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Utility Metering: Measure When and How Much? - By Patti Harper-Slaboszewicz

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For the past few years, automatic meter reading equipment suppliers, utilities and analysts have driven home the message that the benefits of AMR extend beyond metering and customer service. Utilities have clearly heard the message and business cases from all industry segments are incorporating benefits from a wide array of business units within utilities.

But, that's only half the story. Utilities have a mandate to serve customers with reliable delivery of electricity, water and natural gas at a price consistent with the cost of the provision of that service. AMR could significantly lower the electric bills of customers and increase reliability if customers were only given the opportunity to manage their energy use depending on how much it costs to provide the energy.

Not the 1980s Again, or Deregulation

For those who have been in the industry for a long time, this message probably sounds like a rerun of the 1980s when time-of-use rates came of age for higher consumption customers. It isn't though. For the moment, we need to move to the other side of the equation, and put aside the utility/grid operator concern of reducing the peak load. Instead, let's think in terms of how a utility might help customers lower their bills, and give customers a chance to choose not only how much energy to purchase but also when to purchase energy.

The putative advantages of deregulation for small customers have typically depended on the ability of retail suppliers to obtain energy and sell it profitably. Conventionally, retailers could not identify customers who were less expensive to serve, based on their load profiles, as the available metering only provided the total usage for the billing period. Even if a customer were less expensive to serve, in the conventional model the retailer would still be charged as if the customer had an average residential or small commercial energy profile. Installing advanced metering then in the deregulated market by a competitive supplier would have allowed the small customer's rate to be based on the actual cost to serve. However, this option would prove too expensive for the competitive retailer since its customers would likely be scattered across a service territory.

An Example: Co-op in New York City on Real Time Pricing Rate

If smaller customers were presented with a time sensitive rate, would the customers pay attention, and would the customers save money?

An interesting example of residential customers adjusting to time-sensitive energy prices is occurring in a co-operative building—a tenant-stockholder housing corporation—in the Central Park West neighborhood of New York City. The co-op has a master meter, and there are 50 submeters, one for each of the 48 apartments, and two for metering in the public spaces. The co-op, working closely with Energy Information Services (EIS), the cooperative's consultant and Peter Funk, an officer of the cooperative and a partner at the law firm of Thompson Hine, underwent extensive negotiations and discussions with the New York Public Service Commission, Consolidated Edison (ConEd), the New York City government, and the New York State Energy Research and Development Agency (NYSERDA). They secured the right for the building to receive electric service under a Real Time Price (RTP) basis [ConEd Rider M for SC-8 (master metered buildings)].

ConEd's RTP tariff results in a rate for the co-op building that consists of two major components: the energy rates based on the day ahead market (DAM) administered by the New York Independent System Operator (NYISO), and a demand charge based on the maximum 30 minute demand of the billing period. The demand charge comprises anywhere from 25 to 35 percent of the co-op building's cost of electricity.

In this scenario, Comverge provided the metering equipment, and NYSERDA provided funding to cover half of the equipment costs. There is one master meter, capable of recording hourly interval data, and the submeters for the apartments communicate with the master meter using power line carrier signals. The interval master meter was installed in June 2002, and advanced interval submeters for the apartments and public spaces were installed in April 2003. In October 2003, ConEd began billing the co-op building under its RTP tariff. NYSERDA recently declared the co-op project a success, and has authorized EIS to expand the project to develop additional RTP demonstration projects.

