8	33.7	1.7	1960	39640	450	19678
2030	0.7	1.1	35325.6	43094.8	3365.3	484.2	32.3	1.7	0.7	1.1	34950.1	43330.2	3273.7	484.7	33.8	1.8	1824	40057	451	19775
2031	0.7	1.0	36198.4	43532.1	3399.7	485.1	32.5	1.8	0.7	1.0	35813.6	43770.0	3307.2	485.6	34.0	1.8	1688	40463	452	19865
2032	0.6	0.9	37109.4	43967.7	3436.7	485.6	32.6	1.8	0.6	0.9	36715.0	44207.9	3343.2	486.2	34.1	1.8	1551	40865	452	19964

Request IR-4:

With reference to Section 4.3 Economic Information, page 30 of 98, the application finds that housing completions are highly correlated with residential customer counts and that it will be used in the near term.

(a) Please confirm that the data provided in Figure 17: Residential Economic Drivers, under the column heading "New Construction (number)" represents Nova Scotia housing completions.

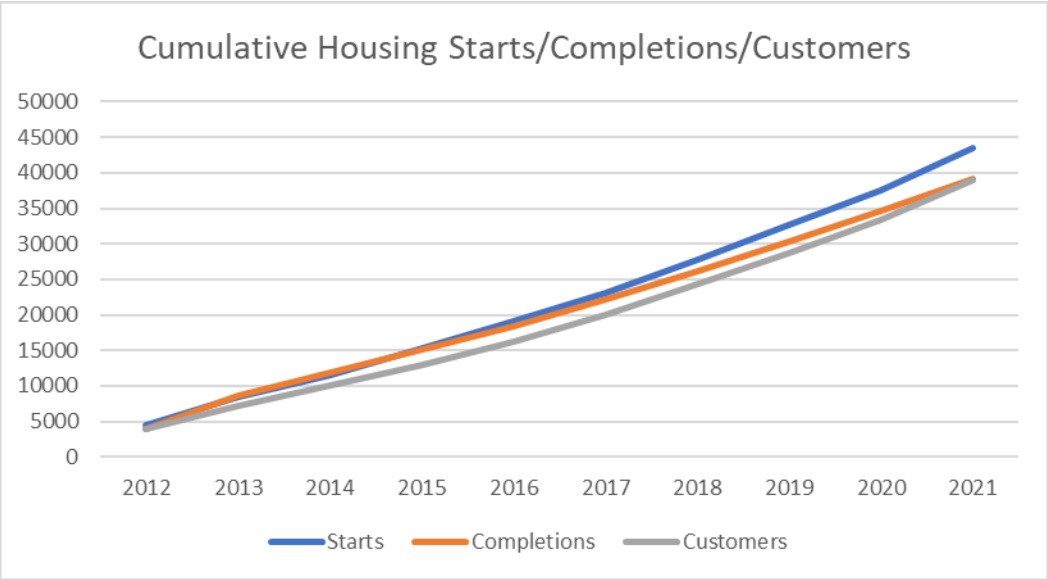
(b) Please confirm if housing starts are considered in the model when there is a trend from historic activity that will impact future completions.

(i) Has the appropriateness of incorporating housing starts been examined for estimating medium and long-term housing completions and/or new residential customers?

Response IR-4:

(a) Confirmed.

(b) Yes, the appropriateness of incorporating housing starts was examined, but they are not included in the model. The graph below shows the cumulative housing starts, housing completions and new residential customer additions over the 2012-2021 period. All three metrics are closely aligned, though housing starts would overstate the number of new customers in 2021, indicating that the completions metric is better aligned with new customer additions.


Cumulative Housing Starts/Completions/Customers
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Starts
Completions
Customers

1

Request IR-5:

With reference to Section 4.3 Economic Information, page 31 of 98, the application states that GDP and employment data are used in the non-residential models.

(a) Please cite the sources for the GDP estimates used in the forecast model.

(b) Please confirm the year that the values are chained to.

(i) Please confirm that the data has been updated to adjust for updates made by Statistics Canada.

(i) Please review the values for the years 2019, 2020, and 2021 as they do not align with the values from Statistics Canada Table 36-10-0402-01 Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000), chained (2012) dollars.

(c) Attachment 02 - Small General Intensities, and Attachment 03 -General Intensities contain a worksheet labelled "EmploymentData" which cites the year 2013. Why are employment numbers not updated to reflect the current environment?

Response IR-5:

(a) All forecast economic data comes from the Conference Board of Canada. The historic data is based on Statistics Canada Table 36-10-0402-01.

(b) GDP values are chained to 2012 and were updated in February 2022. Please refer to IR-3 Attachment 1, column N. 2019 and 2020 values match the Statistics Canada table referenced above, while 2021 differs. Stats Can does make periodic adjustments to historic data, but the forecast inputs for economics were frozen as of February 2022.

(c) 2013 is used as it is the base year used to calibrate to the US Energy Information Agency (EIA) intensities to Nova Scotia. Natural Resources Canada commercial energy use data is only available at the Atlantic Provinces level, so employment is used to calibrate specifically to Nova Scotia.

