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Power Smart Pricing
2009 Annual Report

Submitted to:
Ameren Illinois Utilities

FINAL REPORT
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Prepared by

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Acknowledgments

CNT Energy prepared the 2009 Power Smart Pricing Operational Report. Their complete report is included as Appendix A in this document. Highlights from their report are included within the main body text of this document whenever the facts are relevant to the discussion. Readers who are not familiar with the Power Smart Pricing program may find it helpful to review Appendix A before reading this evaluation report.

Special thanks go to CNT Energy for their preparation of the chapter on participant bill savings in the evaluation report.

Table of Contents

Table of Figures

Table of Tables

Executive Summary

This report is the assessment of the Power Smart Pricing program for 2009. Program evaluation work will be concluded after the end of calendar year 2010, providing the opportunity to refine and update the assessment that was done this year with an additional year of program participation data. The following conclusions highlight the major findings presented in this 2009 report.

2009 was a summer of unusually mild weather during an economic recession. This created an electricity market where the real-time prices for a kWh never rose above 11 cents, and day-ahead prices never predicted a kWh to be over eight cents. This is in contrast to 2008 where there were 122 hours that were predicted to be over 13 cents by the day-ahead price.

Number of Customers Using Hourly Pricing

CNT Energy's marketing and enrollment efforts resulted in 7,422 active Power Smart Pricing participants as of December 31, 2009. This was a 136% increase over the participant count of 3,147 at the end of 2008. New participants in the program had higher average energy use than the existing participants. This is considered to be a result of a successful targeted marketing campaign used in 2009 to attract high use customers to the program.

Changes in Customers' Energy Use Patterns

Elasticity modeling done for 2009 shows that Power Smart Pricing participants continued to respond to variation in hourly prices during the summer season, even though 2009 electricity prices were much lower than 2008 prices. The overall own-price elasticity was –2.3%, meaning they reduced their electric usage by 2.3% for every 100% increase in the price of electricity.

Additional analysis revealed that customers show a much higher response to price when prices are above a given threshold. For example, during the summer season, the own-price elasticity is -1.0% when prices are below 13 cents per kWH, but when prices rise above 13 cents, the own-price elasticity jumps to -24.8%.

There were no High Price Alert days in 2009. However, on regular summer weekdays in 2009 PSP participants showed an average load reduction of 0.13 kW per hour between the hours of Noon and 5 p.m. when compared to a control group. This is similar to the load reduction of 0.18 kW per hour found for regular summer weekdays in 2008. Survey data reinforced the observation that PSP participants were continuing to shift their summer energy usage out of the high price afternoon period even though 2009 energy prices were much lower than 2008 prices.

In addition to shifting energy during the summer, participants also showed an overall reduction in energy use. Power Smart Pricing participants reduced their average energy use by 5.1% during the summer season and by 0.6% during the shoulder months. However, they did not show any energy savings during the winter months. This created an overall annual energy savings of 1.2% per year which is similar to the annual savings of 1.5% found in 2008.

Value of the Program to Participants

In 2009, the aggregate savings for PSP participants was $1,388,996 which represented a 23.6% total savings compared to what the same bills would have been under the standard rate. Average annualized savings were $304.98 or 24.4%.[1] These percentage savings are three times greater than what was seen in 2008, largely due to the low market prices for electricity.

This estimate of bill savings does not include the additional savings that comes from the conservation effect of the program. Including an annual decrease in consumption of 151 kWh per customer at roughly ten cents/kWh for energy and distribution, there is an additional $15.10 that the average PSP participant avoided paying in 2009. If that savings had been included, the average annualized savings would have risen from 24.4% to 25.6%. For 6,652 participants, that represents an additional annualized aggregate bill savings of $100,445.

Value of the Program to Non-Participants

A thorough assessment of the net benefits from the Power Smart Pricing program will be presented in the 2010 Annual Report to the Commission after the program has completed three full years of operation. Plans are in place for the 2010 Annual Report to contain a summary of all the costs and benefits related to the PSP program, including a probabilistic risk assessment of the net benefits.

This 2009 report includes a preview of what the basics of the 2010 net benefit assessment will look like. It looks at actual benefits and costs estimated for the years 2008 and 2009. This includes estimation of non-participant benefits from reduced MISO prices that are a consequence of the PSP program demand reductions. This preview offers the opportunity for a full year of review and discussion on refinement of the methodology before the final net benefit assessment results need to be completed in 2010. It is expected that this opportunity for careful thought and sharing of ideas will lead to a very robust final assessment.

[1] Due to the growing enrollment levels over the course of the year the overall savings percentage and the annualized average savings percentage are not the same. Annualized savings represent what the average customer would have paid if they were on the program for all 12 months of 2009.

Section I » Introduction

Summit Blue Consulting, a part of Navigant Consulting,[2] (Summit Blue/Navigant Consulting) was engaged by the Ameren Illinois Utilities (AIU) to perform three years of impact evaluation on the Power Smart Pricing (PSP) real-time pricing program for residential customers. The first year evaluation covered program participation impacts from the inception of the program in mid-year 2007 through the end of calendar year 2008. The report was filed with the Illinois Commerce Commission in May of 2009. This report is the second in the series of three planned annual impact evaluations and it presents results for program participation during calendar year 2009.

The introduction to this report starts with a recounting of background information on the potential benefits of real-time pricing rate designs, and a description of the unique characteristics of the Power Smart Pricing program. This is followed by a discussion of the objectives for the 2009 impact evaluation, and a summary of the organization of the remainder of this report.

Background: The Potential Benefits of Real-Time Pricing

Electricity prices are among the most volatile of any market commodity. Driving this volatility is the fact that electricity cannot be stored in significant quantities. As a result, during periods of high demand (hot summer days for example), hourly electric prices can vary substantially over just a 12-hour period. On extreme days, price spikes during resource constrained periods can see increases of 100 fold or more if there is not enough demand-side response to mitigate the system and supply-side factors that are driving prices up. These extremely high prices, even though they may occur only during a few hours each summer, can represent a substantial cost to all the customers in the regional electricity market.

While the costs of electricity in wholesale markets can vary dramatically, retail pricing, particularly for residential and small commercial customers, has largely remained subject to regulated tariffs. These tariffs typically have provided customers with fixed rates, i.e., they pay the same price for electricity regardless of when and how much is used. This fixed rate does not reflect the true cost to the economy of consuming electricity at a given point in time, and therefore it distorts key market decisions.

An important near-term challenge facing electricity markets is the rational pricing of retail electricity. The goal of any market — regulated or unregulated — is to allocate resources equitably, promote efficient investment, and provide incentives for innovation. Prices provide the market signals that are used to allocate resources. Specifically, the key is to appropriately price what is scarce. For electricity markets, what is scarce is on-peak energy. If the market is not designed to appropriately price what is scarce, the market will not be efficient and disconnects between demand and supply can occur, resulting in price spikes. Clearly, non-time-differentiated electricity rates cannot reflect the true costs at the wholesale level of on-peak electricity. With standard rates, customers have no idea what the actual cost of electricity is at any given time and they are not able to make choices regarding conserving a scarce resource. As a result, they cannot make decisions regarding the appropriate use of electricity required for an efficient market. Innovative pricing, such as real-time pricing (RTP), is one method of allowing for the interaction of demand and supply needed for efficient markets. Research on time-differentiated pricing is growing as the benefits of these pricing options are becoming better recognized. These options allow customers to see

[2] Summit Blue Consulting became a part of Navigant Consulting, Inc. on January 1, 2010.

the real wholesale costs of electricity and make decisions regarding their energy use based on market conditions. Overall, customers who see real prices and adjust their demand in response to these price signals can make the electricity system more efficient and stable. As a result, retail electric prices that better reflect the costs of obtaining power in wholesale markets can provide benefits to electricity markets, including the following:

- **Increased system reliability** as price mitigates demand when resources become scarce.
- **Reductions in costs** of electricity to all customers in a regional market as a result of better management of scarce supplies and reductions in capital costs incurred to meet peak demands.
- **Risk management** by allowing customers to manage a portion of the electricity price and commodity risks and be compensated for this service.
- **Environmental benefits** by promoting efficient use of resources and price signals to manage demand.
- **Customers benefit** from being on an RTP rate since now their ability to use electricity flexibly across on-peak and off-peak periods is valued, i.e., a key attribute of their energy use – flexibility in time-of-use – is given a value.
- **Market power mitigation** by providing a demand response to offset high prices for generated electricity.
- Providing the **incentives for innovation** needed to create technologies and value propositions for load management and peak demand response.
- RTP better reflects the actual cost of service, allowing a **more equitable distribution of costs** across customers and customer classes.
- Unlike conventional load control or curtailable/interruptible incentives, dynamic tariffs such as RTP can be made **available to all customers,** regardless of usage level or appliance ownership.

These potential benefits from RTP options can accrue to a number of entities:

- **Participants.** RTP participants can benefit by having the ability to make more informed choices regarding how they use electricity. This provides them the opportunity to lower their monthly bills.
- **Electricity customers not participating.** The RTP rate can also benefit all customers (participants and non-participants) in a regional electricity system because a relatively small fraction of price-responsive demand can have sizeable impacts on market-wide price spikes and electric system efficiency.
- **Utilities.** Utilities can benefit through load reductions on their delivery network during peak periods, and delaying or avoiding the need to make additional capital investments.

Recognition of these potential benefits has led to a number of pilot programs and a move towards time-differentiated rates for large customers. The Illinois legislature was one of the first legislative bodies to encourage real-time pricing rates for residential customers. Illinois Public Act 94-0977 required that electric utilities which serve more than 100,000 customers must have RTP available to residential customers as a rate option. This Act led to the Illinois Commerce Commission (ICC) Docket 06-0961, which found that a residential RTP program would be likely to provide a net economic benefit to the residential community as a whole. As part of this docket, the Ameren Illinois Utilities (AIU) received approval to launch Power Smart Pricing (PSP).

Power Smart Pricing Program

Power Smart Pricing presents "de-averaged" electricity supply prices that are a direct pass through of MISO hourly prices without mark-up. These prices provide a day-ahead price signal to customers about the real cost of their electricity use.[3] The program also provides information regarding opportunities to control electricity bills through energy efficiency and peak load management. A key component of that information is the targeted use of "high price alerts" via email or phone on the evenings before expected high price days. MISO day-ahead prices are used as the basis of the high price alerts and they provide information on which hours are most critical for taking additional energy management actions.

PSP is an optional program for the Ameren Illinois Utilities' residential customers who participate through the program administrator, CNT Energy. In early 2007, the Ameren Illinois Utilities conducted a competitive solicitation to select the administrator for the program. CNT Energy (formerly the Community Energy Cooperative) was selected. CNT Energy provides all aspects of the enrollment process as well as ongoing participant support. That support includes a web interface that allows customers to compare bills, view, and analyze their hourly energy use, and conduct a home energy self-audit.

The Ameren Illinois Utilities' residential customer base is approximately one million households and will be subject to selective targeting for enrollment in the PSP program over the 2007 to 2010 contract period. Specific principles that apply to this enrollment are as follows:

- Participants in Power Smart Pricing pay an additional $2.25 per month to participate. This charge covers a portion of the $5 a month incremental cost of their interval demand meter. The additional cost of the meter and the other program expenses are not recovered from participants, instead they are recovered via Rider PSP which is applied to all residential customers. The charge is currently five cents per month.

- A two percent PSP market penetration objective affords a marketing approach where emphasis is on customer education and experience.

- Enroll participants that fully understand the PSP concept and program and therefore understand the associated risks and rewards.

- While the entire Ameren customer base is eligible for participating in PSP, certain customer segments may not be good candidates for participation because they are not likely to receive any economic benefit from participating in PSP. Experience has shown that these segments include customers with very low usage (due to the $2.25 monthly fee being a large part of their bills),

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[3] The Ameren Illinois Utilities began billing day-ahead prices on June 1, 2008 under the PSP Program. Prior to that date, program participants were billed the real-time price.

customers with health issues (due to the risks involved in reducing energy consumption), and customers heating their homes primarily with electric space heat (due to a late-2007 rate redesign that provides them with a subsidized winter price).

- Incorporate basic energy efficiency and conservation awareness as a goal for on-going customer education.

The costs of the Power Smart Pricing program consist of the incremental cost of metering to collect hourly usage data, additional Ameren Illinois Utilities' expenses for software and data processing systems, and the program administrator and evaluation contracts.

Evaluation Objectives

There are two categories of objectives for the impact evaluation of the PSP program. The first category focuses on determining how PSP participants are responding to the real-time rates. The second category looks at assessing the net benefits of the program.

For Category One objectives, determination of participant response will be repeated annually for the 2008, 2009, and 2010 program year reports. Several basic evaluation objectives will be covered each year:

- Day-ahead vs. real-time prices – Does billing on day-ahead prices meet the need of providing demand response during hours of high real-time prices?
- Elasticity – How much do participants change their use in response to changing prices?
- Changes in hourly demand – When does most response occur? What time? What season?
- Conservation effect – Does participation in the program reduce overall energy use?
- Bill savings – How much do participants actually save on their electric bill?
- Participation in other Ameren energy efficiency programs – How do savings from PSP participation interact with savings from other Ameren energy efficiency programs?

Each annual report also offers opportunity for the in-depth evaluation of particular issues.

In the 2008 program year, a test group of 120 customers had PriceLights—tabletop glass orbs that glow different colors to reflect current electric price levels. For example, a red glow indicates a high price alert. The 2008 evaluation assessed differences in load reduction for customers with PriceLights.

The 2008 PriceLight program was a special offering funded by a one-year grant from the Illinois Clean Energy Community Foundation (ICECF). A small number of customers who were willing to contribute a portion of the subscription fee continued to use their PriceLights in 2009. However, since there was so little variation in price across the summer the PriceLights never changed their color. Anecdotally, CNT Energy received calls from several customers who thought their PriceLights were broken. Given that there was so little use of the PriceLights, it does not make sense to do a special study of their impacts in 2009.

However, other opportunities for in-depth evaluation are available. Examination of impact differences between two-year (experienced) participants and one-year (new) participants is an enhancement in the 2009 evaluation, as well as an identification of participants who are using the PSP rate to benefit from pre-cooling their home during nighttime hours in the summertime.

The second category of evaluation objectives, assessment of net benefits, will be presented as a completed analysis in the 2010 report. The 2008 report started work on this objective by presenting the methodology to be used, including an approach for estimating market benefits for non-participants. This 2009 report tests the proposed approach for estimating market benefits and presents a preview of what the net benefits assessment will look like. As stated previously, the 2010 report will include the final net benefits assessment based on analysis of program data from 2007 through 2010. The cost/benefit analysis of this program will include a calculation of whether the benefits that non-participants receive exceed the Rider PSP charge they are paying to support the program.

Report Organization

Section II of this report presents the program impacts found from analysis of program participants' electric energy use during 2009. It answers the evaluation questions about participants' demand response posed in the previous section

Section III presents a preview of the estimation of economic benefits from the program, along with an initial assessment of net benefits. This work will be finalized in 2010.

Appendix A contains a complete copy of the 2009 Operational Report for the Power Smart Pricing program. The operational report was prepared by CNT Energy. Readers who are not familiar with the Power Smart Pricing program may find it helpful to review Appendix A before reading the rest of this evaluation report.

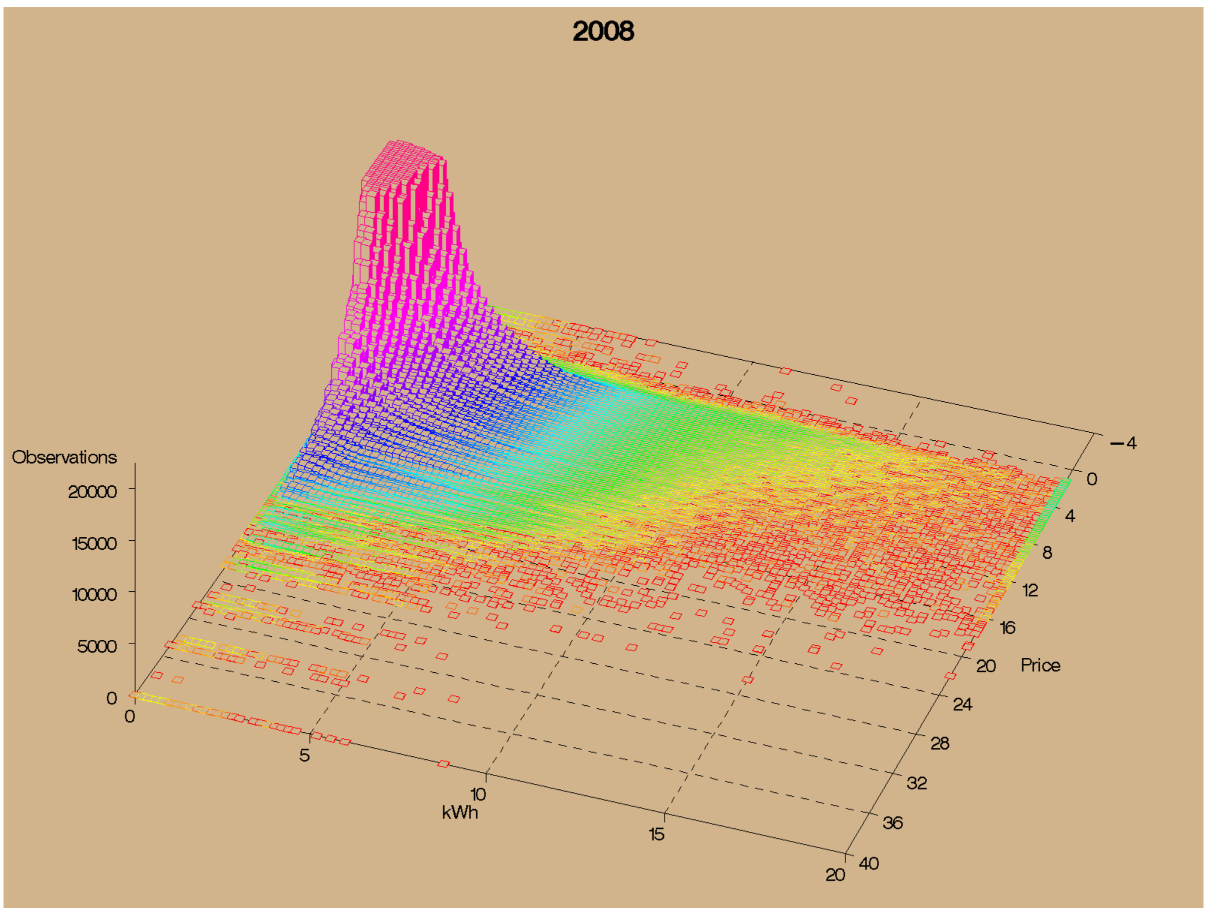
Appendices B, C, D and E present supporting detail for the impact evaluation sections of this report.

Section II » Program Impacts for 2009

2009 was another year of rapid growth in participation in the Power Smart Pricing program. At the end of 2008 there were 3,147 participants. By December 31 of 2009, the number of participants had grown to 7,422. This chapter will present findings on how participants changed their electric energy use in 2009 in response to real-time rates.

Much of the analysis focuses on hours of the year with high prices and high loads. This is where the action is. However, it is good to keep in mind that every customer uses electric energy every hour of the year, and most hours of the year are low price hours with low usage levels. This becomes apparent when viewing Figure 1 and Figure 2, which show the frequency distribution of hourly energy consumption for all PSP customers over prices and usage levels for 2008 and 2009, respectively.

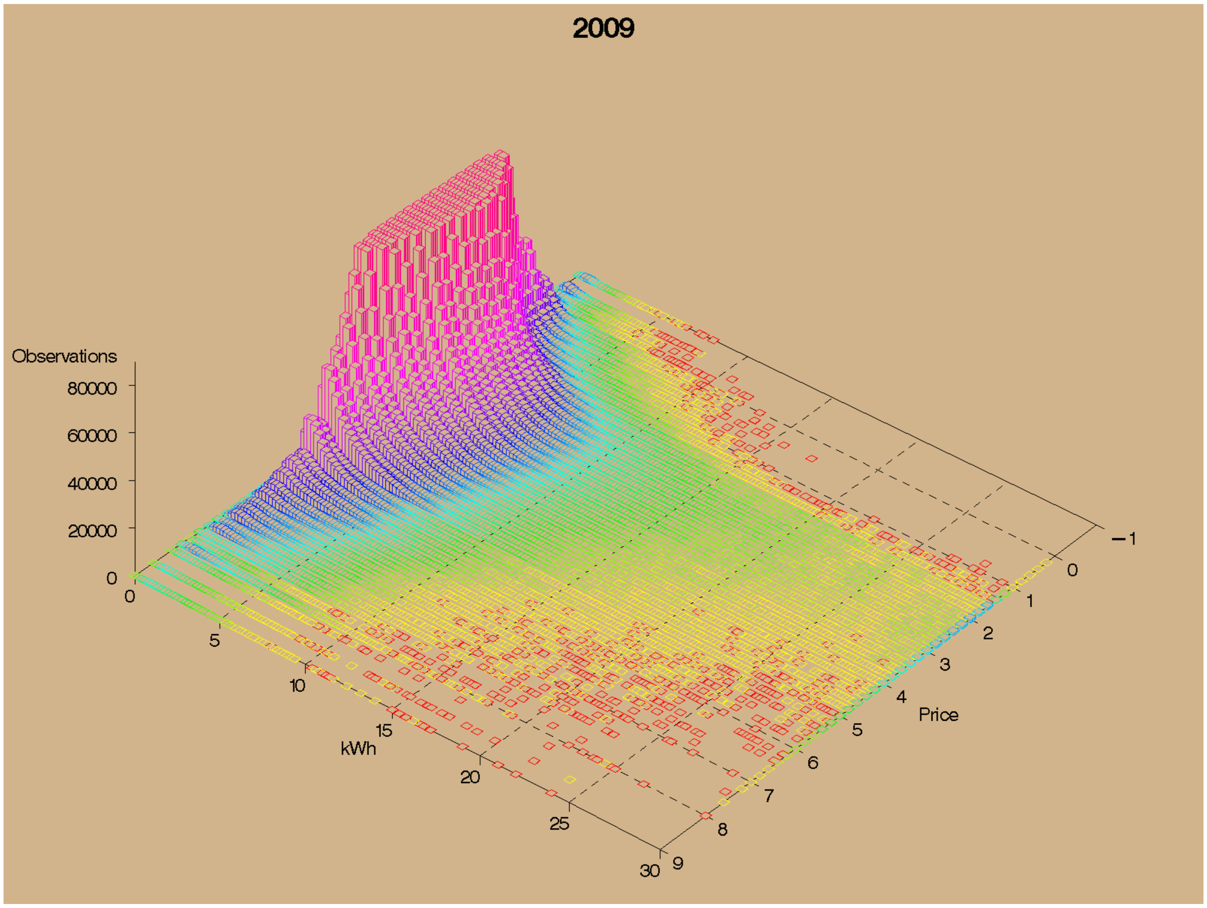
Figure 1. Distribution of Hourly Prices and Average Loads per Customer in 2008



Both figures have a mountain shape that indicates the dominance of low price – low usage hours. In fact, many of the lowest use hours have been truncated and are not shown on the graph (i.e., the top of the mountain has been cut-off) because including them would make the peak so high that the variation around the base of the mountain would be indiscernible.

The kWh variable in these figures is the kWh usage for one customer during one hour. In the figure the range of this usage rate extends from zero to 20 kWh. There were some hours where hourly usage for some customers was greater than 20 kWh, and these observations are "piled up" and plotted at the edge of the range, hence the preponderance of yellow and green on the 20 kWh line. Similarly, the upper boundary of the price variable was arbitrarily set at 40 cents per kWh, although a few hours had higher prices. This can be seen in the orange and yellow shown on the 40 cents line. These arbitrary boundaries were needed to keep the scale of the chart focused on variations within the primary data.

Figure 2. Distribution of Hourly Prices and Loads per Customer in 2009



A comparison of the two figures is a quick way to understand the fundamental changes in prices and base usage between 2008 and 2009 for PSP participants. In 2008, prices ranged up to 40 cents per kWh. In 2009, they did not exceed nine cents per kWh. On the usage side, as many more participants joined the program, there was a surge in the number of hourly observations with usage greater than 20 kWh per hour. This indicates that customers with higher usage were joining the PSP program in 2009.

The rest of this section of the report will dig deeper into how these basic differences in price levels and usage levels in 2009 translated into program impacts.

Elasticity

A cornerstone of the impact evaluation of the PSP program is the understanding it provides about how much PSP participants change their use of electricity in response to hourly electricity prices. The most commonly used measure of the impact of price on energy consumption is the elasticity of demand. The elasticity of demand indicates the percent change in consumption in response to a 100% change in the price of the good. This section of the PSP impact evaluation presents two different methods for estimating the elasticity of demand that essentially reflect different assumptions about the residential energy demand function. Summit Blue/Navigant Consulting believes that the second method – Method B – is the more accurate of these two (i.e., more accurate than Method A).

Method A – Constant Own-Price Elasticity of Demand

The first method used to estimate the elasticity of demand is identical to that used in the 2008 PSP impact evaluation, in which a log-log demand specification generates a constant elasticity of demand. The model includes fixed effects accounting for household-specific constants. These constants capture the unobservable household-level features that cause a household to consume more or less energy than average. Such features include square footage of the residence, the household size, the absence/presence of attic insulation, and so forth.

The log-log fixed effects model is:

$$y_{it} = \alpha_i + \rho PRICE_t + \beta X_t + \varepsilon_{it}$$

Where:

y_{it} =	Natural log of household *i*'s consumption of electricity (kWh) in hour *t*.
α_i =	Customer-level fixed effect.
ρ =	Estimate of the own-price elasticity of demand.
$PRICE_t$ =	Natural log of the hourly price of electricity in hour *t*.
β =	Vector of parameters.
X_t =	Vector of weather variables in hour *t*.
ε_{it}=	Unobservable random variables

For such a log-log demand specification, ρ is the elasticity of demand. The expected sign for this estimate is negative, since an increase in price would be expected to cause a reduction in the consumption of electricity.

The available hourly data starts in mid-April 2007 with five customers. By the end of 2007, hourly data are available for 350 customers. By June 2008, there are data for 1,470 customers and by the last day of the data set available for analysis the data set includes hourly observations for over 7,000 customers.

In a very small number of hours, the price was zero or negative. This generally occurred in the middle of the night. Data for these hours was excluded from the datasets used for estimation. The natural log of a zero or negative value is an imaginary number. The inclusion of such values would make it impossible to implement a linear regression.

The elasticity was modeled by season, with the two seasons examined (Summer, Winter) defined in exactly the same manner as for the estimate of overall elasticity in the 2008 PSP impact evaluation;

"Summer" including June, July, and August, and "Winter" including all other months. As with the 2008 impact evaluation, only data-points between 10 a.m. and midnight were included in the data-set used for estimation.

Results – Method A

The estimate of the summer demand elasticity using 2009's data, as well as the estimate of the summer demand elasticity reported in the 2008 PSP impact evaluation, are presented in Table 1.

Table 1. Overall Summer Own-Price Elasticity Estimate

	Summer	
	Elasticity Coefficient	Statistically Significant at 90% Confidence Level?
Price (2007 – 2008 inclusive)	-4.3%	Yes
Price (2007 – 2009 inclusive)	-2.3%	Yes

As in the 2008 PSP impact evaluation, the overall elasticity estimate from the winter model did not have the expected negative sign, so there is no winter own-price elasticity to report. A number of reasons were provided in the 2008 PSP impact evaluation as likely causes of the unexpected sign.

These reasons include:

- The natural upswing of inelastic or nondiscretionary electricity consumption in the winter months, particularly the increased lighting requirements engendered by shorter days.
- Generally lower price volatility in the winter than in the summer months (although summer of 2009 prices were not volatile, those of the preceding summers were), meaning that there is less of an incentive both for customer participation (i.e., actively shifting consumption) and for habitual price awareness.

Noting the smaller (in absolute terms) estimate of elasticity once the 2009 consumption data was included in the dataset, Summit Blue/Navigant Consulting conducted some exploratory analysis to determine why the estimate had fallen.

The two major changes in the composition of the dataset since the 2008 PSP impact evaluation were the inclusion of another cohort of participants and the fact that summer prices in 2009 never exceeded $0.08 per kWh (in contrast, from the beginning of the dataset in April 2007 until the end of December 2008 there were 445 days in which the price exceeded $0.08 at some point during the day).

To determine whether the fall in the elasticity estimate was due to the new cohort, two ancillary regression models were estimated. Both use the same model specification as above, the only difference being that in one regression only those customers whose first observation occurred *before* 2009 ("experienced" participants) were included, and in the other regression only those customers whose first observation occurred *in* 2009 ("New" participants) were estimated.

The results of this are shown in Table 2.

Table 2. Elasticity Estimate by Cohort

	Summer	
	Elasticity Coefficient	Statistically Significant at 90% Confidence Level?
Experienced Participants	-1.3%	Yes
New Participants	-5.3%	Yes

The estimates presented in Table 2 suggest that the explanation for the decrease in demand elasticity is not that "new" participants are less price responsive than "experienced" participants. While there may be some exogenous reason for the drop in price responsiveness on the part of the "Experienced Participants" cohort,[4] the only other major change that is endogenous to the system is the much lower average prices observed during the summer of 2008.

If the elasticity of demand is in fact constant – as is implicitly assumed by the model specification – then the fact that prices were much lower in 2009 than they were in previous years should not affect the elasticity estimate. The implication of this analysis is that the assumption that the own-price elasticity of demand for electricity is constant may be too restrictive.

With this in mind, Summit Blue/Navigant Consulting further explored the data, using a series of regressions to estimate the slope of the implied demand curve at a variety of different price-points. The conclusion of this further analysis was that it is highly likely that the elasticity of demand varies by price and that, in addition to own-price effects, there is strong evidence to suggest the presence of cross-price effects. A consumer's consumption of electricity in any given hour of a day is a function not just of the price in that hour of the day, but also a function of the price in other hours of the day, indicating load-shifting. The details of this exploratory analysis may be found in Appendix B at the end of this report.

Method B – Two Constant Own-Price Elasticities of Demand

While exploratory analysis undertaken in Appendix B provides good direction for the PSP impact evaluation in 2010, a full analysis of sufficient robustness to be reported following the procedures suggested in Appendix B is beyond the scope of this year's PSP impact evaluation. Indeed, given the paucity of high-price data points in 2009, even the most robust analysis implemented according to the suggestions of Appendix B might not produce conclusive results.

Instead, Summit Blue/Navigant Consulting presents Method B as an interim step toward the more detailed variable elasticity analysis that will be undertaken in the 2010 PSP impact evaluation. Method B is an interim estimation of the elasticity of demand that assumes the elasticity of demand is constant both above and below a threshold price, but allows the demand elasticity to change across the threshold. The threshold price, $.13/kWh, somewhat arbitrarily serves as the lower boundary of the "high" price range.

[4] The question of behavior persistence will be addressed more fully in the final year of the PSP Impact Evaluation when there is more data available on how customer behaviors change over time.

This Method B provides results that are easily compared with the results reported in the 2009 PSP impact evaluation and the results reported in other similar studies, but somewhat relaxes the assumption of constant own-price elasticity of demand. It is anticipated that this assumption will be further relaxed in the 2010 PSP impact evaluation.

Summit Blue/Navigant Consulting believes that the results presented below are more accurate and should be used for comparison and reporting purposes rather than the estimate obtained by Method A, which Summit Blue/Navigant Consulting regards as being based on an assumption that is too restrictive.

In this case, Summit Blue/Navigant Consulting has estimated the same model as in Method A, for non-holiday weekdays, between 6 a.m. and midnight, by season (winter, summer, and shoulder), both below and above a threshold price implied by the analysis presented in Appendix B. Note that these estimates, as with those presented in Appendix B, will tend to be conservative because of intra-day correlation. This means that positive estimates of own-price elasticity observed below the chosen threshold price may safely be considered to be no different than zero, since otherwise it would imply that consumption will rise in tandem with prices – clearly a spurious conclusion.

Results – Method B

The results of the Method B regressions are reported below. Cells with values of N/A indicate nonsensical positive estimates and should be treated as equivalent to an estimate of zero. Model output with all parameter estimates are presented in Appendix C of this report.

Table 3. Method B Summer Elasticity Estimates

	Summer - $0.13 Threshold Price	
	Elasticity Coefficient	Statistically Significant at 90% Confidence Level?
Below Threshold Price	-1.0%	Yes
Above and Including Threshold Price	-24.8%	Yes

Table 4. Method B Winter Elasticity Estimates

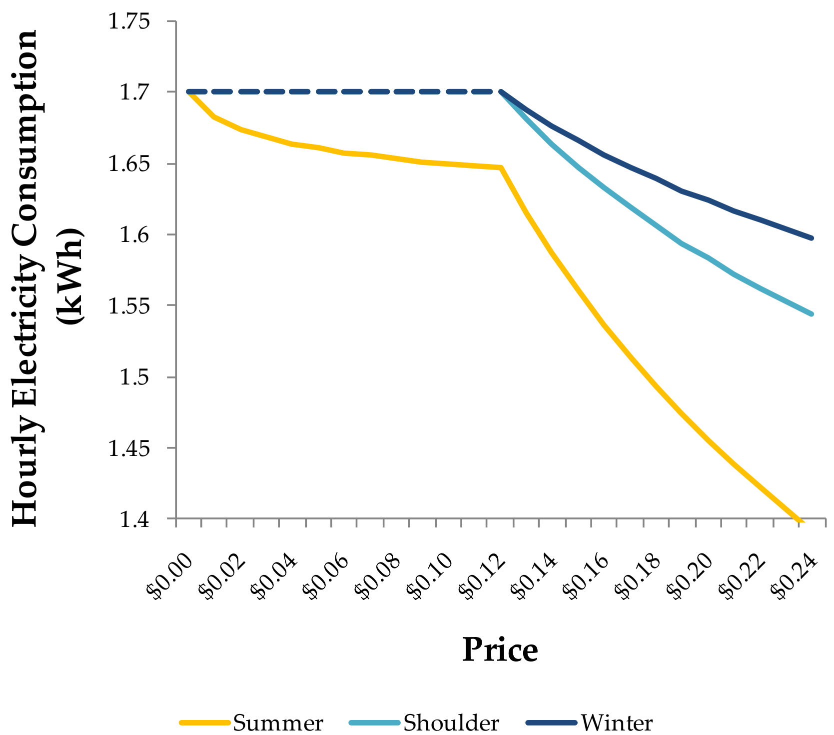
	Winter - $0.13 Threshold Price	
	Elasticity Coefficient	Statistically Significant at 90% Confidence Level?
Below Threshold Price	N/A	Yes
Above and Including Threshold Price	-8.7%	Yes

Table 5. Method B Shoulder Season Elasticity Estimates

	Shoulder - $0.13 Threshold Price	
	Elasticity Coefficient	Statistically Significant at 90% Confidence Level?
Below Threshold Price	N/A	Yes
Above and Including Threshold Price	-13.5%	Yes

In order to provide the reader with some context as to the meaning of these estimates, Summit Blue/Navigant Consulting has plotted the implied demand curve for a customer whose average base hourly consumption of electricity is 1.7 kWh (see Figure 3). From this plot the predicted consumption for such a consumer may be observed at each price level. Where the demand curve line is dashed indicates positive nonsensical estimates of the own-price elasticity of demand.

