Buying Electricity in a Time Differentiated Market—ASP Presentation Outline

The intent of this lesson is to provide information and skills to the attendees who have demonstrated an interest in real time pricing as a means to reduce farm electricity costs.

Slides 1 through 4: Introduction. The presenter introduces self and points out that while the topic is a bit complicated, it will be worthwhile to understand how we got here and how it all works. There may be cost savings to be enjoyed if attendees are willing to understand the process and put effort into being informed about energy pricing patterns. The introductory slides outline the module's content, the topics covered, and the learning objectives.

Slides 5 through 8: The development of deregulation. The author is of the opinion that an understanding of how and why we now have a deregulated electricity supply will aid the development of overall understanding for the training audience. Many states have deregulated the electric supply (generation) portion of their electric service. Transmission and delivery services continue to be regulated.

Slides 9 through 12: The major electricity billing components under deregulation. Slide 12, in particular, compares the billing components before and after deregulation.

Slide 13: Simple graphic of the "supply," "transmission," and "distribution" components of the electricity system.

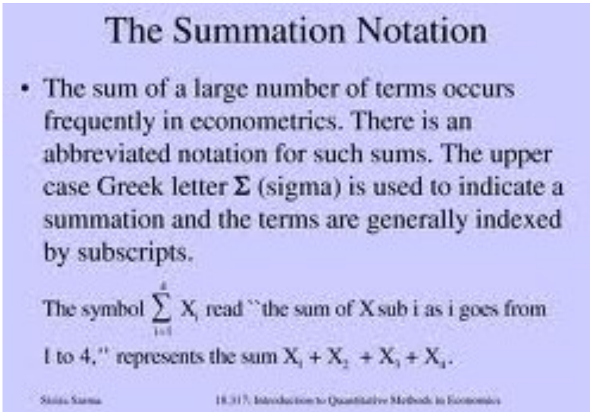
Slide 14: Map of the U.S. indicating the participation in deregulation.

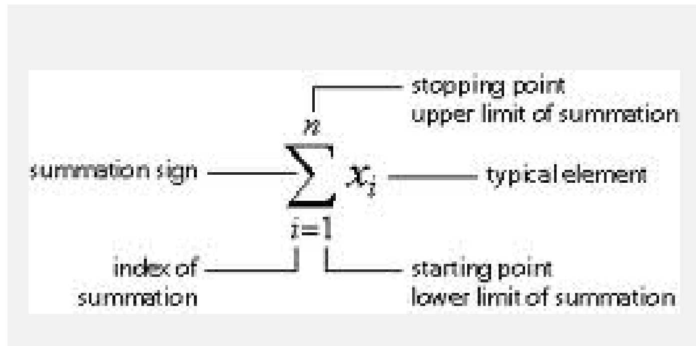
Slides 15 through 17: The effects of deregulation on the generation or supply portion of the electric system.

Slide 18: Introduces the "time differentiated" aspect by providing the Wikipedia definition. Ask the audience what items they can think of for which price varies with time. (e.g., Produce is more expensive when it is out of season. Heating oil distributors often offer discounts if you fill your oil tank in summer.)

Slide 19: Introduces electricity units that are not typically used on an end user bill or account. Kilowatts (kW) and kilowatt-hours (kWh) are the usual billing units for retail electric customers. Megawatts (MW) and megawatt-hours (MWh) are the usual units of measure for utility level loads. Hence, when day-ahead prices and high level load shapes are discussed, the Mega-prefix needs to be familiar. The price to compare may be shown on electric bills as, for example, 7¢ per kWh. The day-ahead market is priced on a per megawatt-hour basis. The conversion factor from MWh to kWh is 1,000. And 100 cents per dollar. So just multiply the cents per kWh by 10 to get $/MWh. Or, to go the other way, divide by 10; $50 per MWh converts to 5¢ per kWh.

Slides 20 and 21: Illustrate the hourly nature of the billing calculation in order to further the understanding of hourly pricing. The use of the summation symbol, sigma (Σ) on the tariff page requires some explanation. Although it is not particularly complicated, it adds to the apparent mystery of the billing calculation. Explanation of the summation follows:





All hours in the billing period, on average 730 hours per month, are included in the monthly calculation. Thus, the starting point for the summation is hour 1 (i=1), the first hour since the prior month's meter reading, and the stopping point is the number of hours since the meter was last read. A month has about 730 hours in it, so "n" is usually around 730. (There are 8,760 hours in a non-leap year. Billing is monthly so 8,760/12 = 730)

Slides 22 and 23: Graphic representations of load variations for summer and winter seasons. The graphs display the electric load at utility level for average days of summer and winter. These are intended to clarify why price changes due to changes in demand for the electric generation. The concept of economic dispatch of generation assets should be reserved until the variable load (demand) concept is understood. But it is important to point out that the highest priority of the Independent System Operator (ISO) is reliability. This means that there must be sufficient electric generation to serve the total electric load at all times. To help ensure this availability, the electric load is forecasted, and reserve capacity is added to the forecasted load. In doing so, reserves are available to serve any unexpected electric load. There are also programs in place to encourage large electric customers to reduce their load upon request if there is a shortfall in electric capacity (often called load curtailment). By reducing load or increasing available capacity, the result is the same; the lights stay on!