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Request IR-6:

With reference to Section 4.4 End-Use Intensity Trends, page 35 of 98, the application indicates that the SAE model uses end-use data from the US Energy Information Agency (EIA) which is "calibrated to fit existing Nova Scotia data". Please provide worksheets with the EIA data used in this forecast, showing how the inputs are calibrated and the resulting data outputs used, with formulas intact.

Response IR-6:

Please refer to 2022 Load Forecast Report Attachment 1 Residential Intensities, Attachment 2 Small General Intensities, and 2022 LFR Attachment 3 General Intensities, which were filed electronically and contain both EIA data and all corresponding calculations. The year over year change in EIA data is used for the forecasts of efficiency (as appliance end use efficiency is similar in Nova Scotia and New England) and shares where no other estimates are available. These can be found in the Shares and Efficiency tabs of the attachments referenced above.

Request IR-7:

With reference to Section 4.4 End-Use Intensity Trends, page 36 of 98, the application states, "E3 provided a forecast for heat pump adoption that would be required to achieve carbon reduction targets of net zero by 2050." Please explain why NS Power considers this modeled scenario realistic?

Response IR-7:

Both the federal[1] and provincial[2] governments have set economy-wide net zero emissions goals for 2050. Please refer to SBA IR-2 for additional details.

E3 has modeled the transition in the residential and commercial space heating sectors that would be required to achieve those targets, much of which will involve the adoption of electrification technologies, while accounting for equipment lifecycles in a stock rollover model. This modeling builds upon the Deep Decarbonization in Nova Scotia report[3] which informed the 2020 Integrated Resource Plan (IRP). That report concluded that "low-carbon electricity is essential to achieving decarbonization by enabling emissions reductions in the electricity sector, as well as by enabling complementary reductions in buildings and transportation from electrification."[4] It also highlights the need to consider the long lifetimes of equipment, such as building heating systems, on the path to 2050 to reduce the cost of the transition to a net zero economy.

These findings are consistent with other recent decarbonization modeling work, such as *Canada's Net Zero Future*[5], which finds that near-complete electrification of transportation and most

[1] https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html
[2] https://climatechange.novascotia.ca/what-ns-is-doing#:~:text=It%20sets%20the%20most%20ambitious,in%20Nova%20Scotia%20by%202050
[3] Nova Scotia Power IRP Final Report, Appendix A
[4] Nova Scotia Power IRP Final Report, Appendix A, page 11 of 64
[5] https://climatechoices.ca/wp-content/uploads/2021/02/Canadas-Net-Zero-Future_FINAL-2.pdf

buildings is a "safe bet" as these measures are lower cost and commercially available to support economy-wide decarbonization.

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Request IR-8:

In matter M10109, Section 4.4 End-Use Intensity Trends, page 32 of 89, the application indicates that NS Power expects heat pump saturation to increase to 55 percent by 2031. Whereas, on page 36 of 98 in the current application, the anticipated saturation is 66 percent by 2032.

(a) Please provide the evidence used to predict the level of market saturation and explain the difference in findings between the forecast provided in matter M10109 and the current forecast.

Response IR-8:

(a) Details of the market saturation estimates can be found in 2022 LFR Attachment 01 Residential Intensities, Shares tab, as well as Synapse IR-42 Attachment 2 for E3's heating source share forecast. The difference is related to the 2050 net zero targets for carbon emissions. The 2021 Load Forecast Report did not include an assumption for carbon reduction targets and associated changes to space heating in the province, while the forecast provided by E3 considers a trajectory associated with those changes required to achieve the federal and provincial net zero objectives.

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Request IR-9:

With reference to Section 4.4 End-Use Intensity Trends, page 37 of 98, the application states that "E3 saturation estimates had a lower starting point than the NS Power models, so the NS Power series was adjusted to meet the E3 series by around 2040". Please explain why E3 used a lower starting point and why that was not adjusted to meet NS Power's starting point.

Response IR-9:

NS Power is not aware of comprehensive data on energy end use in the commercial sector specific to Nova Scotia. The difference in starting points is due to the approaches used. E3 estimated building level heating demand by fuel type while the NS Power saturation is based on aligning historic trends with NR Can data (which is composed of data for the Atlantic provinces as a whole). In the near term (including the timeframe of the load forecast), the important driver in the forecast is the year over year changes in intensity, which are similar between the forecasts. The difference in starting points plays a larger role in the long term (i.e. beyond the timeframe of the 10 year load forecast) and potential impact of converting all or most space heating to efficient electric sources.

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Request IR-10:

With reference to Section 4.4 End-Use Intensity Trends, page 38 of 98, the application states "the peak impact predicted by E3 using building stock modelling produces a higher peak impact than the existing SAE peak model". In response to this discrepancy between NS Power's model and E3's model, NS Power estimated the peak impact over that predicted by its SAE model and added it into the Load Forecast.

(a) Please explain why NS Power adjusted its SAE model to meet E3's forecast.

(b) According to Figure 23: Heat Pump Energy and Peak Comparison, the differences between NS Power's and E3's heat pump energy are significant. Please advise whether NS Power made downward revisions to the Load Forecast to meet E3's estimates?

