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IURC 30-DAY FILING NO.: 2693
Indiana Utility Regulatory Commission

May 18, 2010 via Electronic Filing

Secretary of the Commission
Indiana Utility Regulatory Commission
National City Center
101 West Washington Street, Suite 1500 East
Indianapolis, Indiana 46204

Re: Experimental Residential Time of Use Tariff (Rate RTX),

Dear Secretary:

Pursuant to 170 IAC 1-6 ("Rule 6"), the Thirty-Day Administrative Filing Procedures and Guidelines Rule, Indianapolis Power & Light Company (IPL) submits herewith for filing an Experimental Time of Use (TOU) tariffed rate, which is a "New rate" as defined in 170 IAC 1-6-2(6).

As discussed in Cause No. 43623, IPL has completed a Time of Use rate study which was used to draft the attached proposed TOU tariff for use exclusively in the Home Area Network (HAN) test planned for up to 160 voluntary, residential customer participants this summer (July 1 – September 30, 2010). IPL has engaged the Indiana Office of Utility Consumer Counselor (OUCC) in the rate study and experimental rate design process and believes this filing is "noncontroversial," as that term is used in Rule 6. IPL requests approval of these tariffs under the 30-day filing procedure.

This residential TOU rate is necessary for the HAN test and provides the ability for IPL to assess customer responses to time varying rates and timely access to energy consumption information.. IPL respectfully requests approval of this tariff in an expedited time frame to activate it for the period of July 1 through September 30, 2010.

The Experimental Tariff was designed to be "revenue neutral", meaning that if all customers selected the experimental tariff and did not change their electrical usage behavior, they would collectively essentially pay the same total charges as they would under existing tariff rates.

Following the completion of the HAN test, IPL will perform process and impact evaluations with qualitative and quantitative results including participation levels, and kW and kWh savings using a control group methodology from accounts currently metered for load research purposes. These evaluations will be shared with the OUCC and IURC.

This filing also includes supporting documentation. The following documents are attached:

Exhibit A - IPL's proposed Experimental Residential Tariff (Rate RTX), Original Sheet Nos. 13 and 14

Exhibit B – Time of Use Study performed by Christensen Associates Energy Consulting, LLC

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Exhibit C - Revenue and cost projection summary

In addition, this filing contains a Verified Statement by IPL concerning notification of customers regarding the proposed TOU rate and a copy of such notification.

IPL appreciates your assistance in processing this request through the Commission's 30-day filing procedures.

IPL's contact person for this filing is:
Ken Flora
(317) 261-6713
Ken.flora@aes.com

Please contact me with any questions regarding this matter.

Sincerely,

Ken Flora

Ken Flora
Director of Regulatory Affairs

Attachments

cc: Office of the Utility Consumer Counselor

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RATE RTX
EXPERIMENTAL TIME OF USE SERVICE

AVAILABILITY:
The Experimental Time of Use rate is available exclusively for general service residential purposes to individual, owner-occupied dwellings. This rate is not available, however, to residential customers with electric water heating or electric space heating. This rate is also not available to clubs, fraternities, boarding or rooming houses or motels. Availability is restricted to the first 160 eligible customers selected by the Company for service under this tariff. Customers must have broadband internet and must agree to install and maintain any necessary equipment.

The following will not be served under this rate: (1) Single phase motors having an individual capacity in excess of five horsepower, except where Company's system conditions permit, and upon approval of the Company; and (2) welding equipment and other apparatus that in the opinion of the Company may cause objectionable voltage fluctuations.

This rate is available for residential service only. Water heating service may be separately metered and separately billed in accordance with the Company's applicable rate schedule. When electric energy is used on the same premises for other than residential purposes, such energy shall be separately metered and billed in accordance with the Company's approved rate schedule applicable thereto, except as provided for in Rule 29.3.

CHARACTER OF SERVICE:
Standard Characteristics: Three wire, single phase, sixty cycle alternating current ordinarily supplied at 120/240 volts.

The Company may, however, furnish three phase, four wire service, 120/240 volts or 120/208 volts, if in its judgment, which shall be final, it would be more advantageous to both the Customer and the Company due to engineering, safety or other practical reasons. Residential service at 120/208 volts single phase will be available in those multi-family projects or geographic locations where this is the standard voltage established. Where line extensions are required, such extensions will be provided under the Company's standard conditions for line extension.

RATE:
The sum of the Customer Charge and Energy Charge shown hereafter plus the Demand Side Management Adjustment, the Fuel Cost Adjustment, the Air Conditioning Load Management Adjustment, the Environment Compliance Cost Recovery Adjustment and the Core and Core Plus Demand-Side Management Adjustment calculated in accordance with Rider No. 3, Rider No. 6, Rider No. 13, Rider No. 20 and Rider No. 22, respectively.

Customer Charge	
For bills of 0-325 KWH per month	$ 6.70 per month
For bills over 325 KWH per month	$11.00 per month
Energy Charge	
For all Peak kWh	8.794¢ per kWh
For all Mid-Peak kWh	6.119¢ per kWh
For all Off-Peak kWh	2.948¢ per kWh

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RATE RTX (Continued)

Hours

	Peak	**Mid-Peak**	**Off-Peak**
Weekdays (Monday through Friday)	2 p.m. to 7 p.m.	10 a.m. to 2 p.m. 7 p.m. to 10 p.m.	Midnight to 10 a.m. 10 p.m. to Midnight
Weekends & Observed Holidays**		10 a.m. to 10 p.m.	Midnight to 10 a.m. 10 p.m. to Midnight
**July 5 and September 6 2010			

MINIMUM CHARGE PER MONTH:
The Customer Charge which is payable for each month that service is connected for the Customer's use.

STANDARD CONTRACT RIDERS APPLICABLE:

No. 1	see Page 150
No. 3	see Page 153
No. 6	see Page 157
No. 7	see Page 159
No. 9	see Page 161
No. 13	see Page 165
No. 20	see Page 179.2
No. 21	see Page 179.3
No. 22	see Page 179.5

PAYMENT:
The above rates and charges are net. If the net bill is not paid within seventeen (17) days after its date of issue, a collection charge will be added in the amount of ten percent (10%) of the first Three Dollars ($3.00) plus three percent (3%) of the excess of Three Dollars ($3.00).

MOTOR SPECIFICATIONS:
All electric motors used by the Customer shall conform to the Company's Standard Motor Specifications relating to rated voltage, starting current, power factor, etc.

TERM:
The term for the Experimental Time of Use rate is July 1, 2010 through September 30, 2010. However, all service is subject to the term of any contract for a line extension to the premises to be served. All Time of Use customers will revert to Rate RS at the conclusion of the three-month trial period.

RULES:
Service hereunder shall be subject to the Company's Rules and Regulations for Electric Service, and to the Rules and Standards of Service for the Electrical Public Utilities of Indiana prescribed by the Indiana Utility Regulatory Commission, as the same are now in effect, and as they may be changed from time to time hereafter.

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Assessment of Time-Based Pricing at Indianapolis Power and Light

Steven Braithwait and Dan Hansen
Christensen Associates Energy Consulting, LLC
800 University Bay Drive, Suite 400
Madison, WI 53705

Voice 608.231.2266 Fax 608.231.3273

May 17, 2010

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Assessment of Time-of-Use and Peak-Day Pricing at Indianapolis Power and Light

Steven Braithwait and Dan Hansen
Christensen Associates Energy Consulting
May 17, 2010

1. INTRODUCTION

This report describes an assessment of time-based pricing products that Indianapolis Power and Light (IPL) is considering offering to a sample of residential consumers in a pilot study, and subsequently as an optional future rate for all residential consumers. This assessment comes at a time in which numerous utilities are considering the potential value of installing automated, advanced, or smart metering equipment, and offering time-based pricing to its customers to encourage demand response. IPL already has installed automated metering equipment that has the capability to record and retrieve monthly energy usage for billing purposes. The meters are typically polled each night to upload usage data for the previous day. However, some additional infrastructure would be needed to obtain data on an hourly or time-of-use basis.

