Volume 2: Tab 3, Customer, Energy and Demand Forecast Report

Q. Please describe the methodology used to determine the elasticity effects including the following:

a) When was it developed?

b) Given the material increase in sales in 2022 and 2023 relative to the approved 2022-2023 General Rate Application test year forecasts, has Newfoundland Power conducted a recent assessment of the accuracy of the price elasticity methodology used in developing the load forecast?

c) Has the methodology been recently reviewed by an external consultant?

A. **A. General**

Elasticity refers to changes in consumption based on changes in price. For the electricity sector it means a change in the consumption of electricity due to the change in customer rates. Generally speaking, if electricity rates increase, customers are inclined to respond by using less electricity. If electricity rates decrease, customers are inclined to increase consumption. The concept of elasticity in the electricity sector was discussed as part of the *Commission of Inquiry Respecting the Muskrat Falls Project* ("Muskrat Falls Inquiry").[1]

Changes in electricity prices can change customer consumption in the short-run and in the long-run. In response to a rate increase, customers may make relatively simple changes in their behaviors to reduce electricity consumption over a short period of time. This includes, for example, turning back thermostats, increasing usage of existing secondary heating sources such as propane and wood, using less hot water, or using a clothesline instead of a clothes dryer. If rate increases persist, customers may invest in longer term solutions to reduce their electricity consumption. This includes installing more insulation, installing a heat-pump to offset baseboard heating, or installing another source of heat such as a propane fireplace or woodstove.[2]

Another factor when considering elasticity in the context of electricity consumption is whether there are alternatives available to customers and whether they provide an economic path to conserving electricity. Generally, the more the alternatives, the greater the price elasticity.[3] Other factors also influence a customer response to changes in electricity rates. These include the health of the provincial economy and income levels.[4]

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1 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019.

2 The concept of price elasticity is explained in the report *The Long-Run Price Elasticity of Demand for Electricity and the Feasibility of Raising Electricity Rates to Finance Muskrat Falls*, James P. Feehan, MSc (Econ), PhD, July 31, 2018, page 3. A copy of the report was provided as Attachment A to the response to Request for Information CA-NP-076.

3 Ibid, page 8, lines 15-16.

4 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Kevin Fagan – Director of Regulatory Affairs for Newfoundland and Labrador Hydro, page 19.

B. Newfoundland Power's Methodology

The methodology used by Newfoundland Power to determine the elasticity effects on the Company's energy sales involves the regression analyses used to forecast average usage for the Domestic Service and General Service Rate #2.1 customers. For Domestic Service, the regression analysis estimates the average use per customer based on a number of factors including: (i) market share of electric space heating; (ii) the price of electricity in the current year; (iii) the price of electricity in the previous year; (iv) customer conservation and demand management activities; and (v) household disposable income.[5]

Newfoundland Power's average use regression models have been an effective way of establishing the relationship between the Company's average customer use and changes in electricity prices.[6] To forecast energy sales, the pricing coefficients determined in the regression analysis are applied to the forecast number of customers and forecast changes in customer rates anticipated in the forecast period.[7]

The inclusion of price elasticity in Newfoundland Power's energy sales forecast originated during Newfoundland Power's *1996 General Rate Application*. In its final order in relation to the *1996 General Rate Application*, the Board stated:

> *"The Board finds that the load forecast presented by the Applicant is reasonable and that the revenue forecasts based upon them are acceptable for evaluating the proposals contained in the Applicant's rate application. However, the Board directs that the Applicant develop measures of price elasticity and build them into its forecasting methodology…"*[8]

Newfoundland Power's *1998 General Rate Application* was the first to include an energy sales forecast that took price elasticity into consideration. For Domestic customers it was determined that for every 1.0% increase in the price of electricity, the total impact on annual use is a decline of 0.3%. For small general service customers, a 1.0% increase in the price of electricity would result in a decline of 0.17%. From the perspective of total Company sales, it was determined that a 1.0% increase in the price of electricity will result in a decline in energy sales of 0.21%.[9] In its final order in relation to the *1998 General Rate Application* the Board found that the load forecasts for 1998 and 1999 were reasonable.[10]

The price elasticity factors used at the time of the *1998 General Rate Application* were developed using the same regression techniques that are used by the Company today. In Newfoundland Power's *2025/2026 General Rate Application*, the Company's elasticity

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5 Newfoundland Power's regression analysis includes data from 1980 onwards.
6 The R-Squared value for the Domestic average use model is 0.983.
7 The pricing coefficients are statistically significant with t-stat values of -3.86 and -2.55.
8 See Order No. P.U. 7 (1996-1997), page 45.
9 See *Direct Testimony of Ronald G. Crane, Section 4 Price Elasticity* filed as part of Newfoundland Power's *1998 General Rate Application*.
10 See Order No. P.U. 36 (1998-99), page 23.

assumptions equate to a 0.19% decrease in energy sales for every 1.0% increase in the price of electricity.