Figure 3. Demand Curves by Season Implied by Method B Estimates[5]



The analysis and results presented above should be understood to be both a significant improvement on those presented in the 2009 PSP impact evaluation, and a step toward a more rigorous and robust analysis of the consumer demand function for electricity. It is expected that the analysis to be presented in the PSP impact evaluation report for 2010 will make use of either a regime-changing model with

[5] Although no prices exceeding $0.08 were observed in the summer of 2009, hourly prices exceeding $0.24 (the x-axis limit of Figure 3) were observed in all seasons over the entire period of analysis.

Markov-switching (to better assess a threshold price) or an almost ideal demand system framework (to better control for cross-price effects) or some amalgam of both. Readers interested in these frameworks are encouraged to read the final section of Appendix B, which presents these frameworks in greater detail, along with some citations of previous work of a similar nature performed using them.

Hourly Demand Impacts

An elasticity estimate is a way to describe general price responsiveness in a single number. Elasticity measurements provide a convenient way to compare results across studies, and they also provide a predictive modeling tool that can be used to create ex ante estimates of savings in future years under different price scenarios.

There is additional information about the hourly demand impacts of the PSP program in 2009 that can be gained by comparing typical load curves for PSP participants to load curves for a control group of similar customers that did not participate in the program. The difference in these load curves is a good indicator of the ex post hourly impacts of the program in 2009 if the control group is a good match to the participants.

This section describes the methodology used to develop a good set of matched control group load curves, and then results of the comparisons will be summarized and shown in graphical form.

Methodology

The objective of the hourly demand impact study is to compare average load curves for PSP participants to a matched control group. In the 2008 evaluation, hourly demands were estimated for the following day types:

1. Regular Summer Weekdays
2. Regular Summer Weekend Days
3. High Price Alert Summer Weekdays
4. High Price Alert Weekends
5. Regular Shoulder Month Weekdays
6. Regular Shoulder Month Weekend Days
7. Regular Winter Weekdays
8. Regular Winter Weekend Days

In 2009, the summer was very cool and there were no High Price Alert days. Consequently, hourly demand estimates will only be developed for the other six day types (Summer, Shoulder, Winter – Weekdays and Weekend Days).

The basis of the typical load curves developed for PSP participants was the same collected and cleaned hourly load data that was used for the development of the elasticity models. While the elasticity study looked at all available hourly data going back to 2007, the load curve study used only data for the calendar years of 2008 and 2009.

The hourly data for the control group came from the Ameren-Illinois load research sample. Average load curve information was supplied for twelve different customer groups. The twelve customer groups covered four strata for each of three companies. The three companies were CIPS, CILCO, and IP. The four strata had the following definitions:

Strata 1: Low Summer, Low Winter

Strata 2: Low Summer, High Winter

Strata 3: High Summer, Low Winter

Strata 4: High Summer, High Winter

For these strata designations, summer is defined as June, July, August, and September. Winter is December, January, and February and shoulder months are April, May, October, and November. Low summer use is defined as a maximum monthly kWh usage less than or equal to 1,300 kWh, and high summer use is over 1,300 kWh. Low/High Winter use is determined by looking at the winter-to-shoulder ratio. The winter-to-shoulder ratio compares average winter use per day to average shoulder use per day for each customer. If the winter-to-shoulder ratio is less than or equal to 1.6, then the customer is Low Winter use; otherwise they are High Winter. The one exception to these definitions is for CILCO where the cut-off for the winter-to-shoulder ratio is 1.8 instead of 1.6.[6]

The goal of the load curve comparisons is to make a control group that is very closely matched to the characteristics of the participant group. In this way, the observable difference in the load curves for the two groups is most likely to represent the impact of the PSP program on the participants' energy use. If not for the program, the two load curves would be the same because the two groups are similar.

Given the data available for this analysis, the best way to create a matched control group was to determine which load research group each PSP participant matched best. This was done by looking at the company designation for each customer and using the strata definitions to place each PSP participant into the appropriate strata. This step created several interesting observations about PSP participants that are shown in Table 6.

Table 6. Comparison of Strata

	All Residential Customers	PSP Participants 2008	PSP Participants 2009
Low Summer – Low Winter	52%	43%	44%
Low Summer – High Winter	12%	11%	12%
High Summer – Low Winter	31%	40%	36%
High Summer – High Winter	5%	5%	8%
TOTAL	100%	100%	100%

[6] The 1.8 cut-off for CILCO was determined by the AIU load research team based on differences in weather patterns and base usage in the CILCO service territory.

PSP participants in both 2008 and 2009 are less likely to be low energy users than the general residential customer population. While 52% of all residential customers are in the low use category (Low Summer – Low Winter), only 43%-44% of PSP participants are low energy users. PSP participants show a good representation across the smaller High Winter use categories, matching the distribution of the residential customers almost exactly in 2008 (17% High Winter users for residential customers compared to 16% for PSP participants in 2008). The biggest change in the composition of the PSP participants in 2009 compared to 2008 comes from a surge in the number of High Summer – High Winter users, moving from 5% to 8%. This reflects the impact of the targeted marketing that was done throughout the year to attract high winter users to the program. It makes sense to target this group since customers who use more electricity have a greater opportunity to save money on the PSP rate, as well as having a higher electric bill and more of an incentive to try to save.

After determining the correct strata designation for each PSP participant, average load curves were developed by strata for each of the day types of interest. These average load curves could be compared directly to similar day types for each strata calculated from the Load Research data. The result is a series of 32 graphs (eight day types by four strata), which show the estimated hourly demand impacts of the PSP program.

These graphs were reviewed to see if there were obvious differences in the shape of the program impacts across the four strata for a given day type. The conclusion was that each strata responded similarly to similar hours of the same day type. The magnitude of the response varied; since low use strata had noticeably lower load curves than high use strata, the differences between the PSP participant group and the Load Research control group occurred in the same hours with roughly the same percentage impact. Based on this visual observation, it was determined that the four strata could be combined to create a good overall estimate of the hourly demand impacts for each day type. Consolidating the strata charts by day type increases the sample size and smoothes out the curves, creating a better estimate of typical hourly demand impacts. In the 2008 evaluation report, the set of 32 load shapes across individual strata groups were presented to illustrate these points. Since strata variations showed the same characteristics in 2009, the revised set of 32 load shapes will not be included in this report. The 2009 individual strata charts do not add any new information to the on-going evaluation, and leaving them out creates the opportunity to look at differences in load shapes for a variety of other customer subgroups instead.

The final overall control group load curves for each day type were constructed by weighting the strata-level control group load curves based on the distribution of customers in the corresponding PSP participant strata. For example, the strata one comparison curves were known to represent 43% of all the PSP participants. This weighting creates final overall load curves that compare actual PSP participant loads on the given day type to a matched comparison group created from the Load Research data.

Results

In 2009, average hourly demand impacts from the PSP program were estimated for three different seasons. The following season definitions were used:

Summer – June, July, August[7]

Winter – January, February[8]

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[7] Seasons for load curve comparisons were defined based on similarity of usage patterns, not standard rate tariff definitions. Summer is June, July, and August.

Spring/Fall – March, April, May, September, October, November

Results for each season will be presented separately, starting with summer. The summer season is generally the season of greatest interest since it is the season of the system peak.

Summer Weekdays

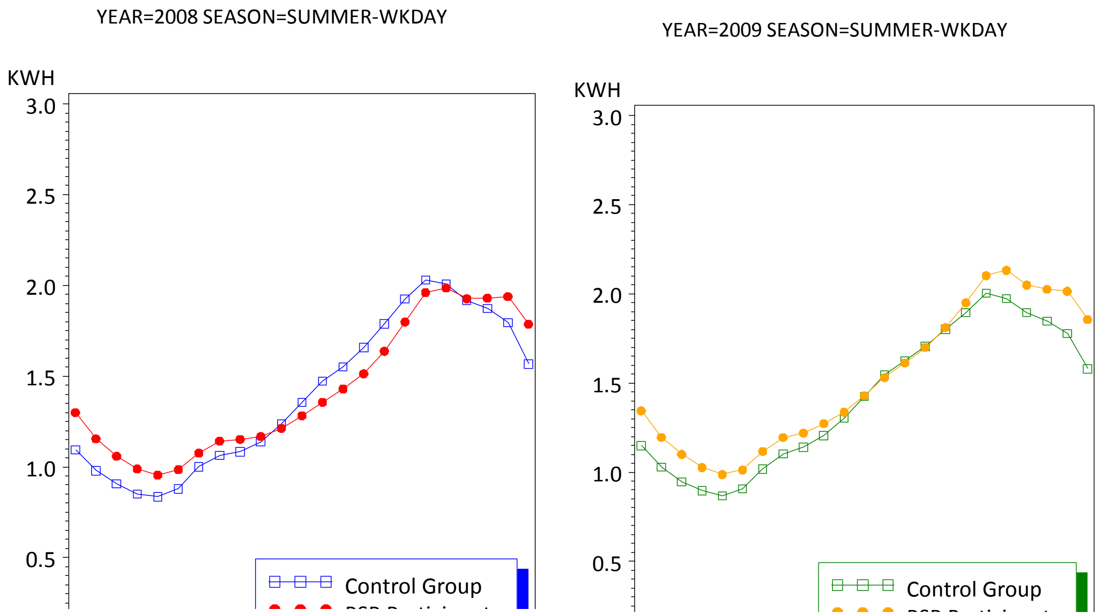
As previously discussed, there were no High Price Alert days during the summer of 2009. In 2008, these were the days that showed the most daytime load impact for PSP participants with an average load reduction of 0.23 kW per customer from Noon to 5 p.m. On other summer weekdays, PSP participants continued to show lower daytime use and higher nighttime use, with an average load reduction of 0.15 kW per customer from Noon to 5 p.m. The important question for 2009 is whether or not PSP participants continued to show daytime load reductions on regular summer days even though the weather was cooler and prices were lower than the summer before.

A comparison of the summer weekday load curves for 2008 and 2009 given in Figure 4 shows that PSP participants continued to alter their daily load shape in 2009. In 2009, PSP participants showed greater usage than the control group during evening and nighttime hours and similar use during the daytime. In comparison, in 2008 the evening and nighttime hours were also higher, but daytime use was actually lower than the control group.

In 2008, the difference between the PSP participants and the control group was used without adjustment to estimate the average load reduction of 0.15 kW per customer from noon to 5 p.m. Using this same method in 2009 would create an average load reduction estimate of zero reduction for the same time period. This is not a reasonable answer since the comparison of the load shapes shows a definite daytime response for PSP customers. Why does the 2008 method not work for estimating load reductions in 2009?

[8] December was not included in the winter season for this study because quality-checked load research data for December 2008 was not available at the time the analysis was completed.

Figure 4. Summer Weekday Average Load Shapes for 2008 and 2009

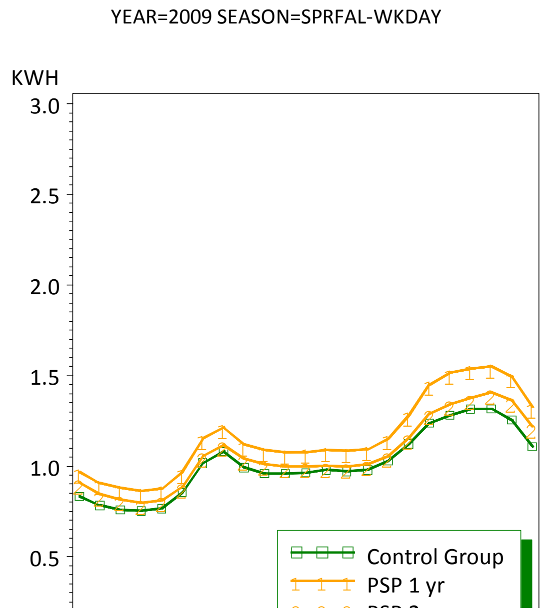


The most likely answer is that base use for PSP participants has changed since 2008. This would be consistent with the previous finding that there are now more High Summer – High Winter customers in the PSP participant group. There was also a significant increase in program participation between year-end 2008 and year-end 2009. The number of participants more than doubled, going from 3,147 to 7,422.

These conditions could create some real differences in the base use of participants who have been in the program for two or more years versus those that are new participants. If the base use for PSP participants has actually changed because of new participants, a different method for estimating average summer impacts from the comparison load shapes could be warranted.

One good method for assessing changes in base use is to look at usage during the Spring and Fall seasons. All electric use in these months tends to be base use since outdoor temperatures are moderate and electric space heating and air conditioning are not significant factors. Figure 5 shows that new one-year participants have a decidedly greater base use than the older two-year participants during the Spring and Fall months, and this greater use is particularly strong in the evening hours. This supports the conclusion that the PSP participant group has a higher average base use in 2009.

Figure 5. Comparison of Base Use Load Shapes for 1-year vs. 2-year Participants



The increased base use of new PSP participants may be simply a result of targeted marketing to high use customers, but it is also possible that the increased use of PSP participants in 2009 is spurred by their access to low rates. While elasticity estimates are generally referenced when predicting decreased usage due to higher prices, elasticity works both ways and lower prices could cause increased use. Did the general low rates for PSP participants in 2009 encourage them to use more energy and increase their base use compared to regular customers on standard rates?

Anticipating a need to answer this question in the evaluation, a special series of survey questions were included in the Fall 2009 participant survey.[9] These questions tried to assess participant awareness of the low rates in 2009, and then follow-up with a question on whether or not they changed their energy usage in response to their awareness. A neutral open-ended question was asked about how they changed their energy use if they had indicated they did make changes. This was done to create the opportunity for customers to report that they were using more energy because prices were so low, without offering that possibility as a leading question.

Table 7 shows the results of this series of questions. Only 66% of respondents were aware that 2009 summer prices were lower than 2008 prices. Of those who were aware of the lower prices, 70% indicated that they changed their use of energy in 2009 compared to 2008. Review of the verbatim responses to the open-ended question on how they changed their use revealed only eight customers who made any mention of using electricity more, or even reducing their efforts to shift/save, because of the low prices. Most customers reported taking the load reduction and shifting actions recommended in the PSP

[9] The Fall 2009 participant survey was part of the Fall Newsletter sent to all PSP customers. Responses were voluntary and were received from approximately 950 participants.

literature. The conclusion from review of this data is that the low prices in 2009 were not a contributing factor to the overall increase in base use for PSP participants.

Table 7. Survey Responses on Increased Use Due to Low Prices in 2009

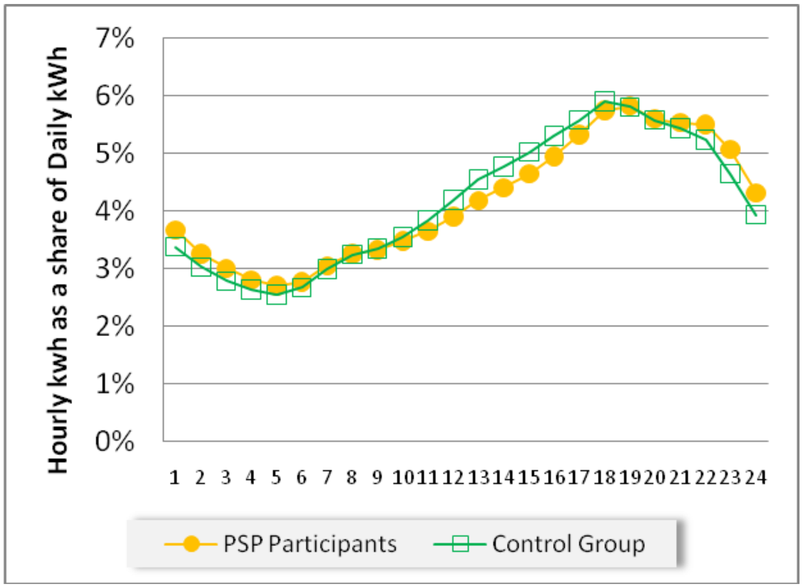
Survey Question	Total N = 941
"Think about the prices you paid for electricity this summer compared to what you paid for electricity last summer." Number who feel Summer 2009 prices are lower than 2008:	618 (66%)
Of these, number that said they changed how they used electricity in Summer 2009:	432 (70%)
Of these, number that said they used more electricity or "did not make heroic efforts" to save in 2009 because prices were low:	8 (2%)

Now that an increase in base use as a distinguishing characteristic of new 2009 PSP participants has been established, it becomes necessary to develop a better method for estimating the summer hourly impacts of the program.[10]

The best method for estimating the hourly summer impacts of the PSP program in 2009 is to create indexed load shapes for each group, the control group, and the PSP participants, and then calculate the hourly differences based on the average daily kWh consumption for PSP participants. Figure 6 shows the indexed load shapes, and this brings the relationship between participants and the control group very much in line with what was seen in 2008. Therefore, while overall use has increased a bit for PSP participants, their basic response pattern on regular summer days has not changed.

[10] It is noted that, theoretically, the weighting of the different strata load curves for the control group to match the distribution of PSP participants should create an overall control group load curve that reflects the PSP participants' move towards high use strata. While this is true, the fact that the weighting does not work as well in 2009 as it did in 2008 indicates that PSP participants are coming from the higher use customers *within* each strata, as well as from different strata.

Figure 6. Indexed Summer Weekday Load Shapes for 2009



Using the indexed load curves and applying the same average daily kWh use to each group, the 2009 estimate of the average hourly load reduction per customer from Noon to 5 p.m. on summer weekdays is -0.13 kW. This is very close to the estimate of -0.15 kW reported last year for 2008.

However, the indexing method was not used last year because there was less of a difference in base use between the two groups. Table 8 shows that in 2008 PSP participants only used slightly more energy on summer weekdays than the control group, an additional one kWh per day. In 2009, this increased to a difference of 2.6 kWh/day.

Table 8. Average Daily kWh Use for Summer Weekdays

	Control Group	PSP Participants	Difference
2008	33.3 kWh/day	34.3 kWh/day	+1.0 kWh/day
2009	34.0 kWh/day	36.6 kWh/day	+2.6 kWh/day

While use of the indexing method would have had less of an effect on 2008 estimates than it has shown in 2009, it is still a better method for even-handed comparison of hourly load differences between the two groups. Data from 2008 was used to re-estimate the average summer impacts using the indexing method for that year. The results in Table 9 show that the original estimate of -0.15 kW average load reduction for the hours of noon to 5 p.m. on regular Summer Weekdays would change to -0.18 kW using the indexing method, and the estimate of -0.23 kW for High Price summer days would change to -0.27 kW. This does not change the general finding from the 2008 study that on High Price summer days (summer peak days) four PSP customers contribute approximately the same amount of load reduction as one Direct Load Control customer would.

Table 9. Average Load Reduction for PSP Participants During the Hours of Noon to 5 p.m.

	2008 Original Estimate	2008 Revised Estimate	2009 Estimate
High Price Summer Days	-0.23 kW/cust	-0.27 kW/cust	Not Available
Regular Summer Weekdays	-0.15 kW/cust	-0.18 kW/cust	-0.13 kW/cust

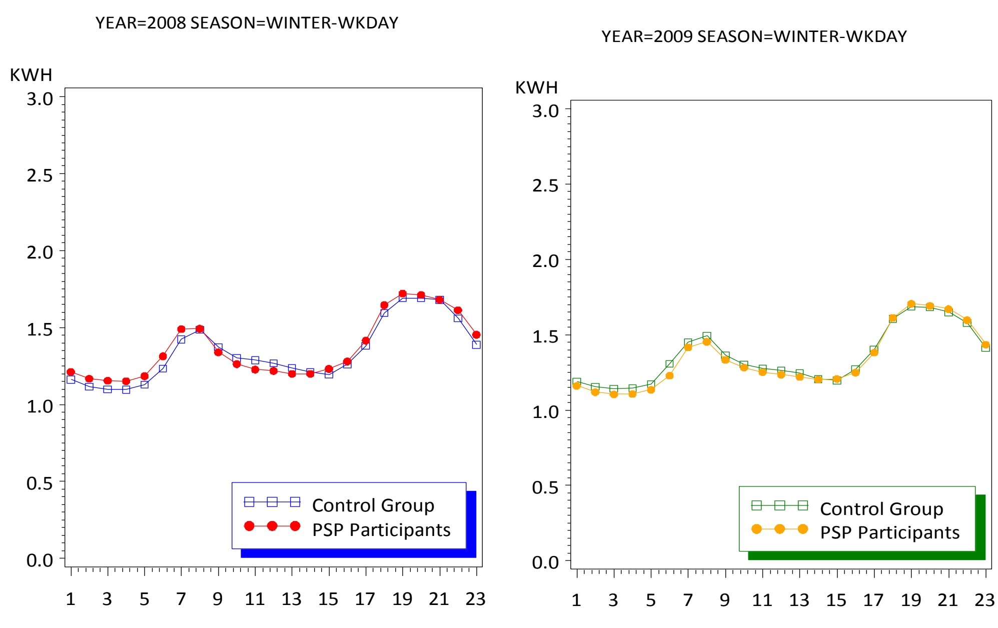
We recommend use of indexed load shapes as a better method for estimation of hourly PSP impacts in the future because it adjusts for any differences in average daily use that may exist between the control group and the PSP participants. While this difference was considered to be insignificant in 2008, it is growing and it has become important to adjust for it.

Winter Weekdays

The single-hump load shape for summer changes to the traditional double-hump load shape in winter for both the PSP participant group and the control group. There is a morning peak between 6 a.m. to 8 a.m. when customers are getting ready for their day and before many of them leave their home, and a second peak in the evening from 5 p.m. to 9 p.m. when many come back home again and everyone is turning on lights, cooking dinner and being active within their homes.

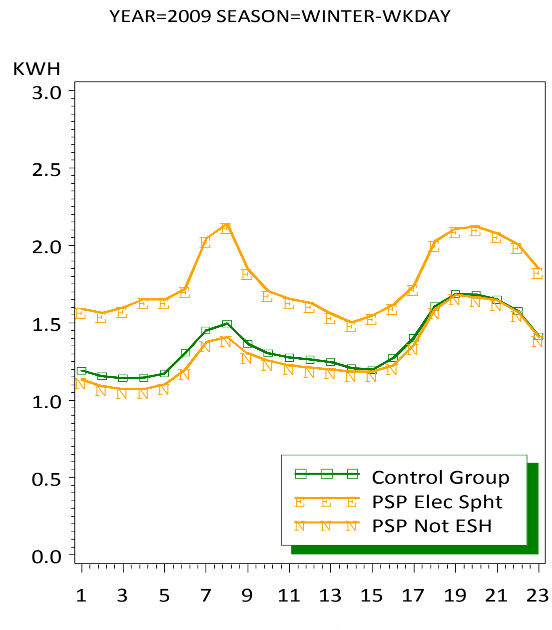
In the 2008 evaluation, it was found that PSP participants have slightly more nighttime use in winter than regular customers. Figure 7 shows that this same relationship does not continue in 2009. In 2009, the average daily load shape is nearly identical for PSP participants and the control group.

Figure 7. Winter Weekday Average Load Shapes for 2008 and 2009



It is likely that this change is coming from a difference in the saturation of electric space heating within the PSP participant group. This hypothesis is based on the observation that electric space heat customers have very distinctive load shapes in the winter, and a small additional influx of electric space heat users could make small differences in the overall participant load shape. Figure 8 illustrates the unique winter load shape of electric space heat customers. Additional work would have to be done to isolate the impact of electric space heat customers on the overall load shape, but this effort does not seem warranted at this time given the very small difference between PSP participant and control group load shapes on Winter Weekdays.

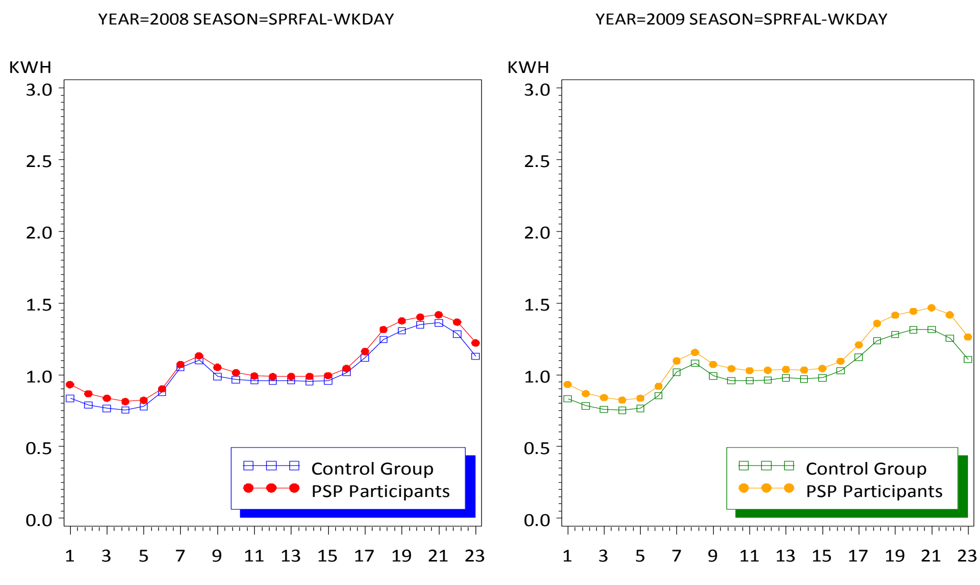
Figure 8. 2009 Winter Weekday Load Shapes for Electric Space Heat vs. Other Heat



Spring/Fall Weekdays

In 2008, it was noted that PSP participants and the control group had very similar load shapes in the Spring and Fall. Figure 9 shows that in 2009 the load shapes remained very similar during this season, but total use for PSP customers increased across all hours. There is some indication that use increased even more in the evening hours. As presented previously, this increase in base use is largely coming from the new participants in the PSP program.

Figure 9. Spring/Fall Weekday Load Shapes for 2008 and 2009



Customers Using Super-Cooling

One strategy that PSP participants can use to save money on their electric bill is super-cooling. On hot summer days, they can run their air conditioning overnight, when prices are low, to super-cool their home. Then, if they can keep it insulated from the daytime heat (i.e., draw down window shades, limit door openings, etc.) they can stay comfortable for much of the day without using expensive daytime energy. The added benefit of this strategy is an overall reduction in energy use. Air conditioning runs more efficiently when outdoor temperatures are lower, and this reduces total energy use.

Of course, this strategy can be used at various levels of intensity. Some people may just turn off their air conditioning when they leave for work in the morning and then turn it back on when they get home in the evening so they can sleep comfortably. Others may make conscious efforts to make their home extra cool during the nighttime and ride through the daytime with low outdoor temperature infiltration and regular fans for comfort.

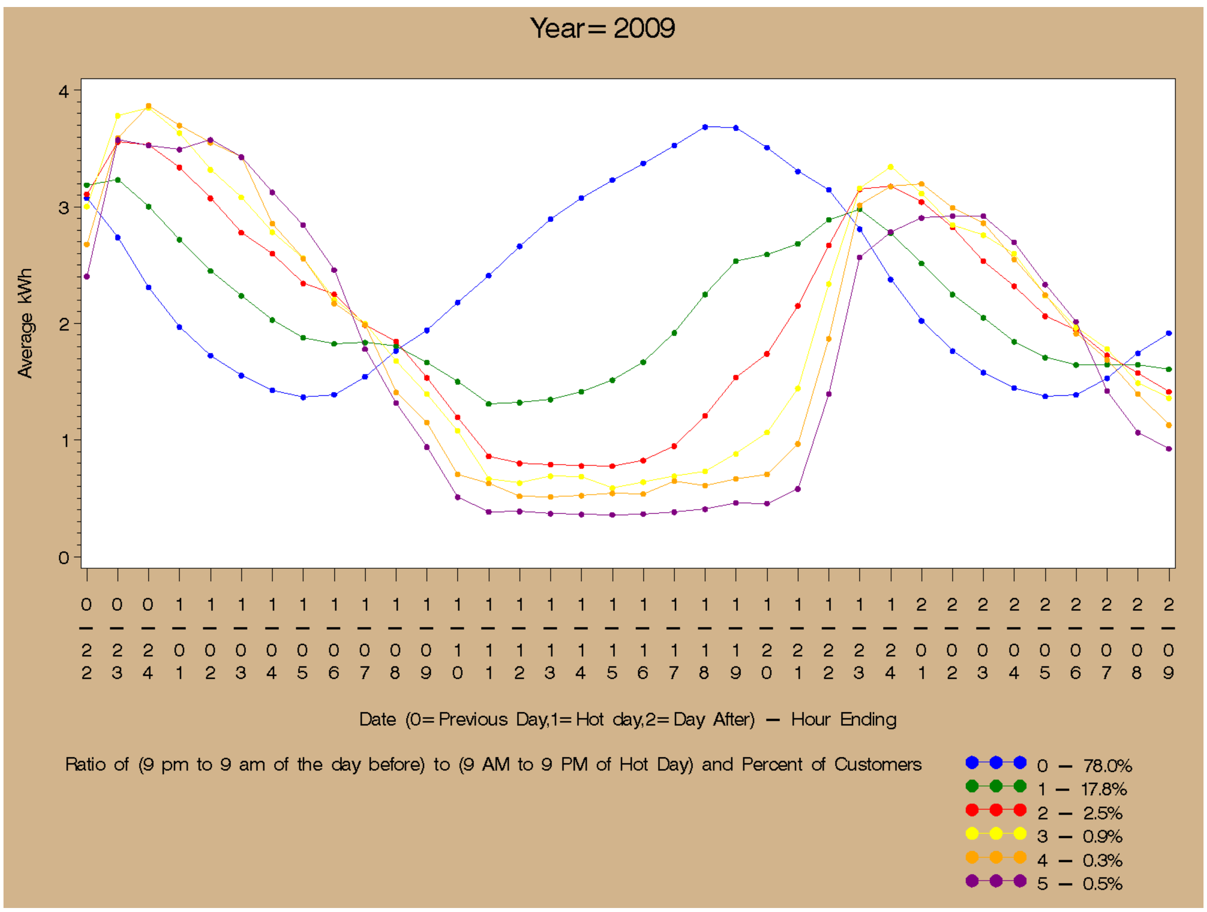
The available hourly data was examined to estimate how many PSP customers are using super cooling strategies at different levels of intensity. To do this, data for the five hottest weekdays during the summer was selected. Since we are looking at activity during the night before and the night after the hottest day, a period of thirty-six hours was analyzed which spanned from 9 p.m. on the evening before the hottest day and continued through 9 a.m. on the morning after the hottest day.

To gauge the intensity of super cooling efforts, a ratio was developed for each individual customer's usage pattern on each individual hot day. The ratio compared the total 9 p.m. to 9 a.m. usage before the hot daytime to the total 9 a.m. to 9 p.m. usage during the hot day. Each customer day was then assigned to a group by taking the integer value of their ratio. Customer days with a ratio of zero used more energy during the daytime than during the nighttime. Customer days with a ratio of one used between 1.0 and 1.9 times more energy during the nighttime period than during the daytime period, etc.

Figure 10 illustrates the average load shapes for each of these groups, and provides a summary of the number of customers in each group. It shows that in 2009, 78% of participants used more energy during the daytime than during the nighttime period while 22% exhibited some significant load shifting to the off-peak hours. Presumably, these significant load shifts are related to super cooling strategies. This is not to say that the 78% did nothing to respond to price, but simply that they did not make shifts that were as extreme as some other customers did. The five hottest days in 2008 were also examined and results were very similar, with 24% of customers showing extreme shift patterns.

This graph also illustrates that about 18% of customers are practicing lower intensity super cooling with the remaining 6% using more extreme intensity practices. There are obvious inflection points around 7 a.m. to 8 a.m. in the morning and later at 10 p.m. to 11 p.m. were the super cooling groups start making their transition in usage.

Figure 10. Load Shapes on Hottest Days for Different Super Cooling Intensities



One curious observation is that off-peak loads appear to be higher on the night before rather than the night after. Our initial thoughts were that the loads on the night after would be higher because of snapback. Of course, the outdoor weather has a large influence on the overnight loads. It is likely that the evenings before were hotter than the evenings after. It is also interesting to note that the average nighttime peaks for the extreme intensity super cooling groups are as high as the daytime peaks of the regular participants. This is an indication that it may be larger users that are making use of super cooling strategies the most.

Appendix D offers the interested reader additional load curve comparisons for various subgroups of customers.

