SUBJECT:

Load Forecast

REFERENCE:

Simpson/Gotham report, page 5

PREAMBLE:

The report states that "[Elenchus] does not consider the important effects of Hydro rates projected in the NFAT apart from a limited discussion in section 2.1.3"

QUESTION:

Are you aware of any predictable correlation between rising prices and decreasing demand, i.e., the impacts of price elasticity with respect to electricity? Conversely, if there is no accepted correlation, what approach do you suggest to predict the effects of rate increases on load forecast?

RESPONSE:

We have cited a number of U.S. sources that we consider reliable and similar, i.e. differences in consumer responses in other jurisdictions are unlikely to be large. The problem in MB is that Hydro had paid little attention to measuring price response and real electricity prices have not varied much (which reduces the reliability of estimates of price elasticity, should Hydro try to measure them).

SUBJECT:

Load Forecast

REFERENCE:

Simpson/Gotham report, page 5

PREAMBLE:

The report critiques the lack of top-down modelling by Manitoba Hydro based on customer groups.

QUESTION:

Do you have a recommended approach, or is this simply a general observation?

RESPONSE:

The context of this comment was a change in the forecast methodology for electric heating share from a regression model to an adjusted five-year average. The recommendation is that this five-year average be compared statistically to the regresssion approach, and we suggest "a set of regression models for the customer groups that would include population, income (GDP or household income measures), prices, weather, and other factors." We also note that this is consistent with a criticism in the Elenchus report.

PUB/CAC-Simpson/Gotham-3a

PREAMBLE

The report discusses the use of "headship rates" determined based on age, income, marital status, and the prior year's headship rate.

QUESTION

In your view, is the necessary data available in Manitoba?

RESPONSE

I do not know if all of the specific data used by SUFG to forecast headship rates, and conversely, the number of occupants per household, is available for Manitoba. The example provided was intended to illustrate one of many methods that are possible to develop a more rigorous method for projecting the number of households. Another example from an Indiana utility is to use population and personal income as drivers for the number of households. Yet another method is to use population within specific age groups.

Population projections from the Manitoba Bureau of Statistics provide population projections by age group, which can be very helpful in projecting the number of households.[1] For instance, if the population groups under the age of 17 grow the fastest, population growth will outpace household growth (children do not form their own household). Conversely, if the groups over the age of 55 grow fastest, household growth will grow faster than population (the elderly often have only one or two people per household).

Furthermore, commercial macroeconomic projections often include a projection of the number of households. For instance, IHS Global Insight’s macroeconomic projections for Manitoba include the number of households.

[1] http://www.gov.mb.ca/mbs/

PUB/CAC-Simpson/Gotham-3b

PREAMBLE

The report discusses the use of "headship rates" determined based on age, income, marital status, and the prior year's headship rate.

QUESTION

In the absence of a long-form census, what approach could be used to obtain such data?

RESPONSE

See response to PUB/CAC-Simpson/Gotham-3a

PUB/CAC-Simpson/Gotham-4a

PREAMBLE

The report states that "Manitoba Hydro projects the number of dwellings that use electricity for heating from a five-year average and then uses that as an exogenous assumption to the end use model. This nullifies one of the major benefits of end-use modeling, which is the ability to simulate the economic trade-off of different technologies and fuel sources based on the capital and fuel costs of the different options. Ideally the number of new dwellings would be an exogenous input and the fuel choice decision would be handled endogenously by the model."

QUESTION

Are you aware of the apparent continued trend in Manitoba towards electric heat in new construction?

RESPONSE

Yes.

PUB/CAC-Simpson/Gotham-4b

PREAMBLE

The report states that "Manitoba Hydro projects the number of dwellings that use electricity for heating from a five-year average and then uses that as an exogenous assumption to the end use model. This nullifies one of the major benefits of end-use modeling, which is the ability to simulate the economic trade-off of different technologies and fuel sources based on the capital and fuel costs of the different options. Ideally the number of new dwellings would be an exogenous input and the fuel choice decision would be handled endogenously by the model."

QUESTION

If this trend represents an economically irrational decision based on other, non-economic factors, would a model such as the one you propose still be reliable?

RESPONSE

It is likely that the trend is related to a number of factors, some economic and some non-economic. Manitoba has had a history of relatively low and stable electricity prices combined with high and volatile natural gas prices in the 2000s. While natural gas prices have dropped in recent years, Manitoba has yet to experience the electric rate increases that are projected for the future. Thus, it is likely that the perspective for some customers remains that electricity is cheaper than natural gas for home heating. Additionally, there is often a lag effect before the perception of both customers and developers catch up with a changing reality. This can be incorporated in the forecasting model using a lagged price.