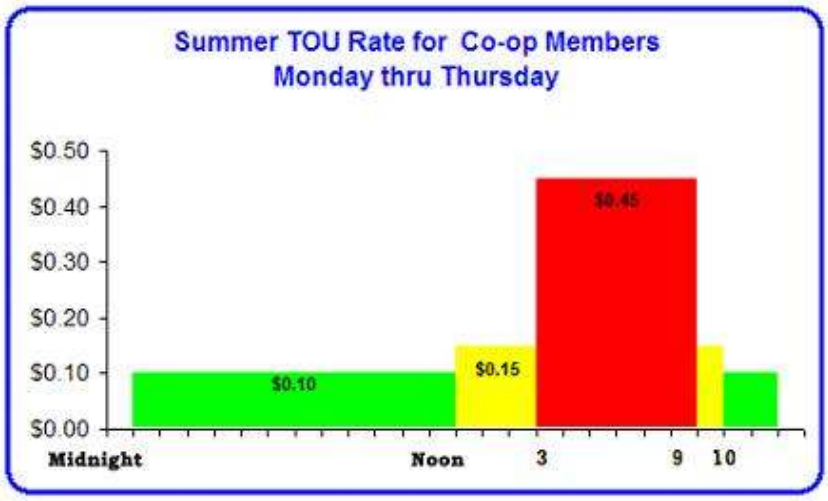
According to Lewis Kwit, president of EIS, placing the order for the metering was intimidating, even with NYSERDA picking up half the cost. At that point, despite modeling the comparative rates, it really was not clear if the co-op building bill would be less under the RTP tariff than it had been on the SC-8 wholesale rate for master metered buildings. However, as Peter Funk said at the end of a detailed presentation to the co-op members, "If we are not willing to lead by example to demonstrate the benefits of RTP, who will?”

Since no other co-op (or any other customer of ConEd) had sought to purchase RTP under ConEd's Rider M, the co-op board had required Peter Funk to thoroughly examine the concept and available facts prior to their supporting the project. His main point was that RTP power should cost no more than the building was then currently paying for electricity but offered the opportunity to achieve substantially reduced costs and achieve other external benefits to the extent that co-op members could reduce (and shift) on-peak usage. Fortunately, the project gained co-op board approval, the metering was installed, and EIS began collecting and analyzing the hourly data for the building.

The next step was to design a pricing plan for co-op members that would not only save them money, but would be easily understood by the membership. This meant that while the building was on a real-time pricing rate with ConEd the co-op members would be placed on a simpler time-of-use (TOU) rate developed with the assistance of Gulf Power, an investor-owned utility operating in Florida. To develop the TOU rate for the co-op members, Cristina Villegas of EIS extensively modeled building energy costs based upon actual interval data and the NYISO DAM. Subsequently, she modeled each apartment in the building based upon the TOU schedule created by EIS and Gulf Power and Peter Funk and presented the TOU schedule to the co-op board.

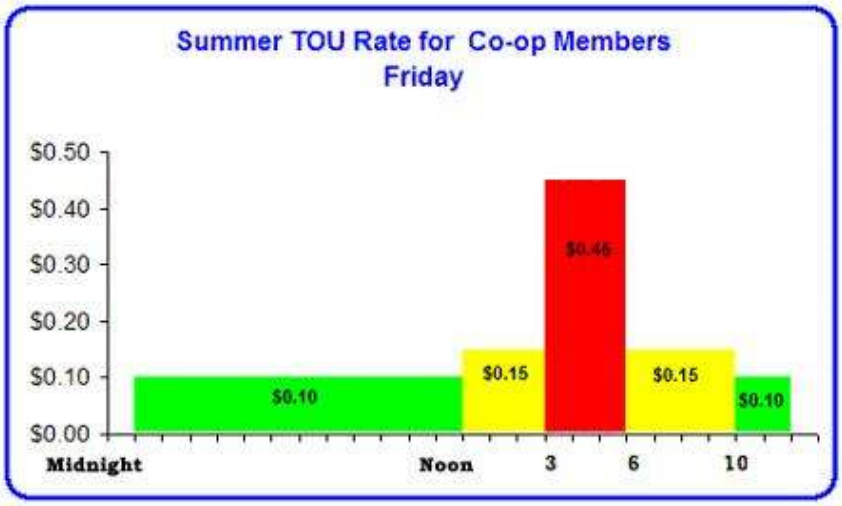
The objective of the rate design was to provide sufficient revenue to cover the co-op building bill from ConEd, based on historical building usage, and to provide pricing signals to the co-op members consistent with historical price variations in the day ahead market administered by the NYISO. The higher prices for the NYISO DAM tend to occur from 3 p.m. to 7 p.m. on weekdays, with even higher peaks from 4 p.m. to 6 p.m. Figure 1 below shows the co-op rate from Monday through Thursday for the summer months.

