

# **Making Waves in the Heartland: How Illinois' Experience with Residential Real-Time Pricing Can Be a National Model**

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## **ABSTRACT**

As the debates in California on smart meters, smart thermostats and critical peak pricing continue, an alternative model of residential real-time pricing is gaining momentum. In Illinois the innovative work of CNT Energy paved the way for legislation to expand the option to residential customers state-wide. Meanwhile, residential real-time pricing pilots are getting underway in Washington DC and elsewhere.

This paper will document how residential real-time pricing has emerged in Illinois as a means to provide customer choice in a deregulated state, and report on the first year of state-wide availability. Illinois policy makers view real-time pricing as one key strategy that reduces peak demand and prices and in doing so can be a tool to reduce costs for all consumers. It is also emerging as a platform for future technological innovations ranging from home automation to internet-based tools.

From its start as a pilot program in 2003 (the Energy-Smart Pricing Plan<sup>SM</sup>) to its emergence as full scale programs in 2007 (Power Smart Pricing and the Residential Real Time Pricing Program), real-time pricing has demonstrated that it cuts peak demand, reduces bills, lowers overall consumption and creates satisfied consumers. This paper will update the findings presented at the 2006 ACEEE Summer Study Conference with a comparison of the two programs, and will focus on the role that real-time pricing will play in the evolution of regulatory policies that create meaningful options and value to customers, the electric grid and the environment.

## **Background**

In the spring of 2006 the Illinois General Assembly unanimously passed legislation that required the large investor-owned utilities in the state (ComEd in northern Illinois and Ameren<sup>1</sup> in central and southern Illinois) to offer real-time pricing (RTP) programs as an optional service for residential customers. RTP is a rate structure that offers consumers an electric price that varies hour by hour based upon the wholesale electric market rather than a predetermined rate schedule. The theory of RTP is that consumers gain value from the many hours where prices are low and in exchange reduce demand during times of higher prices (when overall demand is likely to also be high), thereby lowering stress on the electric grid. In addition, when RTP has programmatic elements to educate and support customers, it can raise consumer awareness of their energy use and lead to better energy consumption behavior and purchasing habits.

In contrast to the smooth adoption of RTP in Illinois, the debate in California over the creation of a similar critical peak pricing rate was a bitter and contentious battle. For example,

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<sup>1</sup> Ameren serves customers in both Illinois and Missouri. For the purposes of this paper all reference to Ameren are intended to only refer to the Ameren service territory in Illinois which is comprised of the former utilities Illinois Power, CILCO and CIPS.

one consumer advocacy group opposed new pricing programs, instead favoring traditional hardware based approaches, “California should step back from the rate-base oriented mode of promoting a combination of supply side resources and advanced meters, even though those programs are most advantageous to utility shareholders, while giving short shrift to other peak-oriented programs.” (TURN, 2006)

In 2006, two papers were presented at the ACEEE Summer Study Session on the findings of the Energy-Smart Pricing Plan. This program was a pilot RTP program run by the Community Energy Cooperative<sup>2</sup> in cooperation with the Chicago-area utility ComEd. One paper examined the measured energy impacts of real-time pricing, and the other explored the consumer behavioral and attitudinal aspects of RTP.

The first paper found:

“Over the past three years of operation, the Community Energy Cooperative’s residential real-time pricing program, the Energy-Smart Pricing Plan<sup>SM</sup> (ESPP), has proven itself as a viable model that links retail and wholesale markets and, through that link, increases price sensitivity of customers. This can lead to more efficient use of resources, energy and capacity.

Despite hot weather and high prices, the results from the summer of 2005 were very encouraging and reinforce the results of previous summers. The Cooperative found that rather than customers losing their sensitivity to price, the price elasticities found in previous years held up. The participants weathered a tough year and could provide system benefits through their changed energy usage.” (Star, 2006)

And from the other paper:

“An essential component of administering ESPP is educating participants to adopt energy efficient technologies and behavior.... This experiment included two years of relatively cool summer weather and one year of atypically high temperatures and high electricity prices. Participants’ energy use fluctuated as well. While only minimal behavioral responses in the first two years resulted in net savings on energy bills, more effort and conservation behavior was required to be successful in saving money in the third year....Even following 2005’s summer of high temperatures and electricity prices, a majority of respondents (75%) continued to categorize participating in ESPP as “quick and easy.” (Isaacson, 2006)