IPL plans to offer a residential summer time-of-use (TOU) rate as part of its initial study. It is also interested in a generic year-round "Smart Grid" TOU appliance rate for usage that would be separately metered.[1] Among the issues that IPL is interested in examining are the nature of the TOU prices that would be consistent with expected wholesale market costs and IPL's current residential rate, the amount of load response that might be expected from TOU customers, the range of bill impacts across various customer types, the cost savings that IPL might experience, and the benefits that consumers might achieve.

This report is organized as follows. Section 2 provides background by summarizing the data used in the assessment, including IPL's system and residential customer loads, and wholesale energy prices. Section 3 describes our assessment of TOU pricing. Section 4 describes our assessment of customer demand response to the TOU rate. Section 5 describes the Smart Grid TOU appliance rate. Section 5 offers conclusions and recommendations.

2. LOAD AND ENERGY COST DATA

This section summarizes key features of the load and energy cost data used in the assessment. A determination was made to use data for 2008 to establish *hourly patterns* in customer loads and market costs, as 2008 had more typical weather than 2009, and is the most recent year that was not strongly affected by the recent economic slowdown. The hourly patterns of market costs were then scaled to reflect expected future levels

[1] IPL is also interested in critical-peak pricing (CPP), which is also sometimes referred to as peak-day pricing (PDP), and the mirror image peak-day rebate (PDR) option. Analysis of those rate and program types is not included in this initial report due to timing constraints, but will be included in a follow-on supplemental study.

based on available forward contract prices. Designing TOU rates typically focuses first on examining differences in system loads and wholesale market costs by time period, to determine appropriate definitions of peak and off-peak prices. This section illustrates those differences.

2.1 IPL System Load

IPL's system load duration curve for June through September, 2008 is shown in Figure 2.1. The following points summarize some of its key features:

- Across the 130 hours of highest system load, the loads are within 9.7% (275 MW) of the system maximum demand of 2,844 MW.
- Ranked by *daily* maximum demands, the top 15 days have maximum demands that are within 5.7% (162 MW) of the system peak.

Figure 2.1: IPL Summer Load Duration Curve – 2008

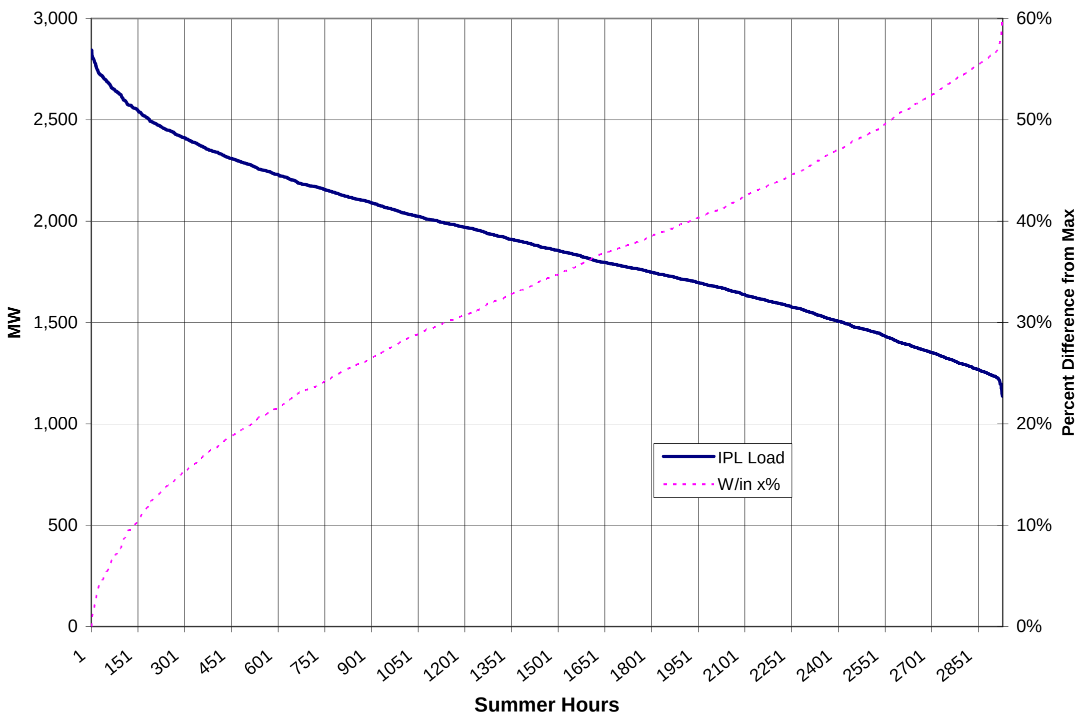

Figure 2.2 shows the average system load profile across the 15 weekdays of highest maximum demand, as well as for the average weekday. The top load profile peaks in hour-ending (HE) 15, and both profiles generally have the highest loads in HE 13 through HE 18.

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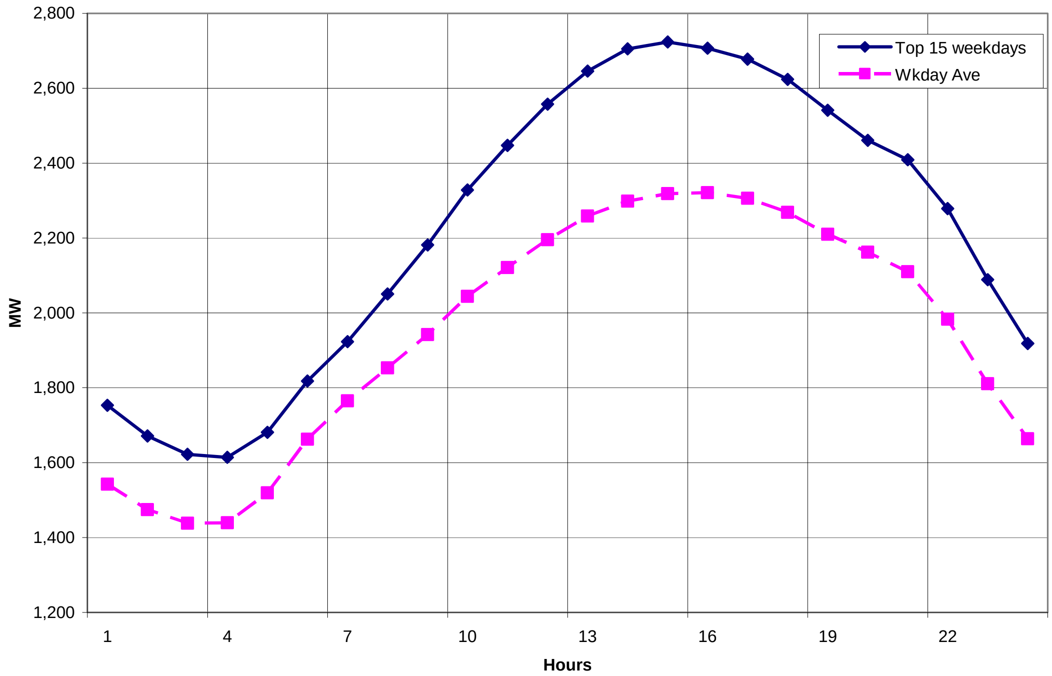
Figure 2.2: IPL System Load Profile – Weekday Average and Average of 15 Weekdays with Highest Maximum Demand



2.2 Residential (RS) Class Loads

Average load profiles for the portion of the residential RS class that does not have electric space or water heat are shown in Figure 2.3 for summer weekdays and weekends. These loads have a later peak (HE 19) than the system load.