C. Energy Sales in Recent Years

Newfoundland Power experienced growth in its Domestic customer rate class in 2022 and 2023. This followed six years of either no growth or declining energy sales. Table 1 shows the change in Domestic customer energy sales and the change in the Domestic customer energy rate for the period 2016 to 2023.

Table 1:
Domestic Energy Sales and Energy Rate Change
(2010 – 2023)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Energy Sales Change[11]	0.0%	-0.3%	-1.4%	-0.9%	-0.4%	-1.3%	1.4%	3.4%
Domestic Rate Change[12]	-8.1%	9.1%	7.4%	7.1%	0.0%	2.6%	-1.4%	7.4%

Domestic customer energy sales declined by 4.3% from 2016 to 2021.[13] During the same period, the Domestic energy rate increased by 18%. The reduction in consumption during a period of electricity rate increases supports the concept of price elasticity related to electricity consumption.

The increase in Domestic customer energy consumption in 2022 and 2023 was driven by a number of factors.[14] These include a marked increase in the cost of home heating fuel and propane. From 2021 to 2023 the cost of home heating fuel increased by 97% while the cost of propane increased by 31%.[15] During the same period, electricity prices increased by only 1.2%.[16]

The increase in electricity consumption in 2022 and 2023 at a time when the cost of alternatives increased substantially is further evidence of the influence of price on Domestic customer energy consumption, particularly for home heating. Increases in the

[11] Reflects weather adjusted energy sales for the Domestic Service rate class.

[12] Reflects annual change in the energy rate for the Domestic rate class. Rate changes for 2016, 2017, and 2018 occurred on July 1st of those years. The rate change for 2019 occurred on October 1, 2019. The rate did not change in 2020. The rate changes in 2021 occurred on July 1st. There were two rate changes in 2022: a 1.1% decrease on March 1, 2022 and a 0.3% decrease on July 1, 2022. On July 1, 2023, the rate increased by 7.4%.

[13] Domestic energy sales were 3,656 GWh in 2016. In 2021 Domestic energy sales were 3,499 GWh (3,499 GWh / 3,656 GWh – 1 = -4.3%). The Domestic energy rate on January 1, 2016 was 10.573 ¢/kWh and 12.520 ¢/kWh on December 31, 2021 (12.520 ¢/kWh / 10.573 ¢/kWh – 1 = 18.4%).

[14] Factors that contributed to increased Domestic customer energy consumption in 2022 and 2023 also include population growth and government incentives for customers to convert from oil to electric heating.

[15] For the Avalon Peninsula Northeast Zone, the price of home heating fuel was $0.7555/l, $1.0523/l and $1.4878/l on January 7, 2021, January 6, 2022 and January 4, 2023, respectively. The price of propane was $0.829/l, $1.194/l, and $1.086/l on those dates. See http://www.pub.nl.ca/PP_historical2023.php.

[16] The Domestic Service energy rate was 12.203 ¢/kWh, 12.52 ¢/kWh, and 12.346 ¢/kWh in January 2021, 2022, and 2023, respectively.

cost of electricity, including those forecast by Newfoundland Power over the forecast period, can be expected to influence customer electricity consumption in the future.[17]

D. Electricity Price Elasticity in Newfoundland and Labrador

In addition to Newfoundland Power's historic approach to reflecting the impacts of price elasticity in its energy sales forecast, consideration of price elasticity is used and accepted throughout the jurisdiction.