Response IR-10:

(a) E3 has modeled the impacts of heat pump uptake at the building level. NS Power considers this to be an improved predictor of peak impact related to heat pumps than the current forecast model. The SAE model uses a blended XHeat variable that incorporates various heating components at the monthly energy level; however, it does not incorporate detailed assumptions around reduced heat pump efficiencies at peak temperatures or backup heat contribution to peak, both of which are included in E3's forecast.

(b) The energy differences were much smaller than the peak differences – the energy variance represents less than 1 percent of the energy consumption of the residential class in 2025, compared to a variance of 3 percent on the peak side. To simplify the analysis the same forecast for heat pump shares was used and sales were not adjusted.

Request IR-11:

With reference to Figure 24: Heat Pump Forecast, page 40 of 98, the total cumulative new installs for 2022 is 16,000 and the Overall Heating Intensity (kWh/house) is 1,214 and the Overall Cooling Intensity (kWh/house) is 185.

(a) Please explain why the overall percentage saturation for heating and for cooling has decreased from the 2021 forecast provided in Figure 13 of NS Power's application in matter M10109.

(b) Please explain why the heating intensity and cooling intensity has increased from the 2021 forecast provided in Figure 13 of NS Power's application in matter M10109.

Response IR-11:

(a) The saturations for 2022 and 2031 are shown in the table below for comparison:

	2021 Forecast		**2022 Forecast**	
	Heat Pump Heating Saturation (%)	Heat Pump Cooling Saturation (%)	Heat Pump Heating Saturation (%)	Heat Pump Cooling Saturation (%)
2022	38	46	35	46
2031	55	63	63	77

The 2021 forecast used the Natural Resources Canada (NR Can) household number, which is almost 60,000 less than the NS Power customer number. As NR Can numbers for heat pumps are not used in the most recent series, the saturation was updated to use the NS Power customer count. This adjustment also involved updating the 2019 estimate of heat pumps in the province based on the end use survey of that year. As a result, the saturations changed between the forecasts. The calculations can be found on the "HP" tab (columns O and S) of 2022 Load Forecast Report Attachment 1 Residential Intensities.

(b) The heating intensities for 2022 and 2031 are shown in the table below for comparison:

	2021 Forecast		**2022 Forecast**	
Year	Heat Pump Heating Intensity (kWh/house)	Heat Pump Cooling Intensity (kWh/house)	Heat Pump Heating Intensity (kWh/house)	Heat Pump Cooling Intensity (kWh/house)
2022	1,162	186	1,214	185
2031	1,625	253	2,104	310

The heating intensity calibration value was adjusted to reflect the higher winter loads that are attributed to heating. A scaling factor is applied to the "HP Heat" calibration value on the "Calibration" sheet in the 2022 Load Forecast Report Attachment 1 Residential Intensities. The factor scales EIA estimates for unit consumption to Nova Scotia and was changed from 0.4 in the 2021 forecast to 0.45 in the 2022 forecast. Both intensities increase by 2032 due to the increased share compared to the 2021 forecast.

Request IR-12:

With reference to Figure 24: Heat Pump Forecast, page 40 of 98, the Overall Heating Intensity (kWh/house) and Overall Cooling Intensity (kWh/house) are forecast to increase over time. Please explain why NS Power expects that the energy usage per house will increase over this period? Please expand this table with the actual data for the years 2016 to 2021 included.

Response IR-12:

Since the intensity values represent the average kWh per household across the province, they will increase with increased saturations.

The expanded table is as follows:

Year	Total Cumulative New Installs	% Install Non-Elec. Heat	% Install Elec. Heat	Overall % Sat. for Heating	Overall Heating Intensity (kWh/house)	Overall % Sat. for Cooling	Overall Cooling Intensity (kWh/house)
2016	11,132	44	56	18	665	22	89
2017	22,270	60	40	21	760	27	109
2018	38,423	60	40	24	846	31	127
2019	52,603	60	40	27	931	36	146
2020	65,980	57	43	29	1,016	39	157
2021	82,761	62	38	32	1,119	42	172
2022	98,761	62	38	35	1,214	46	185
2023	114,935	63	37	38	1,310	49	198
2024	131,433	64	36	41	1,408	52	212
2025	148,095	65	35	44	1,506	56	226
2026	164,924	65	35	47	1,605	59	239
2027	181,922	65	35	50	1,705	63	253
2028	199,089	65	35	54	1,805	67	268
2029	216,342	65	35	57	1,905	70	282
2030	233,682	65	35	60	2,005	74	296
2031	251,108	65	35	63	2,104	77	310
2032	268,447	65	35	66	2,204	81	324

Request IR-13:

With reference to Section 4.4 End-Use Intensity Trends, page 41 of 98, Figure 25: Water Heater Forecast:

(a) Please provide actuals for the years 2016 to 2021.

(b) The application states that "Growth is expected to remain steady, with saturation increasing to 82 percent by 2032". Figure 25: Water Heater Forecast, provides the forecast overall percentage saturation and overall intensity (kWh/household) by year for the period 2022-2032. Please explain the differences between this forecast and the water heater forecast provided on page 34 of 89 of the application in M10109, given that growth is expected to remain steady.