Figure 2.3: Residential RS Class Loads – Average Summer Weekday and Weekend

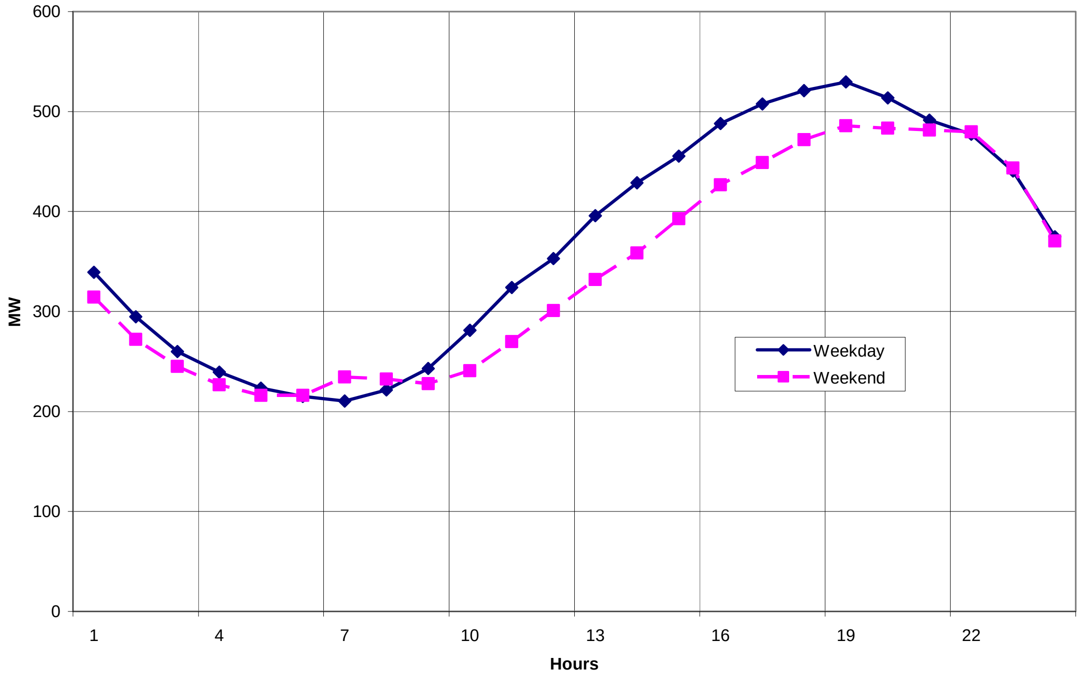
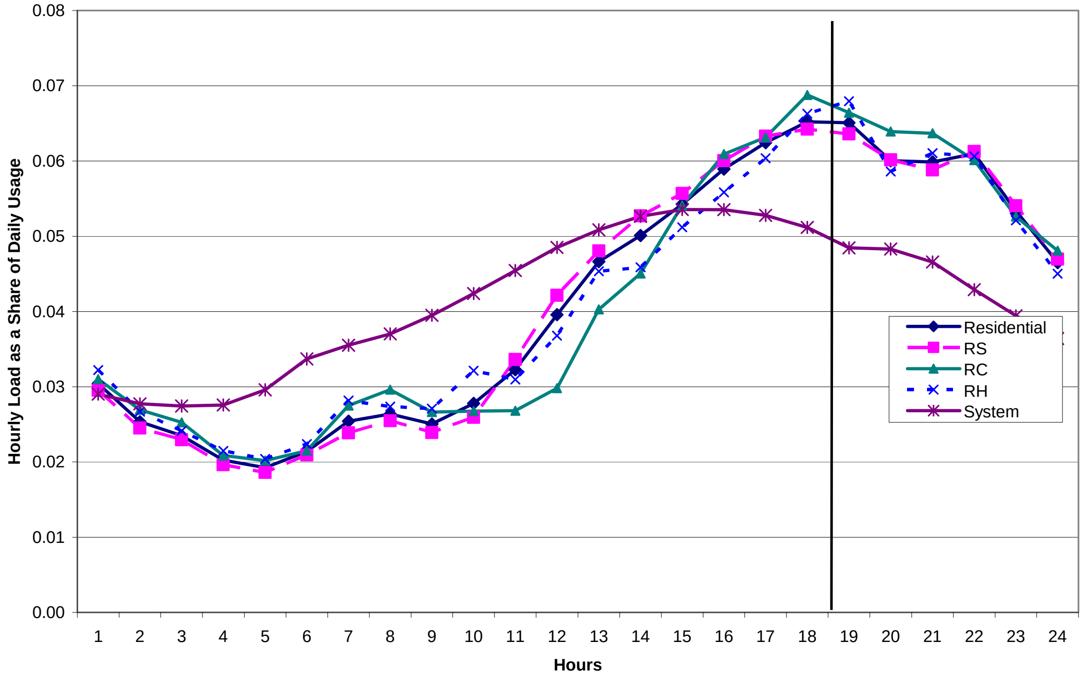


Figure 2.4 compares the normalized class load profiles (*e.g.*, hourly load as a fraction of total daily usage) for the residential RS, RC and RH groups to the normalized *system* load profile on the day of system maximum demand.[2] The normalization was done by calculating each hour's fraction of the day's total usage for each customer group. Interestingly, the three categories of residential customers have very similar normalized load profiles. Furthermore, the residential peak loads occur later and are more "peaky" than is the system load.

[2] In this application, RC denotes residential customers with electric water heating, RH denotes residential customers with electric space heating and possibly electric water heating, and RS denotes residential customers with no electric space or water heating. Technically, according to the RS residential tariff, all residential customers are included in the RS rate. However, customers with electric water heating and/or space heating are eligible for a lower third-tier rate on monthly usage beyond 1,000 kWh. IPL refers to these residential sub-classes as RC and RH. The summer TOU rate was designed for RS customers only, excluding the RC and RH sub-classes.

Figure 2.4: Normalized Residential Class Loads and System Load – Annual System Peak Day



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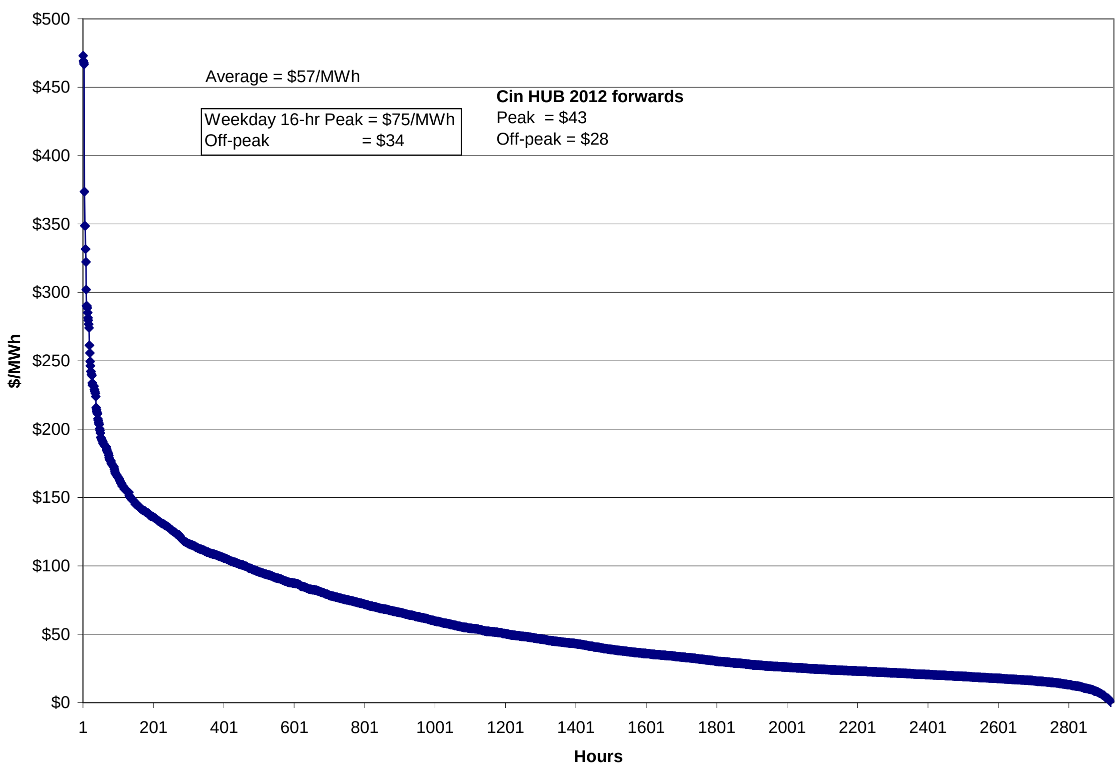
2.3 Midwest ISO Locational Marginal Prices

A key factor in assessing the value of time-based pricing at IPL is the nature of the short-term cost of energy at which IPL must purchase power on days of high loads, or may sell power if capacity is available. IPL provided historical data on Midwest ISO real-time and day-ahead wholesale locational marginal prices (LMPs) at the CIN hub. Figure 2.5 shows the distribution of hourly real-time LMPs for June through September 2008. The average LMP across all hours was $57/MWh. Average values for 16-hour peak and 8-hour off-peak periods were $75/MWh and $34/MWh respectively. These compare to forward prices for 2012 of $43/MWh and $28/MWh for on-peak and off-peak energy at the CIN hub, as described below.