Similar to Newfoundland Power, Hydro's methodology uses regression analysis with consideration of price elasticity. Hydro's energy forecast methodology was reviewed as part of its most recent *Reliability and Resource Adequacy Study Update*. Hydro's consultant, Daymark Energy Advisors made the following observation:

> *"Hydro's energy forecast methodology aligns with industry standards for residential and business forecasting through their reliance on regression analysis with consideration of economic growth and price and income elasticity."*[18]

The concept of price elasticity was thoroughly discussed and accepted during the Muskrat Falls Inquiry. During the proceeding, representatives from Newfoundland Power,[19] Hydro,[20] the Consumer Advocate,[21] and independent experts,[22] discussed how the price of electricity can influence consumption by customers. Price elasticity, as it relates to electricity customers, was also discussed in the Final Report of the Muskrat Falls Inquiry.[23]

E. Price Elasticity Assumptions

Estimating the specific effects of changes in electricity consumption due to changes in price in Newfoundland and Labrador is complex, particularly at present. This is for a number of reasons including: (i) customer response to anticipated rate changes due to the Muskrat Falls Project; (ii) customer expectations regarding government rate mitigation plans; (iii) recent incentives that incent customers to convert from oil heating to electric heating; (iv) current and future government policies regarding carbon pricing; (v) the

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17 Newfoundland Power's electricity sales forecast includes the effects of the July 1, 2023 customer rate increase, a 9.0% increase in July of 2024, a 7.75% increase on July 1, 2025, and rate increases of 2.25% annually thereafter.

18 See Hydro's *Reliability and Resource Adequacy Study – 2022 Update Volume III: Long-Term Resource Plan, Attachment 3, Daymark Energy Advisors Independent Review of Hydro's Load Forecast 2022*, Page 1 of 6.

19 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Peter Alteen, pages 9–11.

20 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Kevin Fagan, pages 13-21.

21 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Dennis Browne, pages 27-28.

22 See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Dr. Brandon Schaufele, pages 5–9.

23 See *Muskrat Falls: A Misguided Project – Volume 4: Looking Forward,* pages 61-69.

substantial increase in alternative sources of heating fuels; (vi) and changes in the economy including a period of high inflation in recent years.

Evidence and testimony at the Muskrat Falls Inquiry provides a range of elasticity assumptions that can be applied to electricity usage.

In testimony at the Muskrat Falls Inquiry, Dr. Brandon Schaufele stated that the elasticity of demand for electricity in the short-run could be -0.3 and in the long-run could approach -0.7.[24] This effectively means that a 1% increase in electricity rates would lead to a 0.3% decrease in electricity rates in the short-run and a 0.7% decrease in the long-run.

Hydro provided a scenario based on past analysis where a 15% increase in electricity rates results in a decrease in electricity consumption of 5%. Hydro stated that, based on past analysis, the elasticity of demand for electricity is -0.3, which implies that a 1% increase in electricity rates would lead to 0.3% reduction in energy consumption.[25]

Dr. Peter Feehan provided a report as part of the Muskrat Falls Inquiry.[26] It included an estimate of price elasticity that was based on annual data for the average consumption by Newfoundland Power's domestic customers for the period 1992 to 2016.[27] The regression analysis estimated the price elasticity for Newfoundland Power's Domestic customers to be -0.42.[28] This implies that an increase in customer rates of 1% would lead to a 0.42% reduction in energy consumption.

For the Domestic customer rate class, Newfoundland Power's current analysis indicates that price elasticity is -0.30. On a total basis, adjustments related to elasticity equate to approximately -0.19. Effectively, the Company's energy sales forecast assumes that an increase in price of 1% would result in a decrease in consumption of 0.30% for Domestic customers and 0.19% for the totality of Newfoundland Power's energy sales. Based on a comparison of elasticity figures presented at the Muskrat Falls Inquiry, Newfoundland Power's elasticity assumptions used in its energy sales forecast is reasonable.

[24] See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Dr. Brandon Schaufele, page 46.

[25] See *Commission of Inquiry Respecting the Muskrat Falls Project, Transcript, Phase 3, Volume 1*, July 16, 2019, Testimony of Kevin Fagan, page 46.

[26] See Exhibit P-00326: *The Long-Run Price Elasticity of Demand for Electricity and the Feasibility of Raising Electricity Rates to Finance Muskrat Falls*, James P. Feehan, MSc (Econ), PhD, July 31, 2018, page 3. A copy of the report was provided as Attachment A to the response to Request for Information CA-NP-076.

[27] Ibid, page 4.

[28] Ibid, page 19.