Externalities, or non-economic factors that affect economic decisions, can also be a significant factor. These can be environmental considerations (if one source is viewed as more environmentally friendly than another) or a preference for the locally produced option. Externalities can be particularly important when the relative economics of the options are close. The value of these externalities will vary from customer to customer. As an option becomes more expensive, some customers will not being willing to pay a premium for non-economic factors.

In order to account for this in an end-use forecasting methodology, one would have to internalize the externalities (establish a dollar value as a proxy for the other factors). The costs associated with the preferred technology would then be adjusted by that amount. A statistically-adjusted end-use (SAE) approach is particularly well suited for this in that it incorporates the historical choices to the decision-making process in the econometric formulation. This obviates the need to exogenously determine the proxy for the externalities.

It should be noted that with significant electricity price increases, the reliability of an end use model in projecting the fuel choice for future end uses, even if

externalities are not captured, would be better than assuming that customers will continue to adopt the fuel at higher and higher prices.

PUB/CAC-Simpson/Gotham-5

PREAMBLE

The report discusses the Indiana experience with respect to general service customers, and the way intensity of use correlated to rising and declining rates.

The report also comments on the fact that Manitoba Hydro combines commercial and industrial customers and separates out the largest users, while Indiana uses commercial and industrial classifications.

QUESTION

Do you have any evidence that one system is actually more accurate than the other? If so, please elaborate.

RESPONSE

The distinction is intended solely to explain why the Indiana price elasticities provided as an example are on a different basis from the MH forecasting methodology. It is not a criticism of MH's approach of separating on the basis of large commercial and industrial (C&I) from small C&I. It is entirely possible that one method may be more appropriate in one jurisdiction while the other works better in another.

PUB/CAC-Simpson/Gotham-6a

PREAMBLE

The report suggests the use of regression analysis for general service top consumers.

QUESTION

Please comment on the limited number of data points (i.e., not that many top consumers) and its potential effect on the suitability of regression analysis.

RESPONSE

The output variable here would be the aggregate consumption of all customers in the category and the explanatory variables would be the appropriate economic and other factors (like gross domestic product). Thus, the number of data points is independent of the number of customers (there is a single consumption value for each time step regardless of whether there are 5 customers or 500).

The impact of having a small number of customers is experienced more in terms of the variability of the historical data. If there are few customers, a change in the consumption of a single one can cause a large change in the aggregate consumption. In general, this will be accompanied by a corresponding shift in an explanatory variable (if a customer halts production for an extended period, both the consumption and manufacturing output will drop).

The drawback associated with segregating the large customers is that there is likely to be a significant change in the future to one or more of those customers that will not be offset by changes at other customers. As the number of customers increase, the impact of the actions of an individual customer on the total is lessened. Thus, the setting of my thermostat can have a significant impact on my electricity usage, a small impact on the loading of the local distribution substation, and an immeasurably small impact on my utility’s total loading. This phenomenon is actually worsened by the use of trend analysis, where expected changes in the economic factors that ultimately determine the consumption of large customers are ignored.

PUB/CAC-Simpson/Gotham-6b

PREAMBLE

The report suggests the use of regression analysis for general service top consumers.

QUESTION

In light of references in other areas of the report to the Indiana experience, please elaborate on how Indiana forecasts top consumer or large industrial load.

RESPONSE

SUFG does not segregate industrial customers according to size. SUFG uses three customer classes (residential, commercial, and industrial) for each of the utilities in Indiana. The industrial customers for each utility are classified by industry type, such as “chemicals and allied products” or “primary metals.” There are 15 industry types.

SUFG uses an econometric model, INDEED, that was originally developed by the Electric Power Research Institute. The particular formulation of the model simulates the competition between four production factors (capital, labor, energy, and materials) for the projected manufacturing output of the sector.

SUBJECT:

Load Forecast

REFERENCE:

Simpson/Gotham report, page 8

PREAMBLE:

The report states that "there should be less concern about adjustments for weather (which are, in any case, of dubious value in the NFAT according to Elenchus (27-29)) and more concern about the limitations of the trend forecasting methodology."

QUESTION:

Please comment on the impact of Manitoba having a continental climate with extreme weather variations on this analysis.

RESPONSE:

A continental climate refers to the trend, i.e. wide seasonal variations in mean temperatures. These variations are along the annual trend rather than variations about that trend. There may be evidence that the variation about the seasonal trend are greater for a continental climate like Winnipeg, but I am not aware of it.

SUBJECT:

Load Forecast

REFERENCE:

Simpson/Gotham report, page 8.

PREAMBLE:

The report states that "It is also a puzzle why the load growth forecast for Manitoba (1.6%; NFAT, ch.4, p.12) exceeds the load
growth forecast for the U.S. (0.9%) despite similar population growth forecasts in Manitoba and the U.S. and higher GDP growth forecasts for the U.S. compared to Manitoba. This was not resolved in
the interrogatories."