Figure 2.5: Distribution of Midwest ISO Real-Time LMPs – June to September 2008



Calculating average hourly values of LMP across summer weekdays and weekend/holidays produces the daily profiles in Figure 2.6, which shows hourly averages and standard deviations in high/low format (weekday hourly standard deviations are shown as solid vertical line segments, while weekend values are shown by the dashed lines). The afternoon hours show relatively high variability around the overall averages.

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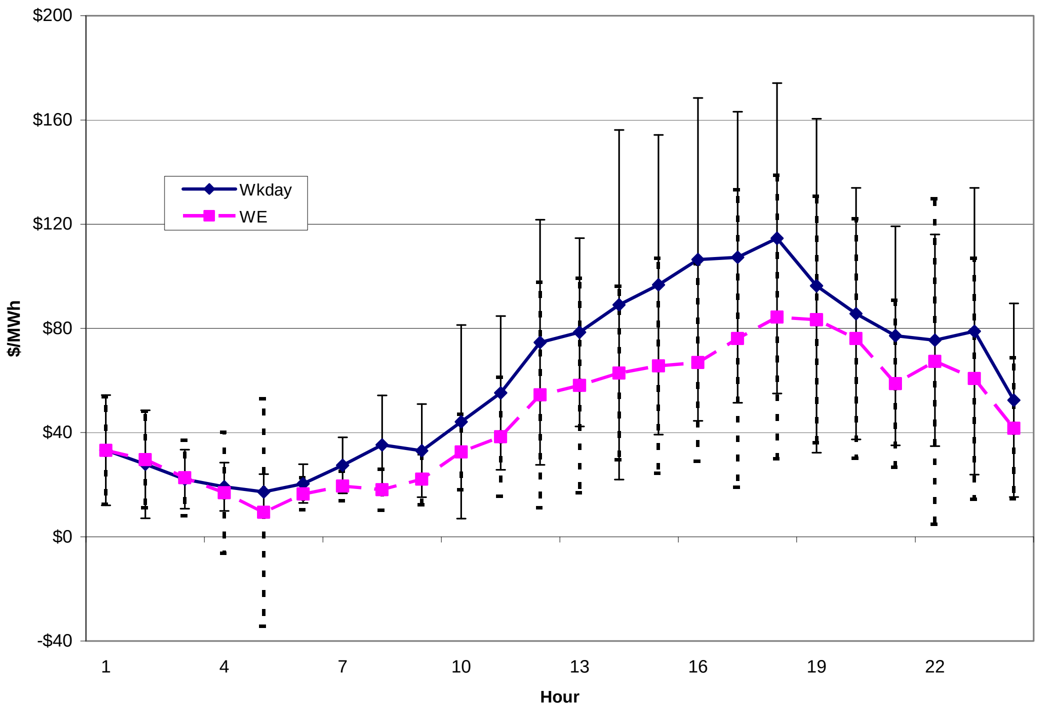
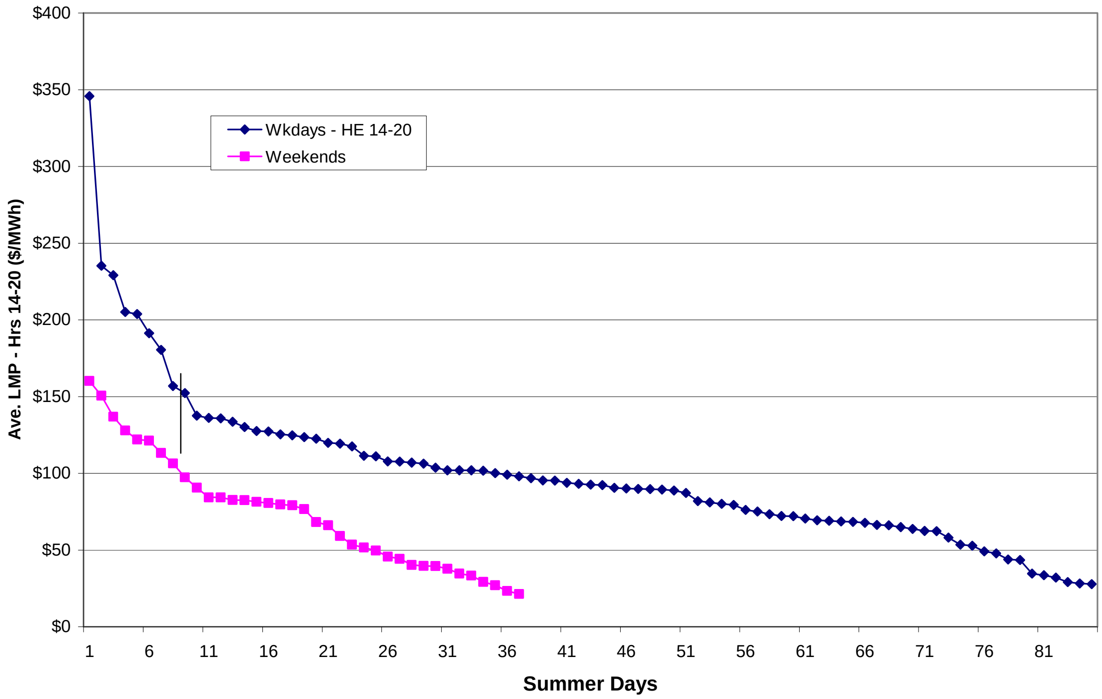
Figure 2.6: Average Hourly LMP – Summer Weekdays and Weekends (2008)



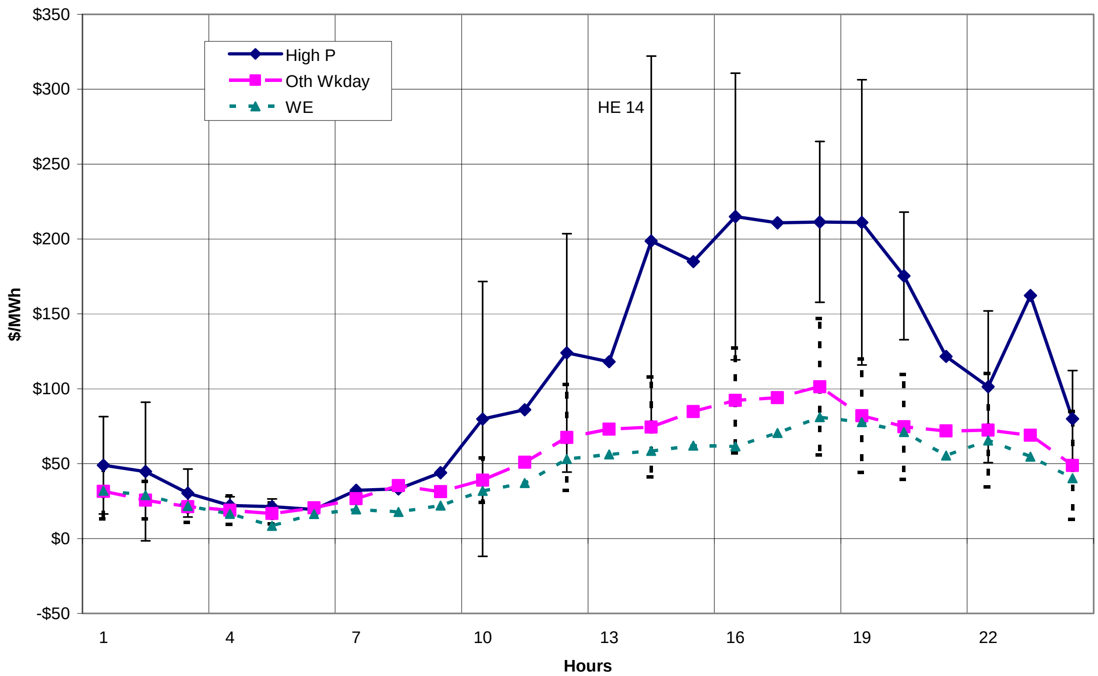
The hours of highest average prices are generally HE 14 – 20. Calculating the average LMP across those hours and sorting days by those values suggests that an average value of $150/MWh forms a natural break point in the distribution, in which 9 weekdays and 2 weekend days have values above that level (see Figure 2.7).