Conservation Effects

The conservation effect can be defined as the percentage change in average total energy used by customers over a defined time period. For example, an annual conservation effect of 3% means that the average total annual use for participants is 3% less in the years following their joining the program, when compared to the years before. This effect is also evident when seasons (i.e., summer, winter, and shoulder) are modeled independently of the rest of the year.

The conservation effect gives a good indication of how customers are (or are not) changing their overall behavior with regard to their overall level of energy use once on the program, even when there are not many high price days. In addition, it shows how much total energy is saved when air conditioning load is shifted to later in the day by customers setting their thermostats to a higher than normal temperature at the peak cooling time. This reduces the energy needed to cool even when the thermostat returns to its usual temperature because the temperature outside will have fallen from its high point in the late afternoon.

The next section describes the econometric models used to estimate the conservation effect for this year of the study, and this is followed by a section that presents the results from the models.

Methodology

Approach

For this task, we used an approach that compared weather-normalized average monthly use from the pre-participation period to the post-participation period for each participating customer and for a control group. The control group was comprised of individuals in AIU's load research samples.

Usage and other related data were available both across a group of customers (i.e., cross-sectional) and over time (i.e., time-series). With this type of data, known as "panel" data, it is possible to control at the same time for differences across facilities as well as differences across periods in time through the use of a fixed effects model. The term "fixed effect" refers to the assumption that differences across customers can be explained in large part by customer-specific intercept terms, as discussed below.

Because the consumption data in the panel model includes some months before and after customers started to participate in the program, the pre-participation months of consumption act as controls for post-participation months. In addition, this model, unlike annual pre/post-participation models such as annual change models, does not require a full year of post-participation data.

The fixed effects model can be viewed as a type of differencing model in which all characteristics of the customer that(a) are independent of time, and (b) determine the level of energy consumption, are captured within the customer-specific constant terms. In other words, differences in customer characteristics that cause variation in the level of energy consumption, such as building size and structure, are captured by constant terms representing each unique customer facility.

Algebraically, the fixed-effect panel data model is described as:

$$y_{it} = \alpha_i + \beta x_{it} + \Delta E \cdot F_{it} + \varepsilon_{it}$$

Where:

- y_{it} = Energy consumption for site *i* during month *t*
- α_i = Constant term for site *i*
- β = Vector of coefficients
- x = Vector of variables that represent factors causing changes in monthly consumption (i.e., the time-effects variables such as weather)
- ΔE = Coefficient that represents change in energy use for participants
- F_{it} = Flag indicating participation in the program for each month (set to one if participating and zero if not participating), for site *i* during month *t*
- ε = Error term

In practice, rather than estimating a unique intercept term for each customer, an equivalent approach is employed that expresses both the dependent and independent variables in terms of deviations from the time-series means for each customer. The resulting estimated coefficients from this "deviation from the mean" approach are equal to the coefficients found by having customer-specific intercept terms.

That is, it can be shown that:

$$\alpha_i = \overline{y_i} - \beta \overline{x_i}$$

This implies that the customer-specific intercept term captures the difference between the average energy use for that customer and the predicted average energy use (from the model) during the time period used in the model. Therefore, the fixed-effects model explains the month-to-month deviation in energy use rather than the level of energy use.

Participation in Other Energy Efficiency Programs

423 of the customers in the data set also participated in one or more of five other residential efficiency programs that were offered by AIU in 2009.

Of these customers, 397 participated in one EE program, 27 participated in two EE programs, and four customers participated in three EE programs. Total savings for each program from the initial month of participation through the end of 2009 for the participating customers, and number of participants, are shown in Table 10.

Estimated annual savings and date of measure installation were available for all PSP participants and these values were included in the model to prevent savings from the measures being attributed incorrectly to the PSP program. Annual savings were distributed by month equally throughout the year, starting in the month that the measure was installed.

Table 10. Savings and Participation in Other EE Programs[11]

	Home Energy Performance	ARCA Appliance Recycling	HVAC New	Lighting & Appliances	Demand Response
Total Savings (kWh)	11,709	196,530	31,720	26,131	1,194
Average Savings (kWh/day)	1.00	5.24	8.87	1.19	0.46
Participants	82	181	29	128	38
Average Number of Months of Savings	5	7	4	6	2

An attempt was made to compare PSP customer participation in these programs to the general participation rates observed for all residential customers. The evaluation report on overall results of the residential energy efficiency programs in Program Year One (PY1) provides some information on participation rates for the overall population.[12] However, PY1 for energy efficiency programs does not coincide with calendar year 2009 which is the focus of this study. It was not possible to make the comparison using existing reports.

Data

Data was available for years 2007, 2008, and 2009 and it included both the PSP participants and a much smaller control group. The basic unit of time for the data in the conservation model was one billing period. This billing period was usually, but not always, approximately one calendar month. There were some occasions in which there was more or less than one billing period in each calendar month.

The data included the following categories:

1. Basic customer data – customer account number, primary month, primary year, and number of billing days in each billing period.

2. Energy data – kWh used during each billing period, expressed as kWh/day to normalize for the number of days in the billing period.

3. Pricing data – number of high-priced days in the billing period.

4. Climate data - average monthly temperature, heating degree days, cooling degree days, and temperature humidity index for each billing period. Heating degree days, cooling degree days

[11] Descriptions of these programs can be found in "ActOnEnergy Energy Efficiency and Demand-Response Program Results, Year One Activities" prepared by Ameren Illinois Utilities, January 2010.
[12] See "Residential Program Portfolio: PY1 Evaluation Report", prepared by The Cadmus Group, Inc., October 23, 2009.

and the temperature humidity index were normalized for billing days in the period (e.g., average heating degree days per day during the period).

5. A participation flag that indicates whether or not the customer was a participant during each billing period. This is set to zero if the customer was not participating and set to one in the first billing period that the customer started participating, and for all subsequent months. This was zero in all months for the control group.
6. A flag indicating if the customer was in the control group or the PSP group.
7. Effects of participation in other energy efficiency programs – this data was the estimated (non-verified) savings due to the customers' participation in one or more of five other energy efficiency programs. Savings were given as estimated kWh saved per month, starting at the month in which the measure was installed, and then normalized for the billing days in the period.

Regression Model

The regression model was run using all available Control Group and PSP Group data. Some data screening was done to ensure a sufficient number of data points per customer for a reliable result. For example, customers in the PSP Group that had less than five data points in which the participant flag was set were excluded.

The model was then run in two ways:

1. Annually, by strata. The strata designations were supplied by AIU and there are four of them, as follows:
   - Strata 1: Low Summer, Low Winter
   - Strata 2: Low Summer, High Winter
   - Strata 3: High Summer, Low Winter
   - Strata 4: High Summer, High Winter
2. By season and annually for the whole population. The seasons are defined as:
   - Winter – November, December, January
   - Summer- June, July, August
   - Shoulder – all other months

Once the models had been run and verified as statistically significant, the change in consumption was then calculated as the coefficient of the participation flag times the number of days in the period of the model.

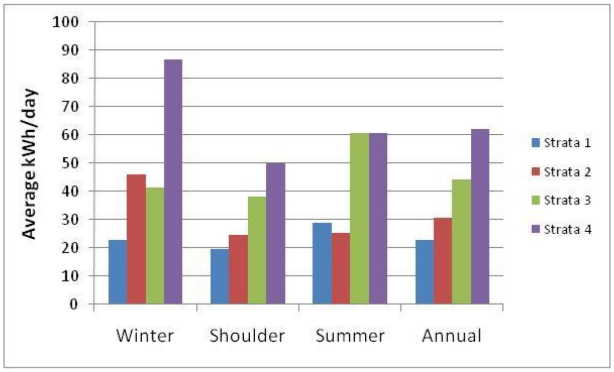
Results

The key result from the conservation modeling is that Power Smart Pricing participants reduced their total energy use in response to variations in hourly prices during both the summer season and shoulder months, but increased their total energy use in the winter months. Overall, the annual energy use of participants was lower when compared with the time before they joined the program. Precision levels for the savings estimates range from 11% to 20% at the 90% confidence interval, and all of the estimates are statistically significant at the 99% confidence level.

Baseline

A simple statistical analysis was first done to determine average kWh use by strata, for each season and annually, to establish a baseline total energy use in the months when customers were not participating. As can be seen in Figure 11, customers in stratum one and three use more in winter than in summer, and the converse is true of stratum two and four. Annual energy use and energy use in shoulder months increases moving through strata one to strata four.

Figure 11. Average Energy Use by Strata and by Season



Savings

Table 11 shows the results of the conservation model when run by season and for the whole year. For the seasonal analyses, the data for each season was run as a separate model. The variables included in the model were: PSP Participation flag, average THI/day, average HDD/day, and the estimates of savings from the other energy efficiency programs. The inclusion of savings estimates from the five other energy efficiency programs improved the model, but the individual realization rates for the savings estimates were not significant.

The results show that PSP customers saved over 5% of total summer use, and just over half a percent of use in the shoulder months. The result for winter was not valid, but comparing the annual savings value of 1.2% and the values for summer and shoulder implies that the savings were negative in the winter.

The overall savings effect of 151 kWh per customer per year (1.2%) for the period of 2008-2009 is very similar to the 2008 reported savings of 186 kWh per customer (1.5%). We believe this new estimate to be a more accurate value as the data set contains more data points (i.e., customers) over a longer time period. If, in fact, summer savings are related to shifting air conditioning use, it is possible that savings were suppressed in the summer of 2009. The cooler weather meant less total use of air conditioning, and that would translate into less savings from air conditioning.

Table 11. Conservation Effect by Season

Season	kWh Savings	Days	Average Base kWh Use	Savings %
Winter	not valid	90	3,403	
Shoulder	33	183	5,408	0.6%
Summer	203	92	3,948	5.1%
Annual	151	365	12,759	1.2%

Savings were also modeled by strata as a verification of the overall estimates. Modeling the data by strata showed that those strata with a higher winter use had an overall negative savings value, and those with higher summer use had positive savings, as shown in Table 12. A weighting was given to each strata based on the number of customers in the analysis group, and a weighted average for the savings was calculated. This compares well with the seasonal and annual model shown above, with annual savings for all strata at 1.8%.

Table 12. Annual Conservation Effect by Strata

Strata	Savings (kWh)	Strata Weighting[13]	Average Annual kWh Use	Customer Count	Savings as % of Total Use
1	234	47%	8,246	2256	2.8%
2	-264	11%	11,149	465	-2.4%
3	434	36%	16,181	1534	2.7%
4	-848	6%	22,652	240	-3.7%
Weighted Average	183		12,300		1.8%

Interpretation of Results

It is sometimes useful to look only at seasonal, or incremental, energy use, i.e., energy use related to heating or cooling due to changes in the outside temperature. A good estimate of this can be made by simply subtracting energy use in shoulder months from energy use in winter and in summer. Table 13 shows seasonal energy use for the four stratum and compares energy savings due to the program with seasonal use. The percentages of savings of seasonal use ranges from -14 to 21, which implies that those who increase their use in winter do so at about the same rate as those who decrease their use in summer

Because customers in strata one and three have higher winter use, we can assume there must be some kind of heating-related electricity use in their homes. Their overall use increases after beginning participation in the program. This could be because as prices are lower in the winter, there is a take-back effect: i.e., "prices are low so I can heat my house more." For strata two and four, the picture is more straightforward. As they have higher summer use, they conserve more in the summer when prices are high, and thus show an overall decrease in annual use.

[13] These strata weights differ slightly from the participant population strata weights reported previously because some participants did not have sufficient data to be included in the billing analysis. The strata weights for the analysis group are used here since the primary purpose of the calculation is to show the relationship to the results from the overall model.

To conclude, total energy use tends to go up when usage, like space heating, coincides with low prices and down when usage, like air conditioning, coincides with high prices.

Table 13. Seasonal Energy Use and Savings by Strata

Strata	Incremental Winter Use	Incremental Summer Use	Savings as % of Incremental Use
1	259	863	21%
2	1746	189	-14%
3	239	2129	18%
4	2774	1285	-21%
Weighted Average			13%

Bill Savings

In 2009, the aggregate savings for Power Smart Pricing participants was $1,388,996.09 which represents a 23.6% total savings compared to what the same bills would have been under the standard rate. Average annualized savings were $304.98 or 24.4%.[14] However, savings varied greatly by month, and to a lesser extent by which Ameren Illinois utility the participant was a customer of, because the underlying standard rates were different. In addition, despite the reintroduction of a subsidized electric Space Heat rate in December, 2007, and active efforts to discourage customers who were taking service under that rate to sign up for PSP, 117 customers eligible for the subsidized electric Space Heat rate have still chosen Power Smart Pricing. For those customers, bill impacts varied greatly.

Methodology

The two methods, aggregate savings and average annualized savings, used to calculate the 2009 PSP savings were the same as those used to calculate the 2008 PSP savings. Only the aggregate savings method was used for 2007 PSP savings reporting, due to less than a full year of PSP bills (PSP promotional campaigns didn't start until October 2007, after the rate relief settlement) and the resultant small number of months of participants' bills. CNT Energy recalculated PSP bills to show what they would have been under the appropriate Ameren standard rate and the difference between the two was the savings (either positive or negative). Distribution charges and taxes are the same for PSP customers and standard rate customers, and were not changed. The recalculation took into account the line items in the Electric Supply portion of the bill.

Within that section, several line items (the Market Value Adjustment, the Supply Cost Adjustment, and the General Assembly Rate Relief Credit) remained the same. The hourly energy charges were replaced by multiplying the monthly kWh by the appropriate summer/non-summer standard rate tariff (prorated as needed for bills that spanned both periods), and the Transmission Service Charge was recalculated to be on a kWh basis rather than a kW-day basis. The recalculated standard rate bills also did not include the $2.25 PSP Participation Charge or the RTP Supplier Charge.

[14] Due to the growing enrollment levels over the course of the year the overall savings percentage and the annualized average savings percentage are not the same. Annualized savings represent what the average customer would have paid if they were on the program for all 12 months of 2009.

The recalculations of bills focused on recreating a bill for the same usage as the PSP bill. It did not take into account the conservation effect reported in the previous section that suggests an average overall decrease in annual consumption of 151 kWh per customer, because that amount is an indirect observation, not clearly stated on actual bills.

Results

Table 14 shows the average monthly bill and savings/loss for all Power Smart Pricing customers. The summer savings are the result of the unusually low summer energy prices. A reduced overall system load, due to the combination of a cool summer and economic slowdown, worked to create these low prices. The large early and late year savings are also the direct result of the very low energy prices that were seen in the market and passed through directly to PSP participants.

Table 14. Overall Average Bill Impacts

	Savings/ (Loss)	Savings/ (Loss) %	Avg kWh	Comparable Standard Rate Bill	PSP Bill
January	$ 27.24	23.3%	1,073	$ 116.92	$ 89.68
February	$ 30.28	30.0%	895	$ 100.78	$ 70.50
March	$ 32.48	35.9%	786	$ 90.45	$ 57.97
April	$ 34.24	39.0%	756	$ 87.83	$ 53.59
May	$ 29.38	34.1%	775	$ 86.03	$ 56.66
June	$ 20.03	16.7%	1,117	$ 119.74	$ 99.71
July	$ 14.62	11.9%	1,136	$ 123.04	$ 108.42
August	$ 13.29	11.1%	1,103	$ 119.81	$ 106.52
September	$ 22.86	23.8%	881	$ 95.95	$ 73.09
October	$ 25.00	29.9%	792	$ 83.59	$ 58.59
November	$ 29.75	30.8%	954	$ 96.45	$ 66.71
December	$ 25.82	20.1%	1,250	$ 128.40	$ 102.58
Totals:	$ 304.98	24.4%	11,517	$ 1,249.00	$ 944.02

If savings/losses are broken out by utility, the impact of the various underlying standard rates (and the special Space Heat rates) can be seen in the following tables.

Savings for Ameren CIPS customers were higher than for Ameren IP customers in a large part because the underlying standard rates for Ameren CIPS were higher, in particular the non-summer first 800 kWh block (7.484 cents/kWh versus 6.874 cents/kWh).

Table 15. Ameren IP and Ameren CIPS Monthly Bill Savings

	Ameren IP			Ameren CIPS		
	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %
January	1,067	$ 27.44	22.9%	1,181	$ 33.81	27.6%
February	897	$ 30.08	29.1%	979	$ 36.77	35.2%
March	787	$ 31.94	34.5%	852	$38.80	41.6%
April	768	$ 33.92	37.4%	785	$ 39.22	44.7%
May	799	$ 29.39	32.7%	786	$ 32.00	38.5%
June	1,141	$ 20.30	16.2%	1,219	$ 22.15	18.3%
July	1,166	$ 14.76	11.4%	1,142	$ 16.50	14.4%
August	1,129	$ 13.51	10.7%	1,140	$ 14.75	13.0%
September	900	$ 23.12	22.8%	908	$ 24.53	27.2%
October	801	$ 24.33	28.1%	856	$ 30.09	35.6%
November	957	$ 29.09	29.3%	1,112	$ 37.56	36.6%
December	1,255	$ 25.77	19.4%	1,439	$ 32.92	23.5%
Totals:	11,668	$ 303.65	23.4%	12,399	$ 359.12	28.6%

Ameren CILCO and Ameren CIPS-ME do not have a special Space Heat rates and instead all standard rate customers pay a very low charge for non-summer usage over 800 kWh. (2.334 cents/kWh and 0.992 cents/kWh respectively).

A small number of Ameren CIPS-ME customers at the end of 2009 appear to have significantly higher winter monthly usage suggesting that some of them have electric heat. As a result the average savings for these customers is lower.

Table 16. Ameren CILCO and Ameren CIPS-ME Monthly Bill Savings

	Ameren CILCO			Ameren CIPS-ME		
	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %
January	981	$ 23.01	23.3%	1,624	$ 0.75	0.6%
February	799	$ 27.39	31.9%	1,170	$ 12.92	13.7%
March	722	$ 30.73	38.7%	847	$ 23.53	29.7%
April	676	$ 32.27	42.4%	795	$ 30.53	38.4%
May	658	$ 27.40	38.2%	773	$ 27.38	35.4%
June	914	$ 16.89	18.3%	1,123	$ 20.24	18.5%
July	975	$ 11.97	12.2%	1,210	$ 17.38	14.5%
August	944	$ 10.87	11.5%	1,124	$ 14.61	13.1%
September	765	$ 20.11	26.3%	850	$ 21.73	25.8%
October	688	$ 23.51	33.8%	735	$ 22.23	31.4%
November	787	$ 25.79	33.5%	839	$ 23.37	31.1%
December	1,011	$ 18.94	19.7%	1,100	$ 13.77	14.4%
Totals:	9,920	$ 268.88	26.5%	12,190	$ 228.43	20.5%

As noted above, 117 PSP customers were eligible for the special standard rate Space Heat rates had they not switched to PSP. For those customers, many experienced their lowest savings (or loss) in winter months. However, former Space Heat customers with moderate usage were still able to save money during the winter. The lower overall hourly prices did lead to all but three of these customers having net savings for the year. CNT Energy reached out to the customers with the largest losses to discuss their participation in the program and several of them decided to leave after their twelve month term was up.

Table 17. Ameren IP and Ameren CIPS Former Space Heat Customers Monthly Bill Savings

	Ameren IP Former Space Heat			Ameren CIPS Former Space Heat		
	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %	Avg kWh	Savings/ (Loss)	Savings/ (Loss) %
January	1,492	$ 5.21	8.8%	2,265	$ 12.57	12.2%
February	1,324	$ 8.48	12.1%	1,933	$ 13.90	14.4%
March	1,095	$ 21.18	24.5%	1,301	$ 29.52	29.2%
April	853	$ 26.24	31.9%	1,061	$ 34.03	37.4%
May	741	$ 25.67	33.2%	807	$ 35.12	41.9%
June	793	$ 17.51	21.4%	1,039	$ 26.39	27.5%
July	1,015	$ 14.88	11.2%	1,099	$ 17.45	15.8%
August	963	$ 12.27	9.2%	1,106	$ 15.39	13.9%
September	942	$ 20.77	17.1%	1,004	$ 21.07	21.0%
October	760	$ 18.56	22.8%	844	$ 26.30	31.7%
November	805	$ 17.07	25.3%	1,017	$ 25.70	30.6%
December	1,081	$ 11.72	18.2%	1,597	$ 22.52	21.3%
Totals:	11,864	$ 199.56	17.5%	15,073	$ 279.96	22.7%

As stated in the Methodology section, the recalculation of individual customer bills focused on recreating a bill for the same usage as the PSP bill. It did not take into account the conservation effect reported in the previous section that estimates an overall decrease in annual consumption of 151 kWh per customer. However, at roughly ten cents/kWh for energy and distribution, that is an additional $15.10 that the average PSP participant avoided paying in 2009. If that savings had been included, the average annualized savings would have risen from 24.4% to 25.6%. For 6,652 participants (the number of participants in December 2009), that represents an additional annualized aggregate bill savings of $100,445.

Day-Ahead Prices vs. Real-Time Prices

Before considering changes in use, it is important to have a thorough understanding of what real-time prices were like in 2009. More specifically, we examine both day-ahead prices (which are what participants paid) and real-time prices (which reflect actual market conditions). In 2008, customer perception of a discrepancy between day-ahead prices and real-time prices was seen as a barrier to entry for the program. In June 2008, billing for participants was switched from real-time prices to day-ahead prices for increased predictability and to limit the confusion caused by two different pricing information mechanisms.

2009 was a summer of unusually mild weather during an economic recession. This created an electricity market where the real-time prices for a kWh never rose above 11 cents, and day-ahead prices never predicted a kWh to be over nine cents. This is in contrast to 2008, where there were 122 hours that were predicted to be over 13 cents by the day-ahead price.

The key purpose for comparing these prices again in 2009 is to document the continuing relationship between real-time price and day-ahead price patterns. Even though 2009 prices were relatively low compared to past years, documenting the relationship between day-ahead and real-time prices is important for determining that day-ahead prices continue to elicit the appropriate response from participants during the hours of the day that have the highest real-time prices.

Methodology

In order to understand the relationship between real-time prices and day-ahead prices, the analysis focused on the highest priced hours predicted by 2009 day-ahead prices . In general, the highest priced hours are defined by High Price Alert days. On High Price Alert days, the customer is contacted the evening before to raise their awareness to the need for action in hopes that they will reduce their load. In 2009 there were no High Price Alert days. Although no High Price Alert days occurred, participants can still benefit from the program by responding to day-ahead prices. Non-participants are billed at a standard rate that does not fluctuate with the actual price of energy.

The highest day-ahead price hours were selected for comparison with real-time prices. Because prices in 2009 were so much lower than in 2008, a much lower threshold of day-ahead prices was used to generate sufficient data for analysis. In 2008, the threshold was thirteen cents per kWh; in 2009 this was lowered to five cents.

Results

Figure 12 presents 24-hour price plots for the ten days in 2009 when the day-ahead price for at least one hour was predicted to be over five cents per kWh. The day-ahead price and the real-time price curves follow similar patterns. Participants in the program who reduce their loads according to the day-ahead price will be achieve savings at the right time of day to achieve meaningful system load reductions . Day-ahead and real-time prices are not exact matches but their correlation is sufficiently strong that day-ahead prices are an excellent aid in predicting the rise and fall of real-time prices.

Figure 12. 24-Hour Price Cycles on Days in 2009 When At Least One Hour Was Predicted to be > Five cents/kWh

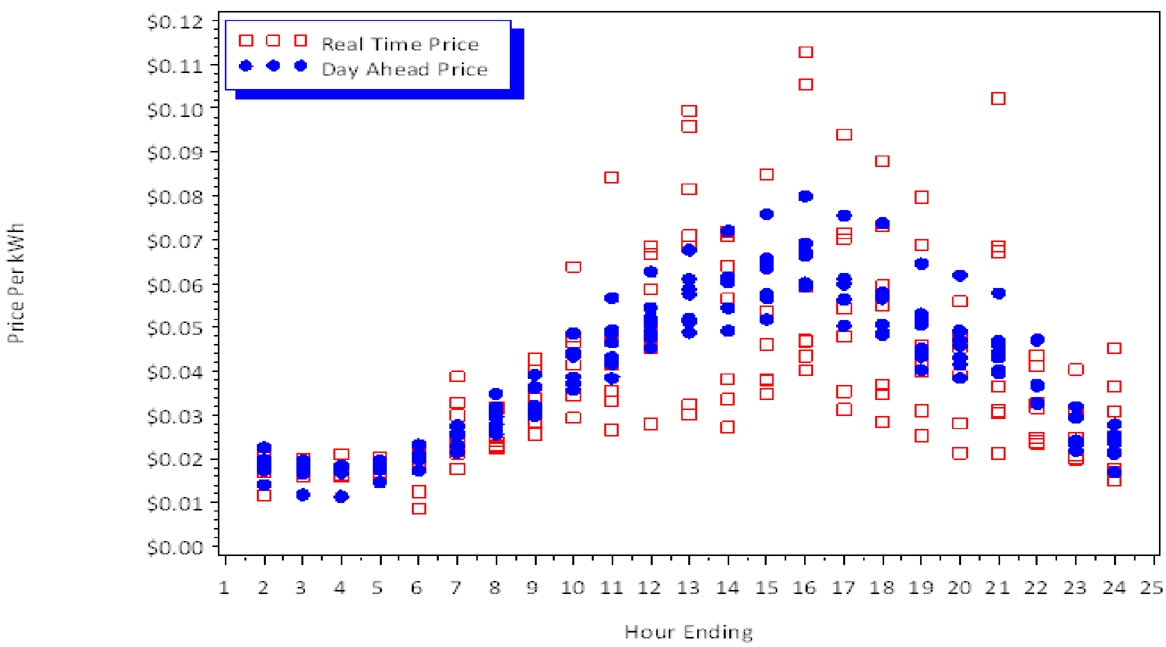
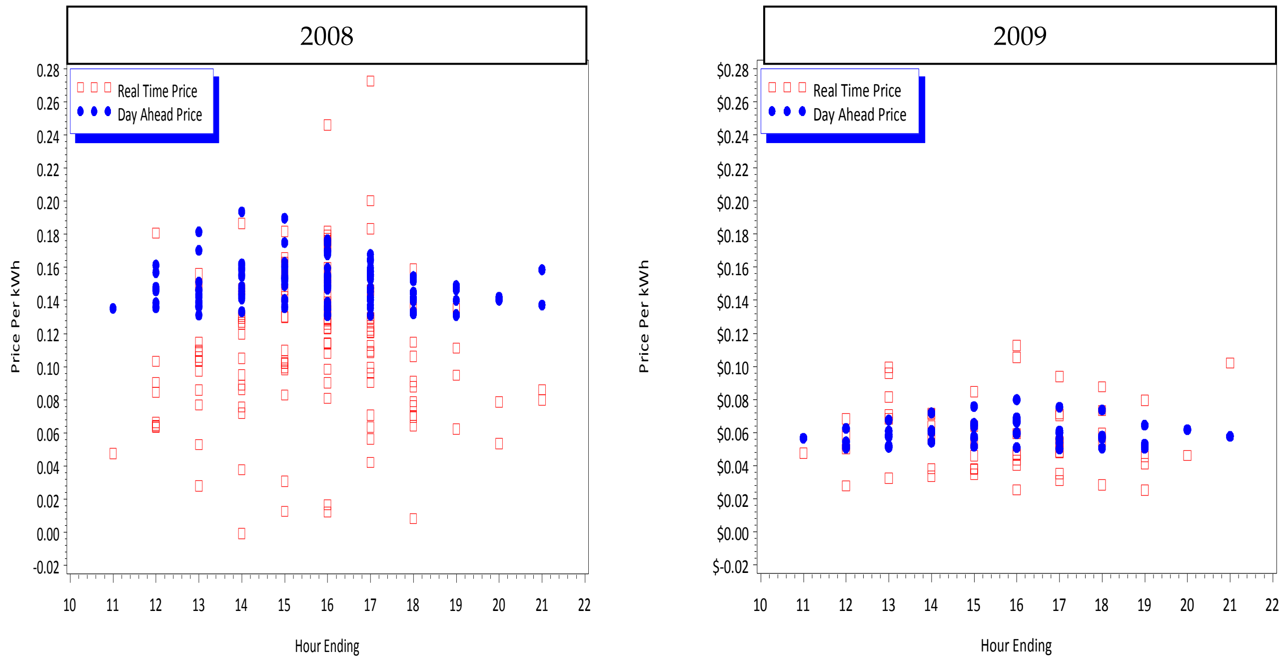


Figure 13 highlights the 52 hours in 2009 when the day-ahead price was predicted to be over five cents. Of these 52 hours, the real-time price was greater than the day-ahead price for 22 hours. The mean difference was two cents per kWh for these hours. The day-ahead price was higher than the real-time price for 30 hours with a mean difference of 1.7 cents per kWh. Overall, customers are more likely to be paying more by being on day-ahead pricing during the higher price hours in 2009, but the difference in prices is very small.

Figure 13. Comparison of DAP and RTP on High Price Hours in 2008 and 2009



The ability of day-ahead prices to forecast real-time prices can become problematic to the extent that errors are heteroskedastic—that is, the variance of prices rises as prices rise. Even so, predictability was not a serious problem in 2008, when prices were much higher than in 2009. Real-time prices were generally lower than day-ahead prices in 2008. There were only a few hours in 2008 where real-time prices spiked, becoming much higher than day-ahead prices. Future years of data will provide more insight into how well day-ahead prices predict real-time prices during periods of high prices.

From two years of observation, it appears that the day-ahead price is a good proxy for real-time prices for administration of the Power Smart Pricing program. Customers pay a bit more, but they are protected from occasional real time price spikes. There is enough correlation between the day-ahead and real-time prices that customers are rewarded for shifting behavior in the hours that will create the most demand reduction benefits for the system.

Section III » Preview of Net Benefit Assessment for 2010

After reviewing several alternatives, the 2008 report recommended the following methodology for estimating the net benefits of the PSP program in 2010:

1. Create a MISO-based regression model to predict LMPs from hourly demand and other publicly available information;

2. Use results from the impact evaluation of the PSP program to estimate demand reductions for different participation levels;

3. Use the regression model and estimated demand reductions to estimate reduction in LMPs;

4. Follow the Brattle method for estimating market benefits, but without adjusting for lost profit to suppliers;

5. Add a probabilistic approach to assess future market benefits based on weather and load risks over a ten year time frame, similar to what was done in the Summit Blue IEA study; and

6. Quantify additional benefits from reduced price volatility, and avoided energy and demand costs using the basic methods outlined by Dr. Neenan.

This section of the 2009 report will present a preview of what the 2010 net benefit assessment will look like, focusing on a realistic illustration of putting this basic methodology into action. The preview offers the opportunity for a full year of review and discussion on refinement of this methodology before the final net benefit assessment results need to be completed in 2010. It is expected that this opportunity for careful thought and sharing of ideas will lead to a very robust final assessment.

The first part of this section of the report will cover work done to address items one through four, the estimation of market effects. Market effects refers to the price reduction benefits that accrue to non-participants because system demand has been lowered by the program.

Item five, adding a probabilistic approach to assess future market benefits, is not included in this report but will be developed over the coming year to be part of the 2010 final net benefits assessment. However, this report does present a preview of some of the confidence intervals, or probability distributions, that will be used with key inputs in the final assessment. We believe it is best to refine the basic methodology before adding the forecasting and probability enhancements.

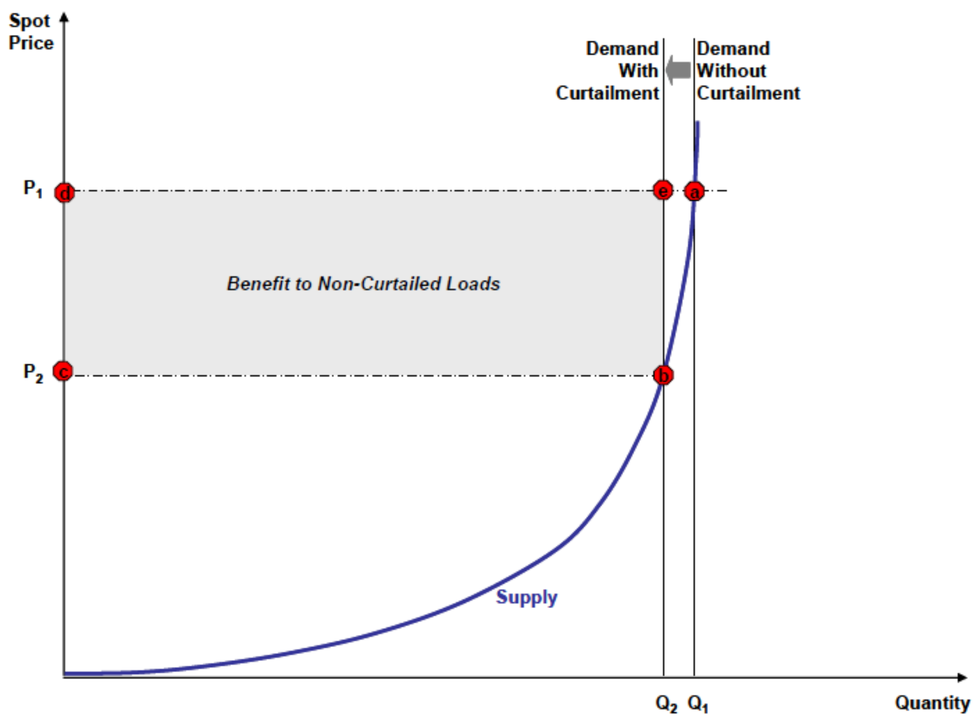
Item six, quantifying all benefits, will be addressed in the second part of this section, along with a comparison to program costs. This will provide a preview of the net benefits assessment methodology using realistic values for 2008 and 2009. Quantification of the benefits related to reduced price volatility will be left for the final net benefits assessment in 2010 when an additional year of historical information will be available for analysis.