These results continued into 2006 where participants in the program continued to save money, reduce peak electric demand, and lowered their overall summer consumption. (SBC, 2007)

The ESPP experience demonstrated that consumers will sign up for a RTP plan, can save money and will change their energy use, particularly at peak demand times. The ongoing challenge was how to take those findings and how to expand them to a larger scale where they

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<sup>2</sup> In 2007 the Community Energy Cooperative changed its name to CNT Energy. In this paper we will use the current name, CNT Energy in subsequent references to the organization even when discussing work carried out under the auspices of the then Community Energy Cooperative.

would have a meaningful impact on energy markets and consumer choice and the adoption of new energy saving practices and technologies.

## **Residential Real-Time Pricing Elsewhere In The United States**

While many utilities have long offered time of use rates, the newer concept of critical peak pricing (CPP), a time of use rate that has an option for the utility to call an extra high price time, has continued its slow advance in popularity. Initially offered by Gulf Power in Florida, it was also the rate that was extensively examined in California's Statewide Pricing Pilot. While the findings of that pilot were highly encouraging, the expansion of CPP in California has been stalled by ongoing debates over the role-out of smart meters to all California homes and businesses.

Meanwhile, several residential RTP pilots are underway and in March, 2008, the Philadelphia-area utility PECO requested permission to conduct a 2,000 household test of real-time pricing. (Philadelphia Inquirer, 2008)

One is a pilot in the Olympic peninsula in Washington State. This program looks at the use of RTP in a winter peaking utility, where it is tied to the use of grid-friendly appliances that can automatically change energy use in response to price signals. In this pilot other rate options were also offered, but the RTP rate was the most popular. While the results of the pilot of been encouraging, it should be noted that this experiment used shadow billing and participants were not at risk of paying more than their standard electric rate. (Lohr, 2008)

Another pilot, "PowerCentsDC" run by Pepco along with several stakeholders in Washington DC is testing RTP along with the use of smart thermostats. The program launched to its 1,400 randomly selected participants in October, 2007. No results are available yet. It is also testing other pricing options including CPP and a critical peak rebate. The RTP rate differs from those in Illinois in that it is designed to be revenue neutral. That is, the prices are adjusted so that a customer making no changes in their energy use pays the same as they would have on a standard rate. In contrast, the Illinois RTP design is not revenue neutral in that in normal market conditions, the customer would save money by not paying the implied risk premium built into flat rates. PowerCentsDC also differs in that the RTP rates are not a direct pass through of the market rates, but rather are amplified to provide a stronger price signal. Low prices are made lower, and high prices made higher. (Parham, 2007) While this may allow for a clear signal to consumers and an easier calculation of demand response to price, it eliminates the transparency argument used in Illinois that consumers get to pay actual wholesale prices directly from the market.

## **The Illinois Situation**

Illinois restructured its electric industry in 1997 with residential rates frozen and reduced for a period of ten years ending at the conclusion of 2006. As a result, an entirely new set of rates and procurement of power for customers was set to begin in 2007. For the default rates in Illinois, the two large investor owned utilities ComEd and Ameren proposed a reverse auction structured on the model used in New Jersey as a way to procure power for customers taking a flat rate, while also offering the choice of third party suppliers and a real time rate (but this real time rate included no customer support for residential customers as had been provided by CNT Energy during the ESPP pilot). This procurement method was approved by the Illinois

Commerce Commission in January of 2006. Subsequently a further set of rate cases established new customer charges, distribution rates and other bill components. In this context, while real time pricing was technically available to any customer, for residential customers, more than just a rate was needed to make it an attractive and viable option.

## **Legislative Process**

CNT Energy was interested in making sure that the value it had found in real-time pricing be a choice that would be available to consumers. When the Energy-Smart Pricing Plan was launched, CNT Energy made a conscious effort to recruit not just average consumers, but also to recruit a handful of policy leaders. This included the head of the Citizens Utility Board, the state's main consumer watchdog organization, and five members of the state legislature, including members of each party and chamber. The goal was that if the pilot program was successful, it would ultimately lead to the need for a policy discussion in Illinois over how to integrate RTP into new rates and options for 2007 and beyond. This strategy worked, and CNT Energy worked with legislators to introduce legislation expanding RTP as part of the energy options for customers that would start in 2007.