Figure 1



Even though wholesale prices typically drop down by 7 p.m., EIS wants to discourage usage until 9 p.m. to reduce the building maximum billing demand, which tends to occur in the evening. The building rarely sees its peak established on Friday evening, so the peak period ends early on Fridays during the summer months. Figure 2 below shows the Friday summer rate for the co-op.

Figure 2



The typical price paid per kWh for residential customers in New York City is around 21 cents per kWh. For residential master metered buildings without the RTP rider, the typical price is around 17 or 18 cents per kWh. It is not possible to provide an exact figure for the typical master metered building rate because these buildings also face a demand charge, and the average rate depends on the individual building's load factor.

The co-op members in the building on the RTP rider with ConEd are paying a lower price for energy for the medium and low pricing periods, and are paying a significantly higher rate for the high-priced period. Not only that, but the high-priced period extends through the dinner hour. One of the key purposes of this ongoing demonstration project is to determine whether (and how) customers responded to economic signals.

Were customers able to save money? And could they choose to respond? According to Peter Funk, the overall cost of electricity to the building has been reduced by approximately 10 percent. The individual co-op member experience varied. Some have saved more, and some have saved less. When the rates were first applied, the members were evenly divided between those who paid more, and those who paid less. As the members responded to the prices, most paid lower bills, even with the $4 per month per bill charge paid to EIS to produce the bills. The reduced building demand charges that have resulted from some of the co-op members changing their energy usage patterns provide benefits for all co-op members, even those who have not yet changed their pattern of energy usage. No co-op member has paid higher than the 21 cents per kWh typically paid by other direct ConEd residential customers in the city.

N.Y.C. Co-Op: Selling the Plan to the Members

The time of use rate plan presented a challenge inasmuch as certain time periods for high wholesale prices of the NYISO DAM overlapped with high usage of building residents. Such usage is not unique to this building as

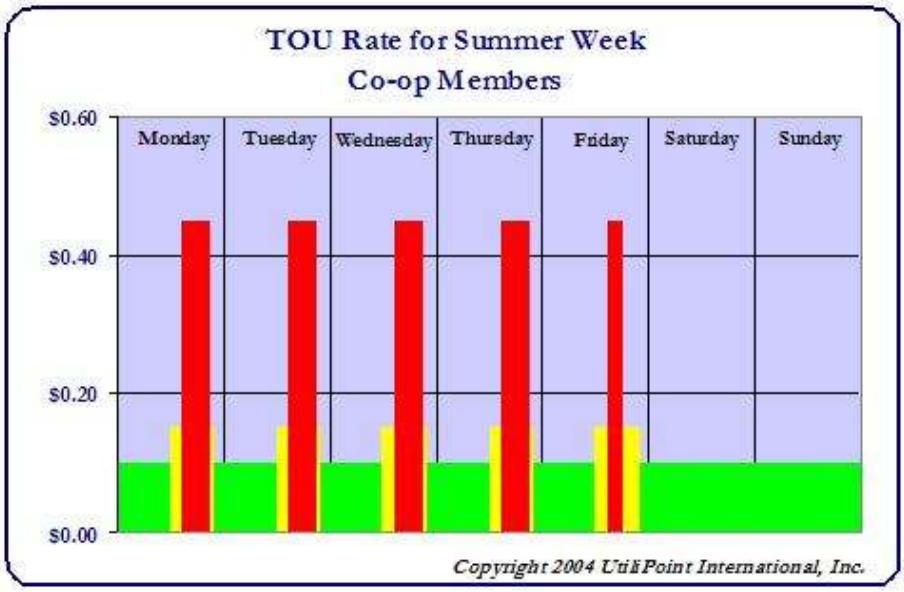
residential customers increasingly contribute significantly to New York City's system peak load. For that reason, the results of this on-going demonstration project are of great potential value to New York City, Con Edison, and any similar area that has significant residential demand. How did the co-op members rise to the challenge and save?