Estimating Market Effects

Following the approach outlined in the 2008 PSP impact evaluation, we use regression analysis to estimate the benefit of the PSP program that accrues to non-participants. This is called the market effects.

With reference to Figure 14, this benefit arises because a reduction in energy consumption due to the PSP program serves to reduce the locational marginal price (LMP), and this price reduction applies to all customers in the market.

Figure 14. Conceptual Diagram of Direct Energy Benefits to Non-Curtailed Loads

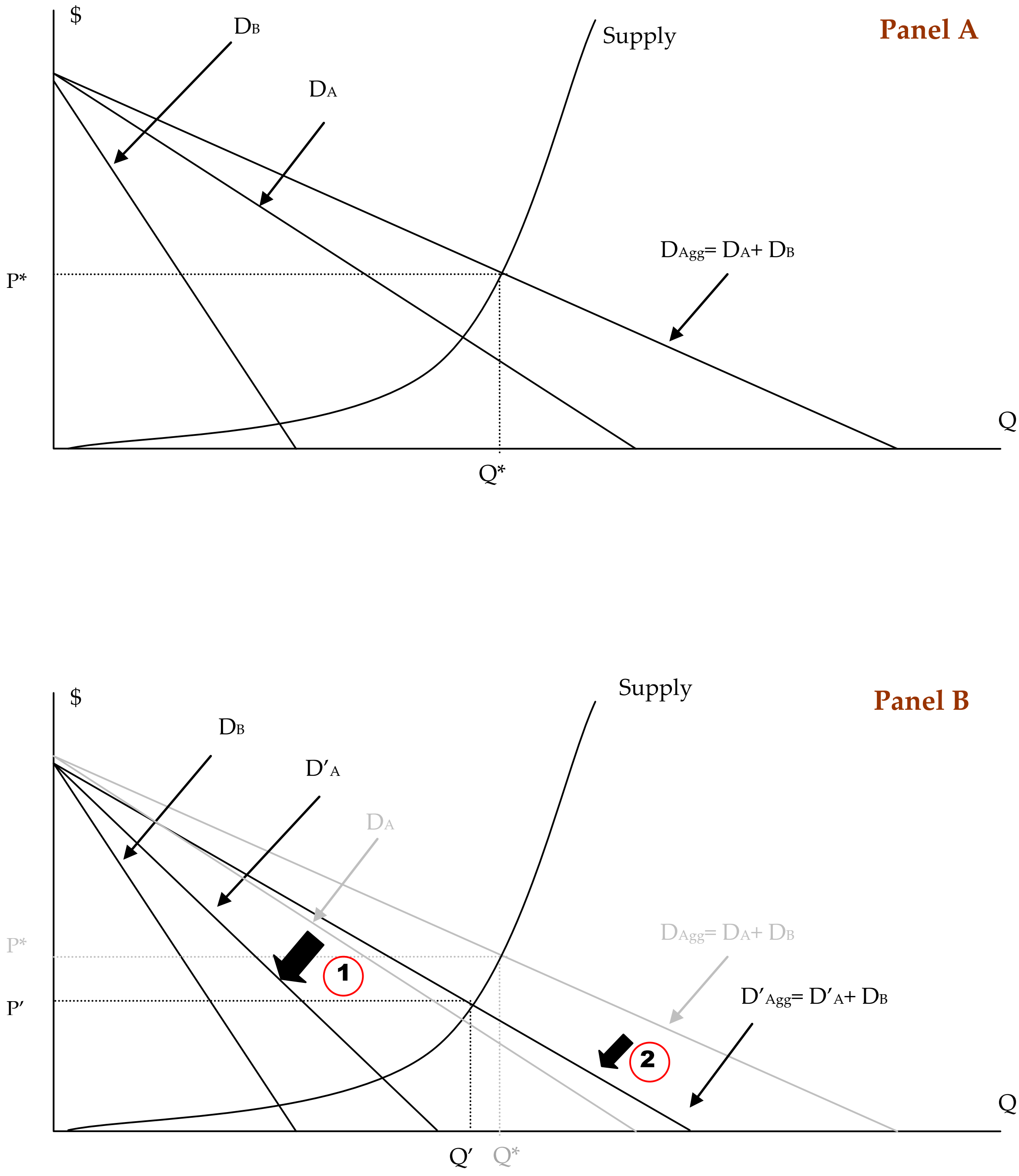


Source: Quantifying Demand Response Benefits in PJM, prepared for PJM Interconnection, LLC and the Mid-Atlantic Distributed Resources Initiative (MADRI) by The Brattle Group, January 29, 2007, page 20.

In particular, LMPs in the MISO market include an energy price component that is the market clearing price of energy in the MISO market. It follows that a demand reduction at any given hub generates a price reduction *throughout* the MISO market. This point is illustrated in the 2-hub market in Figure 15.

Aggregate demand is the horizontal summation of the demands for each hub, A and B. In Panel A, the initial market clearing price P* is determined from the intersection of *aggregate* demand D_{Agg} and supply S. Panel B illustrates the overall market effect of a demand reduction program, such as the PSP program, for one of the hubs, hub A. Demand at hub A shifts down from D_A to D'_A (arrow (**1**) in the diagram), causing aggregate demand to shift down (arrow (**2**) in the diagram), which in turns moves the market clearing price from P* to P'. This price reduction applies to the entire market.

Figure 15. Illustration of How a Demand Reduction Influences Price in a 2-Hub Market



In the following discussion, we focus on the market-wide benefit of the PSP program that arises via its effect on the energy price.

The standard supply function $Q_t(\cdot)$ takes as arguments input and output prices, as well as technological factors that may cause the supply curve to shift. Over periods short enough for little or no change in input prices (coal, natural gas) or technology factors, the function reduces to a simple relationship between the energy price and the quantity supplied at the price. Over our study horizon (summer 2007-summer 2009) input prices have shifted and technology may have changed, but we avoid the necessity of fully and properly accounting for these factors by separately estimating supply functions for each of the three summers. In this case, the effects of these factors are embedded in the constant term for each estimated supply equation.

Formally, we estimate for each summer season a supply equation of the form,

$$Q_t = \alpha_0 + \alpha_1 \ln(P_t) + \alpha_2 Q_{t-1} + \alpha_3 Out_t + \varepsilon_t$$

Where Q_t is the MISO load in hour t, measured in gigawatts; $\ln(p_t)$ is the log of real-time energy price at hour t, measured in \$/MW; Out_t is the reported generator outage at hour t, measured in gigawatts, and is included as a technological factor that changes considerably over the course of the season and even over the course of a day; Q_{t-1} is included as a technology proxy to capture the structural impediments to hourly changes in generation; and ε_t is the error term capturing unobserved factors influencing supply.

There is an interesting statistical/conceptual relationship at issue in the estimation of the supply equation. We expect that as real-time price P_t increases, supply starts to asymptotically approach an upper limit Q^{Max} due to fixed or quasi-fixed capacity, as illustrated in Figure 15. This relationship implies that as P_t continues to rise the supply response decreases—the effect of P_t falls towards zero. The econometric implication is that the coefficient on P_t in a regression will be close to zero at high prices and therefore it becomes statistically difficult to conclude that it is not equal to zero. In other words, more and more data is necessary to obtain statistically significant estimates of the supply equation as the equation approaches Q^{Max}.

A major concern with hourly time series data is the potential for an autoregressive error structure. For instance, if the error in the model prediction at hour *t-1* is positive, it is likely to be positive in hour *t* as well, because the unobservable variables influencing the prediction error at hour *t-1* are likely to persist at hour *t*. Failure to account for such an error structure will lead to inefficient and, in the presence of a lagged dependent variable, biased parameter estimates and invalid statistical inference.

Preliminary analysis revealed that the data exhibits considerable error autocorrelation with long (24-hour) lags. We took two measures to address this issue. First and most importantly, we drew a subsample of 20% of the observations for each season, restricting the sample to those hours with the highest real-time energy prices. Although this does not guarantee the complete purging of error autocorrelation, it is likely to significantly dampen it. Second, in model estimation with this subsample we test for autoregressive error processes (up to fourth order) and where statistical inference indicates the presence of autoregressive errors we use the parameter estimates from the appropriate corrected regression in the calculation of market effects.

Over the next year, we will continue to examine and refine specifications of the supply equation. For instance, one promising approach with the high-price subsample is to estimate a random effects or fixed effects model in which the cross-section is the particular day of the season and the effects parameter(s) account for the correlation across hours within the day. A reasonable argument could be made that such a specification is likely to provide unbiased estimates of the supply equation. Some testing of this alternative modeling approach was done for the summer of 2007, for both the case where the energy price enters the supply equation linearly and where it enters in logged form. It was found that the estimated price effects are smaller than for the models we present here, but the statistical significance is higher due to lower standard errors. We intend to investigate this alternative modeling approach further for the 2010 evaluation.

A final estimation issue is supply-demand simultaneity bias in supply equation estimation. This arises in the case where unobservable factors affecting energy demand and energy supply are correlated, potentially interfering with unbiased estimation of supply equation parameters, in particular the price parameter. In the absence of a good theoretical case or empirical evidence for such correlation in the hourly energy market—a market dominated by intra-daily demand shifts that have the effect of strongly identifying the supply equation—we assume that such correlation is not a significant identification issue. We plan to give this issue additional consideration over the final year of the project. In particular we will investigate the use of instrumental variables estimation to eliminate simultaneity bias.

Supply Equation Estimation Results

Table 18 presents estimated supply equations for each of three summers (June-August, 2007-2009). Equations pertain to the highest 20% hourly real-time prices in each season (N=444); as revealed by the range of prices used in estimation (see Figure 16), this implies that the portion of the supply equation fitted to the data varied from year to year.[15] In all years we present the model with the highest statistically significant autoregressive error structure. In particular, the 2007 and 2008 models include a first-order autoregressive structure, while the 2009 model has no autoregression in the errors.

Model fit is high mainly due to the inclusion of lagged load Q_{t-1}. Outages have a small effect on supply. The price effect is statistically significant in the 2007 and 2008 models but not in the 2009 model. Nonetheless, in the analysis below we calculate market effects for 2009 as well as the previous years because the point estimate for 2009 is our best estimate of the true value of the price coefficient, though for all calculations we provide confidence bounds.

[15] We considered estimating the 2009 model for prices in the range of the 2007-2008 models, but in 2009 there were only 32 hours with prices greater than $75/MW, the minimum price used in 2007-2008.

Table 18. Supply Equation Estimation Results

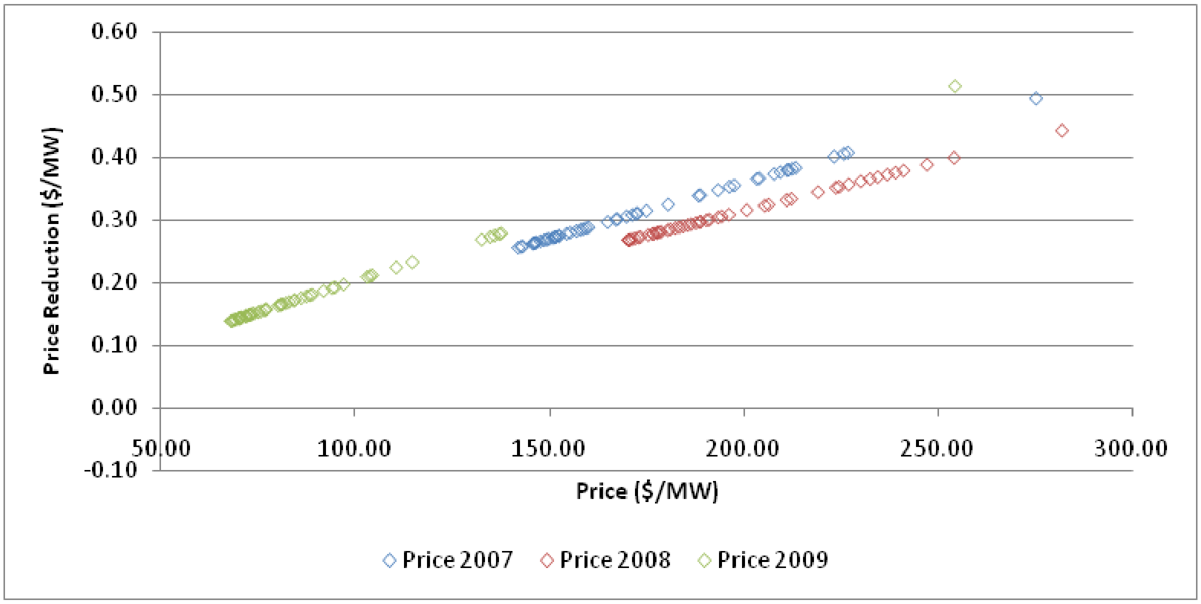
Variable	2007	2008	2009
	Parameter Estimate (standard error)		
Intercept	3.8581**	4.9619***	5.7860***
	(1.9498)	(1.7818)	(1.9259)
Log price	0.5546*	0.6354**	0.5101
	(0.3013)	(0.2529)	(0.3636)
Lagged load (Q_{t-1})	0.9263***	0.9068***	0.9195***
	(0.0158)	(0.0152)	(0.0181)
Outages	-0.0203	-0.0781*	-0.2082
	(0.0542)	(0.0467)	(0.0791)***
Lagged error (ε_{t-1})	0.2589***	0.2761***	-
	(0.0461)	(0.0459)	-
Model price range ($/MW):	75.00-275.26	91.80-461.45	31.22-254.35
Model R-squared	0.9528	0.9539	0.8804

*Significant at .10 level
**Significant at .05 level
***Significant at .01 level

Program Benefits to Non-Participants Induced by Energy Price Changes

Figure 16 presents the estimated price reduction from a one MW reduction in load for the 50 highest price hours in each of the summers of the study period. Price reductions were typically in the range of $.20 to $.40 per MW per hour. The figure confirms that prices were lower in 2009 than in previous years, but indicates that the supply curve was steeper in 2009 than in previous years, so that for a given price a demand reduction in 2009 effected a greater price reduction than in 2007 and 2008.

Figure 16. The Real-time (Hourly) Energy Price Reduction from a One MW Reduction in Demand



These energy price reduction equations can now be used in combination with demand reductions from the PSP program in 2008 and 2009 to estimate non-participant benefits in those years. The program benefit to non-participants for a given hour is calculated by first determining from the supply equation the price reduction induced by the PSP program (the values presented in Figure 16), and then multiplying this price reduction by the total MISO load for the hour.

Table 19 presents program benefits for non-participants for the 50 highest price hours in each summer of the program, 2008 and 2009.

Price reductions for 2008 were calculated using an overall program-induced load reduction of 0.75 MW for the 50 highest price hours. This is based on the 2008 evaluation findings that average peak hour loads were reduced by 0.25 kW per PSP participant between the hours of noon and 5 p.m. across all High Price Alert days. This is roughly equivalent to the 50 highest price hours for the summer. 0.25 kW for 3000 participants creates a 0.75 MW program-induced load reduction.

Price reductions for 2009 were calculated in a similar manner using an overall program-induced load reduction of 1.05 MW for the 50 highest price hours. This is based on the 2009 evaluation findings that PSP participants reduced their hourly loads by an average of 0.15 kW per customer on all summer weekdays. This reduction is a conservative estimate of what would have occurred on the 50 highest price hours. 0.15 kW for 7000 participants creates a 1.05 MW program-induced load reduction.

Non-participant benefits are not monotonically decreasing in price reductions due to shifts in the supply curve arising from changing values for Q_{t-1} and Out_t in the supply equation. Although 2009 had more participants and greater total demand reduction, non-participant benefits are lower because price reductions per MW were considerably lower in 2009 (see Figure 16).

Table 19. Program Benefits to Non-participants, 50 Highest Price Hours, 2008-2009

2008			2009		
Price ($/MW)	Price Reduction ($/MW)	Non-Participant Benefit ($)	Price ($/MW)	Price Reduction ($/MW)	Non-Participant Benefit ($)
461.45	0.54	**41,024**	254.35	0.54	**42,360**
330.86	0.39	**31,949**	137.71	0.29	**22,410**
316.93	0.37	**25,875**	137.17	0.29	**22,714**
281.76	0.33	**27,996**	135.98	0.29	**22,826**
253.98	0.30	**24,902**	134.89	0.29	**21,141**
247.02	0.29	**21,977**	132.7	0.28	**19,855**
240.99	0.28	**21,839**	114.83	0.24	**17,880**
238.90	0.28	**22,285**	110.69	0.23	**19,683**
236.85	0.28	**22,555**	104.52	0.22	**16,040**
234.34	0.28	**22,328**	103.93	0.22	**18,886**
232.36	0.27	**20,238**	103.21	0.22	**15,603**
230.04	0.27	**19,629**	97.15	0.21	**16,250**
226.85	0.27	**18,852**	94.93	0.20	**17,587**
224.44	0.26	**21,075**	94.25	0.20	**17,059**
223.63	0.26	**17,839**	92.05	0.20	**14,969**
218.98	0.26	**20,428**	89.09	0.19	**15,718**
212.11	0.25	**21,943**	88.56	0.19	**14,439**
210.96	0.25	**19,172**	87.68	0.19	**15,305**
206.26	0.24	**19,194**	86.3	0.18	**11,996**
205.27	0.24	**18,229**	84.64	0.18	**14,844**
200.66	0.24	**20,314**	84.39	0.18	**12,897**
196.10	0.23	**17,199**	83.19	0.18	**13,459**
194.26	0.23	**19,800**	82.35	0.17	**13,778**
193.30	0.23	**16,467**	81.41	0.17	**12,825**
191.01	0.23	**16,145**	81.15	0.17	**14,946**
190.34	0.22	**16,571**	80.93	0.17	**14,622**
188.86	0.22	**17,427**	80.42	0.17	**13,926**
188.56	0.22	**17,740**	77.32	0.16	**14,315**
187.60	0.22	**18,222**	77.24	0.16	**11,720**
186.36	0.22	**16,687**	76.84	0.16	**12,441**
185.45	0.22	**17,805**	75.86	0.16	**11,979**
184.25	0.22	**17,602**	75.19	0.16	**13,456**
183.30	0.22	**16,922**	74.07	0.16	**13,857**
182.31	0.22	**19,145**	73.55	0.16	**12,409**
181.00	0.21	**15,987**	73.26	0.16	**12,276**

2008			2009		
Price ($/MW)	Price Reduction ($/MW)	Non-Participant Benefit ($)	Price ($/MW)	Price Reduction ($/MW)	Non-Participant Benefit ($)
180.33	0.21	**17,964**	72.99	0.15	**11,445**
178.58	0.21	**14,959**	72.91	0.15	**12,920**
178.13	0.21	**16,286**	72.22	0.15	**12,748**
177.58	0.21	**15,387**	72.2	0.15	**12,355**
177.51	0.21	**17,989**	72.01	0.15	**11,580**
176.69	0.21	**15,861**	71.02	0.15	**9,864**
176.48	0.21	**15,898**	70.75	0.15	**11,753**
175.36	0.21	**16,067**	70.44	0.15	**9,865**
173.29	0.20	**14,652**	70.35	0.15	**11,628**
172.75	0.20	**14,722**	70.3	0.15	**10,584**
171.89	0.20	**16,767**	70.23	0.15	**9,378**
171.08	0.20	**15,938**	69.39	0.15	**10,271**
170.43	0.20	**16,473**	69.13	0.15	**12,229**
170.36	0.20	**16,102**	68.7	0.15	**12,146**
170.35	0.20	**15,087**	68.48	0.15	**11,952**
170.20	0.20	**15,149**	68.2	0.14	**11,508**
Total Market Effect:		**$978,664**			**$758,700**

Non-Participant Benefits from Congestion Price Reductions

In preliminary analysis, we used regression methods to also examine the effect of the program on the congestion price component of LMPs. We found no statistical effect of hub loads on hub marginal congestion prices, indicating the PSP program is unlikely to generate significant non-participant benefits via congestion price reductions.

Net Benefits Assessment

The primary objective of the net benefits assessment is to answer the question: "Is the PSP program cost effective?" A net benefits assessment looks at all of the benefits of the program, both for participants and non-participants, and compares those benefits to the total costs of the program. If there are net benefits, i.e., benefits are greater than costs, then the program is contributing to an overall reduction in the cost of electricity for consumers.

Methodology

The first step is to identify the separate benefits and costs that should be quantified. While there are many such costs and benefits which were discussed in the 2008 report, this assessment will focus on those which are most important and quantifiable. There are three benefit components and three cost components for this assessment, and each will be described in more detail below. The second step is to compare total benefits to total costs to determine if there are positive net benefits for the program.

BENEFIT #1: REDUCTION IN MISO PRICE

This is the market effects benefit discussed in detail in the previous section of this report. It represents the price reduction benefits that accrue to non-participants because system demand has been lowered by the program.

BENEFIT #2: AVOIDED CAPACITY COSTS

Following the MISO resource adequacy requirement, AIU secures capacity to cover their monthly load requirements. Contracts for this capacity are made at the beginning of the year, with the ability to buy or sell in the month-ahead capacity markets as needed. This means there is an advance benefit (both annual and month ahead) related to demand reductions from the PSP program. The main point is that demand reductions caused by the PSP program reduce AIU capacity costs. As shown in Table 20, the annual value of the avoided capacity cost was $16.25/kW-year for 2008 and $9.21/kW-year for 2009.

Table 20. Avoided Capacity Costs for 2008 and 2009

BGS 3b – BGS 4	2008		2009	
	$/kW-day	$/kW-month	$/kW-day	$/kW-month
January	0.015	0.465	0.006	0.186
February	0.008	0.234	0.003	0.084
March	0.005	0.155	0.002	0.062
April	0.005	0.150	0.001	0.030
May	0.005	0.155	0.001	0.031
June	**0.029**	**0.870**	**0.007**	**0.210**
July	**0.221**	**6.851**	**0.150**	**4.650**
August	**0.221**	**6.851**	**0.117**	**3.627**
September	0.011	0.330	0.005	0.150
October	0.002	0.062	0.002	0.062
November	0.002	0.060	0.002	0.060
December	0.002	0.062	0.002	0.062
Annual Total:		$16.25		$9.21
Summer Total:		**$14.57**		**$8.49**

Source: AIU work papers and monthly filings with the ICC

Previous sections of this report have shown that demand reductions from the PSP program vary by season. The largest savings occur at peak times during the summer months. For simplicity in the net benefits calculation, only summer demand reductions will be considered. This is when the greatest demand reductions occur and also when the avoided capacity costs are the highest. Avoided capacity costs for the summer months of June, July and August are $14.57 for 2008 and $8.49 for 2009. The value of demand reductions during the other seasons is minimal compared to the summer benefit.

BENEFIT #3: AVOIDED ENERGY COSTS

In the design of the PSP program, the avoided energy costs become the major source of participant benefits. Due to this unique characteristic of the program, there is a straightforward and simple way to quantify the avoided energy costs from the program. Since the PSP program is all about having customers pay the real-time energy costs on an hourly basis, their bills represent actual energy costs. The difference between what they paid for energy on a real-time basis compared to what they would have paid on the standard rate alternative is essentially the quantification of the avoided energy costs that occurred.

This difference was presented in a previous section of this report as bill savings, but a few adjustments to the reported bill savings need to be made to create the appropriate value to use in the net benefits assessment. When the bill savings were reported, it was a straight comparison of PSP total bills to the same kWh usage billed on the standard rate tariff. The PSP bills include a $2.25 charge per month to cover approximately half of the incremental metering costs required for participation in the program. This meter charge offsets benefits that came from avoided energy costs. To get the total avoided energy costs the meter charge should be added back. In the net benefits assessment, the total cost of the additional metering will be accounted for as a cost of the program.

A final adjustment that is needed is the addition of the avoided energy cost associated with the energy that was conserved after the PSP participant joined the program. The previous section on bill savings credits each of these conserved kWh at ten cents, since that is roughly equivalent to what the PSP participant would have paid for them on the alternative standard rate. However, we estimate that the avoided energy cost associated with these conserved kWh is only seven cents per kWh, so we would add in avoided cost benefits of seven cents per conserved kWh. It is true that the PSP participants also receive the benefit of not paying the three cent distribution charge related to each conserved kWh, but this savings to participants is offset by a reduction in income to AIU to cover their distribution costs. Since this three cents represents a transfer of costs from one party to another rather than a true reduction in overall system costs, it is not included in the net benefits assessment.

COST #1: PROGRAM IMPLEMENTATION COSTS – CNT

As program implementer, CNT Energy is responsible for administration and marketing of the PSP program. They provide an accounting of their program-related expenses each year in their annual report, and these are the program implementation costs.

COST #2: PROGRAM IMPLEMENTATION COSTS – AIU

AIU handles meter acquisition and installation as well as billing for the PSP program. Those costs are also part of the program implementation costs.

COST #3: EVALUATION COSTS

The Illinois Power Agency Act SB1592 defines components that must be included in the net benefits assessment of energy efficiency programs in the state of Illinois. Evaluation costs are one of those required cost components, and for consistency it will be included in this net benefits assessment also.

Results

Data was gathered on the costs and benefits for the PSP program years of 2008 and 2009 following the methodology outlined above. For simplicity, these are one-year snapshots of net benefits. There is no consideration of the benefits and costs related to continuation of the program in future years. The forecasting of benefits and costs will be added to the 2010 assessment of net benefits, along with a consideration of associated probabilities and risks. We are focusing on simplicity of method here to build a solid understanding of the assumptions embedded in the basic net benefits assessment methodology.

Table 21 provides a preview of the one-year net benefits assessment for program years 2008 and 2009. Actual data was used as much as possible.

These preview results show positive net benefits of $501,091 in 2008 which grow to positive net benefits of $1,577,707 in 2009. The growth in positive net benefits comes mainly from the large increase in avoided energy cost benefits in 2009 (bill savings for participants).

Table 21. Preview of One-Year Net Benefits Assessment for 2008 and 2009

	2008	2009
Non-Participant Benefits: Reduction in MISO Price	$978,664	$758,700
Participant Benefits: Avoided Capacity Costs	$10,928	$8,915
Participant Benefits: Avoided Energy Costs	$207,375	$1,735,400
TOTAL BENEFITS	$1,196,967	$2,503,015
Program Implementation Costs - CNT	$420,458	$491,619
Program Implementation Costs - AIU	$211,418	$351,689
Evaluation Costs	$64,000	$82,000
TOTAL COSTS	$695,876	$925,308
NET BENEFITS	**$501,091**	**$1,577,707**

Detailed calculations to support these values can be found in Appendix E.

One of the important issues in the net benefits assessment is quantification of the benefits being received by non-participants. This is important in the determination of how program costs should be allocated between participants and non-participants. These results show that non-participants are receiving substantial benefits from the program in reduced energy prices during the top 50 hours of each year. While the initial reaction is that these results support non-participant contributions toward program costs, it must be remembered that the non-participants are all MISO customers, not just AIU customers. Fair allocation of program costs across all beneficiaries will likely remain an issue even after non-participant benefits are quantified.

Section III » Conclusions

This report is the 2009 assessment of the Power Smart Pricing program. Program evaluation work will be concluded after the end of calendar year 2010, providing the opportunity to refine and update the assessment that was done this year with an additional year of program participation data. The following conclusions highlight the major findings presented in this 2009 report.

Number of Customers using Hourly Pricing

CNT Energy's marketing and enrollment efforts resulted in 7,422 active Power Smart Pricing participants as of December 31, 2009. This was a 136% increase over the participant count of 3,147 at the end of 2008. New participants in the program had higher average energy use than the existing participants. This is considered to be a result of a successful targeted marketing campaign used in 2009 to attract high use customers to the program.

Changes in Customers' Energy Use Patterns

Elasticity modeling done for 2009 shows that Power Smart Pricing participants continued to respond to variation in hourly prices during the summer season, even though 2009 electricity prices were much lower than 2008 prices. The overall own-price elasticity was –2.3%, meaning they reduced their electric usage by 2.3% for every 100% increase in the price of electricity.

Additional analysis revealed that customers show a much higher response to price when prices are above a given threshold. For example, during the summer season the own-price elasticity is -1.0% when prices are below 13 cents per kWH, but when prices rise above 13 cents the own-price elasticity jumps to -24.8%.

There were no High Price Alert days in 2009. However, on regular summer weekdays in 2009 PSP participants showed an average load reduction of 0.13 kW per hour between the hours of Noon and 5 p.m. when compared to a control group. This is similar to the load reduction of 0.18 kW per hour found for regular summer weekdays in 2008. Survey data reinforced the observation that PSP participants were continuing to shift their summer energy usage out of the high price afternoon period even though 2009 energy prices were much lower than 2008 prices.

In addition to shifting energy during the summer, participants also showed an overall reduction in energy use. Power Smart Pricing participants reduced their average energy use by 5.1% during the summer season and by 0.6% during the shoulder months. However, they did not show any energy savings during the winter months. This created an overall annual energy savings of 1.2% per year which is similar to the annual savings of 1.5% found in 2008.

Value of the Program to Participants

In 2008, the aggregate savings for PSP participants was $1,388,996 which represented a 23.6% total savings compared to what the same bills would have been under the standard rate. Average annualized savings were $304.98 or 24.4%.[16] These percentage savings are three times greater than what was seen in 2008, largely due to the low market prices for electricity.

This estimate of bill savings does not include the additional savings that comes from the conservation effect of the program. Including an annual decrease in consumption of 151 kWh per customer at roughly ten cents/kWh for energy and distribution, there is an additional $15.10 that the average PSP participant avoided paying in 2009. If that savings had been included, the average annualized savings would have risen from 24.4% to 25.6%. For 6,652 participants, that represents an additional annualized aggregate bill savings of $100,445.

VALUE OF THE PROGRAM TO NON-PARTICIPANTS

A thorough assessment of the net benefits from the Power Smart Pricing program will be presented in the 2010 Annual Report to the Commission after the program has completed several years of operation. Plans are in place for the 2010 Annual Report to contain a summary of all the costs and benefits related to the PSP program, including a probabilistic risk assessment of the net benefits.

This 2009 report includes a preview of what the basics of the 2010 net benefit assessment will look like. It looks at actual benefits and costs estimated for the years 2008 and 2009. This includes estimation of non-participant benefits from reduced MISO prices that are a consequence of the PSP program demand reductions. This preview offers the opportunity for a full year of review and discussion on refinement of the methodology before the final net benefit assessment results need to be completed in 2010. It is expected that this opportunity for careful thought and sharing of ideas will lead to a very robust final assessment.

[16] Due to the growing enrollment levels over the course of the year the overall savings percentage and the annualized average savings percentage are not the same. Annualized savings represent what the average customer would have paid if they were on the program for all 12 months of 2009.

Appendix A » 2009 PSP Operational Report and Audit Report

This appendix presents a complete copy of the 2009 Power Smart Pricing Operational Report prepared by CNT Energy, followed by an independent auditor's report on CNT Energy's direct expenses for the Ameren PSP project.

CNTEnergy_PSP2009_Annual _Report_FIN

2009 CNT Energy_AuditorRepor

CNT Energy 2009 Operational Report

A.1 Background

At the beginning of 2007, CNT Energy was awarded the contract to serve as the program administrator for the Ameren Illinois Utilities (AIU) residential real-time pricing program. CNT Energy established the program under the brand name "Power Smart Pricing" (PSP) and began the marketing and enrollment of participants. 2009 marked the third year of the program.

As of December 31, 2009 the program had 7,422 active participants and several hundred more in the process of having meters exchanged and beginning their participation. In 2009 the aggregate savings for Power Smart Pricing participants was $1,388,996 which represented a 23.6% total savings compared to what the same bills would have been under the flat rate. Average annualized savings were $304.98 or 24.4%. The following are some of the key metrics of success for the program.

A.1.1 Regulatory Issues

The residential Rate Mitigation Credit created by the 2007 Rate Relief legislation expired with the last billing cycle during December 2009. There were no implications for PSP customers that weren't also for all the other residential customers. CNT Energy received no customer contacts on this issue.

Preliminary discussions with AIU and the Illinois Commerce Commission (ICC) staff on a plan for the ICC Evaluation of PSP have occurred. It is expected that the plan will be formalized in 2010.

AIU has had discussions with the Illinois Commerce Commission (ICC) staff on tariff language to address 2010 enrollment and the 12 month term and December 31, 2010 termination date issues. This issue is expected to be finalized in early 2010.

A.1.2 Operations

CNT Energy has continued to have a very strong working relationship with the AIU. The processing of data files for enrollments and other purposes has continued to be smooth and the review and approval of marketing and other communications materials has been prompt.

The increase in enrollment in PSP has resulted in a higher volume of meter exchanges, and inevitably, a larger number of customers whose meters cannot be read due to inaccessibility. CNT Energy has worked closely with AIU to address these situations.

CNT Energy worked with AIU to promote the free programmable thermostat program, one of the offerings in the Act on Energy residential incentive programs. CNT Energy publicized this offering to PSP participants via a special e-mail in September 2009.

CNT Energy introduced a new online bill comparison tool in 2009. The Bill Comparison Tool provides monthly savings information directly to participants online.

A.1.3 Marketing and Communications

CNT Energy expanded the PSP marketing campaigns to into new areas and used new communication channels. These activities and enrollment results are discussed in more detail below. CNT Energy also conducted a market research campaign to determine customers' awareness of PSP.

A.1.4 Electricity Prices

During 2009, hourly electricity prices were unusually low. Prices did continue to follow the typical summer pattern, with the highest prices of the day occurring in the mid to late afternoon. However, the highest prices of the day remained relatively low, topping out at just 7.993 cents per kWh from 3 p.m. to 4 p.m. on June 24th. Consequently, in 2009 there were no high price alert days. As a result of the low summer prices, PSP participants were able to achieve significant savings with only minor adjustments to how and when they used electricity.

