Farm Energy IQ

Buying Electricity in a Time Differentiated Market—Farmer 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 their 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 and 10: The major electricity billing components under deregulation. Slide 10, in particular, compares the billing components before and after deregulation.

Slide 11: Graphic of the "supply," "transmission" and "distribution" components of the electricity system.

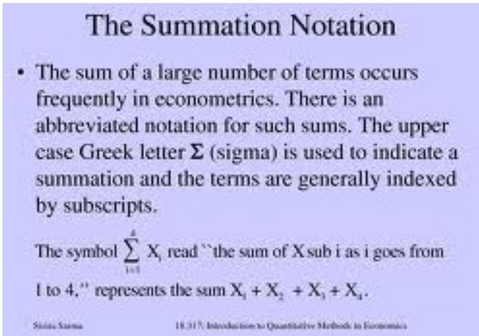
Slide 12: Map of the U.S. indicating the states participating in electricity deregulation.

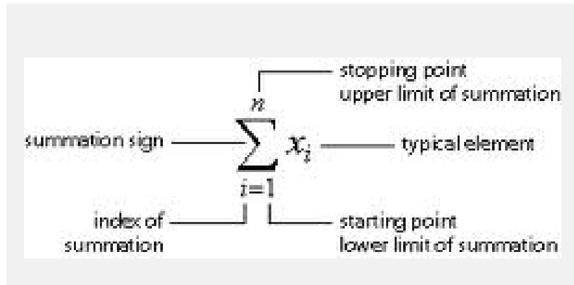
Slide 13: Goals of deregulation on the generation or supply portion of the electric system.

Slide 14: Introduces the "time differentiated" aspect by providing the Wikipedia definition. Ask the audience what items they can think of where the price varies with time. 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 15: Introduces electricity units that are not typically used on an end user bill or account. Kilowatt-hours (kWh) and kilowatts (KW) are the usual billing units for retail electric customers. Megawatt-hours (MWh) and megawatts (MW) 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 kilowatt-hour. 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 kilowatt-hour by 10 and you have dollars per MWh. Or, to go the other way, divide by 10; $50 per megawatt-hour converts to 5¢ per kilowatt-hour.

Slides 16 and 17: 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, (somewhere between 720 and 768 hours per month), are included in the monthly calculation. (For a 30 day month and 24 hours per day, that would be 720 hours or, 8,760 hours per non-leap year divided by 12 months = 730 hours.) 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.

Slide 18: Summarizes the change in electric price for electricity over time.

Slides 19 and 20: Graphic representations of load variations for summer and winter seasons. Their use here is to 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 (Slide 21) 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 load upon request if a shortfall in electric capacity occurs. By reducing load or increasing available capacity, the result is the same; the lights stay on!

Slide 21 displays the 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 satisfied. 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.

Slide 22: 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 23: More information about regions and pricing.

Slide 24: Map of U.S. Independent System Operators (ISOs)

Slide 25: Describes how a farm's electric meter can be used to track daily electricity consumption. It recommends that the farmer read the electric meter multiple times a day to learn how and when 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 26: Depicts an electric meter reading log showing readings at three hour intervals. You can try this as a first effort because it doesn't require fewer readings than 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. Sometimes analysis produces that result. If you can't "beat the average" by enough to justify the effort, that is an important fact to know.

Slide 27: Introduces variable pricing. 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 (hp) motor operates such a pump, it will consume about 0.746 kW per horsepower, times 5 hp, 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.

Slides 28 and 29: Sample calculation using 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. Slide 29 also provides links to Pennsylvania information. Slide 33 provides links to all the ISOs in the Northeast.

Slides 30 and 31: Strategies to reduce the electric bill, encouraging the farmer to read the electric meter to determine the farm's electric use pattern. He can then compare the information to hourly pricing information to establish if sufficient savings would be produced by rearranging electricity use to buy 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 32: Summary of the process of learning how you use electricity and how to calculate a comparison of fixed versus variable generation rates.

Slide 33: Reference links to PJM, the New England ISO, and the New York ISO where pricing information may be found.

Slide 34: Questions.

This project supported by the Northeast Sustainable Agriculture Research and Education (SARE) program. SARE is a program of the National Institute of Food and Agriculture, U.S. Department of Agriculture. Significant efforts have been made to ensure the accuracy of the material in this report, but errors do occasionally occur, and variations in system performance are to be expected from location to location and from year to year.

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