Paper 335-2007

SAS® Application in a Deregulated Electric Retailer

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ABSTRACT

SAS® applications are theoretically endless. Currently at Reliant Energy, SAS® is being used for various levels of electric load forecasting both short term and long term, projecting electric shapes in pricing of competitive deals, and data mining various data bases for various reporting functions. This paper gives a high level overview of these functions and how they interface with various data bases.

INTRODUCTION

The purpose of this paper is to expose the reader at a high level how SAS® can be used for electric load forecasting by a retail provider in a deregulated electric market. The paper shall explain some general differences between the regulated utility and the deregulated electric market from the view of the load forecasting desk. In addition, the challenges of applying SAS® applications to forecasting hourly load both long term and short term and the potential financial risk shall be discussed.

ELECTRIC MARKETS

There are two basic distinct electric markets, the regulated and the deregulated.

Regulated Electric Market

In the regulated electric market, an integrated utility is a company which owns power plants, the transmission and distribution wires that distribute the power, and the retail functions to market the various approved electric rates to the public. The integrated utility must file with the appropriate regulating body for approval of the utility rates. In Texas, this regulating body is the Public Utility Commission of Texas (PUCT). Prior to deregulation in Texas, a rate filing package was prepared by the integrated utility and filed with the PUCT. The PUCT then assigned the case to a presiding judge who held hearings for all interested parties. The integrated utility made its case for certain rates to obtain projected revenue based on the allowed rate of return. The PUCT staff and other interested parties made recommendations on how the rates needed to change based on their point of view. After hearing testimony from both sides, the judge made a recommendation to the PUCT. Once the PUCT ruled on the case, rates or prices of electricity to the consumers were set. So for the integrated utility, there is a stable expected revenue stream based on an approved rate of return.

Deregulated Electric Market

In the deregulated electric market, the rules are considerably different depending on the jurisdiction. The basic idea of deregulating electric markets is to introduce competition which expects to translate into reduced electric prices and numerous service options for consumers. In 1999, the Texas Legislature passed a law to create the deregulated electric market in Texas. According to this law, the transmission and distribution functions (referred to as the wires companies) are still regulated in the same way as described above for an integrated utility. The law also dictated that the generation and retail functions of the business become competitive. The power generating companies are allowed to connect to the electric grid which is owned by the wires companies. There is no guaranteed rate of return for the power generating companies. In order to obtain revenue, the power generating companies must procure bilateral contracts with the retail electric companies or sell into the spot market. The retail electric companies market electric service to the consumers. There is no guaranteed rate of return for the retail electric companies. Because of the lack of a regulated rate of return, an investor may find that the power generating and retail companies carry more risk as an investment. The power generating and retail companies must manage their costs very carefully always being aware of changing fuel costs or lower competitor pricing.

The difference in the market structure and risk between the regulated and the deregulated electric providers causes quite a difference in forecasting requirements. It is in these forecasting requirements that SAS® can become a key tool.

FORECASTING

There are distinct differences in forecasting in the regulated and the deregulated electric markets.

Forecasting in a Regulated Electric Market

Houston Lighting & Power Co. (HL&P) was the integrated utility from which Reliant Energy was created after deregulation. Forecasting at HL&P for a rate filing package mostly included projecting total monthly customer counts by rate class, projecting the total energy use by rate class and projecting the system electric grid peak demand and how that demand was divided into each rate class (by type of customer.) Residential and small commercial are both rate classes. Forecasting in general for an integrated utility is a top down approach at the rate class level. Top down means that the forecast is at the highest level as compared to many lower level forecasts that are then aggregated to the final or top level. Projected revenue is calculated using the rate formulas by rate class to project revenue that would allow a rate of return on costs which is allowable by the regulating body. Certainly there is a degree of pressure on the forecasting personnel to be accurate and clear so all intervening parties can accept the reasonableness of the forecast methodology. However the growth and changes in the electric usage patterns within customer rate classes over time occurs slowly. In addition, the calculations at rate class level are considered to be at aggregate level and are relatively few when compared to the calculations for forecasting in a deregulated market.

In addition, the frequency of filing a cost of service rate case before the regulating body depends on the rate of change in the overall rate of return for the corporation. If costs such as fuel or capital expenditures to build new power plants are escalating, then there may be three or four years between rate cases. If expenses and expenditures are stable, then it could easily be a decade before the next rate filing is necessary.

To recap, forecasting in a regulated electric market is done with few high level aggregate rate class levels and performed infrequently, with the potential for years between filing for rate changes. It is true there are other forecasting needs in an integrated utility but, for now; let's consider this primary forecasting requirement since it relates to the main revenue stream.

Forecasting in a Deregulated Electric Market

In contrast, forecasting for a retail company in a deregulated electric market is quite different. First, forecasting is performed at many levels. Some examples of these different levels include: the total load of the corporation; total load product type; load based on corporate structures such as responsible divisions; and customer deal level when pricing an offer to a customer. Note that forecasting load at lower level forecasts and then aggregating to a total may allow the possibility of additional error. In other words, a top down forecast shall usually provide less error than many lower level forecasts that are aggregated to the top level of granularity.