A.1.5 Conclusions

The Power Smart Pricing program continues to be quite successful in terms of its impacts on energy use and bill savings. While enrollment goals have not yet met expectations, enrollment did pick up substantially in 2009. CNT Energy expects that as the reputation of the program continues to grow, enrollment levels will also increase.

A.2 Operations

CNT Energy has continued to have a very strong working relationship with the AIU. The processing of data files for enrollments and other purposes has continued to be smooth and the review and approval of marketing and other communications materials has been prompt.

CNT Energy and AIU worked together to address ongoing interactions between the AIU meter personnel and the new Power Smart Pricing (PSP) customers during the meter exchange process. Larry Kotewa from CNT Energy and Peter Millburg from AIU created workshops to inform meter personnel about PSP and address any concerns. CNT Energy distributed PSP materials, emphasized how customers make the customers can save on the program and described the PSP enrollment process at the meeting. Questions from meter personnel ranged from internal AIU procedures to CNT Energy's marketing/targeting approach. Four workshops were conducted in Paxton, Centralia, Peoria and Pawnee.

CNT Energy initiated an Energy PriceLight program in 2007-8 for 120 PSP participants. The PriceLight was a special offering funded by a grant from the Illinois Clean Energy Community Foundation (ICECF). Selected PSP participants receive a "PriceLight"— a small orb that glows different colors based on the current estimated price of electricity. Navigant's evaluation of PSP also found that participants with the PriceLight had a higher elasticity of demand than other PSP participants. CNT Energy continued to make the PriceLight available to participants for the rest of 2009 for a nominal fee. However, because additional funding for the PriceLight program was not secured, it was discontinued at the end of 2009.

CNT Energy worked with AIU to promote the free programmable thermostat program, one of the offerings in the Act on Energy residential incentive programs. These E-Smart™ Programmable thermostats allow the user to preset automatic temperature adjustments and change thermostat settings manually or from any Internet connection. Installing these thermostats also enrolls the customer in the central air conditioner cycling program, where the condenser is turned off for short intervals during times of high overall demand for electricity in the summer season. CNT Energy publicized this offering to PSP participants via a special e-mail in September 2009.

As enrollments increased during 2009, inaccessible meters proved to be a growing operations issue. CNT Energy and AIU worked in conjunction to address estimated meter readings. Although all residential customers have the right to utilize Rider PSP, if the customer has a meter located inside their home, or in another inaccessible location, it may be difficult for the meter personnel to have access to probe the meter. When a meter is inaccessible for reading, AIU notifies the customer and CNT Energy and provides a meter reading schedule. CNT Energy also follows up with the customer to reiterate the necessity of access. Customers on PSP are allowed three estimated meter readings within a twelve month period on the program before they are placed back on Basic Generation Service (BGS-1).

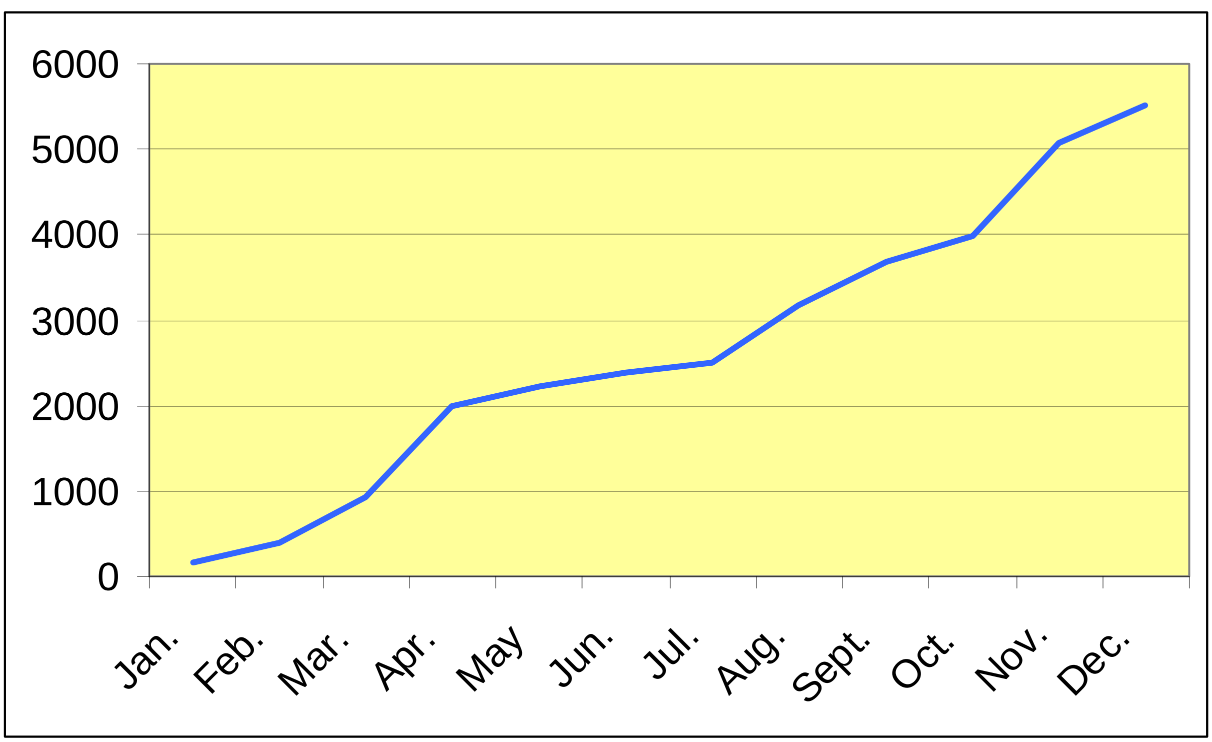
A.3 2009 Marketing of Power Smart Pricing

CNT Energy concentrated its 2009 promotional efforts for Power Smart Pricing (PSP) during winter, early spring, summer and fall. In previous years, marketing was put on hold over the summer in order to ensure that the majority of new enrollees had time to adjust to hourly pricing before the summer months when more action is usually required in order to manage costs. However, due to the mild summer and low hourly electricity prices, CNT did conduct some small promotional mailings later in the summer. A total of 5,519 customers submitted enrollment forms during 2009, bringing program participation to 7,422 by the end of the year.

Target markets included communities targeted in the 2008 campaign as well as additional communities in each of the AIU operating companies' service territories. The 2009 campaign continued to building awareness and participation in and around Peoria, Carbondale, Danville, Decatur, Galesburg, Hillsboro, Litchfield, Bloomington-Normal, and Champaign-Urbana. New areas of focus for 2009 included Macomb, Quincy, Belleville, Jacksonville, Maryville and other communities in the Metro East area,

Promotional strategies included direct mailing, bill inserts, media outreach, online advertising, and community outreach. CNT Energy worked closely with AIU throughout the campaign to monitor responses from customers to ensure a manageable flow of new enrollments. Customer surveys, focus groups, and results from the 2009 campaign all provide insights that will be helpful in designing the 2010 promotional campaign.

Total Enrollment Forms Received in 2009



A.3.1 Communication Channels

Bill Inserts

In February and August all AIU residential customers received bill inserts describing Power Smart Pricing (PSP). The bill inserts where highly effective in driving traffic to the PSP Web site and generating calls to the customer support team at CNT. A noticeable increase in enrollments also occurred as a result of bill inserts, but the response rates were lower than the response rates from direct mail.

Direct Mail

Direct mail has been extremely effective in producing large numbers of enrollments. CNT Energy worked with AIU to refine its mailing lists to effectively target customers who are most likely to be interested in the program and most likely to be able to save money with hourly pricing. Targeting was based on both geography and electricity usage patterns. Direct mail was sent out in March, April, May, July, September, November and December. Monthly quantities ranged from 20,000 to 180,000 pieces and were adjusted throughout the campaign based on results. Over the course of the year, the number of direct mail pieces sent totaled approximately 360,000.

In terms of geographic targeting, CNT Energy focused on ZIP codes that had particularly good response rates from past mailings, and then expanded to other ZIP codes with similar demographic characteristics. In particular, analysis of the results of the 2008 direct mail campaigns showed that response rates tended to be higher in ZIP codes where a large percentage of adults have a BA degree or higher. A large mailing in March 2009 targeted additional ZIP codes with high education levels. This mailing produced excellent response rates and a large number of enrollments (532 enrollment forms submitted in March and 1,060 forms in April).

In addition, mailings were targeted based on customers' individual electricity usage patterns in order to ensure that information reached customers who were most likely to benefit from the program. Specifically, customers who are served under the former electric space heat rate and customers with extremely low electricity usage (under 400 kWh per month) were excluded from mailing lists.

In contrast, analysis of customer usage patterns and savings levels showed that those who have high winter electricity usage but do not receive a lower electric heat rate were among those likely to benefit most from the program. These customers tended to have high savings levels in terms of both percent saved and total dollars saved. A July mailing to AmerenIP and AmerenCIPS high winter users who do not receive the electric space heat rate produced a particularly good response rate with 155 enrollments in July and 683 in August.

Media Outreach

CNT Energy regularly pitched stories to media outlets throughout the AIU service area. Media pitches were timed to correspond with mailings to specific communities, in order to reinforce the message and increase the effectiveness of mailings. Media outreach efforts resulted in good coverage of the Power Smart Pricing program.

1/29/09: USA Today, *Buzz grows for modernizing energy grid*

3/2/09: WHOI, ABC 19, CW 4, *Power Smart Pricing*

3/2/09: WEEK-TV, NBC 25, *Power Smart Pricing*

3/3/09: WICD, ABC 15, *Power Smart Pricing*

3/11/09: WCIA 3, *Power Smart Pricing*

3/22/09: Herald & Review, Ameren customers save money on electricity through Power Smart

8/10/09: Danville Commercial News, *Ameren Offers Power by the Hour*

8/21/09: Belleville News-Democrat, *Some Ameren customers saving big on electric bill*

9/20/09: Herald & Review, *Ameren customers save with Power Smart*

11/11/09: WGEM (NBC affiliate in Quincy), *Choose what you pay for electricity*

Advertising

CNT Energy placed PSP ads in select online media during 2009. Test ads ran on Facebook Champaign-Urbana, and they generated a significant increase in traffic to the PSP website. As a result, Facebook advertising was expanded to additional communities.

Online Communications

CNT Energy continued to improve and expand on the online communication tools used to promote and support the Power Smart Pricing program. The PSP blog generated a significant increase in traffic among participants as well as search engine hits. Most articles focused on Illinois energy issues to attract state residents to the Power Smart Pricing brand. CNT Energy also launched a Twitter feed that tweets a Daily Price Report everyday at 6 p.m. Central Time. The Daily Price Report consists of the highest and lowest price for the following day. In the case of a High Price Day, the Twitter feed reports a special message indicating the hours with prices over 13 cents per kWh. Participants were also instructed on how to set up the PSP twitter feed to send the alerts as a text message to their mobile phone.

Community Outreach and Events

CNT Energy worked with AIU to promote PSP through community outreach and events. CNT Energy staff shared exhibit space with AIU at venues such as Earth Day events in the larger communities and corporate events such as employee "green fairs." CNT Energy also worked to develop relationships with universities, municipal governments and community groups and sought opportunities to give presentations to groups and make brochures available at public facilities such as community centers and libraries.

In May, CNT Energy held a series of Summer Readiness Workshops that provided information about Power Smart Pricing and strategies for managing summer electricity costs. The workshops took place between May 3 and May 21 in Carbondale, O'Fallon, Godfrey, Collinsville, Champaign, Urbana, Bloomington, Peoria, Decatur, Quincy, and Galesburg. A total of nearly 200 people attended the workshops and the events generated media coverage in Champaign-Urbana.

Affinity Marketing

Information about PSP may be best delivered by organizations that people already associate themselves with and trust. CNT Energy continued to develop relationships with groups that have interests in areas such as energy efficiency, the environment, and affordable housing, and cooperate with these organizations to inform their constituencies about the program. In particular, CNT Energy partnered with the Champaign-Urbana area chapter of the Sierra Club to promote the May energy workshops. Thanks to this successful partnership, more than 60 people attended workshops in those communities.

In Carbondale, the Southern Illinois Center for a Sustainable Future and the Shawnee chapter of the Sierra Club helped to promote the May workshops and invited CNT Energy to give a presentation on Power Smart Pricing at the Shawnee Energy Fest. CNT Energy also worked with the City of Urbana, Lewis and Clark Community College, Knox College and public libraries to disseminate information about Power Smart Pricing.

Refer-a-Friend

As participation in PSP grows, program participants have become increasingly important spokespeople for the program. CNT Energy developed a Refer-a-Friend campaign that encourages participants to tell their friends and neighbors about the program. Calls to action were placed in our seasonal newsletters as well as on the PSP website. The campaign provides participants with printed materials, e-mail messages and web content that they can easily share with others. CNT Energy also explored opportunities to use social networking websites such as Facebook and Twitter to encourage participants to spread the word about hourly electricity pricing. New enrollees reporting that they heard about the program through word-of-mouth increased significantly during 2009.

Presentation and Conferences

Real-Time Pricing in the Heartland: Power Smart Pricing Demonstrates the Value of Dynamic Pricing in Central and Southern Illinois, EUCI Evolution of Demand Response and Energy Efficiency Conference, Miami, December 10, 2009.

Panelist, End-User Value: From Promise to Reality, Gridweek, September 22, 2009.

Residential Real-Time Pricing in Illinois: The Policy Implications of Measuring and Evaluating the Impact of Dynamic Pricing, National Town Meeting on Demand Response & Smart Grid, July 14, 2009.

Residential Real-Time Pricing in Illinois: Real World Results from Dynamic Pricing and Demand Response, EUCI Demand Response & Energy Efficiency World, May 19, 2009.

Panelist, The Path Forward: Making the Case for the Smart Grid, GE Energy Smart Grid Executive Summit, Atlanta, GA, May 14, 2009.

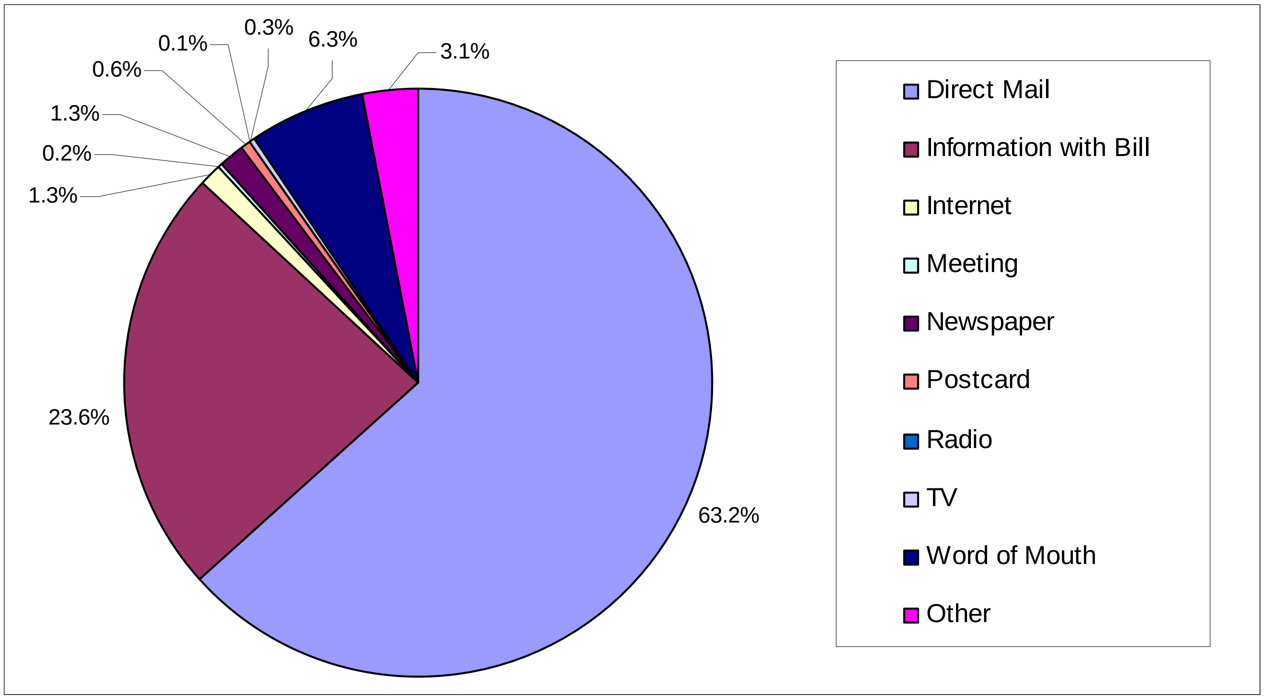
The Center for Neighborhood Technology and its work with the Illinois Smart Grid Initiative, Illinois Sustainable Technology Center, April 22, 2009.

Residential Real-Time Pricing: Increasing Savings and Performance, Metering America Billing/CIS America, Miami, FL March 24, 2009

A.3.2 Analysis of Campaign Results

During 2009, 5,519 customers submitted Power Smart Pricing (PSP) enrollment forms. Direct mail produced the largest number of enrollments, with bill inserts producing the second most. Word-of-mouth was the next most common ways that people reported learning about the program, possibly as a result of increased efforts to encourage participants to tell others about the program. The graph below illustrates the data collected on how people said they heard about Power Smart Pricing.

How heard about PSP



It is worth noting that while media coverage did not directly account for a large number of enrollments, response rates to direct mailings were generally higher in communities where the local media had covered the program. CNT Energy will continue to increase efforts to pair media outreach and direct mailings to improve the effectiveness of future direct mail campaigns.

Characteristics of Participants

Customers who enroll in PSP are asked to provide some basic demographic information such as their household income, and the age and number of people in the household. The information available on the existing customer base provides insights into the types of households that are most likely to enroll in hourly electricity pricing. In particular, the survey revealed the following about the current participants.

Most PSP participants are highly educated.

-74% of surveyed participants pursued additional education after high school.

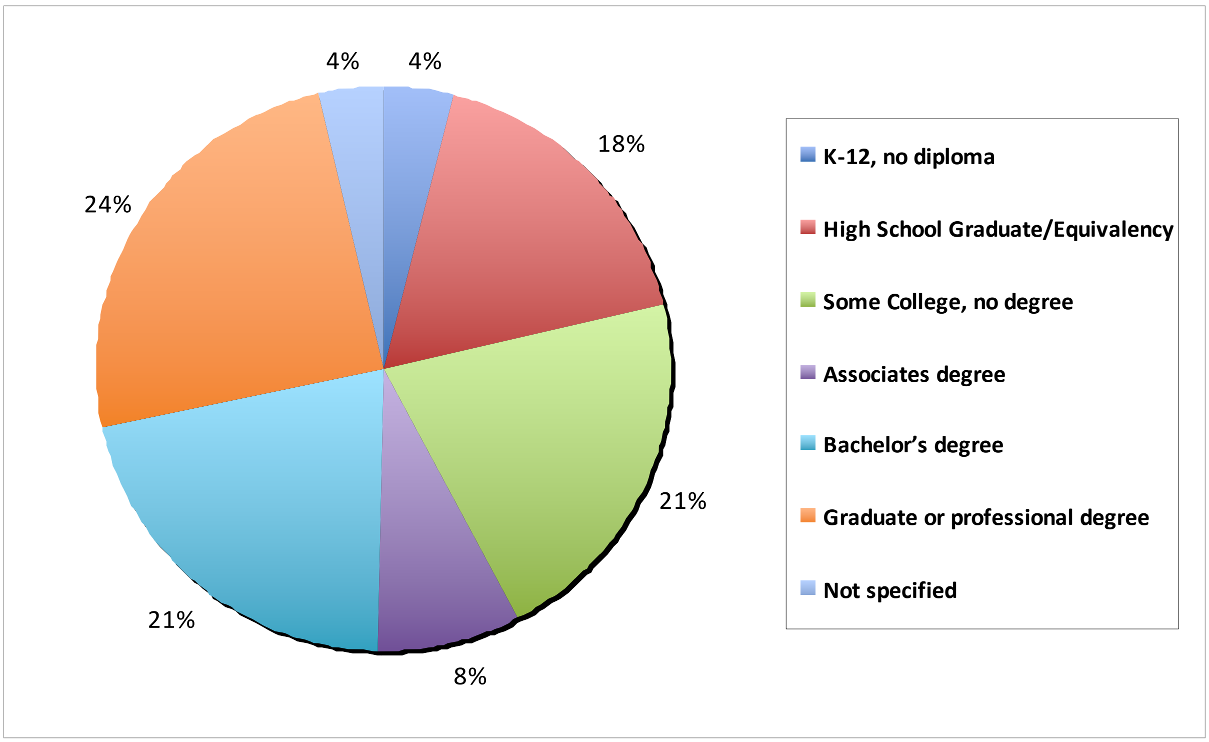
A relatively small majority of participants have household incomes of greater than $50,000.

- 36% of surveyed participants have a household income $25,000 to $49,999.

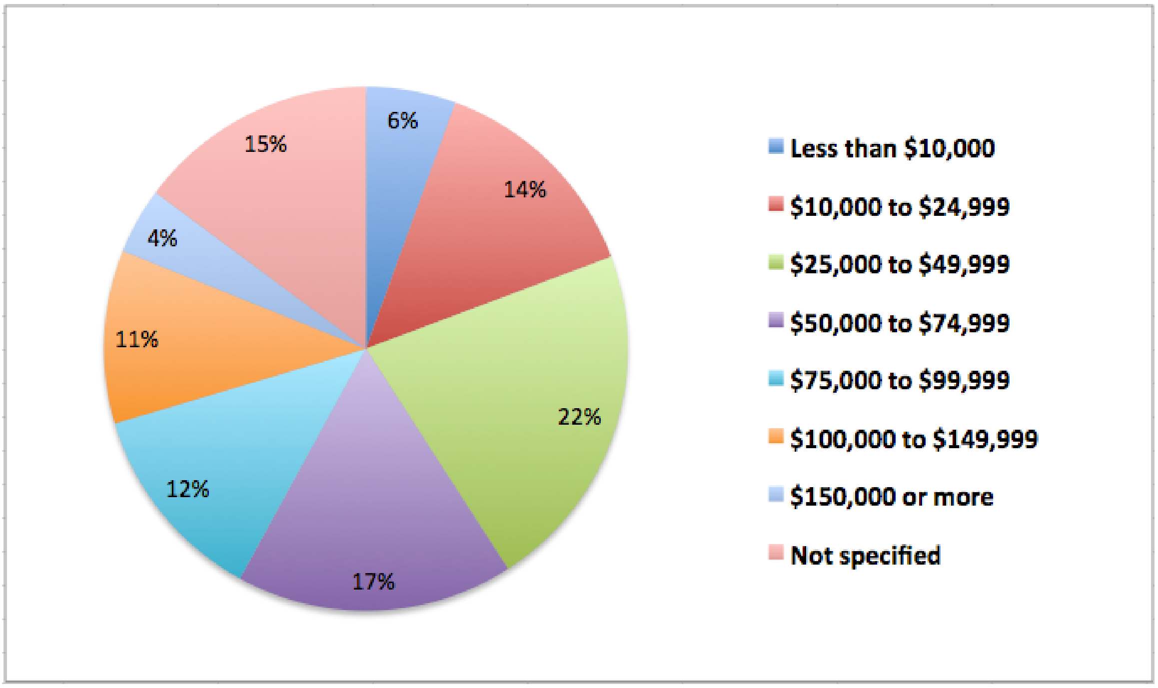
- 44% of surveyed participants have a household income greater than $50,000.

Most participating households have between one and four people in the home, with two-person households making up the largest segment of the survey respondents (47%).

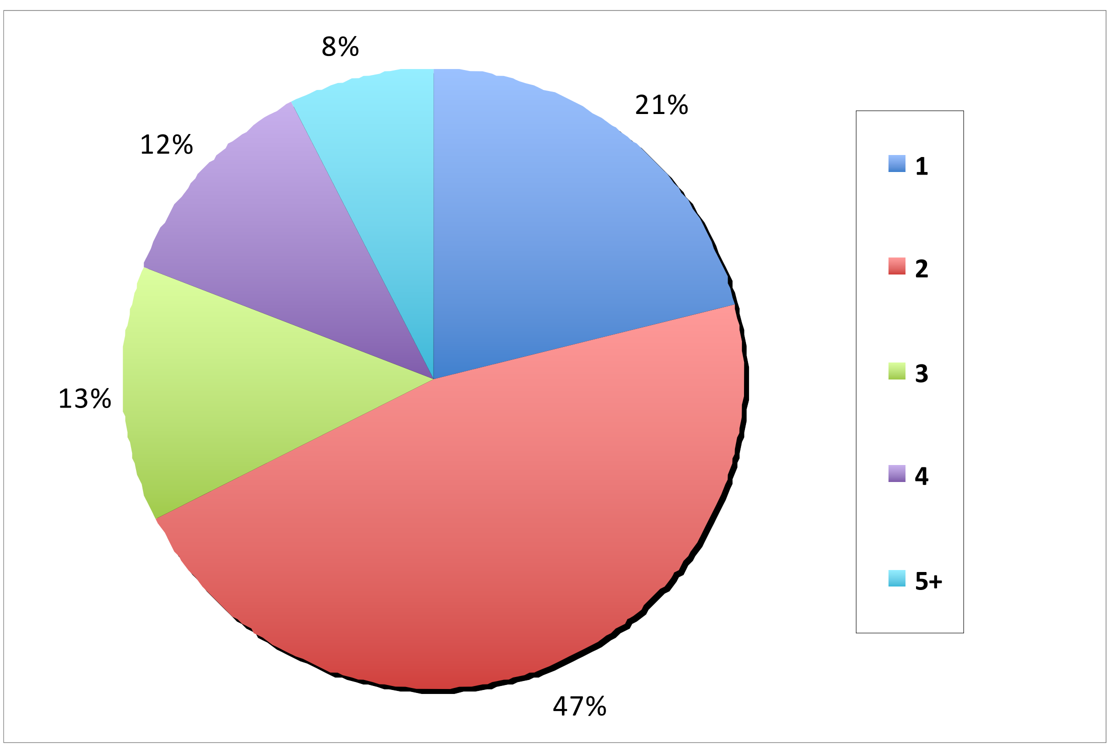
Education Levels of PSP Participants



Household Incomes of PSP Participants



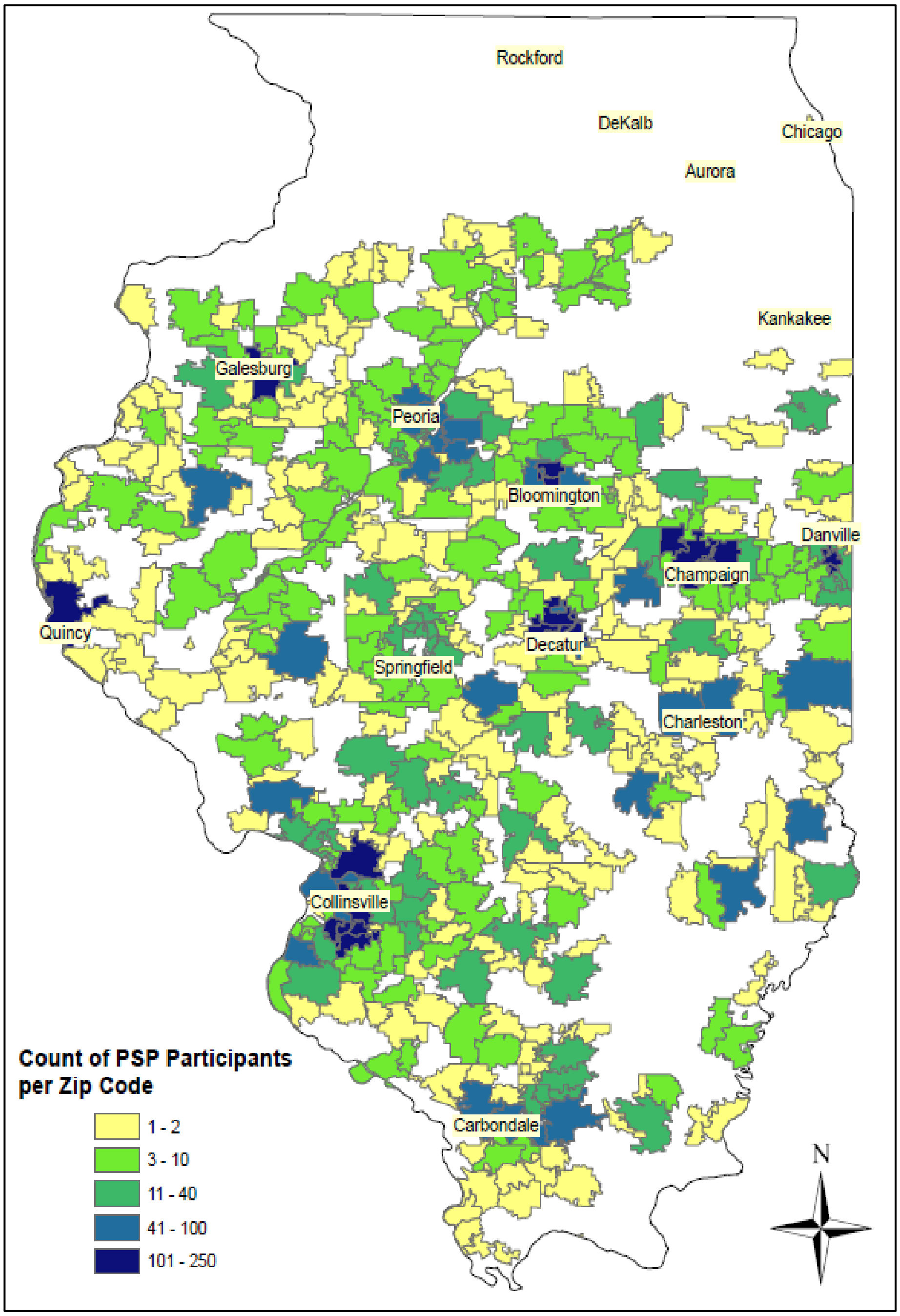
Household Size of PSP Participants



Participation Levels by ZIP Code

CNT Energy mapped the locations of PSP participants in order to visualize enrollment levels in various communities. The map below shows a count of participants by ZIP code, with darker colors indicating larger numbers of participants. This map reveals that, as expected, enrollments were highest in the communities targeted by marketing efforts to date. In addition, shows growth in participation in new areas. For example, in the Quincy area, television news coverage followed by a direct mailing helped drive participation from less than 20 households to nearly 200 during 2009.

Count of PSP Participants by ZIP Code

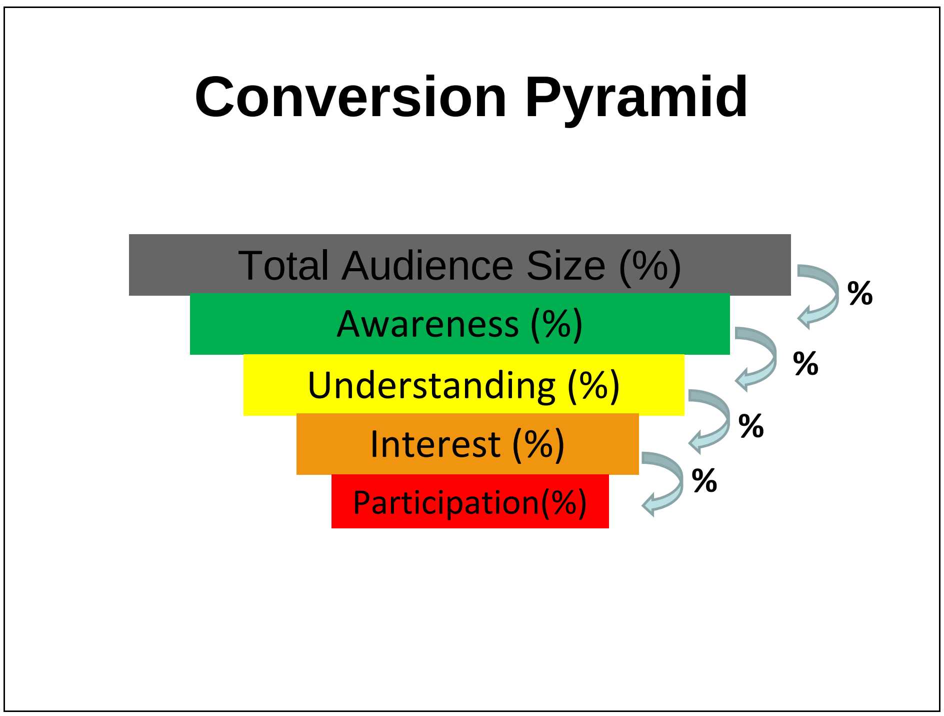


A.3.4 Market Research Results

In the summer of 2009 CNT Energy conducted a phone survey to determine awareness of Power Smart Pricing (PSP). The primary purpose of the survey was to determine awareness of the PSP program among the AIU population that received marketing materials. Among those aware of the program, the goals were to determine effectiveness of communication initiatives and identify barriers to adoption. Among those not aware of the program, we sought to gauge their potential interest and the best methods and messages for communicating. The survey results were used to adapt communications and outreach programs to maximize rate of interest and accelerate consumer sign-ups for the program.

The survey analysis can be conceptualized with the use of a conversion pyramid model. This analysis identifies the steps consumers must take from initial awareness to participation (see figure below).