Figure 2.7: Distribution of Average Summer Daily Afternoon LMPs – *Weekdays and Weekends*



Calculating hourly averages across those eleven high-price days and the remaining weekday and weekend/holiday days produces the graph in Figure 2.8. The solid vertical lines show standard deviations of the hourly prices on high-price days, while the dashed lines show standard deviations for the prices on other weekdays.

Figure 2.8: Summer Average Hourly LMP – High-Price Days and Other Weekdays and Weekends



The peak-period prices on the high-price days are more than twice those on the remaining weekdays, and much of the variability ranges around the averages on the high-price days. Average LMPs in potential peak, shoulder and off-peak periods on the different day types are shown in Table 2.1

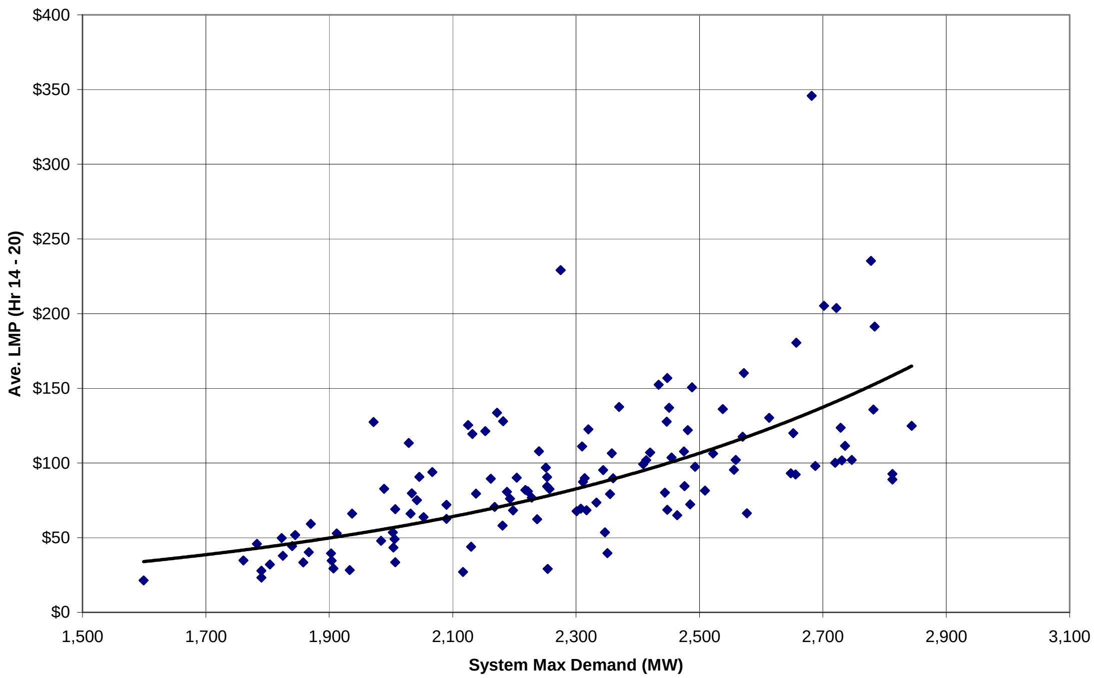
Table 2.1: Average Midwest ISO Locational Marginal Prices by Time Period and Day Type

Hours	High-Price Days (11 days)	Other Weekdays (76 days)	Other Weekend/ Holiday (35 days)
1-10, 24	$41.4	$28.7	$23.2
11-13, 20-23	$126.9	$68.5	$56.2
14-19	$205.3	$88.1	$68.5

Relationship between IPL system demand and LMP

There is a clear relationship between the level of the daily maximum IPL system load and the daily afternoon average LMP, as shown in Figure 2.9. However, the relationship is not extremely tight, as indicated by an R^2 value of approximately 0.5 for the exponential curve fit through the observations, as shown in the figure. The variability in this relationship is reflected in the fact that of the 15 days of highest load, only 5 had average LMPs among the 11 days in which afternoon LMP exceeded $150/MWh.

Figure 2.9: Relationship between the IPL System Load and LMP



Future wholesale prices

CIN Hub on-peak (16-hours) and off-peak forward prices for 2012 are $43.3/MWh and $27.7/MWh respectively. In contrast, the average 2008 LMPs for the weekday 16-hour peak periods and 8-hour off-peak periods were $75/MWh and $34/MWh as noted above.

3. TOU RATE DESIGN

3.1 Background

Various aspects of TOU pricing have been tested and analyzed over the past three decades. Several residential TOU pilot programs were run in various states early in that period, and numerous PDP and PDR pilots have been conducted and analyzed in recent years. Our understanding is that few permanent voluntary residential TOU rates have achieved any significant market acceptance, with the exceptions of Salt River Project and Arizona Public Service in Arizona, which heavily promote their TOU rates.[3]

Time-based pricing can reduce the frequent differences between the *varying hourly cost* of generating and delivering electricity, and the *fixed price* that most consumers pay (or, in the case of IPL's residential customers, the relevant declining block rate). TOU rates generally vary by season and time of day, but are fixed for a relatively long period of time.[4] TOU prices are held constant within each TOU period. For example, a *summer*

[3] See, for example, Arizona Public Service Company Residential Time-of-Use Rates ET-2, ECT-2 Compliance Report, Decision No. 68645 Docket No. E-0135A-05-0674; Initial Filing, Docket No. E-0135A-07-0448, January 2008.
[4] In PDP, at least some prices may be changed at reasonably short notice (*e.g.*, a day ahead or an hour ahead of when they go into effect).

on-peak price typically applies to specified summer weekday afternoon hours that tend to correspond to the hours of highest expected wholesale market prices; and the same price applies to all of these hours throughout the summer. A typical TOU rate structure might have on-peak, off-peak, as well as shoulder periods, where the latter reflect hours of intermediate cost. Because TOU rates are announced months in advance, they induce customers to respond to forecast power system conditions, not to actual power system conditions.

3.2 TOU Rate Design

We designed TOU rates for the RS customer class (residential customers without electric space or water heating) for the summer months (June through September). The TOU rate structure differentiates the price by time period, but removes the declining block structure contained in the RS rate. Three steps were involved in developing the TOU rates.

1. Develop hourly profiles of marginal energy costs and RS loads;
2. Determine the TOU pricing periods; and
3. Scale the energy prices to obtain revenue neutrality for the average RS customer.

Each of these steps is described in detail below.