Response IR-13:

(a) Please refer to the table below:

Year	Overall % Saturation	Overall Intensity (kWh/household)
2016	59	1,358
2017	60	1,379
2018	62	1,411
2019	63	1,444
2020	64	1,468
2021	66	1,506
2022	68	1,537
2023	70	1,569
2024	72	1,601
2025	74	1,630
2026	75	1,655
2027	77	1,680
2028	78	1,707
2029	80	1,733
2030	80	1,747
2031	81	1,763
2032	82	1,779

(b) The difference in the intensities is related to a change in the data series for end use consumption from Natural Resources Canada (NR Can). The historic series for hot water heater consumption was revised in the most recent release, with the calibration value (2015) dropping from 2.32 PJ of total electrical energy consumption in the 2021 data set to 2.16 PJ in the 2022 data set. Overall, the year over year trends are similar between the two forecasts, with the 2021 series having an average of 1.6 percent growth year over year and the 2022 series having an average of 1.7 percent growth year over year.

Request IR-14:

With reference to Section 4.4 Electric Vehicles, page 42 of 98, the application states, "It is estimated that there were approximately 950 EVs in the province as of the end of 2021". Please provide the source of the data used in determining this estimate.

Response IR-14:

Data for the number of EVs was derived from the provincial open datasets "Rebates for New and Used Electric Vehicles by Location in Nova Scotia"[1] and "Electric Vehicle Registration Data"[2].

[1] https://data.novascotia.ca/Mines-and-Minerals/Rebates-for-New-and-Used-Electric-Vehicles-in-Nova/fwin-zgki
[2] https://data.novascotia.ca/Permits-and-Licensing/Electric-Vehicle-Registration-Data/avxy-ifhs

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Request IR-15:

With reference to Section 4.4 Electric Vehicles, page 42 of 98, NS Power indicates that a new EV forecast model has been adopted using stock rollover.

(a) Please identify the source of the stock rollover data used in this model to forecast EV sales in Nova Scotia.

(b) **Please provide a table of the current sales to stock in Nova Scotia for** the forecast period.

Response IR-15:

(a) Please refer to NSUARB IR-2.

(b) In the LDV category, new vehicle sales in Nova Scotia are estimated to be approximately 50,000 units per year based on Statistics Canada Table: 20-10-0001-01 (formerly CANSIM 079-0003), with total vehicle stock remaining steady at approximately 600,000. The estimated stock numbers are provided in the following tables:

LDV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BEV	1,768	3,508	5,962	9,170	13,168	17,983	23,636	30,147	37,565	48,816	64,455
PHEV	1,096	2,417	4,146	6,235	8,633	11,290	14,149	17,160	20,284	24,599	30,017
Diesel	20,920	20,800	20,641	20,444	20,209	19,937	19,631	19,292	18,921	18,380	17,654
Gasoline	575,661	572,496	568,254	562,946	556,589	549,219	540,886	531,644	521,516	506,675	486,701

MDV are expected to remain steady at 11K vehicles:

MDV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BEV		53	123	211	315	436	575	729	900	1,106	1,345
Diesel	5,201	5,176	5,143	5,102	5,053	4,996	4,931	4,858	4,778	4,681	4,569
Gasoline	5,865	5,837	5,800	5,754	5,698	5,634	5,561	5,479	5,388	5,279	5,152

HDV are expected to remain steady at 2K vehicles

HDV	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BEV			26	65	116	199	311	428	550	672	796
Diesel	1,835	1,817	1,793	1,758	1,712	1,638	1,536	1,431	1,321	1,212	1,100
Gasoline	204	202	199	195	190	182	171	159	147	135	122

Request IR-16:

With reference to Section 4.4 Electric Vehicles, page 42 of 98, the application notes the difference between the current forecast of 75,000 EVs on the road in Nova Scotia by 2031, and the previous forecast of 58,000 EVs in the 2021 Load Forecast. Please provide a table with the data that was used in each model.

Response IR-16:

Please refer to Attachment 1.

	kWh/year	kW/vehicle on peak
LDV	4,323	0.85
MDV	8,205	1.62
Transit Bus	113,890	7.33

Year	BEV tot	PHEV tot	MDV	HDV	Total	2022 Energy GWh	2022 Peak Peak MW	Avg kW per car
2021	709	238			947	4	0.8	0.9
2022	1,768	1,096			2,864	12	2.4	0.85
2023	3,508	2,417	53		5,978	26	5.1	0.86
2024	5,962	4,146	123	26	10,258	48	9.0	0.88
2025	9,170	6,235	211	65	15,680	76	14.0	0.89
2026	13,168	8,633	315	116	22,232	110	20.0	0.90
2027	17,983	11,290	436	199	29,908	153	27.1	0.91
2028	23,636	14,149	575	311	38,671	204	35.4	0.92
2029	30,147	17,160	729	428	48,465	259	44.7	0.92
2030	37,565	20,284	900	550	59,299	320	54.8	0.92
2031	48,816	24,599	1106	672	75,192	403	69.3	0.92
2032	64,455	30,017	1345	796	96,612	510	88.6	0.92

ted EV assumptions 2021

	Average use per year (kWh)			Peak Load (l	% charging at peak
Plugin Hybrid Electı	1790	Growth	1.8	Plugin Hybr	3.3	10%
Battery Electric	3950	Decay	0.9	Battery	8.13	10%