Slide 24: Changes in generation costs during the day. Just as mass transit prices are higher during peak ridership hours (higher demand) and some fruits and vegetables are more expensive when they are in lower supply (out of season), supply and demand affect electricity prices. The ISO conducts auctions annually to acquire sufficient generation to reliably serve the forecasted load at the lowest price. Each electric generator wishing to participate in the market submits bids detailing capacity they are willing to provide and the minimum price at which they will provide it. During the auction process, the ISO accepts the lowest bids first. They accept additional bids at higher prices until the entire load forecast is met. In doing so, the overall electric load is served at least cost. This is based on the concept of "economic dispatch." If you ran a taxi company, you would use your most economical taxis as much as possible, dispatching less economical taxis only during periods of peak ridership. This method helps you control costs. The point here is that you want to use a taxi or buy more electricity during peak periods only when you have to.

Slides 25 and 26: Local, day-ahead prices for March 31, 2014. This day is a dramatic portrayal of morning peak prices. The peak price for the day is nearly three times the lowest price of the day. Minimizing your electric use between 6 a.m. and 9 a.m. reduces the impact of the peak price. From the PJM ISO data, the price for the hour ended 8 a.m. was $92.42 per MWh or 9.242¢ per kWh. The average price for the day was $42.61 per MWh or 4.261¢ per kWh while the minimum price was $31.27 per MWh or 3.127¢ per kWh at 3 a.m.

Slide 27: Map of U.S. Independent System Operators (ISOs)

Slide 28: Describes the use of the farmer's electric meter to quantify his use of electricity on a daily basis. It recommends that the farmer read the electric meter multiple times a day so that he will know how electricity is used on the farm. The concept being: read the meter often! Preferably at whole hour intervals, and note the electricity consuming equipment that was operating during that same interval. In this way, the large electricity consumers are identified and can be considered for load shifting away from the daily peak period(s).

Slide 29: A depiction of an electric meter reading log showing readings at three hour intervals. You can try this as a first effort because it doesn't require such frequent readings as hourly readings do. After the three hour reading results are reviewed, hourly readings will probably be needed based on large energy use intervals and high prices during those intervals. If such a coincidence does not occur, purchasing energy in a time differentiated market (hourly pricing) may not be worth the effort it requires. Sometimes analysis produces that result. If you can't "beat the average" by enough to justify the effort, it is an important fact to know. Summarizes the meter reading and log-keeping process.

Slide 30: Describes an electric bill reduction strategy. For example, if an electric pump is used to fill watering tanks or to irrigate, perhaps the peak price period can be avoided. If a five horsepower motor operates such a pump, it will consume about 0.746 kW per horsepower, times 5 horsepower, times one hour or nearly 4 kWh for each hour it operates. For 30 days, that is 120 kWh. If those kWh are moved from the peak hour to an average hour, the price per kWh is reduced: (9.242¢ per kWh to 4.261¢ per kWh) by about 5¢ per kWh. This one change may reduce the electric bill by about $6 per month. Keep in mind that the price curve for electricity changes daily, although the change between week days and weekend days may be a short term variable.

Slides 31 and 32: Sample calculation that uses actual hourly energy use, the price to compare, and the hourly variable generation price to estimate savings that may be available through variable generation rate service.

Slides 33 and 34: Strategies to reduce an electric bill, encouraging the farmer to read his electric meter to determine the farm's electric use pattern. He can then compare that information to hourly pricing information. That comparison will establish if sufficient savings would be produced by rearranging electric use so that the operation uses fewer kWh at or near peak daily prices. The goal here is to "beat the average" by buying the fewest kWhs at peak prices.

Slide 35: Summary of the process of learning how you use electricity and how to calculate a comparison of fixed versus variable generation rates.

Slide 36: Reference links to the day ahead pricing files of PJM. PJM is the Independent System Operator (ISO) of the region where West Penn Power operates as an Electric Distribution Company (EDC). It also provides links to the New England ISO and New York ISO where pricing information may be found.

Slide 37: Placeholder for questions.

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