3.2.1 Develop Hourly Profiles of Marginal Energy Costs and RS Loads

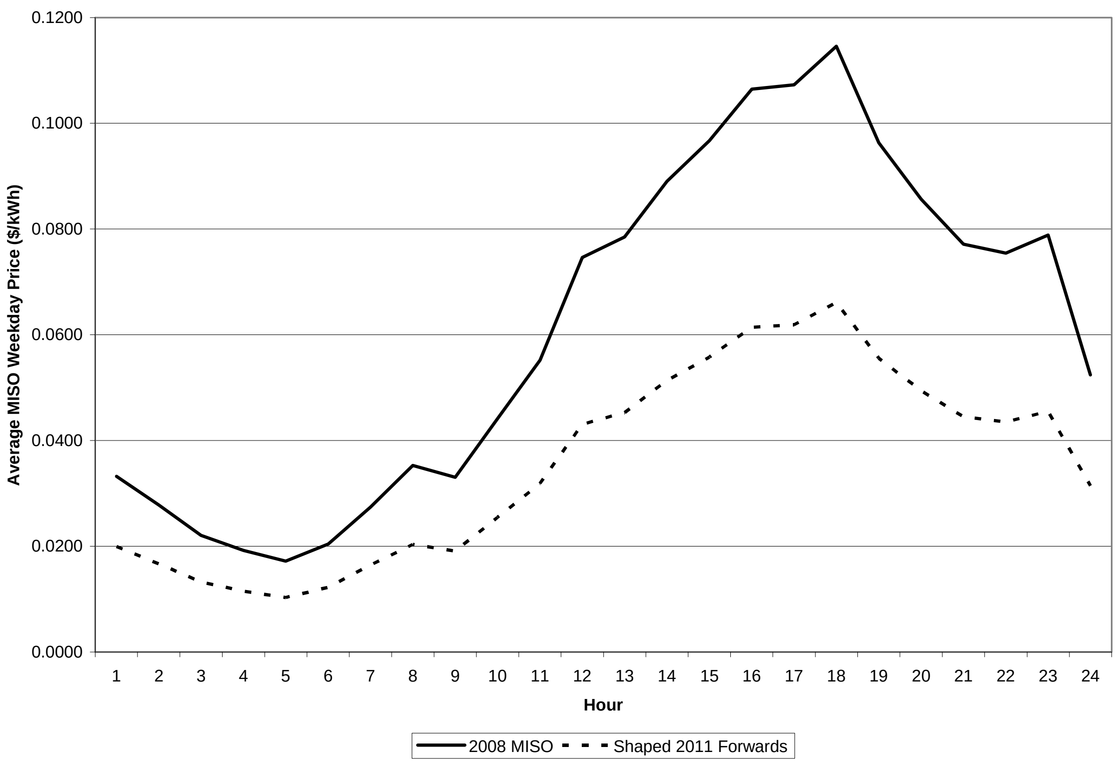
In order to conduct the steps listed above for developing TOU rates, we needed certain data for determining appropriate season and TOU time period definitions, and calculating appropriate TOU prices that represent the relative cost to serve customers in the TOU time periods. Two fundamental types of data were needed. These were information on IPL's expected hourly marginal energy costs, and information on the load profiles of the relevant IPL residential customer class. That is, the concept of TOU pricing is to set retail prices that reflect differences by time period in utilities' marginal cost of serving a class of customers.

Data on wholesale energy market prices for an appropriate market, such as those now published by Midwest ISO, provide the most transparent source of information on utilities' marginal costs. In conducting the initial step of calculating load-weighted marginal costs by TOU period to serve various groups of customers, it is useful to employ historical market price and load data for the same time period. This is the case because that process embeds the effects of any common drivers of customer loads and wholesale prices (primarily weather) in those calculations. IPL provided such data for 2008. Hourly data on customer usage patterns were represented by IPL RS class load research data. Data on hourly Midwest ISO wholesale energy costs were provided by IPL's power trading operations, reflecting prices at which IPL could purchase additional power or sell available power during that period. Characteristics of these data were described in Section 2.

For purposes of setting forward-looking TOU rates for a relevant future period, we needed data on *expected* wholesale market prices. For this purpose, IPL provided forecasts of Cinergy hub peak and off-peak forward prices for 2010 - 2014. We used data for 2011[5] to scale the historical market prices to levels expected in this future period, as described below.

We used the historical hourly Midwest ISO prices to "shape" the 2011 forward prices. Specifically, we calculated the average hourly Midwest ISO prices for the average non-holiday weekday, and for weekends/holidays. These profiles were scaled to match the 2011 forward prices for the appropriate hours. Figure 3.1 shows the resulting weekday marginal cost profiles. The solid line represents the average historical Midwest ISO prices for non-holiday weekdays. The dashed line represents the shaped forward prices. Notice that the forward prices are significantly lower than the historical Midwest ISO prices.

Figure 3.1: Average Weekday Midwest ISO Wholesale Prices, Historical and Shaped Forwards



3.2.2 Determining the TOU Time Periods

IPL wished to develop a TOU rate for the summer season, consisting of calendar months June through September. We examined summer TOU definitions that included peak, off-peak, and shoulder (or “partial peak”) periods, where the latter reflected periods of intermediate levels of wholesale prices, including the possibility of including mid-day weekend hours.

[5] The wholesale prices used were $45 per MWh for the 5x16 peak hours and $25 per MWh for the off-peak hours.

For a given set of TOU definitions, we calculated the load-weighted average marginal cost for each TOU time period. The load weights were the average hourly non-holiday weekday and weekend/holiday RS loads from 2008. The marginal costs were the shaped Midwest ISO forward prices described in Section 3.1.1. We then calculated the peak to off-peak and shoulder to off-peak price ratios that resulted.

The TOU pricing periods were set to maximize the peak to off-peak and shoulder to off-peak price ratios, subject to providing customers with a reasonable opportunity to shift load (*i.e.*, providing a sufficient number of off-peak hours). For example, IPL believed that customers would prefer to have the off-peak period begin at 10:00 p.m. rather than midnight, even though extending the shoulder period to midnight results in a higher shoulder to off-peak price ratio and a lower off-peak price. Table 3.1 shows the reduction in the price ratios as this change is made to the shoulder period definition.

Table 3.1: TOU Price Ratios for Alternative Pricing Period Definitions

Pricing Period	Shoulder Ends at 10:00 p.m.	Shoulder Ends at Midnight
Peak to off-peak	2.98 : 1	3.94 : 1
Shoulder to off-peak	2.08 : 1	2.67 : 1

Based on the evaluation criteria, the most appropriate summer TOU definition had a relatively short five-hour peak period occurring late in the afternoon (hours ending 15 to 19) on weekdays only, shoulder periods on either side of the peak period (hours ending 11 to 14 and 20 to 22 on weekdays), as well as a shoulder period from HE 11 to 22 on weekends, and off-peak periods in all other hours.

3.2.3 Scaling the Energy Prices to Obtain Revenue Neutrality

Retail TOU energy prices should reflect expected load-weighted average wholesale energy costs to serve the relevant customer loads in the various TOU periods. However, in setting retail rates, a regulated utility must also recover costs other than energy costs (*e.g.*, costs associated with transmission and distribution services), such that they recover all allowed revenues. As a result, TOU prices must diverge from the load-weighted average wholesale energy costs in some way. To achieve this constraint, we established TOU price *ratios* (shown in the first column of Table 3.1) based on the expected wholesale energy prices, and then adjusted the price *levels* to achieve revenue recovery, given the baseline load profiles for the relevant customer class.

Revenues were calculated using the current RS tariff rates of 6.70 cents per kWh for the first 500 kWh per month and 4.40 cents per kWh for all usage over 500 kWh; plus the monthly customer charges of $6.70 per month for customers using zero to 325 kWh per month and $11.00 per month for customers using more than 325 kWh per month.

These rates were applied to customer-level billing determinants (*e.g.*, monthly kWh for the on-peak, shoulder, and off-peak periods, for June through September) calculated from the June through September 2008 loads for each of the RS load research sample customers, of which there were 105 with complete data.[6] Sample weights were used to calculate an average RS bill. We then scaled the load-weighted average wholesale marginal costs to obtain revenue-neutral TOU rates. To achieve revenue neutrality, we set the TOU rates such that the sample-weighted average RS bill (which is $282 per summer or $70.45 per month) is equal to the sample-weighted TOU bill before demand response.[7]

The TOU rates were set by applying a scalar (1.46 in this case) to the load-weighted average marginal energy cost in each TOU period. This method creates retail rates that have the same price *ratios* (*e.g.*, the peak to off-peak price ratio) as the wholesale energy costs. The current RS customer charges were retained for the TOU rate. The resulting rates are shown in Table 3.2.

Table 3.2: TOU Rates and Time Period Definitions

Pricing Period	Hours	Rate
Peak	2 p.m. to 7 p.m. on non-holiday weekdays	8.794 cents/kWh
Shoulder (mid-peak)	10 a.m. to 2 p.m. & 7 p.m. to 10 p.m. on non-holiday weekdays; and 10 a.m. to 10 p.m. on weekends and holidays	6.119 cents/kWh
Off-peak	All other hours	2.948 cents/kWh

3.2.4 TOU Bill Impacts

The current RS residential rate has a declining block structure, which reduces the average price per kWh as monthly usage increases. Migrating to a TOU rate removes this rate feature. Therefore, we would expect that customers with higher usage levels would experience higher percentage bill changes when they switch to a TOU rate from RS than would customers with lower levels of consumption. Figure 3.2 shows a scatter plot of percentage bill impacts vs. monthly customer usage for the 105 load research sample customers.