Year	Total conve	PHEV	BEV	PHEV tot	BEV tot	Total	2021 Energy GWh	2021 Peak Peak MW	Avg kW per car
2020	120	0.55	0.45	66	54	120	0	0.1	0.5
2021	413	0.50	0.50	273	261	533	2	0.3	0.6
2022	577	0.50	0.50	561	549	1,111	3	0.6	0.6
2023	816	0.40	0.60	888	1,039	1,927	6	1.1	0.6
2024	1,169	0.40	0.60	1,355	1,740	3,095	9	1.9	0.6
2025	1,694	0.40	0.60	2,033	2,757	4,789	15	2.9	0.6
2026	2,487	0.30	0.70	2,779	4,498	7,277	23	4.6	0.6
2027	3,696	0.30	0.70	3,888	7,085	10,973	35	7.0	0.6
2028	5,559	0.30	0.70	5,556	10,977	16,532	53	10.8	0.7
2029	8,461	0.25	0.75	7,671	17,322	24,993	82	16.6	0.7
2030	13,030	0.25	0.75	10,869	27,046	37,915	126	25.6	0.7
2031	20,301	0.25	0.75	15,800	42,086	57,885	195	39.4	0.7

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Request IR-17:

With reference to Section 4.4 Electric Vehicles, page 43 of 98, the application states, "E3's tool simulates driving and charging electric vehicles in Nova Scotia, based on a bottom-up modeling approach that simulates driving and charging of thousands of EV drivers…".

(a) Please identify if the basis for simulating driving habits uses Nova Scotia data, Canadian data, American data, or other.

(i) Please provide a copy of the data used in the mode and the source for driving habits.

(b) If residential sales are expected to be elevated due to increased work-from-home arrangements, has the amount of driving for commutes been reduced?

Response IR-17:

(a) For LDVs, E3 used a New England profile within the 2017 National Household Travel Survey (NHTS) for population travel behavior for personal LDVs. E3 believes the New England profile remains representative of Nova Scotian driving patterns, as through its experience with other jurisdictions it notes that the timing of these patterns do not vary significantly between jurisdictions (https://nhts.ornl.gov/). For MDVs, Parcel Trucks and Buses, E3 used NREL's Fleet DNA data (https://www.nrel.gov/transportation/fleettest-fleet-dna.html).

(b) No.

Request IR-18:

With reference to Section 4.4 End-Use Intensity Trends, page 47 of 98, Figure 29: PV Impact to Energy (cumulative), please expand this table to include the years 2019, 2020, and 2021 for actual new installs and load reductions.

Response IR-18:

Please refer to the expanded table below:

Year	Total New Installs	Load (GWh)	Peak (MW)
2019	764	-6	0
2020	1796	-16	0
2021	3434	-31	0
2022	6044	-55	0
2023	7381	-67	0
2024	8785	-80	0
2025	10259	-93	0
2026	11939	-109	0
2027	13854	-126	0
2028	16038	-146	0
2029	18527	-169	0
2030	21365	-195	0
2031	24158	-216	0
2032	26503	-236	0

Request IR-19:

With reference to Section 4.4 End-Use Intensity Trends, page 53 of 98, Figure 34: Commercial and Industrial Electrification Forecasts (cumulative), please expand this table to include actuals for the years 2019, 2020, and 2021.

Response IR-19:

Please refer to the expanded table below:

Year	SmGen (GWh)	GenDemand (GWh)	LrgGen (GWh)	SmInd (GWh)	MedInd (GWh)	LrgInd (GWh)	Coinc. Peak (MW)
2019	3	3	1	0	0	0	0
2020	8	14	3	1	2	1	1
2021	13	26	8	5	2	1	2
2022	18	38	12	9	6	3	3
2023	23	54	15	13	10	3	7
2024	25	73	20	17	14	4	12
2025	27	78	23	19	16	7	15
2026	29	83	23	20	17	8	17
2027	30	85	23	21	18	9	18
2028	31	86	23	21	18	10	18
2029	31	86	23	21	18	10	18
2030	31	86	23	21	18	10	18
2031	31	86	23	21	18	10	18
2032	31	86	23	21	18	10	18

Request IR-20:

With reference to Section 4.5 Price Data, page 55 of 98, the application states that "The SAE models are estimated using a -0.15 price elasticity." The application further explains that the elasticity was established using studies and elasticity that other utilities use in load forecasting.

(a) Please explain why the Load Forecast does not use Canadian price elasticities that are publicly available.

Response IR-20:

NS Power is not aware of Canadian publicly available price elasticities specific to long term electricity prices. Details on the price elasticity used were provided in response to NSUARB IR-10 of the 2021 Load Forecast Report (M10178), a copy of which is provided as Attachment 1. Please also refer to Synapse IR-14.