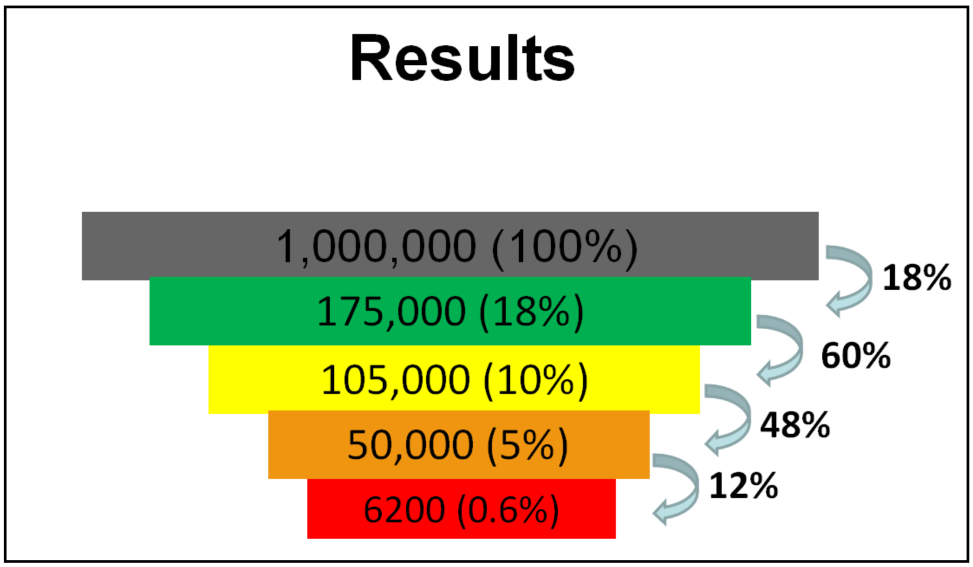
Conversion Pyramid



The survey identified the following results

- Awareness: Eighteen percent of respondents answered yes to the question: “Have you ever heard of Power Smart Pricing?"
- Understanding: Sixty percent of customers who were aware of PSP that could accurately describe it in their own words
- Interest: Sixty percent of respondents indicated that they are "very" or "somewhat interested" in PSP

Results of Survey Analysis



A.3.5 Recommendations for 2010 Marketing Strategies

Based on the survey results and the results of the 2007, 2008 and 2009 marketing campaigns, CNT Energy makes the following recommendations for the 2010 campaign.

- Focus on markets with strong existing penetration to maximize social diffusion, such as Champaign, Belleville, and Decatur.
- Use a mix of local media and tactical direct mail.
- Test outdoor billboard, radio, newspaper ads in conjunction with mailings.
- Work to energize the base.
- Revamp the “refer-a-friend” program.
- Provide a “badge” to current participants (window cling).
- Continue using bill inserts to efficiently drive overall awareness.

A.4 Energy Prices

During 2009, Power Smart Pricing (PSP) participants had unusually low hourly electricity prices. It is typical to see lower prices during the fall winter and spring, while higher prices tend to occur on summer afternoons. That means that in the past, customers on hourly electricity pricing usually got the bulk of their savings during the cooler months of the year. During the summer, more shifting or conservation behavior was required to avoid higher prices in the afternoons.

This summer, hourly prices remained low all summer long, due largely to cool weather and reduced demand for electricity because of the economic slow-down. Prices did continue to follow the typical summer pattern, with the highest prices of the day occurring in the mid to late afternoon. However, the highest prices of the day remained relatively low, topping out at just 7.993 cents per kWh from 3 p.m. to 4 p.m. on June 24. Prices reached their lowest point of the summer from 5 a.m. to 6 a.m. on June 7, when the price actually went below -1 cent per kWh, meaning PSP participants actually received a credit rather than a charge for the electricity used during that hour. As a result of the low summer prices, PSP participants were able to achieve significant savings with only minor adjustments to how and when they used electricity.

A.4.1 High Price Alerts

High price alerts are sent to PSP participants the evening before any day where there are one or more hours over 13 cents per kilowatt hour. Alerts are sent by either e-mail or an automated phone call. Thirty-four percent of participants opted to receive High Price Alerts by e-mail and 64% selected phone notification.

This summer, hourly prices continue to follow the typical summer pattern, with the highest prices of the day occurring in the mid to late afternoon, but remained unusually low all summer long. The highest prices of the day topped out at just 7.993 cents per kWh from 3 p.m. to 4 p.m. on June 24. Consequently, in 2009 there were no high price alert days.

A.4.2 Hourly Day-Ahead Prices

The Day-Ahead MISO market prices continued to be used for the program in 2009. In June 2008 the hourly electricity pricing for AmerenCIPS, AmerenCILCO and AmerenIP were set to be identical using the MISO Ameren Illinois Hub. In January 2009, the prices were changed to each AIU hub, resulting in three very slightly different prices for each AIU utility on some days. Most days the prices were still identical.

The chart below shows how average prices changed across the year, how they compared with 2007 and 2008 prices, and how they compared with the flat rate prices. (Note: the flat rate prices are an all in price and do not include some additional other charges such as the RTP Supplier Charge described below, so the prices cannot be directly compared.)

Average Electricity Prices

	AmerenIP	AmerenCILCO	AmerenCIPS
2007 Average Day-Ahead Prices	4.428	4.517	4.450
2008 Average Day Ahead Prices	4.744	4.776	4.776
January 2009	3.811	3.811	3.811
February 2009	3.220	3.220	3.220
March 2009	2.670	2.670	2.670
April 2009	2.502	2.502	2.502
May 2009	2.352	2.352	2.352
June 2009	2.721	2.721	2.721
July 2009	2.242	2.242	2.242
August 2009	2.448	2.448	2.448
September 2009	2.146	2.146	2.146
October 2009	2.586	2.586	2.586
November 2009	2.378	2.378	2.378
December 2009	3.123	3.123	3.123
Ameren Standard Rates (effective 06/01/09)	**AmerenIP**	**AmerenCILCO**	**AmerenCIPS**
Summer (June, July, August, and September)	5.516	5.525	5.554
Non-Summer, usage under 800 kWh	6.874	7.480	7.484*
Non-Summer, usage over 800 kWh Non-Space Heat	4.856	2.334	5.104*
Non-Summer, usage over 800 kWh Space Heat**	0.885	2.334	2.367*

A.4.3 The Price of Capacity

AIU secures capacity on a monthly basis for PSP and other hourly pricing service customers. For standard rate customers capacity is embedded in the all-in price (the Retail Purchased Electricity Charge). Capacity was relatively inexpensive for 2009 compared to 2008. Summer capacity prices in 2009 were almost halved in comparison to summer 2008, having less of an impact on summer bills, most likely due to lower summer temperatures and overall decreased air conditioner use.

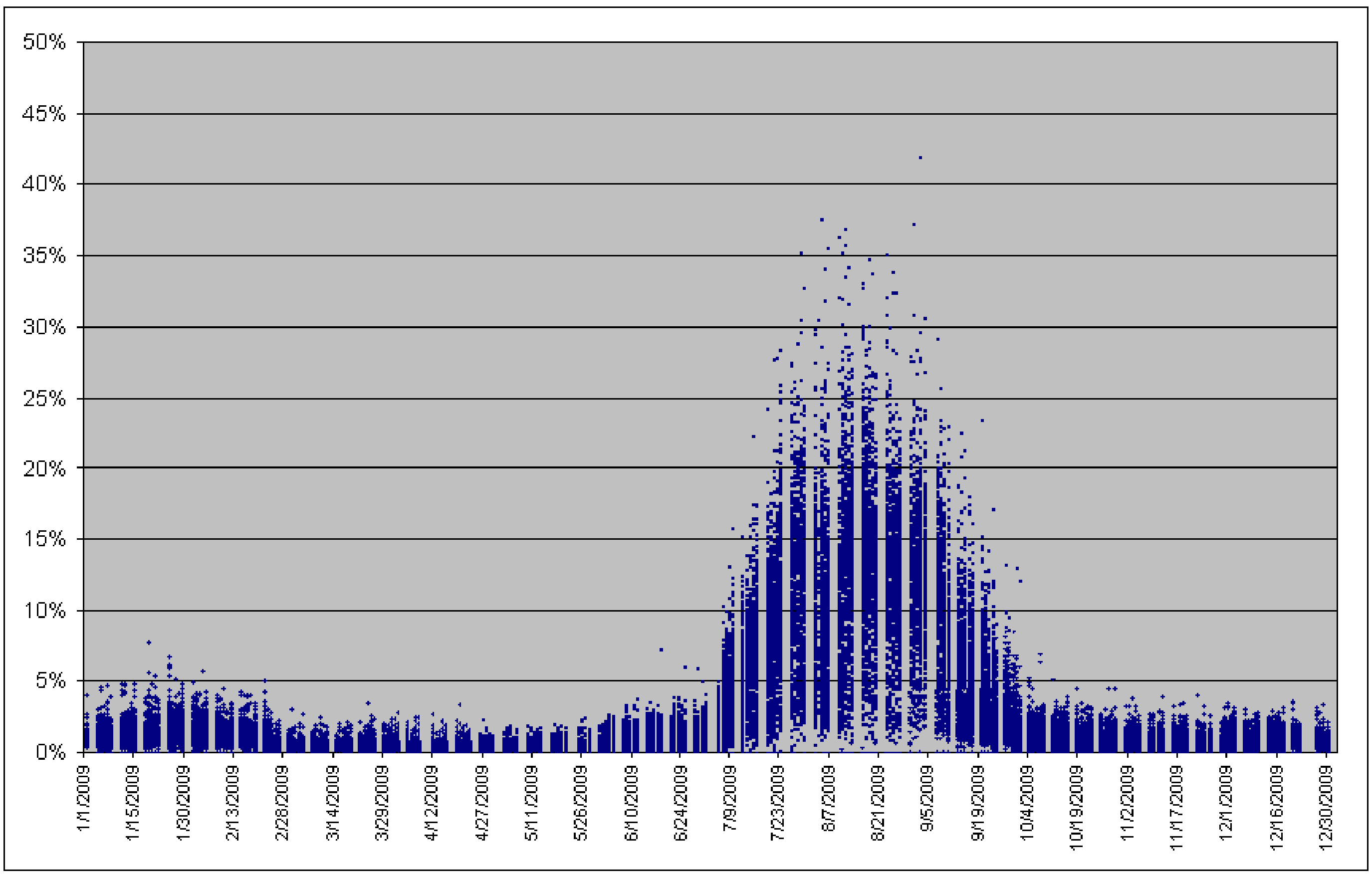
The table below shows how the price of the RTP Supplier Charge changed during 2009 with the highest priced months for the comparable costs from 2008 as a comparison.

2009 Monthly RTP Supplier Charge

	Dollars per kW-day
July 2008	0.242
August 2008	0.244
January	0.023
February	0.008
March	0.007
April	0.006
May	0.006
June	0.018
July	0.158
August	0.125
September	0.013
October	0.009
November	0.009
December	0.009

Capacity is included in the RTP Supplier Charge which also includes a small and relatively consistent cost for ancillary services and is priced by the kW-day, which is a charge that is multiplied by the customer's demand at the system peak during their billing period. When the price of capacity is low, the overall charge is a nominal portion of the bill, but in summer months it can be very large. The method of determining the capacity charge is a source of confusion for customers, and often seen as arbitrary and unfair. If a customer has a low demand at the peak hour, the resulting charge is not that large, but if their demand is high, the charge can be a relatively large portion of the bill. The graph below shows the impact of this charge on bills during 2009, and how it can be a very large spread during summer months.

2009 RTP Supplier Charge as a Percent of the Delivery Services Portion of the Bill
(Not including the General Assembly Rate Relief Credit)



There is a slightly larger than average spread for January 2009, which can be explained by January's slightly higher than normal supplier charge for a non-summer month.

A.5 Customer Surveys

CNT Energy fielded the annual customer satisfaction survey to Power Smart Pricing (PSP) customers in November 2009, to all customers who had been enrolled for two or more months. The response rate was 20%. The Survey addressed the quality of communications and customer behavior. In previous years, participants' opinions about High Price Alert days were solicited. However, the relatively cool weather in 2009 resulted in relatively low electricity prices, and correspondingly, no High Price Alert days. New survey questions to explore participants' actions in this contest were developed. Some highlights of the responses are recorded below.

Changes in energy use

In response to the question, "Have you changed your everyday electricity use since you enrolled in Power Smart Pricing?" 83% report that they had, versus 12% who reported they had not, with 5% unsure. Their activities ranged from simple actions to reduce air conditioning use and turning off lights to investments such as purchasing energy efficient appliances.

Additional questions were designed to explore participants' thoughts on the mild summer. Most participants (67%) recognized the prices were lower, compared to 15% who thought prices were about the same, 4% who believed prices were higher than the previous summer, and 15% who did not know.

Monitoring of energy prices

- 32% of participants checked hourly prices every or most days, while 22% checked only after a high price alert
- 49% of participants check hourly prices online
- 6% call and listened to the recording of prices on the phone
- 41% don't check prices.
- The web tools were used by 3% of participants
- 1% subscribed to the Twitter feed.

Customer information and education

PSP participants receive mailings (in both electronic and paper format) with program updates and tips. Two of the survey questions asked how participants felt about the frequency and the amount of information that was is being sent. A majority of participants were satisfied with the level and quantity of this outreach.

	Too much	About right	Too little
Do you think the frequency of these updates is:	1%	87%	12%
Do you think the amount of information you receive is:	1%	89%	10%

Beginning in 2003 with ComEd's Energy Smart Pricing Plan (ESPP), CNT Energy began asking a benchmarking question about the ease of participating in hourly electricity pricing. The 2009 results are provided with prior years' metrics for comparison purposes below.

Participating in ESPP/PSP has been…	2003 ESPP	2004 ESPP	2005 ESPP	Overall ESPP	2007 PSP	2008 PSP	2009 PSP
Quick and easy	81%	82%	75%	76%	58%	71%	80%
Time consuming and difficult	1%	1%	3%	2%	7%	1%	0%
Somewhere between quick and easy and time consuming and difficult	15%	12%	17%	19%	20%	20%	14%
Don't know	3%	4%	5%	4%	15%	7%	5%

A.6 Recommendations

CNT Energy anticipates that 2010 operations will continue to function smoothly, and that the Power Smart Pricing (PSP) enrollment will continue to grow. In the interest of continual quality improvement, CNT Energy has four recommendations related to the customer experience.

They are: (1) AIU could extend the AMR/advanced meter system to PSP participants with access problems; (2) continuing outreach and education for AIU's staff; (3) explore improvements in the AIU bill format; and (4) continuing to explore ways to adjust the capacity charge.

A.6.1 Interval AMR/advanced/smart meters

As described above, CNT Energy would like to reduce meter reading access issues in 2010. This could both provide a better customer experience and reduce administrative costs for AIU associated with estimated bills. CNT Energy would like to work with AIU to explore options of using its advanced metering system to help overcome the access problems associated with probing interval meters.

A.6.2 Continuing Outreach and Education

CNT Energy would like to continue working with AIU on ongoing training and education of their call center and meter reader and installation staff. We have enjoyed the opportunities we have had to work with AIU staff and would welcome additional opportunities to collaborate.

A.6.3 Bill streamlining or redesign

CNT Energy is aware that AIU is in the process of making changes in their bill due to the upcoming merger of the companies, as well as in an ongoing effort to improve its usefulness for the customer. While we appreciate that making changes in the content of the bill is a difficult process, we would like to take this opportunity to convey the comments of many customers on this subject. Most customers only vaguely understand the details of their bills. In addition, a consistent complaint form PSP customers is that they cannot see their monthly savings on the bill. If this element could be incorporated in the format, it would increase the program's credibility and customer satisfaction. We appreciate that the process of getting to a "better bill" is not a quick or easy one. However, if there is any way CNT Energy can contribute to AIU's work on this topic, we would be happy to do so.

A.6.4 Capacity Charge

Unlike in 2008, the price of capacity paid by PSP participants was relatively low. However, this charge still represents an unexpected and difficult to manage cost for participants of peak time power. We reiterate our interest in further research into how the capacity charge could be adjusted to continue to encourage demand response from PSP participants, but, if possible, to lower the difference in capacity costs between otherwise similar customers, and/or spread some of the costs over a longer period of time.

A.7 Attachments

- Sample Direct Mail Piece
- Summer Readiness Kit
- Sample Media Coverage: Some Ameren customers saving big on electric bill, Belleville News-Democrat, August 21, 2009
- Sample News Coverage: Choose what you pay for electricity, WGEM Quincy News, November 11, 2009

2014 IPA Draft Plan
CUB Comments
Appendix D

CNTenergy

Ameren Illinois Utilities

Power Smart Pricing

An hourly electricity pricing program from the Ameren Illinois Utilities, administered by CNT Energy

Cut 17% off your electricity bills with Power Smart Pricing

We're writing to let you know about an electricity pricing option offered by the Ameren Illinois Utilities that could help you cut your household energy costs. Ameren customers like you who normally pay more than $30 per month for electricity are among those who are likely to benefit from Power Smart Pricing, a program that lets you pay the hourly, wholesale price of electricity.

Customers who signed up for Power Smart Pricing have saved an average of 17% on their electricity bills compared with what they would have paid on the standard rate.*

Power Smart Pricing works a bit like a cell phone plan that offers lower rates for nights and weekends. It lets you pay lower prices for electricity during off-peak times. In addition to nights and weekends, electricity prices often remain low throughout the day during the fall, winter, and spring.

Customers who signed up for Power Smart Pricing say it's a quick and easy way to cut household energy bills. Please review the information on the reverse side of this letter to find out whether it could be a good choice for you.

To learn more, go to **www.powersmartpricing.org** or contact us at **1-877-655-6028** or **info@powersmartpricing.org**.

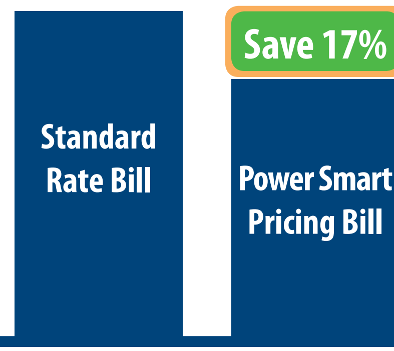
Enroll today

Enroll online at **www.powersmartpricing.org** or complete and mail the enclosed form.

*Based on average customer savings for May 2007 though September 2009. Actual savings vary depending on customer usage and market conditions. While savings are likely for most customers, past performance does not guarantee future results.

$204 annual savings

for a household paying $100 per month on the standard rate*



What people say about Power Smart Pricing

"We have been extremely impressed with not only the information on current electricity charges we receive from the Power Smart Pricing program but also with the tips on how to conserve utility usage."

- Dan E., Decatur

"I really appreciate the Power Smart Pricing Program. It's saving money and raising awareness of energy use."

- Maggie F., Urbana

"I was just recently retired . . . all my bills were being scrutinized for ways to make them smaller, or keep them in a friendly range. Power Smart Pricing offered me that opportunity with electricity usage, so I jumped at the chance to sign up."

- Mary C. Harrisburg, IL

Frequently Asked Questions about Power Smart Pricing

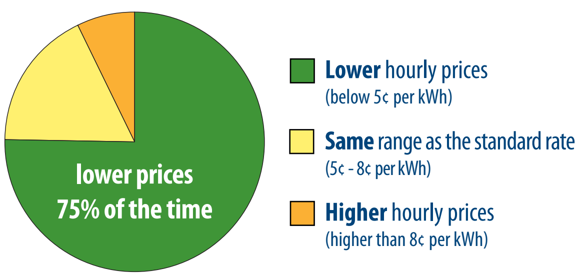
How can I save with Power Smart Pricing?

Under the standard residential rate, electricity costs the same amount no matter what time of day you use it. Power Smart Pricing lets you pay the hourly wholesale market price of electricity. The hourly price varies throughout the day, so you could save money by being smart about both **how much** electricity you use, and **when** you use it.

- **Most of the time, the hourly price is lower than the standard fixed rate.**
  - Prices tend to remain low most of the time during the fall, winter and spring.
  - Higher prices are most likely to occur during the summer on hot weekday afternoons.
- **To reduce your costs, shift some of your electricity use to lower priced hours.**

Power Smart Pricing vs. the Standard Rate

The graph shows the number of hours when prices are higher or lower than the standard rate.*



How much could I save?

AmerenCIPS customers who signed up for Power Smart Pricing have saved an **average of 17%** compared with what they would have paid on the standard rate. Individual savings vary based on electricity use and market conditions. The more you can shift electricity use to lower-priced times, the more you could save with hourly pricing.

Will I still be an Ameren Customer?

Yes. If you sign up for Power Smart Pricing, the Ameren Illinois Utilities will continue to deliver your power, respond to service calls and issue your bill. You will receive additional program support from CNT Energy, an independent nonprofit organization dedicated to helping Illinois residents save energy and money. CNT Energy will provide personalized information, services and tools to help you manage your electricity costs.

*Based on hourly prices for October 2007 though September 2009. Actual prices vary depending on market conditions. Past performance does not guarantee future results.

Is Power Smart Pricing right for me?

Power Smart Pricing is likely to be a good option if:

- You are interested in saving money by using energy wisely at home.
- You want to be part of a program that helps you save energy and improve the environment.
- You can make some simple adjustments in how and when you use electricity. For example, you can do laundry and run the dishwasher at night and on weekends when electricity prices are low.
- You heat your home with natural gas or propane.

How can I track hourly prices and my use?

You'll receive information and support to make it easy to manage your costs.

- Each evening, prices for the following day are available **online and by phone**.
- You'll receive **day-ahead alerts** (by e-mail or phone) to let you know in advance when prices will be high.
- **Online tools** will help you understand and manage your electricity use.
- A specialized **support team** is available to answer questions and help you get the best possible value from hourly electricity pricing.

Is there a fee?

Customers who select Power Smart Pricing will be charged a monthly participation fee of $2.25. This fee will be included in your electricity bill. Savings from Power Smart Pricing are expected to more than offset this modest monthly charge.

How long do I have to stay in the program?

To enroll, you must agree to remain on the hourly electricity rate for a minimum of 12 consecutive monthly billing periods. At the end of that period, you will be free to contact any certified third party supplier or your Ameren Illinois utility if you wish to select a different supply option. **So far, 99% of participants have elected to stay with Power Smart Pricing after their 12-month obligation expired.**

Questions about whether the program is right for you? Reach us at **1-877-655-6028** or e-mail **info@powersmartpricing.org**.

Power Smart Pricing Program Enrollment Form

Enrollment form for Power Smart Pricing, open to residential customers served by AmerenCILCO, AmerenCIPS (includes CIPS in Metro East) and AmerenIP.

All information required for enrollment. If information is missing we cannot process your form.

Enrolling online is quick and easy at www.powersmartpricing.org.

1. Contact Information

Customer name (PRINT as shown on your electric bill)

Mailing address

IL

City State **ZIP**

( )

Phone

E-mail address

☐ **Go paperless.** Check this option to receive the majority of your program updates electronically rather than in the mail.

2. High Price Alert Method

You will receive day-ahead alerts by phone or e-mail when prices will be 13¢ per kWh or higher. **Please select your high price alert method:**

☐ **E-mail** ☐ **Phone** (Check one)

3. Your Heating System

What is your primary source of heat? (Check one.)

☐ Natural gas

☐ Propane

☐ Electric *(Power Smart Pricing may not be your best option if you have electric heat. For more information, go to www.powersmartpricing.org.)*

☐ Other: ____________________

Which best describes your heating system?

☐ Vents (furnace)

☐ Radiators (boiler)

Do you use space heaters?

☐ No

☐ Yes. How many? __________

4. Billing Information

Your Ameren Illinois electric utility: ☐ CILCO ☐ CIPS ☐ CIPS-ME ☐ IP

Ameren account # ☐☐☐☐☐-☐☐☐☐☐

Electric (kWh) meter # ☐☐☐☐☐☐☐☐

You can find your account and meter numbers on page 2 of your Ameren Illinois utility bill. See the reverse side of this form for an example.

5. Customer Signature

By signing this form, I agree to the following:

- I am requesting Power Smart Pricing service under Rider PSP and Rider RTP (available at www.ameren.com) pursuant to an Ameren Illinois utility tariff approved by the Illinois Commerce Commission (ICC).
- I acknowledge that an Interval Data Recording (IDR) meter or meters must be installed at my premises by my Ameren Illinois utility in order to commence service under Rider PSP.
- I acknowledge that the Ameren Illinois Utilities must have access to the meter location at my home during all normal business hours Monday through Saturday throughout the year to insure hourly readings are available to support my participation on PSP.
- **I acknowledge that once Power Smart Pricing service under Rider PSP commences, I am required to take this service under Rider PSP for at least 12 consecutive monthly billing periods.**
- **A monthly participation charge of $2.25 will be added to my Ameren Illinios Utilities electric bill.**
- I agree to the terms and conditions of taking service under both Rider PSP and Rider RTP now in effect and as may be amended from time to time.
- I authorize this participation agreement to be secured and maintained by CNT Energy.
- I authorize my Ameren Illinois utility to release my account information including energy usage and billing information and all other information permitted by law to CNT Energy. I understand that CNT Energy will keep my account information confidential and will use this information only to operate and improve the program, and to provide me with access to my account information through a secure interface on the CNT Energy Web site.
- I authorize my electrical usage data and billing information to be used in aggregate with other Rider PSP participants for purposes of evaluating consumer and system benefits and understand that my individual data will be held confidential.
- I acknowledge that Rider PSP will terminate on December 31, 2010, unless an extension has been approved by the ICC.
- I understand the price I will pay for electricity I use is based on the hourly market price for energy which may be above or below the standard rate for residential customers (BGS 1).

Signature **(Must be signed by the person whose name appears on the account)**

Contact Name (If different from your customer name)

Date

Over →

Power Smart Pricing Program Enrollment Form, page 2

To help CNT Energy maximize your benefits, please provide the following information about your home appliances and electricity usage.

6. Your Household and Energy Usage

Do you:
☐ Own your home
☐ Rent your home

________ **Number of people in your household**

How do you cool your home?
☐ Fans
☐ Window air conditioner(s) Number of units: ____________
☐ Central air conditioner Number of units: ____________

Do you have any electricity generating equipment?
☐ No
☐ Yes, solar (photovoltaic)
☐ Yes, backup generator

☐ Yes, other: ____

7. How You Heard about the Program

How did you learn about this program? (Check all that apply.)
☐ This mailing
☐ Information in my utility bill
☐ Newspaper
☐ TV
☐ Radio
☐ Community meeting
☐ Word of mouth
☐ Internet

☐ Other: ____

Please return this form to:

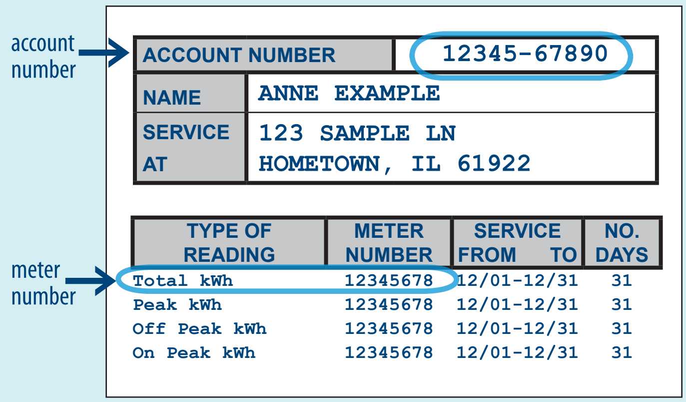
Power Smart Pricing
2125 W. North Ave.
Chicago, IL 60647-5415

Phone: 1-877-655-6028
Fax: 1-773-278-3840
E-mail: info@powersmartpricing.org

To enroll online, go to www.powersmartpricing.org.

Finding Your Account and Meter Numbers

You can find your account and meter numbers on page 2 of your Ameren Illinois Utility bill, as shown below. Look for the meter number next to the reading for **total kWh**.



Your Power Smart Pricing

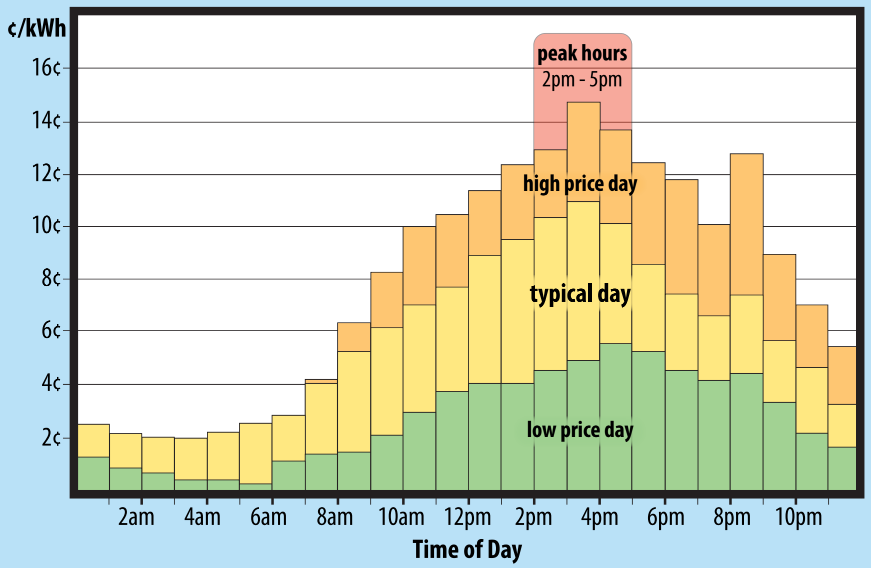
Summer Energy Saving Guide

Time is Money!

Use this guide to find ways to save energy and money throughout your home. The tips in green can help you avoid high electricity prices and make the most of times when prices are low.

Summer Price Patterns

The graph shows how prices normally vary during summer days. High price days tend to occur when the weather is particularly hot. Low price days can occur on weekends and when the weather is cool. Keep the price pattern in mind and shift some of your electricity use from peak hours (when prices are high) to off-peak hours (when prices are low). **The highest prices of the day usually occur between 2 p.m. and 5 p.m., so using energy wisely during these hours can help you cut costs.**



Depending on the weather and other factors, some days will have higher price than others. Your **high price alerts** will let you know in advance when prices will be 13¢ per kWh or higher for any number of hours during the following day.

You can check prices at **www.powersmartpricing.org** or by calling **1-877-655-6028**.

Ameren Illinois Utilities

CNTenergy

Power Smart Pricing is an hourly electricity pricing option offered by the Ameren Illinois Utilities and administered by CNT Energy.

Use fans along with (or instead of) your air conditioner. Fans use far less electricity than air conditioners.

Charge devices such as cell phones and cordless tools at night when electricity prices are low.

Unplug cell phones and other rechargeable devices when they are done charging.

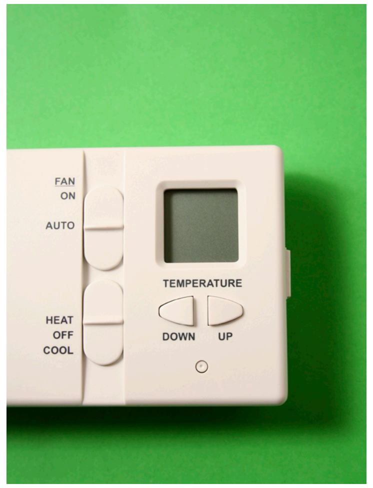
Learn more online.
Check prices and learn more about managing household energy costs at **www.powersmartpricing.org.**

Find more tips at these websites:

Energy Star
www.energystar.gov

U.S. Department of Energy, Energy Savers
www.energysavers.gov

Ameren Illinois Utilities, Act on Energy
www.actonenergy.com



When electricity prices are high or you are away from home, **change your thermostat to a warmer temperature setting.** For window air conditioners, adjust the setting to low (or the energy-saver setting) or turn the air conditioner off.

Use a programmable thermostat to conserve energy automatically during the afternoon (when electricity prices are usually highest) and while you are sleeping or away from home.

Precool your home at night and in the morning when prices are low. (See reverse side for details.)

Run the dishwasher when electricity prices are low. Some dishwashers have a timer that lets you set a start time.

Only wash full loads of dishes, and use the more efficient "energy-saving" or "no-heat-dry" option.

Avoid heating up the kitchen on hot days. Use the microwave, enjoy no-cook meals, or grill outside.

Unplug electronics that aren't in use or use a powerstrip to ensure that devices don't draw standby power while they are turned off.

Clean up on low prices by doing laundry at night or on weekends when electricity prices tend to be low. Avoid running the washer and dryer during times when prices are high.

Wash full loads and use cold water when possible. Make sure the dryer stops once your clothes are dry, or hang clothes on a rack or clothesline.

Your Power Smart Pricing Summer Energy Guide

Dear Power Smart Pricing participant,

We are entering summer, the season when hourly electricity prices typically fluctuate most. **Being smart about your electricity use – especially your air conditioning use – will help you manage your electricity costs with the Power Smart Pricing (PSP) program.**

During the summer, air conditioning usage has a big impact on demand for electricity. As a result **the highest prices of the day typically occur in the afternoon.** Depending on weather and other conditions, some days will have higher overall prices than others. The tips on this poster can help you cut costs during high price times and throughout the season. Here are two tips that will benefit you most during the summer season:

- Reduce electricity usage between the hours of 2 p.m. and 5 p.m. (especially on hot summer days).
- Limit air conditioning usage during higher priced hours and try precooling to take advantage of lower priced hours.