[6] Five load research sample customers were omitted from the analysis because of incomplete data.
[7] Note that the TOU rate is not revenue neutral *after* accounting for TOU demand response or customer self-selection into the voluntary TOU rate.

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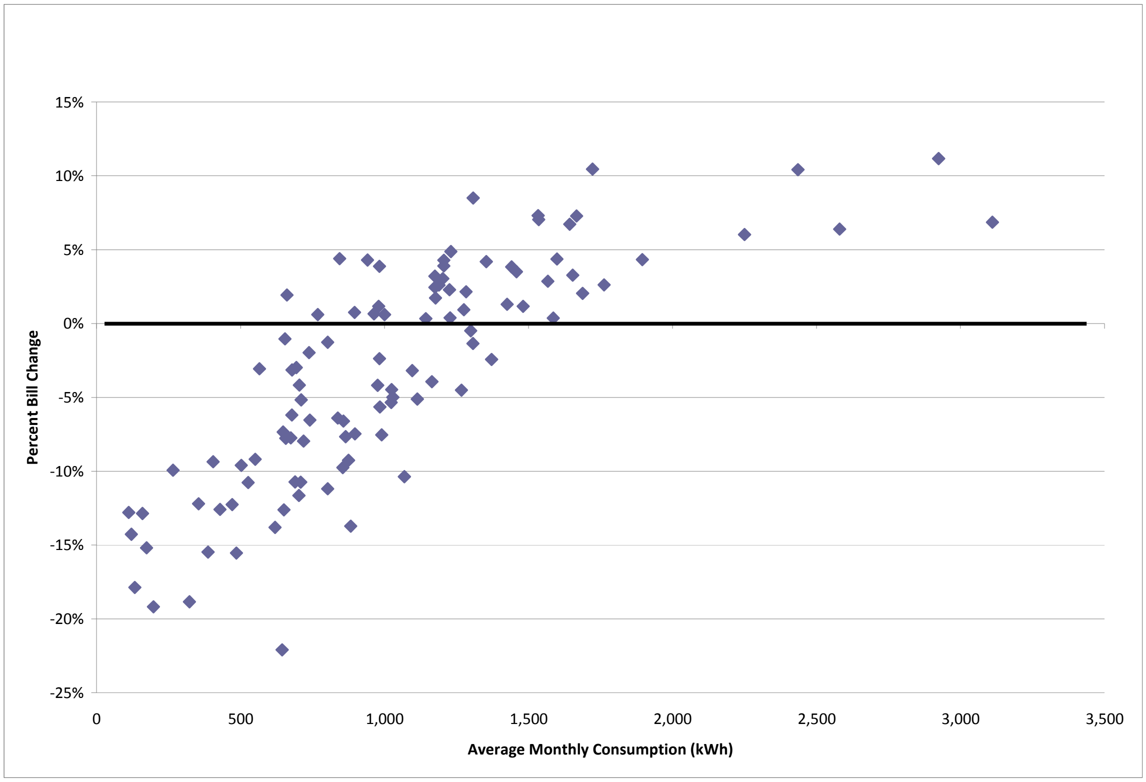
Figure 3.2: TOU Percentage Bill Impacts vs. Monthly Customer Usage



The figure shows a clear relationship between usage levels and bill impacts. Customers who average less than 500 kWh per month can reduce their bill by an average of 14 percent by switching to the TOU rate (without modifying their usage level or pattern). At the other end of the size continuum, customers who average more than 1,500 kWh per month would *increase* in their bill by an average of 5.9 percent by switching to the TOU rate (again, before accounting for any response to the TOU prices). These bill impacts suggest that it could be difficult to encourage larger customers to adopt the TOU rate.

4. EFFECTS OF TOU LOAD RESPONSE

Customers exposed to TOU rates have been observed to modify their usage patterns by reducing consumption somewhat in peak-price periods and shifting some of that consumption to other time periods. Such usage changes can allow customers to benefit from the TOU rates, and can also produce changes in revenues and generation costs to utilities. This section describes an analytical tool for simulating customer TOU price response, and the impacts of that response on customer bills and utility costs.

4.1 Model Description

We modeled the demand response that would occur upon adoption of the TOU rate, for each of the load research sample customers. In the model, customers shift load from the peak period to the shoulder and off-peak periods; and from the shoulder period to the off-peak period. The load profile is then adjusted upward or downward based on the overall change in energy costs.

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A common tool for modeling customer response to time-varying prices characterizes consumers' load shifting behavior by means of an *elasticity of substitution* parameter. This parameter is a measure of the change in the ratio of usage in one TOU period to another in response to a change in the ratio of their respective prices. By convention, this parameter takes on positive values. Based on previous research, we assumed an elasticity of substitution value of 0.10.

In addition to shifting consumption from one time period to another, consumers may change their overall level of consumption, depending in part on their overall cost under the TOU rate compared to their standard rate. This change in overall consumption may be modeled with an additional parameter, a *daily elasticity*. For that parameter, which is analogous to a short-term price elasticity, we assumed a value of -0.05. This value implies a 5 percent reduction in overall usage in response to a doubling (*e.g.*, a 100 percent increase) of electricity expenditures.[8]

The assumed elasticity values are based on our experience and understanding of customers' typical price responsiveness from the literature on electricity demand. In previous analyses we have observed considerable variation in price responsiveness across individual customers within a given customer class. For example, residential customers with a large number of discretionary appliances can more easily move load between time periods than others with fewer appliances. However, in this study, we apply only a single set of typical price response parameters to each profile that represents usage for the average customer in the class.

4.2 Customer Benefits From TOU Load Response

We expect that after customers adopt the optional TOU rate they will shift load from peak, and to some extent shoulder periods, to off-peak time periods. Using the methods described in Section 4.1, we simulated TOU demand response for each customer in the RS load research sample. These results were then combined using the sample weights to obtain results for the average customer. Table 4.1 shows the resulting simulated usage by period and average monthly bill.

[8] In practice, changes in overall electricity expenditures under a TOU rate are relatively small.

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Table 4.1: Effect of Demand Response on Usage by TOU Period and the Average Monthly Bill[9]

TOU Period	RS Rate	TOU Rate	Percentage Change
Peak	207	197	-5.1%
Shoulder	470	459	-2.3%
Off-peak	434	456	5.0%
Total kWh	**1,111**	**1,111**	**0.0%**
Avg. Monthly Bill	$70.45	$69.50	-1.3%

Peak-period usage decreases by 5.1 percent under the TOU rate, while off-peak usage increases by 5.0 percent. While total usage is nearly unchanged, the demand response produces a 1.3 percent reduction in the average monthly bill, which translates into a comparable reduction in revenue to IPL. However, because of the comparatively low energy costs in the off-peak period, some of this bill/revenue reduction is offset by a reduction in the cost to serve. We can calculate the approximate change in the energy cost to serve the average customer by using the average marginal costs by pricing period that were the starting point (pre-scaling) for the TOU rates. These marginal costs (2.02 cents/kWh in the off-peak hours; 4.19 cents/kWh in the shoulder hours; and 6.02 cents/kWh in the peak hours) are multiplied by the change in usage by time period to obtain a $0.65 per month reduction in costs to serve.

Once we account for the change in the cost to serve, the reduction in net revenues is 0.4% of the RS bill. Over time, IPL may wish to develop a strategy for recovering its allowed RS revenues, such as requesting a revenue adjustment mechanism, increasing the TOU rates, or increasing the standard RS rate.[10]

Figure 3.2 illustrated the individual customer-level bill impacts that occur when customers adopt the TOU rate, but have not yet modified their load profile. Figure 4.1 below shows the customer-level bill impacts *after* accounting for TOU demand response.