QUESTION:

Please elaborate on the difficulty resolving this issue. What were you told the reason for this difference was?

RESPONSE:

Please see CAC/MH 168 a and b and 171. The issues include the important differences in forecasts between MB and the U.S., lack of adequate consideration of the recent trend (flat), and lack of consideration of the impact of rising real electricity prices.

PUB/CAC-Simpson/Gotham-9

PREAMBLE

The report states that "Hydro indicates that it does not pay attention to what is a fairly robust literature on the impact of prices on electricity demand from other jurisdictions."

QUESTION

Please indicate to what literature you are referring and provide a brief summary of the findings of such literature.

RESPONSE

The robust literature is primarily from the U.S. and a good reference is cited and used on p.9 of our report, i.e. "Take the U.S. estimates that a 10% increase in the price of electricity can be expected to reduce household load by around 5% in the long run (http://www.e3network.org/ElasticitySurvey2_matt.pdf)." The bibliography in that report provides a listing of a number of studies. In our view, there is no reason to believe that this U.S. evidence about consumer behaviour is not a useful guide to Canadian and Manitoban consumer behaviour in the absence of robust evidence of a local nature.

The elasticities provided on p. 9 for Indiana come from SUFG's modeling system (http://www.purdue.edu/discoverypark/energy/assets/pdfs/SUFG/publications/2013%20SUFG%20Forecast.pdf).

Please also see the response to MH/CAC 38.

PUB/CAC-Simpson/Gotham-10a

PREAMBLE

Electricity prices across North America vary wildly. For example, according to Hydro-Quebec's "Comparison of Electricity Prices in Major North American Cities 2013", in Detroit, residential rates are currently $15,54 cents per kWh, while in New York, they are 21.75 cents per kWh. In Edmonton, which has a similar climate to Winnipeg, rates are 13.90 cents per kWh."

Your report states that "Compounded annually, the projected 2% (real) increase in electricity prices over 30 years amounts to a whopping 80% increase in rates over and above general price inflation."

This would more or less bring rates in line with what Edmontonians are currently paying.

Your report further states that "Applying the U.S. price elasticity estimates, however, implies that the 80% increase in prices would reduce load by 40% (since a 10% price increase would reduce load by 5%), implying that load per household would actually decline by about 25% over the 30 years due to rising electricity rates.

QUESTION

Do you have any data on use per household or per customer in jurisdictions at different price points that quantifies your general criticism that the impact of price increases on use must be considered?

RESPONSE

Cities will differ in their electricity according to a number of factors, including price, the prices of competing energy, weather, etc. The price elasticity estimates the response of consumers to changes in the price of electricity, other factors held constant, which is not the case in a simple comparison of electricity usage in Winnipeg and Edmonton. In particular, incomes are higher in Edmonton than Winnipeg, which will raise consumption in Edmonton compared to Winnipeg, other factors held constant.

PUB/CAC-Simpson/Gotham-10b

PREAMBLE

Electricity prices across North America vary wildly. For example, according to Hydro-Quebec's "Comparison of Electricity Prices in Major North American Cities 2013", in Detroit, residential rates are currently $15,54 cents per kWh, while in New York, they are 21.75 cents per kWh. In Edmonton, which has a similar climate to Winnipeg, rates are 13.90 cents per kWh."

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QUESTION

Do you have any real-world examples that would back up the US price elasticity model to which you refer? For example, does the average Edmontonian use 3/4 of the electricity of the average Winnipegger?

RESPONSE

The declining intensity in the commercial and industrial sectors in Indiana (p.7) is a real-world example of the impact of price elasticity. Usage per unit of floor space in the commercial sector went from increasing by 2.4 % per year to decreasing by 0.4 % per year with increasing prices. Similarly, utilization in the industrial sector dropped with increasing prices.

PUB/CAC-Simpson/Gotham-11

PREAMBLE

The report states that "A consistent econometric approach to forecasting would solve this problem, but other statistical solutions to assess the within-sample reliability of the present forecasting method (Monte Carlo or bootstrapping approaches, for example) are likely feasible as well."

QUESTION

Please provide a brief explanation of the use of Monte Carlo or bootstrapping analysis to test within-sample reliability.

RESPONSE

The connected footnote states that "For any forecasting methodology where the data can be measured and characterized in terms of one or a series of empirical probability distributions, repeated draws from the distribution(s) can be used to measure the difference between the forecast and actual outcomes to assess forecasting error." This should be the case for any of the forecasting models used by Hydro. Monte Carlo simulations rely on a characterization of the underlying data generating process, while bootstrap methods rely on repeated random draws from the observed data.