

MISG Project: Calculation of Risk Multiplier for Net System Load Profile

About Integral Energy

Integral Energy's Retail business provides electricity to customers by purchasing wholesale electricity from the National Electricity Market ("NEM"), and on-selling this at a margin to retail customers, who vary greatly in terms of load demanded. By purchasing electricity at wholesale prices from the NEM, and selling retail electricity to customers, Integral Energy incurs a commodity price exposure equal to the difference between its purchase price for electricity from the NEM, and its sale price to its retail customers. Integral Energy uses the electricity hedge market, customer contract management, the Electricity Tariff Equalisation Fund ("ETEF"), and market forecasting to reduce its exposure to electricity price risk.

1) Electricity Hedge Market

Integral Energy operates in the electricity hedge market, to offset its physical exposure to the NEM. This is achieved by entering into financial hedges, such as swaps and options.

2) Customer Contract Management

Through ongoing management of its contractual arrangements with new or existing contestable customers, Integral Energy seeks to reduce its electricity price exposure at the customer level.

3) Electricity Tariff Equalisation Fund ("ETEF")

Integral Energy is a participant in ETEF, a NSW Government fund which provides a financial hedge between NSW State-owned generators and retailers, by offsetting their exposure to the prices for sales and purchases of electricity, respectively, against each other.

4) Market Forecasting

Electricity market forecasting assists Integral Energy in optimally managing its electricity price exposure. Forecasting is carried out for electricity load to retail customers, daily temperatures, and spot electricity prices.

This project is concerned with the customer contract management component of Integral Energy's electricity price risk management strategy. The NSW state government regulates the prices that retailers can charge default customers for their electricity consumption. The resulting default tariffs do not account for any net system load profile ("NSLP") differences between retailers. Integral Energy seeks to develop a means of quantifying the relative risk differences between the NSLPs of electricity retailers.

Problem Outline

The Independent Pricing and Regulatory Tribunal (“IPART”) regulates the prices electricity retailers can charge their default customers. This regulation takes the form of a default tariff. Currently, IPART considers the NSLP of each standard retailer, and any projected future changes in these NSLPs, before setting tariff levels for default customers.

In the process of constructing the default tariff, IPART assumes that the cost of purchasing energy is equal for all retailers. IPART also makes no allowance for hedging costs, which will vary depending upon the NSLP of the electricity retailer. If one retailer has more NSLP volatility than other retailers, their hedging costs for default customers will increase. Under the current default tariff structure, these increased hedging costs become an unrecoverable expense.

The aim of this project is to explore the volatility of Integral Energy’s NSLP, relative to that of other retailers, with a view toward developing a risk multiplier that accurately and reliably quantifies the volatility differences between NSLPs.

A one-week sample of NSLP data is provided in Figure 1. The data is from the week commencing 4th December 2005, and features both the actual and expected NSLP for Integral Energy, Energy Australia and Country Energy, measured in megawatts (MW). The grey bands represent 95% confidence intervals for the expected NSLP. The expected and actual Bankstown temperature is also provided, again with 95% confidence bands for the temperature forecast. The NSLP features to be examined are the peak loads, price and demand correlation, temperature effects and the daily load volatility.

1) Peak Loads

The sample NSLP for Integral Energy displays much higher peaks (or lower load factors) when compared with Energy Australia and Country Energy. These daily peaks are persistent in the data, and have the potential to become more pronounced during extreme temperatures.

2) Price and Demand Correlation

Periods of high demand are typically accompanied by spikes in the spot electricity price. These extreme events are expected to lie outside of the confidence intervals for the NSLP forecast. On Wednesday in Figure 1, the Bankstown temperature went well above the 95% confidence interval, and was accompanied by a large increase in electricity demand. This event impacted most directly on the NSLP for Integral Energy, reflecting a higher level of correlation between their NSLP and peak demand periods, relative to the other retailers.

