Wednesday, July 20

In the morning, I met with Fred Martin. He mentioned that the load forecasting component of this project should determine if the load forecast has been conducted with due diligence, skill & care expected from an operation of this magnitude. We went over the scope of the project that I had produced. He thought everything on the scope should be examined, including the Strengths/Weaknesses & Suggestions for Improvement sections.

He explained the operational setup of NALCOR which includes:

1. Newfoundland & Labrador Hydro division
2. CFL Co. division
3. off-shore oil & gas division
4. Bull Arm fabrication division

Sam Banfield entered the meeting and explained some history of the electric consumers in Newfoundland. Newfoundland & Labrador Hydro (NL) serves large industrial & rural customers in Newfoundland & Labrador. Newfoundland Power (NP) is a distribution company that serves 90% of the Residential & General Service customers on the island. Currently, NL has only three large industrial customers: a pulp & paper mill in Cornerbrook, an oil refinery at Come by Chance and an iron ore mine. Historical, the large industrial class has been decreasing due to pulp & paper closures at Grand Falls & Stevenville. This trend is expected to change because a 640 GW.h smelter is being constructed by Vale.

In the afternoon, Fred took me to the NALCOR head office where I met with Paul Humphries (Division Manager, System Planning) and Paul Stratton (Manger, Load Forecasting). Mr. Stratton explained the forecasting process in general. Later, he gave me a copy of the 2010 NL load forecast and a load forecasting presentation made to management and we discussed the forecasting process in more detail.

NP retains the bulk of the Residential and General Service billing data & conducts customer surveys and load research. They produce their own five year forecast for revenue and budgeting purposes. NL produces a separate long term forecast of electric demand and energy requirements necessary to ensure adequate generation resources. The five years forecasts are compared for consistency, but the NL forecast is used for purposes of future generation planning.

The three large industrial forecasts are prepared individually by Paul Stratton. He has direct contact with these customers (i.e. not based on Key Account information). The 2010 industrial forecast includes 640 GW.h of new load for the Vale smelter based on contractual arrangements. This load estimate has been recently updated to 730 GW.h. , but is not included in the 2010 load forecast. The industrial forecast does not include any further large customer additions throughout the forecast horizon. Conversely, the long term forecast does not include a probability for the potential closure of the pulp & paper mill at Cornerbrook, which consumes 965 GW.h per year.

The Residential forecast is based on econometric/statistical modelling techniques. The Residential forecast is prepared in two stages. The customer forecast is based on housing starts (Department of Finance) and personal disposable income (Statistics Canada). The average use forecast is based on personal disposable income, electric heat market share, electric water heating market share and electricity price. Electric heat customers comprise 60% of the market and use an average of 19,500 kW.h per. Regular (non-electric heat) customers consist of wood (15%) and oil (25%) and use an average of 9,500 kW.h per year. The combined Residential average use is 15,000 kW.h per year. Electric heat growth is a significant factor to the overall load growth on the island. During the 1985-2000 time period, about 70% of new homes installed electric heating systems. Since 2000, the new home electric heat saturation has grown to the 80-90% range due to increasing oil prices.

The General Service load forecast is prepared using an econometric/statistical model for General Service customers with electric heat. The electrical energy is directly forecasted based on real gross domestic product (Statistics Canada) and commercial building investment (Department of Finance). General Service energy use for the non-electric heat class is assumed to remain constant throughout the forecast period. This load is added to the GS electric heat forecast to produce the overall GS forecast.

Overall, the Newfoundland economy has gone through some rough times in the 1990's with the closure of the fishery and many people seeking employment out-of-province. But since 2000, the economy has improved significantly with the expansion of Hibernia and the switch from the cod fishery to the more lucrative crab & shrimp fishery. This is reflected in the historical data where PDI and GDP were relatively flat during the 1990's and have increased significantly throughout the 2000's.

Thursday, July 21

In the morning, I decided to give Paul some time to gather the data requirements that I need to perform the NALCOR analysis. He needs to put quite a bit of information together before he leaves on holidays tomorrow. I spent my time organizing my research and preparing this communication document.