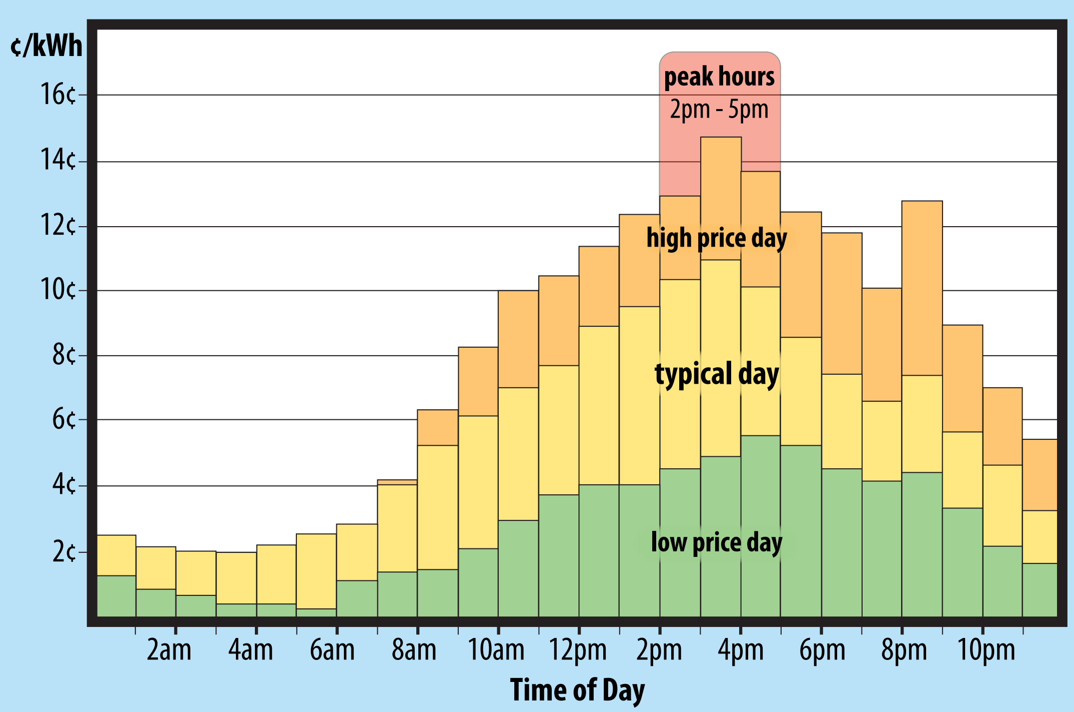
We hope you'll find the poster useful and place it in a central location to help everyone in your home remember to pitch in to save energy and money this summer.

Sincerely,
The Power Smart Pricing Program Team
Reach us at 1-877-655-6028 or info@powersmartpricing.org.

You will receive an alert in advance any time prices will reach 13¢ per kWh or higher.

You can also check prices online at **www.powersmartpricing.org** or by phone at **1-877-655-6028**.

Typical Summer Price Patterns*



The graph shows how electricity prices normally vary during summer days. Prices are usually highest during the late afternoon and tend to peak between 2 p.m. and 5 p.m.

High price days tend to occur when the weather is particularly hot. Low price days can occur on weekends and when the weather is cool.

*Based on prices during the summer of 2008.

Precooling Your Home

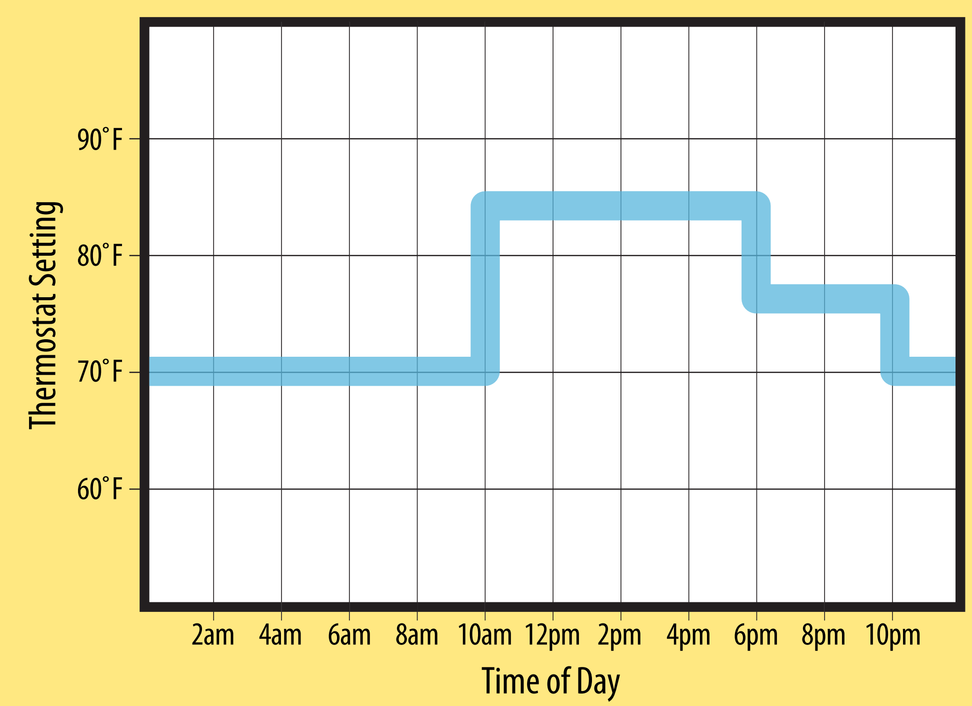
Air conditioner use accounts for as much as 40 percent of a typical household's summer energy consumption. You can manage your cooling costs by precooling your home during hours when the price of electricity is low, then using less air conditioning during higher priced hours. Many Power Smart Pricing participants have shared stories of their success with precooling, saying it's an easy way to manage air conditioning costs while keeping their homes comfortable.

To precool your home, simply run the air conditioner in the evening, overnight and during the morning hours when electricity is cheaper. Then increase your thermostat temperature setting or turn off your air conditioner during the afternoon. The goal is for your air conditioner to idle during the highest priced times, especially between 2 p.m. and 5 p.m.

The graph below illustrates this precooling strategy and the table lists recommended thermostat temperature settings for each precooling phase.

Precooling is easy, but you may have to experiment to find what works best for your house and your comfort level. Of course, the effectiveness of precooling will also depend on the outside temperature, humidity levels, and the insulation in your home. You can make precooling more effective by shading south facing windows during the day to minimize heat from the sun. And if you have a programmable thermostat you can set it to help you precool automatically.

Thermostat Settings for Precooling



Time	Phase	Temperature Setting
10pm - 10am	Precooling	69°F - 72°F
10am - 6pm	Idle	82°F - 85°F
6pm - 10pm	Comfort	75°F - 78°F

Find more energy-saving tips at www.powersmartpricing.org.

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Belleville News-Democrat

News - Metro-east news

Friday, Aug. 21, 2009

Some Ameren customers saving big on electric bill

Almost 6,000 enrolled in power smart pricing

BY MIKE FITZGERALD – News-Democrat

Low wholesale electricity prices -- a result of low demand stemming from cool temperatures and the slumping economy -- have enabled Ameren customers in the Power Smart Pricing program to cut their power bills by 27 percent on average this year.

Almost 6,000 Illinois households are enrolled in the Power Smart Pricing program, according to Stephanie Folk, a spokeswoman for CNT Energy, of Chicago, which administers the program for Ameren Illinois Utilities.

Customers in the program are notified via an electronic meter what price they will pay for electricity each hour of the day. They are warned via e-mail the day before prices are expected to spike above 13 cents a kilowatt hour.

As a result, participants can trim power costs by adjusting their electricity usage to off-peak hours, such as nights and weekends.

"We're just trying to let people know that option is out there and available," Folk said. "For the right customers, that can be really good value if they're looking for ways to cut costs around the house."

The 27 percent rate of savings calculated for Power Smart customers takes into account the $2.25 monthly fee they pay to enroll in the program, Folk said.

Ameren Illinois installs a special meter free of charge at the homes of Power Smart customers. The meter notifies them of hourly, wholesale electricity prices.

More than 830 customers have signed up for Power Smart pricing in St. Clair County. The town in the county with the most Power Smart customers is Belleville, with 369; followed by O'Fallon, 186; Swansea, 50; and Fairview Heights, 48.

Since its early 2007 launch, participants have saved an average of 13 percent compared with what they would have paid under the standard fixed rate.

To enroll, call CNT Energy at 877-655-6028 to order an application form, or apply directly by logging onto www.powersmartpricing.org. Contact reporter Mike Fitzgerald at mfitzgerald@bnd.com or 239-2533.

2014 IPA Draft Plan
CUB Comments
Appendix D

<< Back

WGEM The Tri-States' News Leader

Choose what you pay for electricity

Posted: Nov 11, 2009 5:59 PM CST

QUINCY, Ill (WGEM) -- How can you save hundreds of dollars each year on your electric bill?

By signing up for the "Power Smart Pricing" program by Ameren, electric customers can view real-time prices for their services. David Edwards of Quincy, has saved on his electric bill over the past year.

David said, "Probably three hundred dollars, 350. Something like that. Which is substantial."

David has been enrolled in the program for the past 16 months. At first he thought the lifestyle changes were hard to stick by. But after seeing the savings, he says any inconvenience has been well worth it.

David continued, "It's been an adjustment for a couple of things. We use the timer on the dishwasher to wash the dishes at 11 or 12 at night."

David has had to make other changes as well. Like running the washer and dryer and air conditioner during off peak hours. But these changes can pay off big.

David finished, "There was actually one month where the price of electricity was negative at one or two o'clock in the morning. So they actually pay you for using power."

For more information on the "Power Smart Pricing" Program you can visit the web site http://www.powersmartpricing.org/

CNT ENERGY

SCHEDULE OF DIRECT EXPENSES
FOR THE AMEREN PROJECT
AND SUPPLEMENTARY INFORMATION

**For the Year Ended
December 31, 2009**

CNT Energy

Ameren Project Report

Table of Contents

D&A
Desmond &Ahern, Ltd.
CERTIFIED PUBLIC ACCOUNTANTS & CONSULTANTS

Independent Auditor's Report

To the Board of Directors of
CNT Energy
Chicago, IL

We have audited the accompanying schedule of direct expenses for the Ameren project of CNT Energy for the year ended December 31, 2009. This schedule is the responsibility of the Organization's management. Our responsibility is to express an opinion on this schedule based on our audit.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the schedule of direct expenses for the Ameren project are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the schedule. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall schedule presentation. We believe that our audit provides a reasonable basis for our opinion.

As discussed in Note 1, the schedule of direct expenses for the Ameren project of CNT Energy is intended to present the expenditures of that project's portion of the financial reporting entity of CNT Energy that is attributable to the expenditure transactions of the Ameren project.

In our opinion, the schedule of direct expenses for the Ameren project referred to above presents fairly, in all material respects, the direct expenses charged to Ameren for CNT Energy for the year ended December 31, 2009 in conformity with Generally Accepted Accounting Principles.

The supplementary schedule of revenue and expenses for the Ameren project of CNT Energy is presented for purposes of additional analysis. Such information, except for that portion marked "unaudited," on which we express no opinion, has been subjected to the auditing procedures applied to the schedule of direct expenses for the Ameren project, and, in our opinion, the information is fairly stated in all material respects in relation to the schedule of direct expenses for the Ameren Project.

This report is intended solely for the information and use of Ameren and is not intended to be and should not be used by anyone other than the specified party.

Desmond & Ahern, Ltd.

March 19, 2010
Chicago, IL

10827 S. WESTERN AVENUE, CHICAGO, IL 60643-3206 • PHONE 773-779-4720 • FAX 773-779-8310
www.desmondcpa.com

CNT ENERGY
SCHEDULE OF DIRECT EXPENSES FOR THE AMEREN PROJECT
For the Year Ended December 31, 2009

Salaries	$	159,889
Payroll taxes and employee benefits		31,616
Professional and contractual fees		94,075
Workshops and meetings		4,041
Travel		13,402
Supplies		1,821
Postage and mailings		104,677
Printing and publications		35,373
Amortization on capitalized software		25,000
Telephone		424
Dues and Subscriptions		1,274
Total Direct Expenses	$	471,592

See independent auditor's report and notes to financial statements.

CNT ENERGY
NOTES TO THE SCHEDULE OF DIRECT EXPENSES FOR THE AMEREN PROJECT
December 31, 2009

Note 1 - Nature of Operations and Summary of Significant Accounting Policies

Organization

CNT Energy (formerly known as Community Energy Cooperative) was founded by The Center for Neighborhood Technology (CNT), and incorporated in April 2001 as an Illinois not-for-profit corporation. CNT Energy is a membership organization helping consumers and communities obtain needed information and services to control energy costs. It is exempt from income taxes under Section 501(c)(4) of the Internal Revenue Code.

Basis of Presentation - Ameren Project

The Ameren Project is accounted for as a project in CNT Energy's annual financial statement. The CNT Energy's annual financial statement audit is scheduled to occur after the Ameren reporting deadline. The Ameren Project is a portion of that annual financial statement. This report was prepared solely to meet the request of Ameren.

SUPPLEMENTARY INFORMATION

CNT ENERGY
SCHEDULE OF REVENUE AND EXPENSES FOR THE AMEREN PROJECT
For the Year Ended December 31, 2009

	Unaudited	Audited	Total
Revenue:			
Ameren contract	$ 413,404	$ -	$ 413,404
Expenses:			
Direct Expenses:			
Salaries	$ -	$ 159,889	$ 159,889
Payroll taxes and employee benefits	-	31,616	31,616
Professional and contractual fees	-	94,075	94,075
Workshops and meetings	-	4,041	4,041
Travel	-	13,402	13,402
Supplies	-	1,821	1,821
Postage and mailings	-	104,677	104,677
Printing and publications	-	35,373	35,373
Amortization on capitalized software	-	25,000	25,000
Telephone	-	424	424
Dues and Subscriptions	-	1,274	1,274
Total Direct Expenses	-	471,592	471,592
Indirect Expenses			
Internal contracts with CNT	20,027	-	20,027
Total Indirect Expenses	20,027	-	20,027
Total Expenses	$ 20,027	$ 471,592	$ 491,619

See independent auditor's report and notes to financial statements.

Appendix B » Exploratory Analysis on Alternative Elasticity Models

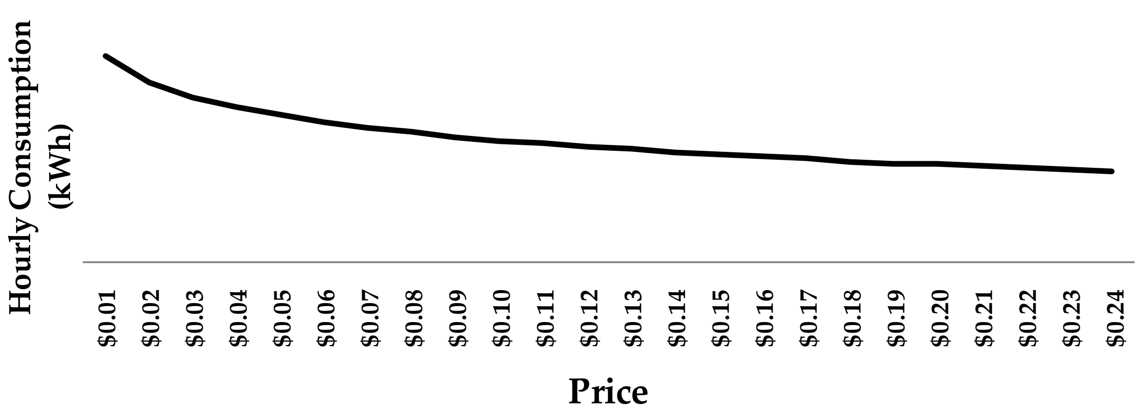
Exploratory Analysis of Fluctuating Price Elasticities

To fully appreciate why the assumption of a constant own-price elasticity of demand may be too restrictive an assumption, it is useful to work through an example of exactly what a constant own-price elasticity of demand implies for price responsiveness. Recall that the own-price elasticity of demand is the percentage change in consumption that is prompted by a 100% increase – a doubling – of price. This means – using the -2.3% overall estimate cited in Table 1 – that an increase in price from $0.01 to $0.02 will decrease consumption by 2.3%, an increase in price from $0.02 to $0.04 will decrease consumption by a further 2.3%, an increase in price from $0.04 to $0.08 will decrease consumption by a further 2.3% and that an increase in price from $0.08 to $0.16 will decrease consumption by a further 2.3%.

In summary, with a constant own-price elasticity of demand, the relative effect on consumption is the same for an increase in price from $0.01 to $0.02 as an increase in price from $0.08 to $0.16.

Plotting the demand curve for a customer with an average consumption of 1.7 kWh per hour using the -2.3% estimate (see Figure 17 below) we see that the steepest part of the curve – the greatest incremental change in consumption given an incremental $0.01 increase in price – occurs at the lowest prices. The implication is that customers will reduce more consumption as the price moves from $0.07 to $0.08 than they will as the price moves from, for example, $0.15 to $0.16. This seems improbable.

Figure 17. Demand Curve Implied by -2.3% Elasticity Estimate



Having concluded that the shape of the demand curve implied by the assumption of constant own-price elasticity is an imperfect hypothesis of the relationship between the price of electricity and residential consumption of electricity, Summit Blue/Navigant Consulting proceeded to use the dataset to conduct an exploratory analysis to determine if in fact the own-price elasticity of demand fluctuates with price.

Before proceeding with this analysis, certain assumptions were made regarding customer behavior in the face of changes in price. These assumptions form the theoretical framework of the analysis.

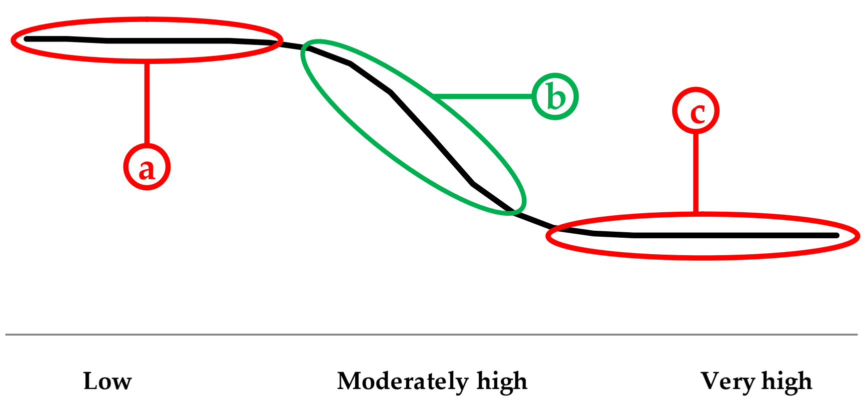
Assumption 1: When the price of electricity is low, customers do not care about small fluctuations in price. It seems unlikely that the benefit to the customer of shifting or curtailing routine electricity consumption at very low prices exceeds the opportunity cost to the customer of shifting or curtailing that routine electricity consumption.
Example: whether the price of electricity is $0.01 or $0.02 it is unlikely that a customer would change when he or she irons his or her clothing.

Assumption 2: As the price of electricity rises to a moderately high level, customers will begin to care more about fluctuations in price. The benefit of shifting or curtailing routine electricity consumption will, at moderately high prices, exceed the opportunity cost to the customer of shifting or curtailing that routine electricity consumption.
Example: observing a price increase from $0.12 to $0.16, a customer may decide to iron his or her clothing later in the day when the price will be lower despite the inconvenience (i.e., the opportunity cost).

Assumption 3: There is some base level of non-discretionary electricity consumption below which a customer cannot go.
Example: it is unlikely that a customer will unplug their refrigerator or hot water heater, regardless of how high the price of electricity is.

If the above assumptions about the behavior of the average customer are accurate, this implies that the demand curve for electricity is S-shaped, as below in Figure 18.

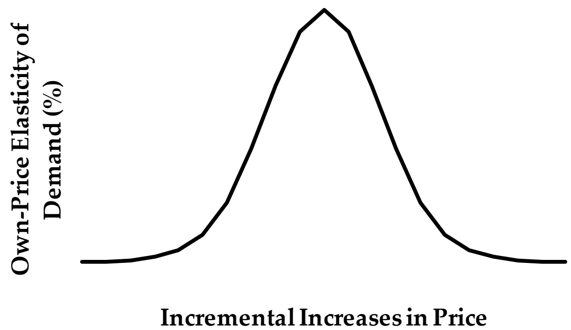
Figure 18. Theoretical S-shaped Demand Curve



The three lettered sections of the demand curve, **a**, **b**, and **c,** correspond with assumptions one through three laid out above. In section **a**, when prices are low, demand is relatively inelastic – the price is too low for the customer to care. In section **b**, when prices are moderately high, prices are relatively elastic and customers will curtail or shift consumption in response to changes in price. In section **c**, when prices are very high, demand is once again inelastic – the only consumption left that has not been curtailed is non-discretionary.

A demand curve such as the one hypothesized above must automatically imply elasticities that fluctuate with the price level. In fact, the theoretical demand curve shown above in Figure 18 would imply a set of own-price elasticities of demand such as those plotted in Figure 19 below.

Figure 19. Elasticities Implied by S-shaped Demand Curve



To determine whether or not the actual demand for electricity matched the hypothesized S-shaped demand curve, the following model was estimated for winter (December, January, and February), shoulder (March, April, May, September, October, and November) and summer (June, July, and August) non-holiday weekdays, using only observations between 6am and midnight. Note that for this model specification natural logs were not used as it was the demand curve itself which was the object of estimation rather than the own-price elasticity of demand.

Exploratory Model:

$y_{i,t} = \alpha_i + \rho PRICE_t + \beta X_t + errors$

Where:

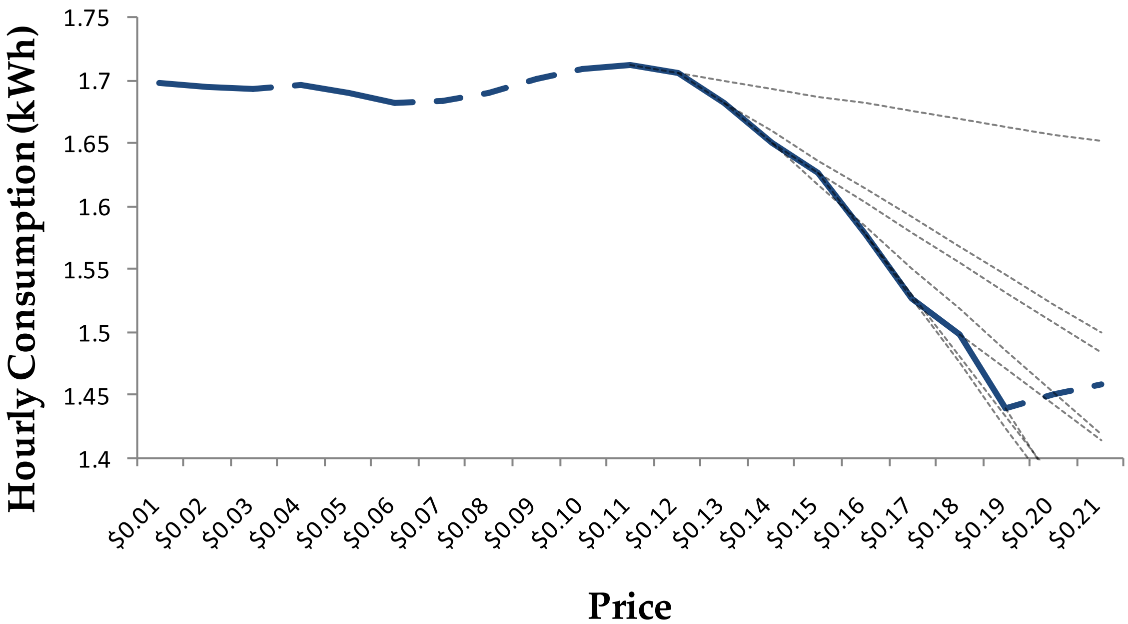
$y_{i,t} =$	Household *i*'s consumption of electricity (kWh) in hour *t*.
$\alpha_i =$	The customer-level fixed effect.
$\rho =$	The estimated effect of an incremental change in price on electricity consumption.
$PRICE_t =$	The hourly price of electricity in hour *t*.
$\beta =$	Vector of estimated coefficients.
$X_t =$	Vector of weather variables in hour *t*. This vector includes cooling degree hours, heating degree hours and a dummy for humid days equal to one when the dewpoint was greater than or equal to 65 degrees F.

This model was then estimated in a number of iterations. For the first iteration, all hours were used, for the second iteration, all hours in which the price of electricity exceeded $0.01 were used, for the third iteration all hours in which the price of electricity exceeded $0.02 were used, and so on.

Results of Exploratory Analysis

The estimates thus obtained were then applied to the average level of electricity consumption per hour (1.7 kWh) and incremental increases in price matching the cut-off price used for each iteration of the estimation above. In this way an estimated demand curve for the average customer (in the summer months) could be generated and plotted as in Figure 20 below. Note that dashed sections of the blue curve represent positive or statistically insignificant estimates of the coefficient on the price variable. The small dashed grey lines represent the linear functions estimated in the model above at the various cut-off points used.

Figure 20. Summer Demand Curve Implied by Exploratory Model Iterative Estimation



Estimates of price obtained above the cut-off point of $0.19 were not significantly different from zero. It is unclear whether this is due to the demand curve flattening out as hypothesized above, or simply due to the paucity of data-points for which the price exceeds that level.

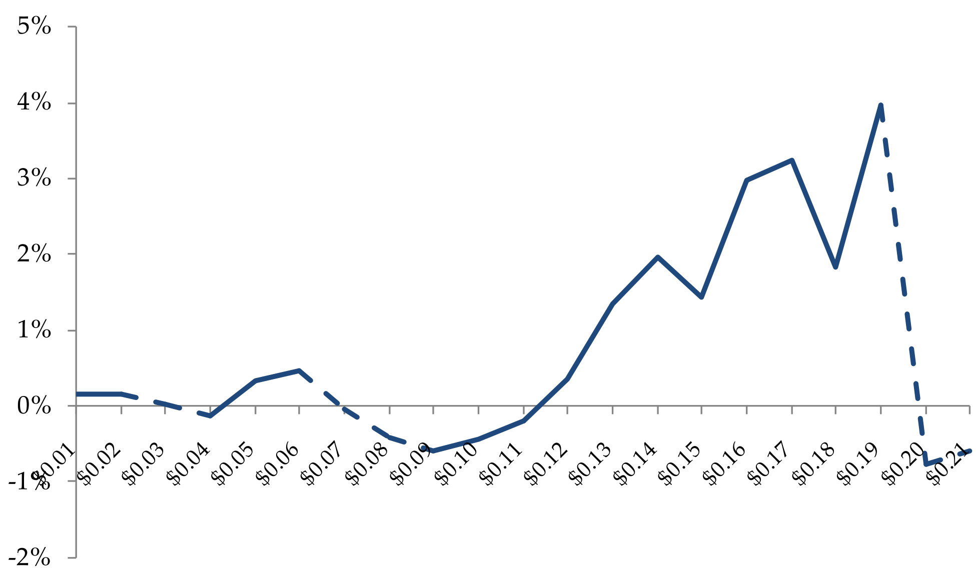
Using this implied demand curve, it is possible to estimate the average customer's own-price elasticity of demand, change in level of consumption, and percentage change in consumption at each incremental increase in price. These are presented in Table 22. Values highlighted in red indicate values derived from estimates that are statistically not significant from zero.

Using the values in the third column of the following table– "Incremental % change in consumption" – the percent reduction in consumption may be plotted for each incremental increase in price. This plot is presented in Figure 21. Dashed sections of the blue line represent values derived from positive or not statistically significant estimates.

Table 22. Implied Summer Own-Price Elasticity of Demand

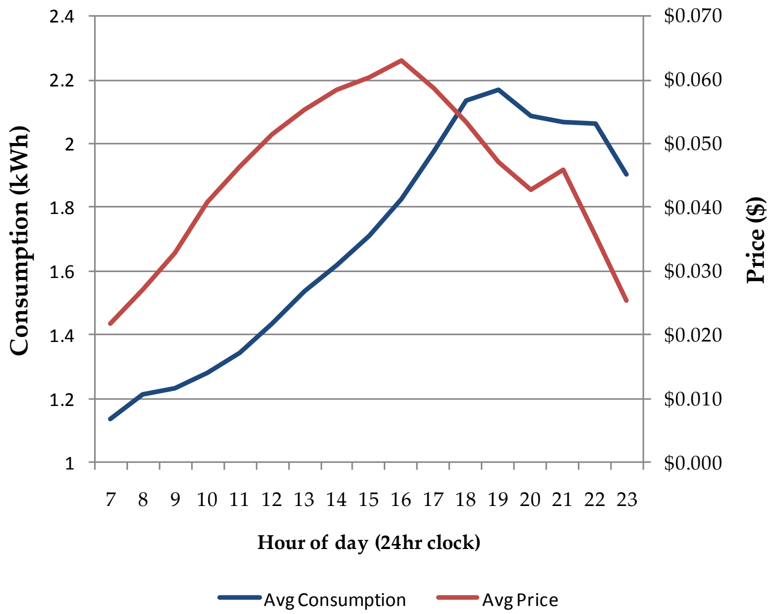
Price	Implied Elasticity	Incremental % change in consumption	Incremental change in consumption (kWh)
$0.01	0.00	0%	0.00
$0.02	0.00	0%	0.00
$0.03	0.00	0%	0.00
$0.04	-0.01	0%	-0.01
$0.05	-0.02	0%	-0.01
$0.06	0.00	0%	0.00
$0.07	0.03	0%	0.01
$0.08	0.05	1%	0.01
$0.09	0.04	0%	0.01
$0.10	0.02	0%	0.00
$0.11	-0.04	-0.4%	-0.01
$0.12	-0.16	-1%	-0.02
$0.13	-0.25	-2%	-0.03
$0.14	-0.20	-1%	-0.02
$0.15	-0.45	-3%	-0.05
$0.16	-0.52	-3%	-0.05
$0.17	-0.31	-2%	-0.03
$0.18	-0.71	-4%	-0.06
$0.19	0.15	1%	0.01
$0.20	0.12	1%	0.01

Figure 21. Implied Percent Reduction in Consumption Given Incremental Increase in Price



It should be noted by the reader that the estimates of customer response to price changes obtained from the exploratory model are likely to be conservative, although the degree of conservatism will decline as the cut-off price increases. This conservatism is due to the correlation of intra-day price and consumption movements. As an illustration, the average summer hourly consumption by hour, and the average summer hourly price are plotted in Figure 22 below.

Figure 22. Average Summer and Consumption and Price By Hour



Note that price and consumption both begin low in the early hours of the day, both gradually rise over the course of the day and both gradually decline together in the evening. These movements are correlated in the opposite manner to what would be expected – that is, consumption is increasing through the day as the price increases. It is clearly not the case that higher prices cause greater consumption, but simply that consumption – and prices – rise during the day and fall at night because that is when most customers require their energy.

This apparent relationship, the spurious positive correlation between intra-day prices and consumption, leads to serial correlation in the error term of the regression and causes a positive bias in the estimates. This spurious correlation will tend to bias estimates of the relationship between consumption and price upwards and make it appear as if an increase in price causes an increase in demand.

The negative estimates obtained above, therefore are negative because the true inverse relationship –price goes up and consumption goes down – is over-powering the correlative effect arising from the spurious intra-day correlation between price and consumption. Thus the estimates are in fact conservative.

The reason why the degree of conservatism declines as the cut-off price increases is due to the fact that higher electricity prices are disproportionately distributed among a small group of hours and by excluding the lower-price hours in one cent increments, the correlative effect is thus gradually reduced.

An attempt by Summit Blue/Navigant Consulting was made to control for this correlative effect by performing a similar estimation, but using only the data-points from a single hour of the day.[17] This would entirely remove any intra-day correlative effects. Unfortunately the results of these ancillary regressions were inconclusive and erratic. This is due to an effect touched on at the start of the Elasticity section of this report above, the estimation of which is beyond the scope of this year's study: the cross-price elasticity of demand.

Recall that the cross-price elasticity of demand is the percentage change in the consumption of one good (or in this case the consumption of electricity in a given hour, for example between noon and 1 p.m.) that comes about when the price of another good (for example, the consumption of electricity between 9 p.m. and 10 p.m.) increases by 100%.

In general, if the price is relatively high between 9 p.m. and 10 p.m. it will also usually be relatively high between noon and 1 p.m. Thus, although a customer's own-price elasticity of demand would indicate that his or her consumption between 9 p.m. and 10 p.m. should decrease, if consumption between 9 p.m. and 10 p.m. and consumption between noon and 1 p.m. are in fact substitutes, the *cross*-price elasticity of consumption will cause consumption between 9 p.m. and 10 p.m. to *rise*. These interactions were suspected to be the reason for the erratic results obtained using hour-by-hour regressions.

When the ancillary regressions were attempted once more, with the price of other hours as well as the price corresponding to the hour of consumption included as regressors, it was found that many of the parameter estimates on these regressors were significant and positive, indicating that there was indeed a significant cross-price effect. No further exploratory analysis was pursued, however, falling as it does beyond the scope of this year's study.

The two central conclusions of the above analysis are:

1. **The own-price elasticity of demand is almost certainly *not* constant.**
2. **There exist significant, if unquantified, cross-price effects.**

These conclusions lay a solid foundation for the 2010 impact analysis and indicate the path which Summit Blue/Navigant Consulting must explore in order to better quantify both own- and cross-price elasticities of demand change with price level.

Suggested Analytic Approach for Elasticity Estimation in 2010 Evaluation – Next Steps

The two central conclusions above, that own-price elasticity of demand is not constant and that there exist significant cross-price effects, suggest that any approach taken in the 2010 PSP impact evaluation must somehow control for both features.

One framework that suggests itself as well-suited to estimating an S-shaped demand curve (from which own-price and cross-price elasticities could be derived) is a regime-changing frame-work driven by Markov-switching. This type of model postulates that there exist two or more "states" or "regimes" within which the relationship between the dependent and independent variables exist, e.g., a low-price regime and a high-price regime. Each regime is, in essence, its own model and is in some ways analogous

[17] That is, regressing consumption that occurs between, for e.g., noon and 1 p.m. against the price at that time.

to the manner in which two price elasticities of Method B were estimated, although inherently superior in that the "threshold" at which one regime switches for another is determined endogenously within the model.

The probability of being in one regime or another is estimated by maximum likelihood and is driven by a cascading Markov chain. In such a model, the hourly price of electricity would be used as a regressor in estimating the probability of switching between regimes. This procedure is well established in econometric literature and is explained exhaustively by Hamilton as well as Kim and Nelson,[18] among others.