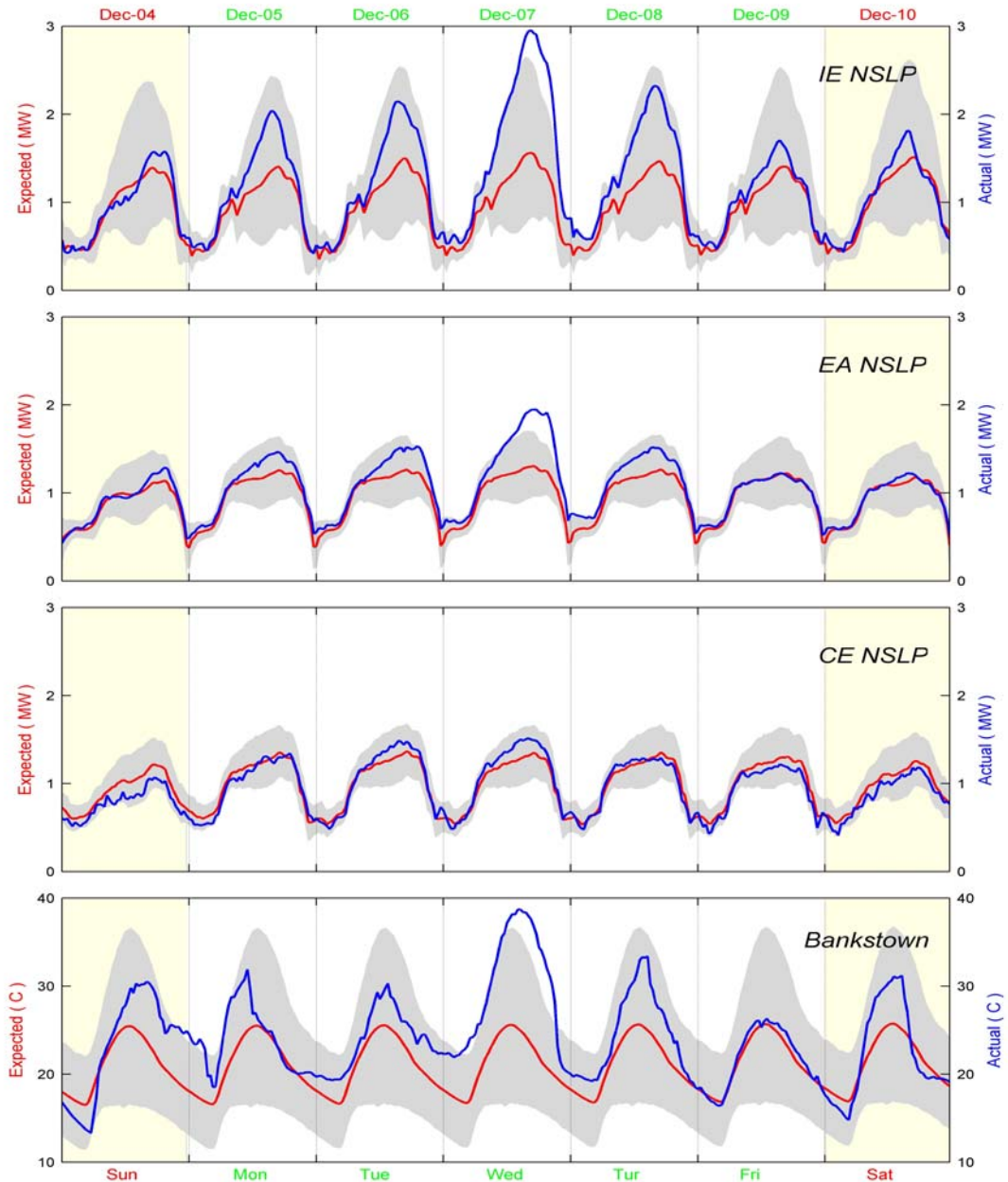


Figure 1 - Comparison of volatility of (volume normalised) NSLPs for early December 2005

3) Temperature Effects

Hot and cold periods produce an increase in electricity demand. The longer these periods last, and the more extreme their values, the greater the impact on demand will be. Default customers are assigned to retailers based on geographical location e.g. Integral Energy services default customers in western Sydney, whilst Energy Australia has default customers from the Sydney CBD. The difference between coastal and inland temperature behaviour can be quite significant. Table 1 provides some sample statistics for Sydney CBD and Penrith temperatures, in December 2005. These differences

in temperature extremes and persistence will have a direct influence on the NSLP of each retailer.

December 2005	Sydney		Penrith	
Daily over the month	Min	Max	Min	Max
Mean	18.9	28.6	17.0	32.7
Lowest	15.3	22.9	11.8	24.9
Highest	23.3	39.0	22.0	40.1

Table 1 - Temperature differentials December 2005

4) Daily Load Volatility

The confidence intervals for Integral Energy' NSLP, shown in Figure 1, are substantially wider than those for both Energy Australia and Country Energy. The actual NSLP profile of Integral Energy also has a tendency to deviate from the expected value far more frequently than for the other two retailers. This indicates strong evidence of persistent NSLP volatility, which Integral Energy will need to hedge.

Assuming that the data in Figure 1 is typical, it is apparent that Integral Energy has a much greater level of volatility which must be managed, relative to Energy Australia and Country Energy. This will introduce hedging costs that will place Integral Energy's cost of electricity for default customers higher than for other retailers. These costs will come at the expense of Integral Energy unless the default tariffs are adjusted to compensate for the level of risk that is inherent in Integral's NSLP.

Desired Outcomes

The goal for Integral Energy is to develop a risk multiplier for the default tariffs, such that the tariff levels can be accurately adjusted to reflect the NSLP volatility risk that retailers need to hedge. This will involve an analysis of the historical NSLP data for volatility levels, and the development of a risk multiplier.

1) Establish Differences between NSLPs

The historical NSLP data must be analysed to statistically determine the extent to which Integral Energy's NSLP differs from the NSLP of other retailers, such as Energy Australia and Country Energy. An assessment of the relative volatility levels for each NSLP is also required.

2) Risk Multiplier

Once a measure for NSLP volatility is established, a risk multiplier is to be developed. This risk multiplier should be based upon the relative differences between the historical volatility of various retailers. A well-defined risk multiplier, when applied the default tariffs currently assigned by IPART, will introduce a risk premium that correctly compensates the retailer for any NSLP volatility exposure they bear above the market average.