One co-op member arranged for the laundry to be done before noon rather than at the end of the afternoon, which had been the custom in that household. In another household, the rates were posted on a wall in the kitchen and the members became very aware of the rates before using appliances that used significant amounts of energy. Many residents wait until bedtime to run their dishwashers. Doing things early or late became the motto.

The co-op members responded so well to the time-of-use rate that in two recent months, the building peak moved from the typical weekday evening hour to Sunday evening. Unfortunately, unlike RTP energy charges, demand charges were the same no matter when the maximum demand occurred. Ironically, the current demand charge ends up penalizing the co-op members for shifting usage to the lower cost hours of a Sunday evening. This prompted EIS to request that New York City include in its rate filing a recommendation to offer time differentiated demand charges as part of ConEd's RTP tariff.

A key to their success is the ratio of on to off-peak prices being above 4, providing opportunity for the customers to save money by the timing of their energy usage. As can be seen in Figure 3 below looking at the time-of-use rates across a summer week, there are many hours in the lower priced category (shown in green and yellow), and relatively few high priced hours (shown in red.)

Figure 3



For members of co-ops in New York City, the real time pricing applied through a master metered residential building presents an opportunity for co-op members to save significantly on their energy bills. If the demand charge is changed to also be time differentiated, the savings could be even higher.

California Provides Quantifiable Savings for Residential Customers

In other areas of the country, results are coming in that provide sufficient evidence that most residential customers will pay less money for energy on time-varying energy rates. Recent results from the Statewide Pricing Pilot (SPP) in California have shown that low and moderate use residential customers will receive reduced energy bills under critical peak pricing rates with either fixed or variable critical peak period definitions without changing their usage patterns. These customers already use a lower portion of their energy during the critical and peak periods and can save even more by responding to the differences in prices across time.

In addition, residential customers prefer the time-varying rates because they make more sense to customers. In the SPP End-of-Summer Survey Report published in the Working Group 3 Report in January 2004, it was reported by Momentum Market Intelligence that more than 77 percent of residential customers in the California statewide pricing pilot preferred the time differentiated rates compared to the standard utility inverted tier rate.

According to the "Statewide Pricing Pilot (SPP) Overview Design Features" by Roger Levy of Levy Associates, published on the California Energy Commission website, during the summer and winter of 2003, more than 70 percent of the customers on either of the CPP rates or on the TOU rate saved approximately 5 percent on their monthly bills. For the customers who saved on their energy bills, the average savings ranged from $3.25 to $6.81 per month. Less than 30 percent of customers in the pilot paid more, and these were not the low to moderate users, as noted above. The customers who paid more on the time differentiated rates paid on average anywhere from 3 percent to 6.2 percent higher bills compared to the standard rate."

In Building the Business Case for AMR Quantify the Benefits for Utilities and Customers

Plentiful evidence is available to support the development of quantified savings for residential customers that accrue with the installation of advanced metering infrastructure and with the availability and promotion of time differentiated rates for the residential customers. Rather than build business cases solely considering the quantifiable benefits for the utility, we in the industry should move toward business cases that consider the benefits for both the utility and utility customers.

To be fair, the technology to provide this opportunity to smaller customers at reasonable prices is a recent development. This strategy requires advanced metering infrastructure that can measure energy usage over small increments of time and the means to communicate the energy prices and energy spending

to customers. But even with AMI systems on display at the various metering and demand response forums around the country that can, and have, provided this information to the utilities, there are still hurdles to overcome. UtiliPoint research shows the clear need to shift our focus as an industry from educating utilities on AMR benefits and move on to explaining the benefits of dynamic pricing to regulators, legislators, consumer advocate groups, utilities and customers.

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