Senator Don Harmon of the Chicago suburb Oak Park introduced Senate Bill 1705 in February of 2005. It required large investor owned utilities to offer an optional real-time pricing program for residential customers. It fairly quickly passed out of the Senate with a unanimous vote, but it then remained in the House without any significant actions taken on it for the rest of 2005 as energy issues were not on the front burner for legislative action.

In 2006 as the issues around how the Illinois electric markets would evolve in 2007, SB1705 began to pick up steam again, and after a few clarifying amendments unanimously passed the House and was sent back to the Senate for concurrence and was then signed into law as Public Act 94-0977 in June of 2006. An example of the support it gathered is demonstrated by the informed discussion during the floor debate on the bill. For example, one conservative Republican state representative stated that, "This just seems to make eminent sense to me-- if you're in a position where you can hold out in the heat of the day and run your air conditioner at night, you're gonna save some money." (Representative William Black (R-Danville) during floor debate on SB1705, April 4, 2006)

Public Act 94-0977 set forth the legislative intent by expanding the existing Public Utilities Act to include the following policy statement,

"The efficiency of electric markets depends both upon the competitiveness of supply and upon the price-responsiveness of the demand for service. Therefore, to ensure the lowest total cost of service and to enhance the reliability of service, all classes of the electricity customers of electric utilities should have access to and be able to voluntarily use real-time pricing and other price-response and demand-response mechanisms." [Sec. 16-101A]

The Act mandated that the large utilities in the state offer residential real time pricing programs administered by a third party program implementer. The programs were only to be implemented if the Illinois Commerce Commission found that they had the potential to produce net economic benefits to the entire residential customer base; and that the costs of the program (including the meter that could record hourly energy use) would be borne both by participants

but also by a portion socialized across the residential rate base. This analysis was kept at the residential level to avoid any opposition to sharing costs by non-residential customers. Ultimately after four years of operation the Commission would analyze the programs to see if they were in fact generating net benefits. The Commission would then determine if it should continue, modify or cancel the programs based upon that analysis.

With this act Illinois became the first state in the United States to have a public policy goal of supporting dynamic pricing as part of regular rates. While Public Act 94-0977 did have a clause that would allow for the termination of real time pricing programs, the programs were intended to be full scale offerings, not just pilot programs as seen in other states.

## **From a Bill to a Program, The Regulatory Approval Process**

Once Public Act 94-0977 became law, the clock starting ticking on a 120 day process for approving new programs and rates. Set against the backdrop of an increasingly volatile debate over the increases in flat rates, the process of approving real time pricing programs was a remarkably collaborative and smooth process. As the results of the reverse auction to lock in supply for the flat rate option became known in the fall of 2006, it became clear that residential rates would be increasing significantly, after a ten year rate freeze and rate reduction. ComEd rates were estimated to increase over 20 percent and Ameren rates over 40 percent (although it later became clear some Ameren customers had much larger increases as discussed later in this paper). Consumer advocacy groups and the state Attorney General stepped up a campaign to get the auction thrown out and old rates reinstated. Despite this contentious debate, the utilities and consumer advocates, in particular the Citizens Utility Board (CUB) came together to put together a regulatory process that approved the new residential RTP programs in time for them to launch in January of 2007.