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Request IR-10:

In reference to Section 4.5, Price Data, on page 46 and page 47, the application states that the SAE models are estimated using a -0.15 price elasticity that was provided by Itron based on other utility forecasting models.

(a) Please confirm that the price elasticity provided by Itron is based solely on other Canadian forecasting models. If not, provide details on the markets used to calculate this price elasticity.

Response IR-10:

(a) Not confirmed. The elasticity provided by Itron is not based solely on Canadian forecasting models. There have been several studies on the price elasticity of electricity consumption, most dating from the 1980s and 1990s[1], with a range of results from -0.05 to -0.30. The elasticity of -0.15 is near the mid-range. In 1997, a study published in the Journal of Business and Economic Statistics estimated the price elasticities in 49 U.S. States (excluding Hawaii) and found variation across states. The mean of the estimates was -0.16[2]. A 2006 study prepared for the National Energy Research Lab[3] showed that the results had not changed significantly since those earlier reports.

[1] Bohi, Douglas R., and Mary Beth Zimmerman, "An Update on Econometric Studies of Energy Demand Behavior," *Annual Review of Energy*, Vol. 9, 1984, pp. 105–154.
[2] Maddala, G. S, Robert P. Trost, Hongyi Li, and Frederick Joutz, "Estimation of Short-Run and Long-Run Elasticities of Energy Demand from Panel Data Using Shrinkage Estimators," Journal of Business & Economic Statistics, Vol. 15, No. 1, January 1997, pp. 90–101.
[3] M.A Bernstein and J. Griffin, "Regional Differences in the Price-Elasticity of Demand for Energy", RAND Corporation Santa Monica, California for NREL, February 2006.

Request IR-21:

With reference to Section 4.6 Demand Side Management, Figure 36: Annual Forecast DSM Savings (incremental), page 58 of 98, please explain the cause of the significant decline in forecast Commercial and Industrial DSM savings and DSM captured by Comm/Ind end use forecast in the years 2023, 2026, 2029, and 2031.

Response IR-21:

The DSM values for 2023-2025 are based on the proposed Settlement Plan filed by EfficiencyOne (E1) with the NSUARB for approval.[1] The remaining years are based on E1's 2019 potential study[2]. Any year to year variance is a result of changes in the forecast DSM amounts as provided by E1 in those two forecasts.

[1] M10473, EfficiencyOne 2023-2025 DSM Resource Plan Filing, March 11, 2022.
[2] M09096, Application for approval of a Supply Agreement for Electricity Efficiency and Conservation Activities between Efficiency One and Nova Scotia Power Inc., NSUARB Decision, September 16, 2019, 2019 NSUARB 105.

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Request IR-22:

With reference to Section 5.0 Residential Sector, page 59 of 98, the application states, "The residential average use model is specified using a SAE model structure and the customer count forecast is based on forecast housing starts". Please confirm whether the residential forecast uses housing starts as stated on page 59, or completions as stated on page 30.

Response IR-22:

The statement on page 59 is incorrect, customer count is forecast based on the housing completions forecast as stated on page 30 of the Report.

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Request IR-23:

With reference to Section 5.0 Residential Sector, the application discusses the model used to determine the residential sales forecast.

(a) Please provide the rationale for excluding the price of substitutes for electricity, in particular the price of home heating oil.

(b) Please explain why multi-unit housing is predicted to decline given the Provincial Government's commitment to invest in affordable housing.

Response IR-23:

(a) The price of oil was considered but was found to be not statistically significant in the model and was therefore excluded.

(b) The forecast for housing completions is provided by the Conference Board of Canada, and NS Power does not have information respecting the expected outcomes of these commitments. As government commitments are translated to housing starts/completions, they will be incorporated into the forecast.

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Request IR-24:

With reference to Section 5.0 Residential Sector, page 59 of 98, Figure 37 Comparison of Forecast to Actuals:

(a) Please explain the weather-adjusted sales metric and elaborate as to why weather-adjusted sales are higher than both forecast and actual sales.

Response IR-24:

(a) The weather adjusted sales metric is the actual sales with the impact of weather added or subtracted to show what the sales would be if the weather was "normal". As an example, for 2019 actual sales were 4688 GWh, and the impact of weather was an increase of 92 GWh related to colder than normal temperatures, so the adjusted sales would have been 4596 GWh (4688 GWh – 92 GWh) under normal weather conditions. The weather adjustment is used to compare with forecast values, which assume normal weather.

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Request IR-25:

With reference to Section 5.0 Residential Sector, page 59 of 98, the application states, "The COVID-19 impact to the Residential forecast is approximately +100 GWh in 2022 and +54 GWh for 2023 and beyond". Given that the impact of COVID-19 on 2021 sales was +42 GWh when restrictions were much greater and in place for the entire year, why is the forecasted impact of COVID-19 higher for 2022 and beyond?

Response IR-25:

Actual sales for 2022 indicate that the COVID-19 variable may understate the impact on residential sales (weather normalized residential sales show a variance of +125 GWh over forecast for Jan-Mar). The +42 GWh in 2021 is related to "unexplained variance", which would incorporate everything not captured by the weather adjustment, so there could be offsetting variances within that value.