Although this approach has not been applied specifically to the estimation of a demand curve for electricity, it has been used quite fruitfully in the past for the estimation of the probability of price spikes occurring in electricity markets. In particular, the work of Kanamura and Ohashi (2007)[19] and of Mount, Ning, and Cai (2006)[20] make use of this framework for forecasting such price spikes. An informative empirical comparison of various regime-switching models for electricity spot prices by Janczura and Weron (2010)[21] provides additional context. Since the effect of quantity demanded on price (the concern of the papers cited above) and the effect of price on the quantity demanded (the concern of the PSP impact evaluation) are effectively two sides of the same coin it seems likely that the methods used in the papers cited above could be very useful in helping to quantify the degree to which price dictates residential electricity consumption.

Another possible analytic framework that could be used to explore and quantify the price responsiveness of residential electricity consumers, and one which is explicitly designed to address the cross-price effects is that of the "almost ideal demand system" (AIDS). This procedure is quite popular for exploring household expenditures on a variety of goods and has in the past been used by Brannlund et al (2007)[22] to estimate elasticities of demand for electricity, although only for overall demand (i.e., with a quarterly rather than hourly time series) in relation to the rebound effect of energy conservation.

Summit Blue/Navigant Consulting intends to explore both of these frameworks, as well as any others which may suggest themselves in the course of those explorations, to enable the estimation both of own-price elasticities of demand, but, just as importantly, the cross-price elasticities of demand to a high degree of rigor for the 2010 PSP impact evaluation.

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[18] Kim, Chang-Jin and Nelson, Charles R. *State-Space Models With Regime Switching*, MIT Press, 1999
Hamilton, James *Time Series Analysis* Princeton University Press, 1994 (see Chapter 22: Modeling Time Series with Changes in Regime).

[19] Kanamura, T., Ohashi, K. (2008). *On transition probabilities of regime switching in electricity prices*. Energy Economics 30, 1158-1172.

[20] Mount, T.D., Ning, Y., Cai, X. (2006). *Predicting price spikes in electricity markets using a regime-switching model with time-varying parameters.* Energy Economics 28, 62-80.

[21] Janczura, J., Weron, R. (2010). *An empirical comparison of alternate regime-switching models for electricity spot prices*. Currently unpublished, available at: http://mpra.ub.uni-muenchen.de/20661/

[22] Brannlund, R., Ghalwash T., Nordstrom J. (2007). *Increased energy efficiency and the rebound effect: Effects on consumption and emissions*. Energy Economics 29, 1 – 17.

Appendix C » Elasticity Model Output

Model Output – Method A – Overall Elasticity Estimate

METHOD A - ESTIMATE OF OVERALL OWN-PRICE ELASTICITY OF DEMAND - WINTER
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7374	7352691.13	997.11	2425.90	<.0001
Error	2.29E7	9428966.01	0.41		
Corrected Total	2.29E7	16781657.13			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.438139	-954.7643	0.641114	-0.067149

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	7371	6955526.571	943.634	2295.79	<.0001
lnprice	1	78379.523	78379.523	190692	<.0001
DEW	1	97009.017	97009.017	236016	<.0001
TEMP	1	221776.016	221776.016	539565	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	52887.2837	52887.2837	128671	<.0001
DEW	1	73248.3545	73248.3545	178208	<.0001
TEMP	1	221776.0158	221776.0158	539565	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	0.1304961479	0.00036380	358.71	<.0001
DEW	0.0076503798	0.00001812	422.15	<.0001
TEMP	-.0126339894	0.00001720	-734.55	<.0001

METHOD A - ESTIMATE OF OVERALL OWN-PRICE ELASTICITY OF DEMAND - SUMMER
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5621	3844679.112	683.985	1510.67	<.0001
Error	8.96E6	4058713.958	0.453		
Corrected Total	8.97E6	7903393.070			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.486459	293.2657	0.672881	0.229444

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	5618	3515858.759	625.820	1382.21	<.0001
lnprice	1	74738.138	74738.138	165069	<.0001
DEW	1	197741.740	197741.740	436739	<.0001
TEMP	1	56340.476	56340.476	124436	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	865.6055	865.6055	1911.81	<.0001
DEW	1	108195.2537	108195.2537	238964	<.0001
TEMP	1	56340.4756	56340.4756	124436	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-0.023487646	0.00053718	-43.72	<.0001
DEW	1.145523426	0.00234335	488.84	<.0001
TEMP	1.082992571	0.00307010	352.75	<.0001

Model Output – Method A – Overall Elasticity By Cohort Vintage

METHOD A - ESTIMATE OF OVERALL OWN-PRICE ELASTICITY OF DEMAND - SUMMER, NEW PARTICIPANTS ONLY
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3610	1840993.696	509.971	1190.63	<.0001
Error	4.22E6	1807025.672	0.428		
Corrected Total	4.22E6	3648019.368			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.504656	300.7560	0.654461	0.217605

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	3607	1657324.892	459.475	1072.74	<.0001
lnprice	1	69815.807	69815.807	162999	<.0001
DEW	1	86835.315	86835.315	202735	<.0001
TEMP	1	27017.683	27017.683	63078.4	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	602.75260	602.75260	1407.25	<.0001
DEW	1	47514.46611	47514.46611	110932	<.0001
TEMP	1	27017.68289	27017.68289	63078.4	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-0.052914049	0.00141054	-37.51	<.0001
DEW	1.158089614	0.00347707	333.07	<.0001
TEMP	1.259747710	0.00501584	251.15	<.0001

METHOD A - ESTIMATE OF OVERALL OWN-PRICE ELASTICITY OF DEMAND - SUMMER, EXPERIENCED PARTICIPANTS ONLY
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2013	2003960.989	995.510	2099.30	<.0001
Error	4.75E6	2250294.550	0.474		
Corrected Total	4.75E6	4254255.539			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.471049	286.9606	0.688630	0.239974

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	2010	1857415.704	924.087	1948.68	<.0001
lnprice	1	30512.470	30512.470	64343.6	<.0001
DEW	1	93031.698	93031.698	196182	<.0001
TEMP	1	23001.116	23001.116	48503.9	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	232.00808	232.00808	489.25	<.0001
DEW	1	59238.83217	59238.83217	124921	<.0001
TEMP	1	23001.11605	23001.11605	48503.9	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-0.013319662	0.00060218	-22.12	<.0001
DEW	1.125660021	0.00318486	353.44	<.0001
TEMP	0.941513970	0.00427502	220.24	<.0001

Model Output – Method B – Overall Elasticity Estimate Below and Above Threshold Price of $0.13

METHOD B - ESTIMATE OF SUMMER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE < $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5621	3252297.953	578.598	1309.16	<.0001
Error	7.85E6	3467426.476	0.442		
Corrected Total	7.85E6	6719724.430			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.483993	489.2876	0.664802	0.135871

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	5618	2959173.869	526.731	1191.80	<.0001
lnprice	1	75768.905	75768.905	171438	<.0001
DEW	1	140194.904	140194.904	317210	<.0001
TEMP	1	77160.275	77160.275	174586	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	114.32601	114.32601	258.68	<.0001
DEW	1	51725.32175	51725.32175	117036	<.0001
TEMP	1	77160.27545	77160.27545	174586	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-0.010243422	0.00063689	-16.08	<.0001
DEW	0.873082752	0.00255209	342.10	<.0001
TEMP	1.348957659	0.00322845	417.83	<.0001

METHOD B - ESTIMATE OF SUMMER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE >= $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1964	143815.5275	73.2258	185.30	<.0001
Error	249542	98614.2589	0.3952		
Corrected Total	251506	242429.7864			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.593225	160.9526	0.628634	0.390571

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	1961	140401.5959	71.5969	181.18	<.0001
lnprice	1	299.4870	299.4870	757.85	<.0001
DEW	1	776.5995	776.5995	1965.17	<.0001
TEMP	1	2337.8450	2337.8450	5915.88	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	171.114592	171.114592	433.00	<.0001
DEW	1	342.305800	342.305800	866.20	<.0001
TEMP	1	2337.845016	2337.845016	5915.88	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-0.248322669	0.01193358	-20.81	<.0001
DEW	0.620157947	0.02107139	29.43	<.0001
TEMP	1.668043521	0.02168690	76.91	<.0001

METHOD B - ESTIMATE OF WINTER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE < $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7229	2116586.476	292.791	884.88	<.0001
Error	5.55E6	1837851.361	0.331		
Corrected Total	5.56E6	3954437.836			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.535243	741.5350	0.575225	0.077572

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	7227	2059898.904	285.028	861.42	<.0001
lnprice	1	38498.541	38498.541	116351	<.0001
TEMP	1	18189.030	18189.030	54971.1	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	14908.92455	14908.92455	45057.9	<.0001
TEMP	1	18189.02980	18189.02980	54971.1	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	0.1726983765	0.00081358	212.27	<.0001
TEMP	-.0052915291	0.00002257	-234.46	<.0001

METHOD B - ESTIMATE OF WINTER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE >= $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	535	7453.59547	13.93195	44.17	<.0001
Error	17693	5580.45297	0.31540		
Corrected Total	18228	13034.04844			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.571856	403.4958	0.561609	0.139186

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	533	7429.655409	13.939316	44.20	<.0001
lnprice	1	3.248710	3.248710	10.30	0.0013
TEMP	1	20.691352	20.691352	65.60	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	4.74180080	4.74180080	15.03	0.0001
TEMP	1	20.69135182	20.69135182	65.60	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-.0867406040	0.02237097	-3.88	0.0001
TEMP	-.0036527030	0.00045098	-8.10	<.0001

METHOD B - ESTIMATE OF SHOULDER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE < $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6929	4389135.278	633.444	1650.50	<.0001
Error	1.42E7	5461247.884	0.384		
Corrected Total	1.42E7	9850383.162			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.445580	-330.4706	0.619508	-0.187462

Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	6926	4332571.863	625.552	1629.93	<.0001
lnprice	1	1566.337	1566.337	4081.23	<.0001
DEW	1	0.372	0.372	0.97	0.3245
TEMP	1	54996.706	54996.706	143299	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	2749.52013	2749.52013	7164.13	<.0001
DEW	1	33762.43195	33762.43195	87971.1	<.0001
TEMP	1	54996.70610	54996.70610	143299	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	0.0395211096	0.00046693	84.64	<.0001
DEW	0.0062678203	0.00002113	296.60	<.0001
TEMP	-.0079837348	0.00002109	-378.55	<.0001

METHOD B - ESTIMATE OF SHOULDER OWN-PRICE ELASTICITY OF DEMAND WHEN HOURLY PRICE >= $0.13
The GLM Procedure

Dependent Variable: lnkwh

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1992	19663.07977	9.87102	22.23	<.0001
Error	45949	20398.74248	0.44394		
Corrected Total	47941	40061.82225			

R-Square	Coeff Var	Root MSE	lnkwh Mean
0.490818	-397.6818	0.666291	-0.167544

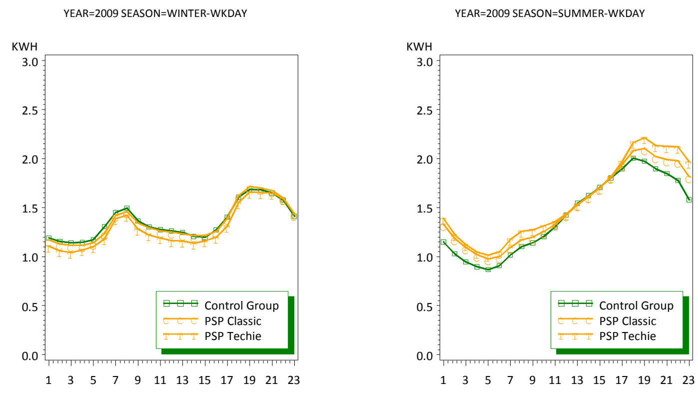
Source	DF	Type I SS	Mean Square	F Value	Pr > F
acctno	1989	19578.08742	9.84318	22.17	<.0001
lnprice	1	12.40984	12.40984	27.95	<.0001
DEW	1	1.60261	1.60261	3.61	0.0574
TEMP	1	70.97989	70.97989	159.89	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lnprice	1	16.60072431	16.60072431	37.39	<.0001
DEW	1	48.76479803	48.76479803	109.84	<.0001
TEMP	1	70.97989415	70.97989415	159.89	<.0001

Parameter	Estimate	Standard Error	t Value	Pr > |t|
lnprice	-.1345412467	0.02200167	-6.12	<.0001
DEW	0.0050628590	0.00048307	10.48	<.0001
TEMP	-.0051640447	0.00040840	-12.64	<.0001

Appendix D » Load Curve Comparisons for Subgroups of Customers

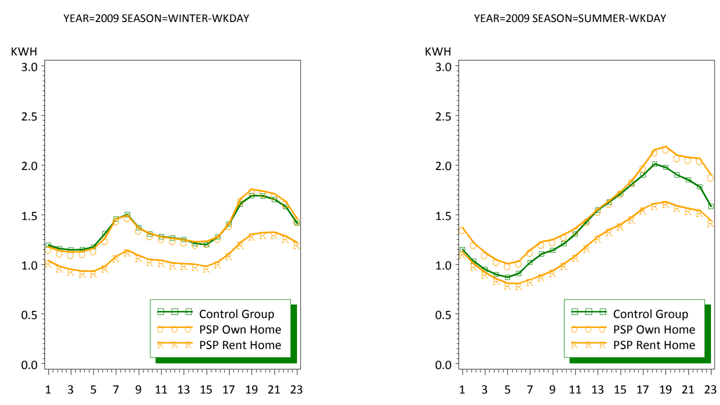
Go Paperless "Techies" vs. Classic - Winter and Summer



Techies show slight price response in Winter. They show more price response in Summer, but maybe they aren't home.

31% chose the 'Go Paperless' option.

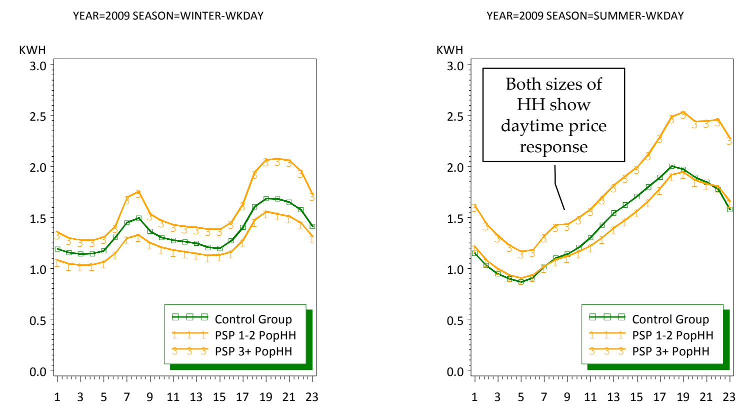
Own Home vs. Rent Home - Winter and Summer



Participants that rent their home use less than Participants that own, particularly during summer peak times.

10% of PSP participants are renters.

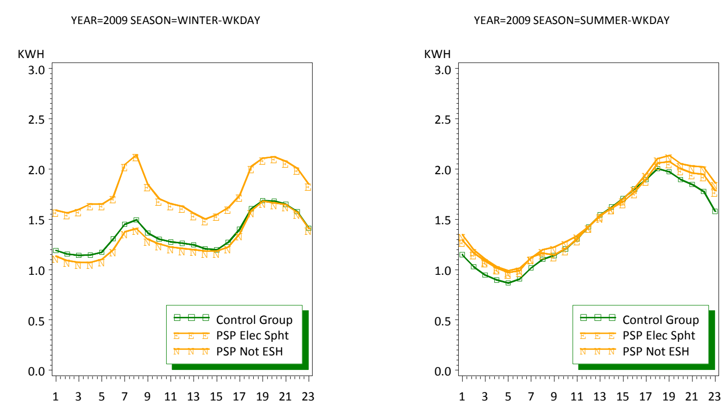
1-2 Person Households vs. 3+ Persons - Winter and Summer



Homes with three or more persons contribute significantly to the evening peak in Winter and Summer.

57% of PSP participants are in 1-2 person households.

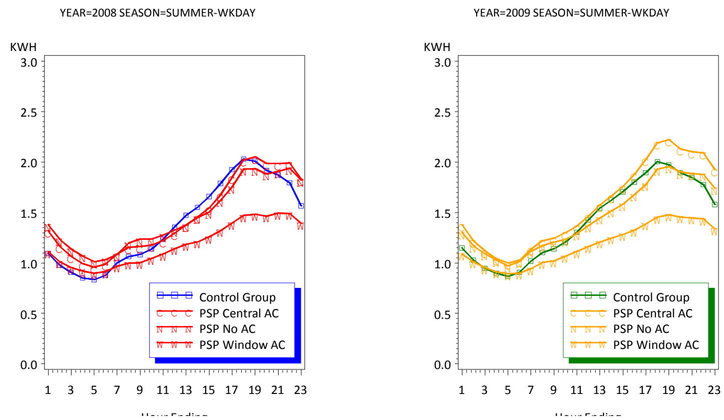
Electric Primary Space Heat Fuel vs. Other Fuels - Winter and Summer



Electric space heat participants use more in winter but the same during summer. Hard to tell if there is price response.

7% of PSP Participants report primary electric space heat use. (591/8706)

Type of Air Conditioning – Summer 2008 and Summer 2009 (Low Price Days)



Central AC are creating the evening peak and were used more extensively in 2009 than in 2008 on low price days.

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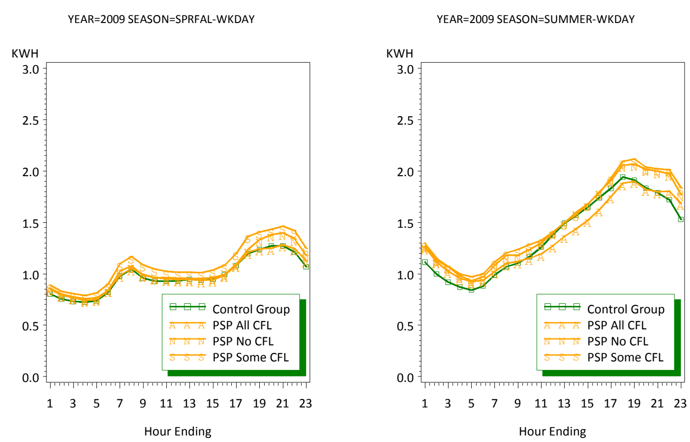
These are comparable because High Price Days are not included in 2008.
Is this increased use due to low rates?
Or is this just a reflection of the higher use, 3+ person homes?
74% have Central AC

Use of CFLs in Home – Spring/Fall and Summer of 2009



PSP Participants reporting CFL use in all fixtures do show lower evening use in Spring/Fall, and lower Summer use.

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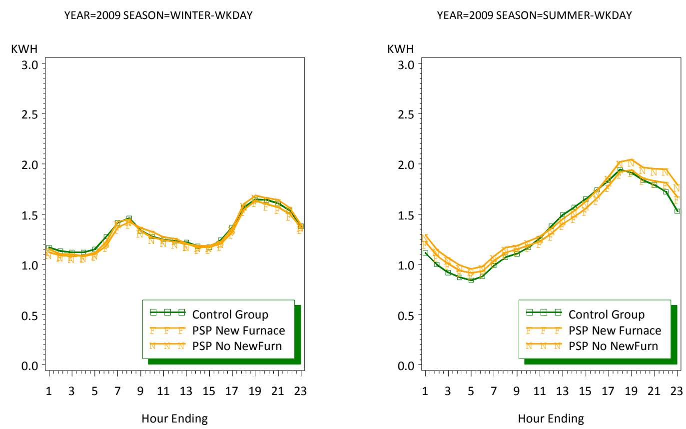
Is having all CFLs a sign of a conservation ethic related to less AC use?
46% of survey respondents report they use all CFLs in their homes.

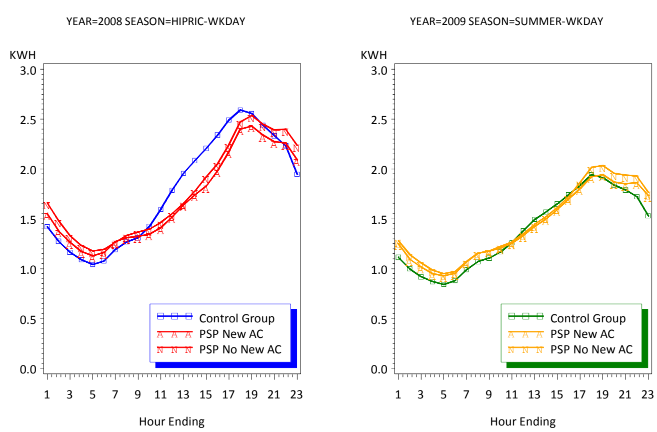
Recently Installed New Furnace – Winter and Summer 2009



PSP Participants with new furnaces do show slightly lower electric use in Winter and Summer. EE furnace fans?

Not a lot of impact, but nice to see some impact in the correct places.
Installation of a new Central AC could be correlated with installation of a new furnace.
25% of survey respondents reported that they installed a new furnace in the last five years.

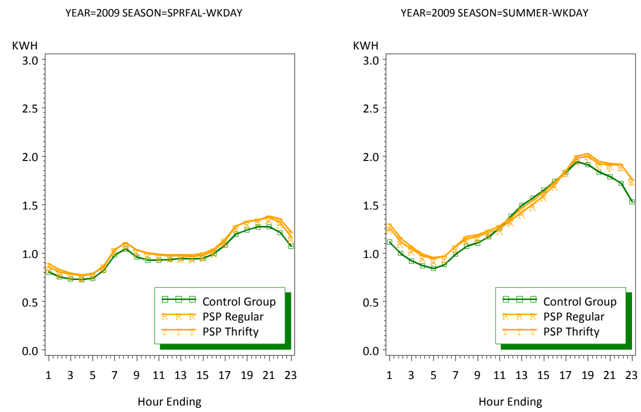
Recently Installed New Central AC – High Price Days 2008 and Summer 2009



PSP Participants with New Central AC use less on very hot days (2008) and regular summer days (2009)

As Central AC stock turns over, we would expect to see decreased summer peaks.
However, PSP price response potential may stay relative.
20% of survey respondents reported that they installed a new air conditioner in the last five years.

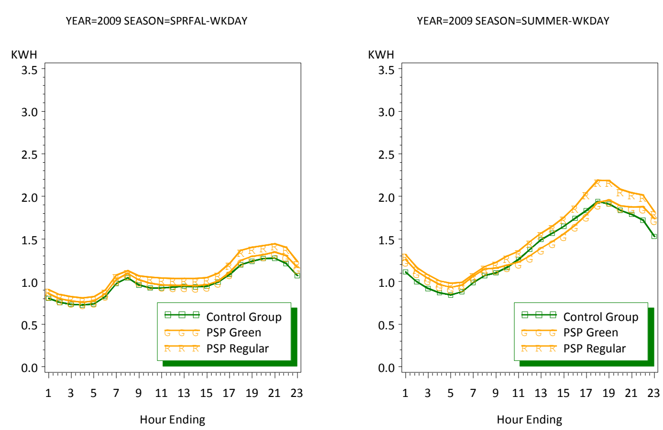
Score themselves High on 'Thrifty' – Spring/Fall and Summer 2009



Apparently, all PSP participants are equally thrifty!

Both groups respond the same to price signals.
61% of survey respondents gave themselves the highest score on the 'thrifty' scale.
"I always shop for the lowest prices, even if it takes more time and effort."

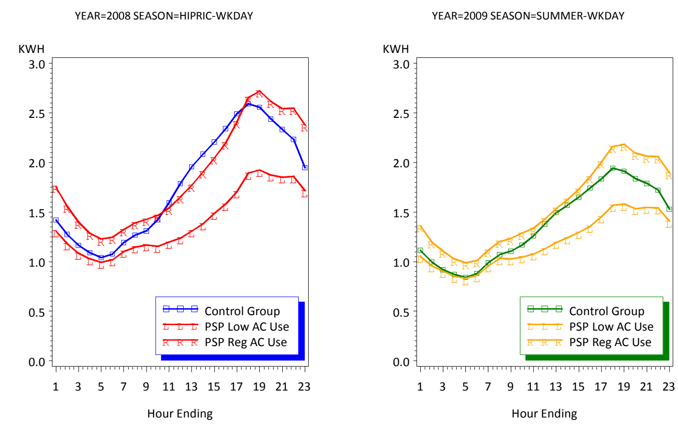
Score themselves High on 'Green' – Spring/Fall and Summer 2009



'Green' participants use less energy, contribute less to summer peak and move more load off-peak.

73% of survey respondents gave themselves the highest score on the 'green' scale.
"Everyone should make a real effort to conserve energy even if they don't have to worry about the cost."

Say they regularly limit their AC use – High Price Days 2008 and Summer 2009



They're not kidding! Structural benefiters.

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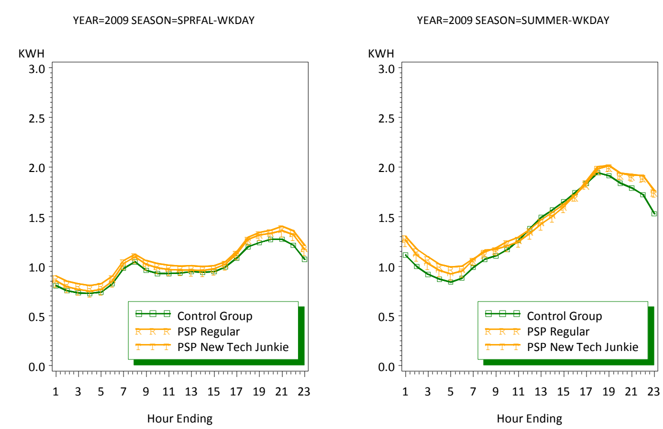
28% of survey respondents gave themselves the highest score on this question:
"I try not to use air conditioning often"

New Tech Junkies – Spring/Fall and Summer 2009



No obvious advantage over non-techies.

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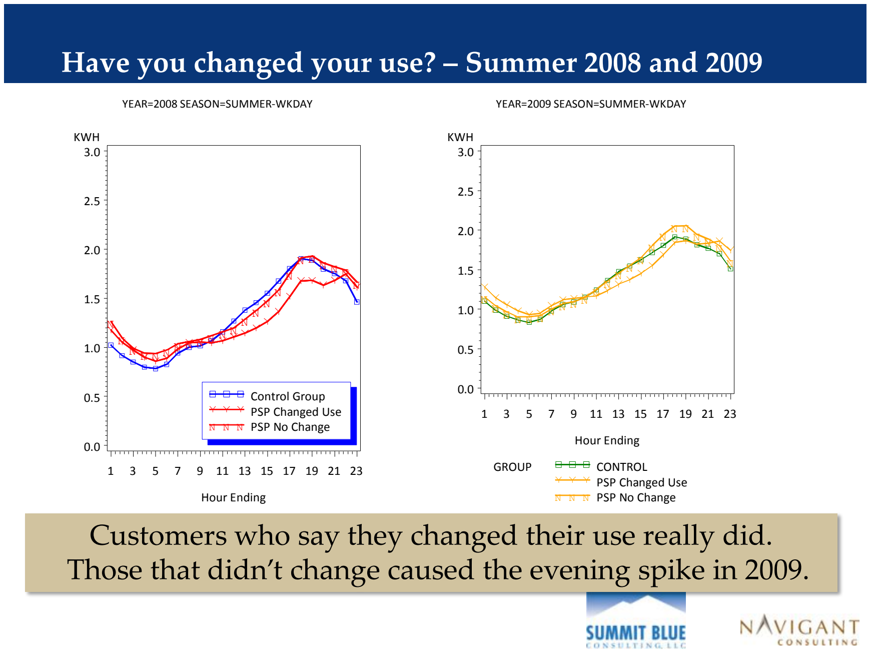
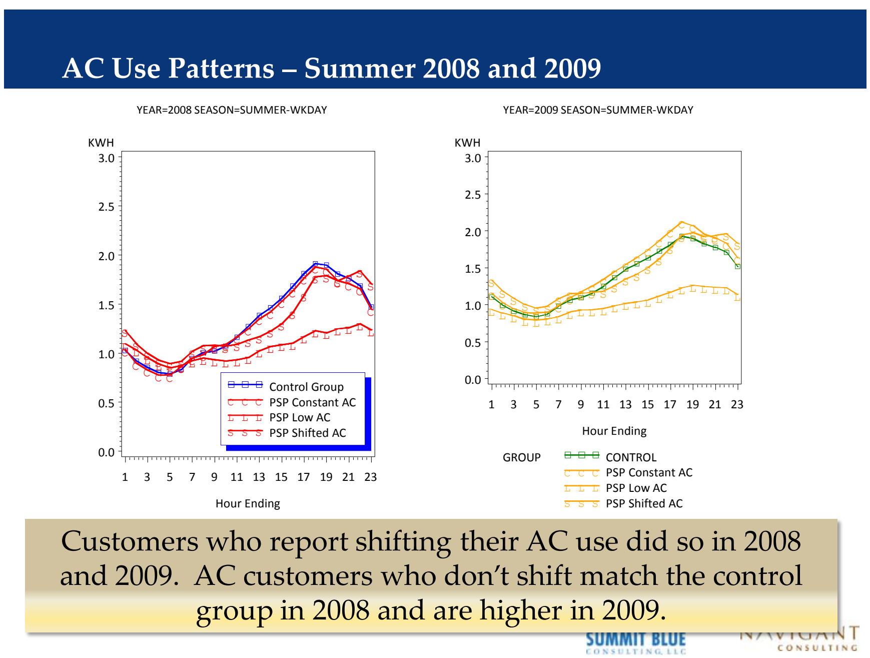
68% of survey respondents gave themselves the highest score on this question:
"I am usually eager to try new products with new technologies."

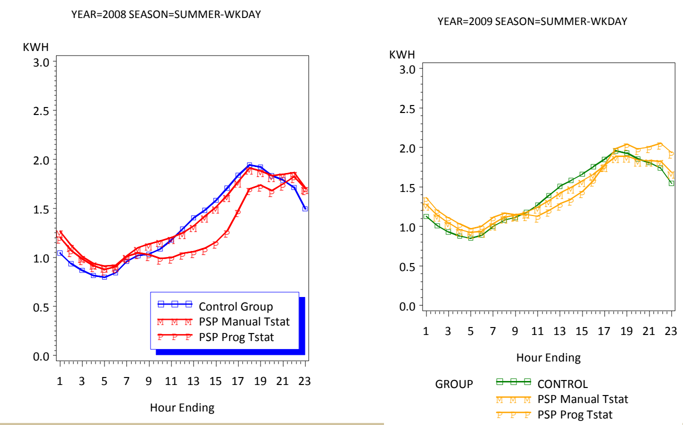


74% of respondents to the Fall 2009 participant survey said that they changed their electric usage in 2009 compared to how they used energy in 2008.



16% of respondents reported that they kept their AC set at a constant temperature all summer.
10% reported that they lowered their use of AC.
74% reported that they shifted their use of AC.

AC Use Shifting by Type – Summer 2008 and 2009



Among customers who report shifting their AC load, those with programmable thermostats accomplish more.

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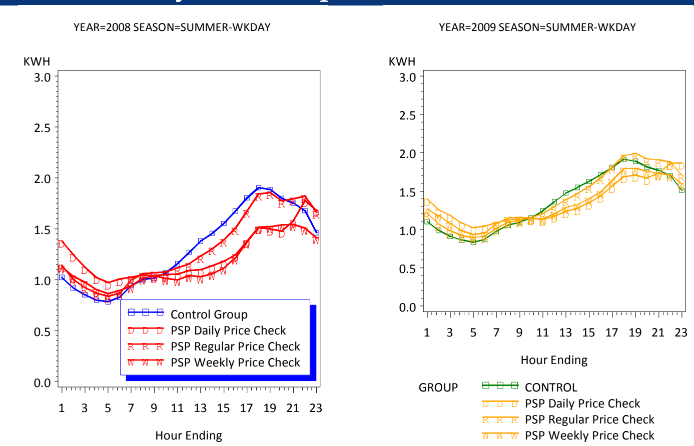
Of customers who reported that they shifted their use of AC, 47% did it with manual adjustments to their thermostat and 53% used their programmable thermostat features.

How often do you check prices? – Summer 2008 and 2009



Customers who report checking prices daily are big shifters.

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21% of respondents reported checking prices daily and 17% checked prices weekly. Others are considered 'regular' price checkers.

Appendix E » Detailed Net Benefit Calculations

Calendar Year	**2008**	**2009**
Incremental Year	1	2
Non-Participant Reduction in MISO Price Over 50 Peak Hours		
Estimated from Market Effects model (see Table 19)	$978,664	$758,700
Utility/Participant avoided capacity costs		
Number of Participants	3,000	7,000
kW per hour reduction during top 50 hours	0.25	0.15
Total MW per hour reduction during top 50 hours	0.750	1.050
Capacity Cost ($/kW-Summer)	$14.57	$8.49
Total value of avoided capacity costs	$10,928	$8,915
Utility/Participant avoided energy costs		
Number of Participants	3,000	7,000
Reported average annualized bill savings per customer	$92.65	$304.98
Add back PSP Participation Charge per customer ($2.25 per month)	$27.00	$27.00
Add average annual bill savings from conservation (@10 cents per kWh)	$18.60	$15.10
Total average annualized bill savings per customer	$138.25	$347.08
Total value of avoided energy costs (new participants get half of annualized savings)	$207,375	$1,735,400
Program Implementation Costs - CNT		
Total Expenses in Annual Report	$420,458	$491,619
Program Implementation Costs - Ameren		
Ameren all-in PSP program costs reported to the ICC	$695,876	$925,308
Take out payments to CNT	$420,458	$491,619
Take out payments to Summit Blue/Navigant Consulting	$64,000	$82,000
Net Program Implementation Costs - Ameren	$211,418	$351,689
Evaluation Costs		
Summit Blue/Navigant Contract	$64,000	$82,000