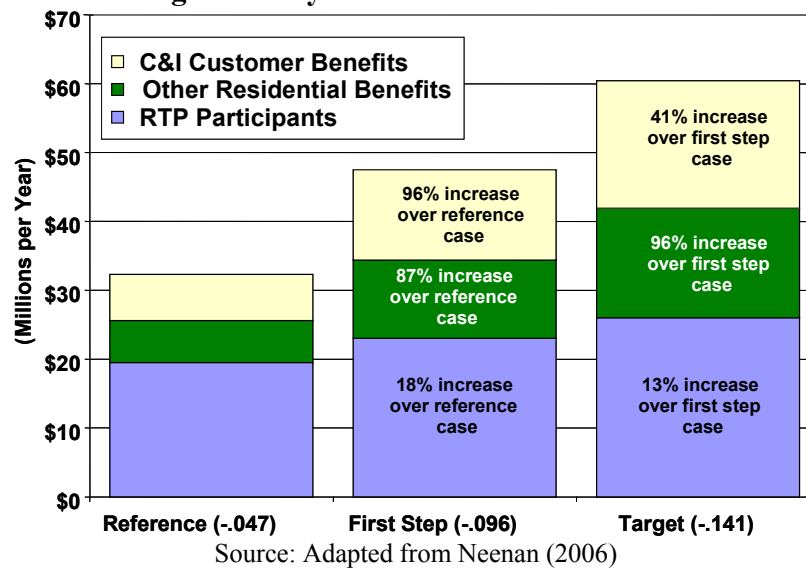
ComEd and Ameren each initially proposed very simple plans and left space for CUB to submit testimony about the potential value of RTP and program design. The commission staff largely concurred with that testimony and the Commission approved the programs.

The testimony filed by CUB in both ComEd and Ameren's rate cases was quite similar and consisted of three parts. First an econometric analysis by Bernie Neenan of Neenan Associates that used the results of the ESPP program and models of the energy markets that serve Illinois (PJM for ComEd, and MISO for Ameren)<sup>3</sup> to estimate the potential gross benefits of residential RTP as it got up to a scale of ten percent of residential customers. His testimony also provided estimates of how as customers increased their responses to prices, the gross benefits would increase (see Figure 1).

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<sup>3</sup> PJM is the PJM Interconnection. It originally stood for the first member states, Pennsylvania, New Jersey and Maryland, but has grown significantly since then to cover much of the Mid-Atlantic and parts of the Midwest. MISO is the Midwest Independent System Operator. It serves most of the Midwest, not covered by PJM.

**Figure 1. How Increasing Elasticity of Demand to Price Increases the Benefits of RTP**



Lynne Kiesling of Northwestern University provided an overview of the value of dynamic pricing, stating that,

“Without dynamic pricing, the power system will fail to deliver efficiency and value to consumers. Technological, institutional, regulatory and cultural changes have created a diversity of products and services that the electricity industry can profitably sell to consumers. Dynamic pricing is necessary to maximize the value of technological innovation and other market reforms that characterize a modern, forward-looking power system; dynamic pricing also is, in and of, itself a valuable step in producing efficient and fair electricity markets.” (Kiesling, 2006)

And Christopher Thomas of CUB combined the testimony of Neenan and Kiesling with estimates of program costs supplied by CNT Energy (\$16.9 million per year at the scale of ten percent of customers) to demonstrate the potential net benefits of RTP. This included proposing to reduce the monthly meter cost for an interval recording meter from \$5 per month to \$2.25 per month and to take the difference as well as the other program costs and socialize that across all residential customers.

Thomas also cited a market research study conducted by CNT Energy that concluded that while RTP was unfamiliar to most residential customers, when it was explained to them there was interest in the rate. 7.7% of ComEd customers and 6.9% of Ameren customers surveyed were “definitely” interested in real time pricing, and 24.2% of ComEd customers and 20.6% of Ameren customers were “probably” interested. (Thomas, 2006) ComEd’s programs were suggested to be capped at 110,000 customers over four year, and Ameren’s programs were given a goal of 20,000 participants over the same timeframe. Due to nuances in their rate recovery mechanisms, ComEd’s program had a firm cap, while Ameren’s had a potential to exceed its goal.

With this testimony in place the record was set to allow the Commission to find that establishing residential RTP programs had the potential to benefit all residential customers in Illinois and the programs were approved. After competitive RFPs issued by both Ameren and

ComEd, CNT Energy was selected to administer the Ameren residential RTP program, while Comverge was selected to administer the ComEd program.