In the afternoon, I met with Paul again and we discussed the Residential and General Service regression equations in detail. The Residential models are based on annual, historical data from 1970 to present. This is quite a long estimation period in which the models seem to perform very well. The Residential average use model is the most important component of the Residential forecast. The regression has a R-squared of 99.8%, has no auto-correlation effect and all explanatory (input) variables are significant. The equation takes the following form:

$$Y=3.0723*X1+7963.5*X2-524.75*X3+0.0649*X4+0.008*X5-35.368*X6-617.91*X7$$

Where:

X1=Residential Market Share of Electricity * Degree Days Heating

X2=Residential Market Share of Electricity

X3=Marginal Price of Electricity for the previous year (t-1)

X4=Personal Disposable Income per Customer (2002$)

X5=Population of Newfoundland

X6=Technological Change Variable (Before 1981=0, 1981=1,….2010=30)

X7=Dummy Variable for 1982 Recession (1982=1, otherwise=0)

It should be noted that NF does not include any adjustment for DSM or Conservation Demand Management (CDM) as they refer to it. The technological change variable is their method of incorporating Demand Side Management. This variable has a coefficient of -35 per year, which means that the Residential average use in reduced 350 kw.h per customer over a ten year period. When this figure is multiplied by 253,900 customers in 2020, the load forecast is including 89 GW.h due to conservation effects. Paul indicated that most energy-efficiency programs will only realize 30-40% of estimated savings because the other 60-70% will be negated by increased electric heating requirements. Only building shell retrofit programs will realize 100% savings for electric heat customers. Of course, non-electric heating customers would realize 100% savings from all CDM programs.

The Residential customer forecast is based on housing starts and personal income per customer. This regression has an R-squared of 93.4% and shows no auto-correlation effect. This regression seems to perform well. It should be noted that this part of the regression equation is not as significant as the average use equation because a large variance of 1,000 customers would only create a 15 GW.h variance to the electricity forecast because each Residential customer only consumes 15,000 annually.

Once the total Residential customer forecast is prepared, the next step is to separate the customers into electric and regular (non-electric heat) categories. This is done through the estimation of two more regression equations. The first equation estimates the penetration rate or market share of electric heat for new customers. This equation has an R-squared of 88.5%. The second equation estimates the conversion rate of existing, non-electric heat customers to electric heat. This equation has an R-squared of 78.9%. The historical conversion rate can vary based on the stability in the price of oil. Most oil customers that converted to electricity installed electric baseboards and retained their oil furnace. In effect, these are dual fuel customers that can switch to or from oil based on the relative price of oil compared to electricity. In summary, the new customers are separated into electric/non-electric classes based on the penetration rate and existing customers are separated into electric/non-electric classes based on the conversion rate.

The Industrial forecast was also discussed. This forecast contains a constant 965 GW.h for the pulp & paper mill at Cornerbrook and a constant 250 GW.h for the oil refinery at Come By Chance. About 70 GW.h is included for an iron ore mine, but this load is removed from the forecast by 2013. The forecast also contains 640 GW.h for the Vale smelter. This load is staged in over the 2013-2015 period. The biggest risk in the long term forecast is the long term viability of the pulp & paper mill, but Cornerbrook

is a low cost producer and the risk is mitigated because no other large industrial loads are included throughout the forecast horizon.

Tomorrow, I will summarize the General Service model and fill in any holes or questions that I have. I plan to meet with Fred in the morning and give Paul some more time to create the data history and forecast files that I will require to complete my analysis. I will meet with Paul again in the afternoon. If I have time, I may try to meet with Ron Crane, who is responsible for the forecasting process at NP. Customer surveys and load research are done by NP staff, but this data is not being used in the long term forecast prepared by NL and is therefore not critical for my analysis.

See you when I get back. I will signoff based on my nickname given to me by my Costa Rican cohorts.
Mucha Grande Expertito