Rate of return is still of great concern in the deregulated market. Forecasts are therefore performed several times a day depending on the level of forecast. For example, in the Texas deregulated market, there are four congestion zones where supply and load must be scheduled daily with the Independent System Operator (ISO). In Texas, the ISO is named Electric Reliability Council of Texas or ERCOT. ERCOT has various rules on settling the load between market participants so as to have a fair and healthy market. . The balancing energy market is where retail companies that have not procured all the supply needed to exactly cover their load can procure additional supply from ERCOT. Balancing energy prices are cleared every fifteen minutes. For example, the market clearing price of energy (MCPE) in the balancing market could be $60 per MWhr. MWhr is a mega-watt hour which is a unit of electric power. Suppose the corporation was short in the balancing market and the scheduled amount was lower than the settled amount by 100 MWhr over the hour. This would cost the corporation 100 MW times $60 per MWhr or $6000 for one hour to clear in the ERCOT financial clearing process. If the corporation does not plan for this risk exposure then one can see that being short for an extended amount of time would be highly costly to the corporation.

An additional risk in this equation is that market conditions can change in an instant. Several large power plants could trip due to bad weather and then the MCPE, could rise to $1000 per MWhr. The example above would be $100,000 of cost instead of $6,000. Companies have gone bankrupt quickly in the deregulated markets when their risk was not appropriately hedged. The degree of pressure on the forecasting personnel to be accurate is far greater in deregulated markets than in regulated markets. And the pressure is constant during every interval of every day and not just when the corporation is preparing a rate filing package for the regulating body.

Other expenses are also apt to change in the near term such as fuel or purchased power. In ERCOT, as the price of natural gas changes so does the cost of electricity since incremental generation in ERCOT is produced using natural gas as fuel. Having an accurate forecast facilitates the management of the long term hedge position with procured fuel and purchase power contracts.

The stability of the customer population is another area of constant concern. A competitor can launch an advertising campaign with a large price incentive and cause significant changes in the customer population and mix of customers. This constant concern for the forecast is never ending and goes on every hour of the day. So where there is stability and slow change in the regulated jurisdiction, all bets are off in the deregulated.

SAS® Applications in a Deregulated Electric Market

SAS® is versatile and robust with modeling capabilities coupled with ease of learning. Therefore, it is a logical choice for a forecasting application. First, and perhaps foremost, is the time series solution to forecasting the load for the retail position now, next hour, rest of day, tomorrow, next year and beyond based on the committed contract periods. The daily forecast may be refreshed many times a day as new refreshed weather or market conditions dictate.

Using several approaches time series load forecasting gives one the comfort one gets from getting a second and third opinion from a doctor. If they all say the same thing, then there is more confidence in the outcome. Where there is divergence, then there is doubt.

Minimizing the doubt and increasing the confidence in the forecast is accomplished by after the fact measurement of performance. This is usually in the form of mean absolute percent error (MAPE). Evaluation of where the variance is greatest can yield where there is weakness in the collection of various subroutines in the forecast system. Focusing on the largest variance contributor first gets the biggest bang for the buck in total error correction. Note that the analysis of after the fact data to determine MAPE can also be a considerable collection of SAS® routines.

The raw data of the forecast is always of interest. The old saying garbage in and garbage out is true. With the fast never ending demands for time series load forecasting the screening of data upstream or cleaning the data is prudent. Significant gaps or anomalies in the data can cause severe model performance error.

Without revealing any trade secrets, let's examine parts of the short term forecast. It consists in part with the model structure, model coefficients, the weather inputs, customer count estimates, perhaps usage factors for size of customer compared to some standard load shaping module. There are volume weights to consider as well as the intangible unknown error. If by chance the intangible unknown error appears as a systematic bias, then it is prudent to overlay a manual adjustment to the forecast. SAS® is not only helpful with combining all this information into a solution but can be used to graphically display the results in a wide array of presentations to provide insight for the manual adjustments.

The long term forecast has a bit of a different twist. Forecast weather is generally not available beyond 7 days. This leaves the forecaster with the problem of making a normal weather scenario to project the future portfolio position. Again, multiple forecasts can provide that comfort that your forecast is accurate when they converge.

The pricing desk really needs a mini-long term forecast of each deal or premise in order to price the time series load data against time series cost data plus a margin factor for profit and expenses. All the same parts of the time series load forecasting techniques are used for the pricing desk but just applied at a much lower load level.

SAS® is also an important tool in data mining where it is used to query a data base and derive a report. SAS® is well equipped for this function as well.

Why use SAS® in a deregulated electric environment? Because combining a versatile, flexible, and robust tool with innovative and creative minds can provide efficiencies that keeps a company one step ahead of its competitors. Competitive advantage comes from managing all the information effectively at least cost for highest return. SAS® can be part of that solution.

Because of the constant pressure to recruit new customers, keep existing customers, and provide supply with least cost, the overall cost of power in a deregulated market is minimized. This translates to the consumer in lower prices. This lower price benefit is often hard to see from the consumer view point when fuel costs are driving up the power bill. But if the fuel prices were to be stable and flat for a long time, then the winners and losers in forecasting best practices would surface in the offered prices. Naturally the consumer would migrate to the lowest cost supplier or the best value products.

CONCLUSION

SAS® with its versatility allows the forecasting department to gather data from virtually any data platform, verify and clean the data, develop models and model coefficients, and build various scenarios at any load level or combination needed. Innovation and creativity of applications are endless. The need for accurate forecasting in the deregulated

market is far greater than in the regulated utility due to the greater level of change and risk encountered in the deregulated environment.

REFERENCES

Podraza, Ernie. 2006. *Challenges in Forecasting Electric Load in Deregulated Markets.* The Journal of Business Forecasting. Fall 2006.

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