## **New Programs For 2007**

2007 represented an entirely new era for residential customers of ComEd and Ameren. Rates that had previously been bundled service were broken out into separate distribution and energy supply charges and the choice between a fixed supply charge and real time pricing was made available (in theory the choice of supply from an alternative supplier was also available, but to date this option has not materialized). One aspect of this change that had major consequences was that special subsidized rates for customers with electric space heating were phased out, completely for Ameren customers and partially for ComEd customers. The resulting rate shock for Ameren customers was as high as 300 percent rate increases and set off a political firestorm that did not end until late in the summer of 2007. In response, legislation was passed that granted bill credits to customers, did away with the reverse auction for fixed price supply, established renewable and energy efficiency portfolio standards and, along with a host of other tweaks. Prior to its passage, several times other legislation that would have done away with the 2007 rates and reinstated the rates from 2006 came very close to passage. Had those rate freeze bills passed, real time pricing would have become irrelevant.

With this tumultuous backdrop, CNT Energy and Comverge began setting up new residential real time pricing programs. In both cases marketing of the new programs was quite limited until the debate was settled, which resulted in most of 2007 being lost to active recruitment of new participants. Approximately half of the participants in ESPP chose to join the new ComEd real time pricing program which did give it a slight head start.

In central and southern Illinois, real time pricing was an entirely new concept and CNT Energy worked to develop a new brand identity for the concept, settling on the name Power Smart Pricing (PSP). CNT Energy also significantly enhanced the online tools available for participants through partnership with Nexus Energy Software (now Aclara) to provide online tools to view hourly energy use and prices as well as to compare bills to flat rate bills.

CNT Energy also secured funding from the Illinois Clean Energy Community Foundation to expand a test of alternative communications technology that it had started during the Energy-Smart Pricing Plan; the use of the “PriceLight.” The PriceLight is an adaptation of the Ambient Orb, a glowing glass ball that receives a pager signal each hour and changes color using a blue-green-yellow-red schema to reflect the current price of real time energy. This additional visual reference point for participants was found in the evaluation of ESPP to increase the elasticity of demand of participants who had one in their home (SBC 2006).

Meanwhile Comverge developed the Wattspot portal as its entry point into what is called the ComEd Residential Real Time Pricing Program (RRTP). The Wattspot also introduced an additional service called Load Guard which built off the earlier research done by CNT Energy on using direct load control as a way to manage air conditioner usage during high priced times.

In many ways PSP and RRTP are quite similar from the customer perspective once they join. Day ahead prices are available each evening to serve as advisory prices for the next day and customers are then billed on the actual real time prices that settle the following day. When the day ahead prices predict high prices the following day, participants are notified by phone or email of the hours where prices are predicted to be high. Comverge has added so-called “real time” notification that attempts to track the real time prices during the day in order to provide

additional alerts to customers. CNT Energy has chosen not to provide real time notification because the volatility of the real time markets and the lag in time of availability of real time prices make them often inaccurate and difficult for customers to respond to.

In 2007 both programs provided benefits to participants. In the ComEd area, “The majority of customers who participated in ComEd’s unique Residential Real-Time Pricing (RRTP) program for all 12 months in 2007 experienced an annual savings between 7 to 12 percent compared to the fixed rate other residential customers received RRTP customers” (ComEd, 2008) Meanwhile in PSP customers saved an aggregate 16 percent off of their bills (CNT Energy 2008). One difference in the savings levels between the two programs was the cost of capacity. ComEd is part of PJM and the recently instituted Reliability Pricing Model has significantly increased capacity costs in PJM. RTP customers are paying those increased costs, while fixed price customers have yet to have their prices adjusted to reflect those costs because they are being served by existing contracts. Over time as those contracts expire, capacity costs for fixed rate customers will begin to increase. In contrast, Ameren is part of MISO which is an energy only market. Ameren does procure some capacity for PSP customers for reliability purposes, but the cost of that capacity is a relatively small component of participants’ bills.

A challenge for both programs has been recruitment of new customers. As described previously most of 2007 was lost for marketing efforts due to the rate increase/freeze fight, and distrust and fatigue on energy issues presented a communications challenge. CNT Energy’s marketing efforts didn’t start until late 2007 and resulted in over 400 enrollments in 2007, which has grown to over 1,500 by the end of April, 2008.

Meanwhile in 2007 Converge recruited 3,300 participants, including over 600 who had come into the program from being participants in the previous ESPP pilot (ComEd 2008). As the dust settles on rate increases, both organizations expect that 2008 will begin to see increased enrollment in the programs. To that end, CNT Energy is currently expanding its work providing additional support to ComEd for outreach and communications efforts to enroll more participants in the ComEd RRTP program.