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Request IR-26:

With reference to Section 5.0 Residential Sector, page 60 of 98, the application identifies that the long-term trend is for higher than previously forecast residential sales due to several factors, including EV penetration rates. Please confirm whether these rates are for the provincial market, and if they have been adjusted to reflect the current shortage of vehicles available for sale in Nova Scotia. If not, please explain.

Response IR-26:

The EV penetration rates are estimated for the provincial market, but do not take into account the current short-term shortages of vehicles, which is not likely to impact the long-term forecast as 2023 sales are forecast to be around 1,900 electric vehicles, or less than 2 percent of the total stock of 97,000 forecast by 2032.

Request IR-27:

With reference to Section 5.0 Residential Sector, page 61 of 98, the application states, "Analysis of billing data showed that new single-family homes use approximately 16,000 kWh per year on average, while multi-unit homes use 4,860 kWh per year on average". Is this billing data used in this analysis gathered from the AMI meters in Nova Scotia?

Response IR-27:

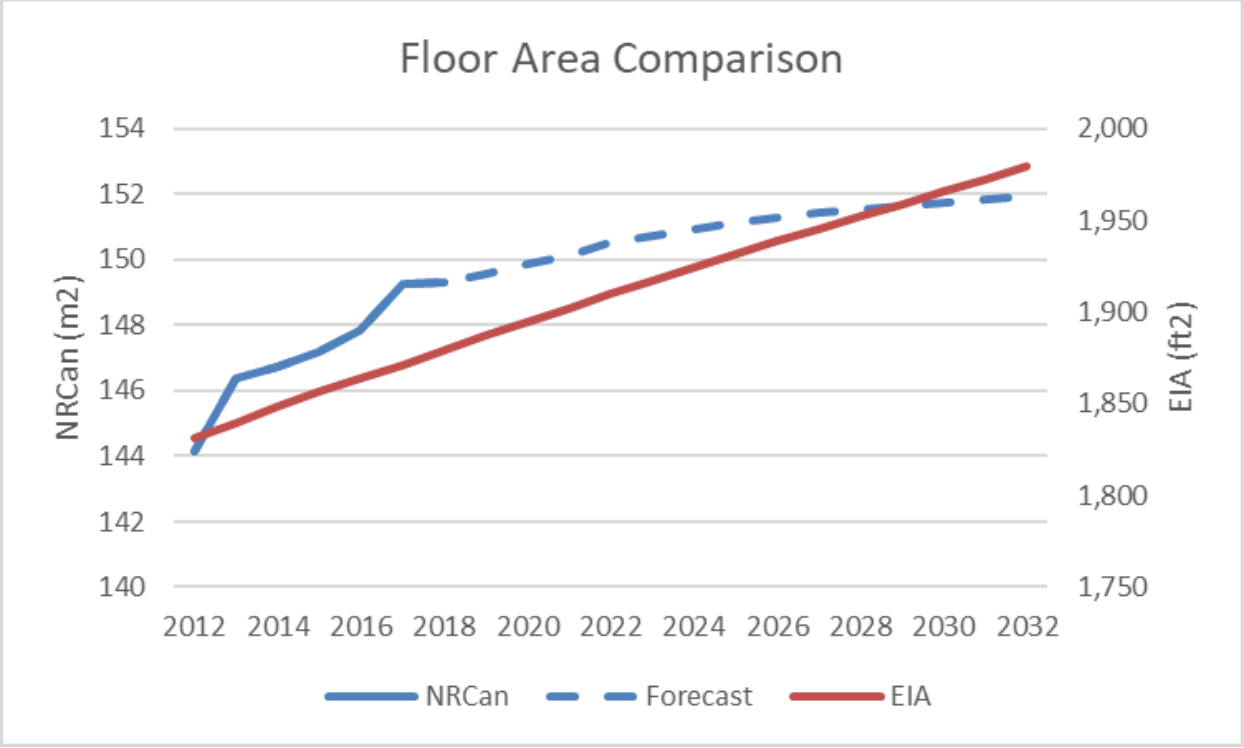
No, the data was gathered from the CIS billing system in 2018, prior to the installation of AMI meters.

Request IR-28:

With reference to Section 5.0 Residential Sector, page 61 of 98, the application states, "While efficiency is expected to increase, house size is also expected to continue increasing, albeit at a slower rate than in previous years". Is this assumption based on results from the EIA forecast for New England? If so, please provide support for the assumption that continued growth in house size in New England is in keeping with trends in Nova Scotia?

Response IR-28:

Estimates for house size (square footage) are in 2022 LFR Attachment 1 Residential Intensities on the "StructuralVars" tab. There are estimates for both Nova Scotia (column D) and New England (column N). A comparison of the two is shown in the following graph:



The overall trends are similar, with NR Can showing a steeper increase between 2016 and 2017 followed by a lower increase in 2018. The forecast has house size increasing at a slower rate than in New England as multi family housing is expected to make up a larger portion of new housing stock.

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Request IR-29:

With reference to Section 6.0 Commercial Sales, page 66 of 98, Figure 42: Commercial Class Sales reflects an anticipated decline in sales during the period 2027 to 2032. Please explain the reason for the anticipated decrease in commercial sales from 2027 to 2032.