Meanwhile some additional lessons learned from 2007 are being applied to program design. For example, while the differences between real time and day ahead prices tend to be minimal over time (typically less than one percent), many customers were hesitant to sign up for real time pricing because they feared the unknown volatility that was possible with the real time prices. Ameren is currently working to adjust its tariffs to change real time pricing entirely to day ahead prices which will simplify the program for participants, and ComEd may consider such changes as well.

## **Evaluating Residential Real Time Pricing**

While the fundamentals are in place for making real time pricing work for customers in Illinois, much is left to determine. Public Act 94-0977 set the bar for evaluating the programs fairly high,

“In examining economic benefits from demand reductions, the Commission shall, at a minimum, consider the following: improvements to system reliability and power quality, reduction in wholesale market prices and price volatility, electric utility cost avoidance and reductions, market power mitigation, and other benefits of demand reductions, but only to the extent that the effects of reduced demand



can be demonstrated to lower the cost of electricity delivered to residential customers.” (Public Act 94-0977, Sect 16-107)

The previous evaluations of the Energy-Smart Pricing Plan had determined that participants did change their energy consumption patterns in response to the price signals they received. This included mostly changing peak demand energy use, but also did include a small conservation effect across all summer kWh (SBC 2007). However the evaluations did not seek to link those changes in peak demand to how they would change the energy markets at a larger scale. This linkage would be new ground in evaluating the value of dynamic pricing.

A study by the Brattle Group of the value of demand response in the eastern regions of PJM found that, “Curtailling 3% of each selected zone’s super-peak load, which reduces PJM’s peak load by 0.9%, yields an energy market price reduction of \$8-\$25 per megawatt-hour, or 5-8% on average, during the 133-152 hours in which curtailment occurs in at least one zone. The range depends on market conditions.” (Brattle Group, 2007) This was one of the first studies to try to link peak demand reductions to larger wholesale market impacts and suggests the potential for RTP in Illinois. However, the participation goals envisioned for ComEd and Ameren over the initial four years of the program were modest, approximately three percent of residential customers. Therefore it is likely that the market impacts of the programs will present a research challenge to evaluate. CNT Energy and Ameren, as well as ComEd, will be hiring third party evaluators to determine the elasticity of demand of participants as well as to develop the models of how their energy use changes impact markets and the other criteria set out in the legislation.

## **What’s Next?**

Residential real time pricing has not yet reached its full potential. The Energy Smart Pricing Plan demonstrated that customers would sign up; would change their energy use in particular during peak times; and could save money. The legislative and regulatory processes that allowed Illinois to move beyond that initial program to the current Power Smart Pricing and Wattspot programs were conducted in the context of giving customers choices and options that allowed them to better manage their energy use and bills. But a tipping point has not been reached. The early adopters have benefited from the programs and reduced their energy costs, but the majority of consumers remain unaware of this option.

Moving forward, there continues to be a national debate about the role of smart meters and smart grids. RTP as currently realized in Illinois hasn’t made it that far yet. Meters are mostly manually read, two way communications with meters is not part of the current metering schemes, but will be easily integrated into any future smart metering proposals. And while there has been some automation of air conditioners, a fully realized system of smart devices communicating in real time with grid operators remains far away.

However, most states that are considering smart meters and smart grids are starting with the hardware and technology and only considering rates after the fact. In doing so, they run the risk of installing expensive infrastructure without thinking through how innovative rates can harness that technology. And if the skepticism in California, first about Critical Peak Pricing, and more recently about mandated Programmable Communicating Thermostats, can be a guide, an uninformed policy debate about how to move from dumb meters and simple rates to smart meters and sophisticated dynamic rates can be risky. The Illinois model in which dynamic rates have been strategically introduced (rather than rolled out to everyone), providing an opportunity

to experiment with new technologies (such as the PriceLight), educate and inform customers, and rigorously explore how behavior at the retail level can impact prices at the wholesale level, provides a healthy space for an informed policy discussion. Over the next several years as the real time pricing programs in Illinois mature and are evaluated, the lessons learned can provide a model for other states.

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