Response IR-29:

The underlying forecast increases slightly over the time frame of the forecast, but DSM is expected to reduce sales overall as seen in the decrease between 2027 and 2032. The impacts from the model, electrification, solar, and DSM can be found in Appendix B on page 12 for the Small General class and on page 17 for the General Demand class.

Request IR-30:

With reference to Section 6.1 Small General Service, page 67 of 98, the application states, "Small General service load shows an average annual increase of 0.5 percent compared to an increase of 1.1 percent per year in the 2021 Load Forecast". Please explain what has caused the growth rate to change.

Response IR-30:

The growth rate is primarily impacted by the starting point. 2021 forecast sales, which were the starting point of the 2021 forecast calculation, were 293 GWh. The 2022 forecast uses 2022 forecast sales as the starting point, and with economic recovery expected in 2022 those sales are forecast at 311 GWh. Details of the components between 2022 and 2032 are provided in Appendix B.

Request IR-31:

With reference to Section 6.3 Large General Service, page 70 of 98, the application indicates that sales growth in this class is expected to be driven by expansions at several hospital sites in the province that contribute more than half of the 50 GWh increase by 2032. Has this estimate adjusted for the potential of the redevelopments incorporating photovoltaic and other green/renewable energy production elements?

Response IR-31:

Solar adoption is taken into account in the commercial class. It is not included for the large general class as there is no specific information on self production. New information on alternative energy production for this class will be incorporated into the load forecast as it becomes available.

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Request IR-32:

With reference to Section 7.1 Small Industrial, page 71 of 98, the application indicates that "sales in this class have been flat for the last 10 years and are expected to grow by 0.7 percent annually" because of economic growth.

(a) Please explain in detail, the economic growth that is anticipated to lead to increased sales given the flat performance over the previous 10 years.

(b) Please explain why anticipated growth for this class is estimated at 0.7 percent annually over the forecast period, given the 2021 Load Forecast had estimated growth of 0.6 percent annually over this period, and yet sales growth has been flat since 2011.

Response IR-32:

(a-b) The small industrial class is forecast using an econometric model with manufacturing GDP as the economic variable, as provided by the Conference Board of Canada. As shown in Figure 19 of the report, this economic variable grew at an average of 0.3 percent per year between 2012 and 2021 and is expected to grow 2 percent per year between 2022 and 2032. This corresponds to the change from flat historic to slow forecast growth. The variable was similar in the 2021 load forecast, with average annual growth of 1.8 percent over the forecast period. Partly offsetting growth is the impact of DSM over the forecast period.

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Request IR-33:

With reference to Section 7.2 Medium Industrial, page 72 of 98, the application indicates that the load in this class has been flat since 2014 and that 2020 experienced an increase in sales due to increased production at several new facilities. NS Power indicates that sales are anticipated to continue to grow at an average increase of 0.1 percent annually due to economic activity.

(a) Please cite the source and explain in detail the economic activity that is expected to drive sales growth for this class.

(b) Please explain why growth for this class is estimated at 0.1 percent, given the 2021 Load Forecast estimated 0.2 percent, yet load has been flat since 2014.

Response IR-33:

(a–b) Like the small industrial class, the medium industrial forecast uses an econometric model with manufacturing employment as the economic variable, as provided by the Conference Board of Canada. As shown in Figure 19 of the Load Forecast Report, this economic variable declined an average of 0.1 percent per year between 2012 and 2021 and is expected to grow 0.5 percent per year between 2022 and 2032. This corresponds to the change from flat historic to slow forecast growth. The variable was similar in the 2021 forecast, with average annual growth of 0.4 percent over the forecast period. Partly offsetting growth will be the impact of DSM over the forecast period.

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Request IR-34:

With reference to Section 10.0 Peak Demand, page 85 of 98, Figure 58: Peak Contribution Components (MW), please expand the table to include actuals for the years 2017, 2018, 2019, 2020, and 2021.

Response IR-34:

The data provided in Figure 58 is forecasted only; actuals are not available for the various components.

Request IR-35:

With reference to Appendix B, the Residential Input Variables table on page 7 of 31, the row Change to load has a positive value in the columns Wash/Dry and Misc. Given the expectation of enhanced energy efficiency of washers and dryers and other electronics, please elaborate as to why these intensities have positive values.

Response IR-35:

The increase in Wash/Dry represents increased shares across the province, increasing from 90 precent for washers and 88 percent for dryers in 2022 to 92 percent for washers and 90 percent for dryers by 2032. Miscellaneous loads represent small plug loads, and these are expected to increase faster than efficiency gains as more electronic devices are purchased.

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Request IR-36:

With reference to Appendix C, Figures C1 Total Nova Scotia Energy Requirement (NSR), Figures C2 System Peak Demand and Figure C3 Firm Peak Demand, all graphs display significant growth after 2022. Please elaborate on the factors causing this result which were not considered in previous load forecasts.

Response IR-36:

The increases are primarily due to higher expectations for space heating and EV adoption than in previous load forecasts. These expectations are driven by assumptions and targets regarding carbon reduction.