The results reflect the bill reductions that customers realize when they change usage patterns in response to the TOU prices. The simple average percentage bill impact changed from -3.3 percent to -4.4 percent after demand response.[11] The large customers

[9] Note that the RS and TOU bills that are calculated from the billing determinants shown in Table 4.1 will not produce the average monthly bills shown in Table 4.1. This is the case because the average monthly bills are a sample-weighted average across the 105 load research sample customers, some of whom pay the lower customer charge of $6.70. That is, the bill at average usage is higher than the average of the customer-level bills because of the blocked customer-charge structure.

[10] This analysis does not account for adverse selection, which could further reduce IPL net revenues. That is, our model implicitly assumes that the adopters of the TOU rate comprise a typical mix of RS customers. In fact, customers with relatively higher shares of usage in the off-peak hours may be more likely to voluntarily adopt the TOU rate, as they would be able to reduce their bill without changing their load profile. This self-selection on the part of customers can lead to revenue attrition for the utility.

[11] The TOU rate was designed to be revenue neutral to the RS rate for those customers without electric water heating and/or space heating, prior to accounting for any demand response. While it may seem to be a counterintuitive result, the 3.3 percent average bill reduction before demand response is consistent with this method. That is, small customers tend to have large percentage bill *reductions*, while large customers

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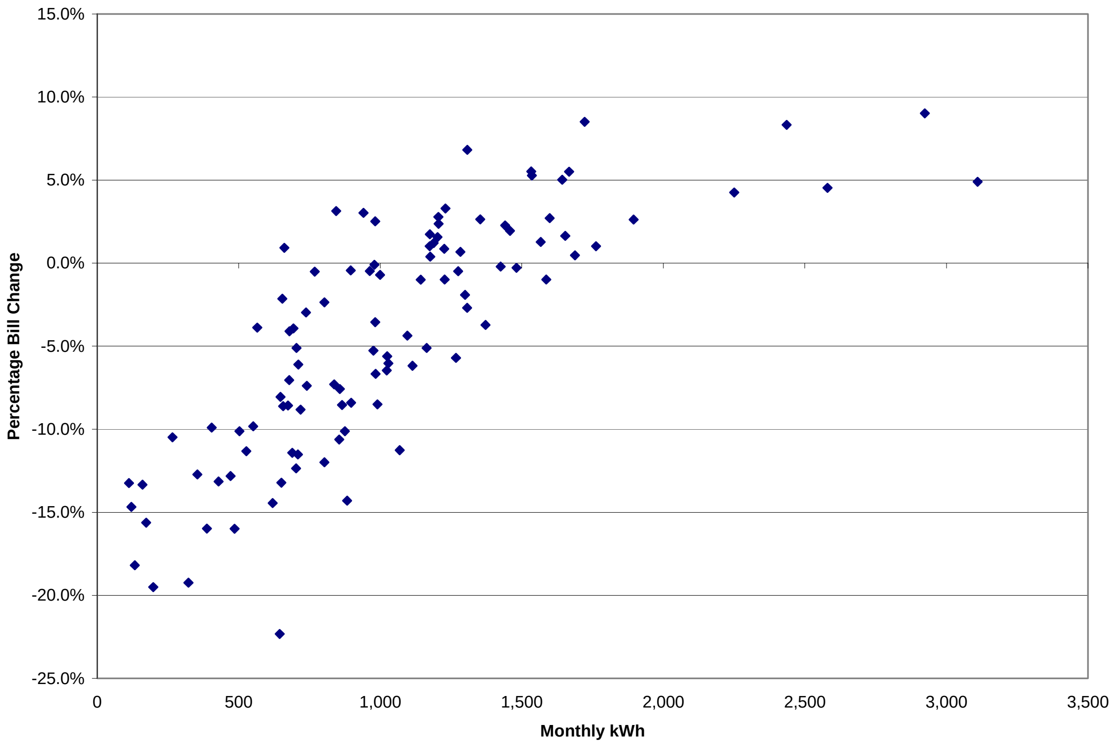
(over 1,500 kWh per month) are able to mitigate their bill impact from an average increase of +5.9 percent to +4.1 percent. These results indicate that large RS customers would need a very high level of demand response in order to be made better off by the TOU rate.

Figure 4.1: TOU Percentage Bill Impacts vs. Monthly Customer Usage, After Demand Response



5. SMART GRID APPLIANCE RATE DESIGN

Thus far, this report has focused on a summer-only TOU rate design. In addition to this rate, IPL requested an annual TOU rate design that could be used for separately metered electric appliances. IPL wants this rate to have the same pricing periods and rates in every month of the year.

IPL provided the following specifications for this rate:

- The TOU pricing periods and rates should be the same throughout the year;
- The off-peak period should be 12 hours in duration, from 8:00 p.m. to 8:00 a.m. every day of the year;
- The peak price should match the first block price of the current residential rate, or 6.7 cents per kWh; and

have smaller percentage bill *increases*. An unweighted average of these values does not produce a zero percent load change (revenue neutrality), but a sample- and load-weighted average does.

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- Two variants of the rate should be designed, one revenue neutral to the RS rate only, and the other revenue neutral to the sum of all residential customers (including customers with electric space and water heating).

Given these specifications, the pricing problem is reduced to setting the off-peak rate to obtain revenue neutrality (at 2008 consumption levels). We used 2008 residential data on the number of customers, the share of customers by usage block (to determine the number of customers paying $6.70 per month and $11.00 per month in customer charges), sales, revenues from rates (not including riders), and hourly sales to the residential customers.

We first calculated customer charge revenue for each month. We then used the hourly data to calculate the share of sales in the peak and off-peak periods (*e.g.*, 52.7 percent of residential sales occurred in the peak period) and peak-period energy revenue (calculated as total kWh times the share of sales in the peak period times 6.7 cents per kWh). The customer charge and peak-period revenue were then subtracted from the total revenues from rates. The off-peak price was then calculated as the remaining revenue divided by the amount of off-peak sales (calculated as total sales times the share of 2008 sales in the off-peak hours).

The resulting rates are shown in Table 5.1. Notice that the off-peak rate for all residential customers is lower than the rate for RS customers only. This is because the RC and RH customers (who have electric space and/or water heating) benefit from a lower-priced third block for usage over 1,000 kWh per month. This reduces the average price per kWh paid by these customers.

Table 5.1: Smart Grid Appliance Rates

TOU Pricing Period	RS Only	All Residential
Peak (8 a.m. – 8 p.m.)	6.700 cents/ kWh	6.700 cents/kWh
Off-Peak (8 p.m. – 8 a.m.)	4.243 cents/ kWh	3.291 cents/ kWh

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The TOU results in Sections 3 and 4 suggest that the potential benefits of TOU to IPL and its residential customers may be relatively small at this time. This result is due largely to two factors – IPL's generally low residential rates, and its expectation of relatively low energy costs in the near term, including an expected low avoided capacity costs. The benefits to IPL of time-based pricing depend greatly on expected marginal costs in the short-term, including the extent to which peak load reductions can be considered to reduce capacity costs.

Even given the relatively small potential benefits of TOU at this time, IPL can achieve valuable operational and customer experience from implementing a TOU pilot. High uncertainty about future energy costs and regulations, combined with falling costs of metering and communications software, could soon lead IPL and its regulators to consider expanding customers' options by offering alternative time-based electricity rates.

6.2 Recommendations

We note that this analysis has necessarily simplified a number of factors that can be important in determining the effect on IPL of offering voluntary rates like TOU. In the near future, we will submit a supplemental report in which we will design a CPP or PDP-type rate, and peak-day rebate program, and assess their potential value. For any additional rates that IPL anticipates offering, on either a permanent or pilot basis, IPL should consider conducting a more detailed analysis of alternative rate designs, including assumptions regarding future capacity cost savings from demand response, facilitating technologies that assist consumers in responding to time-based rates, and analysis of the likelihood that different types of customers will adopt an optional time-based rate. In this way, we can help to devise strategies for targeting customers and pricing the products to minimize revenue attrition and maximize potential load response and cost-saving capabilities.

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Exhibit C – Revenue and Cost Projection Summary

Data:
As stated in Exhibit B (Assessment of Time-Based Pricing at Indianapolis Power and Light) on Page 3, a determination was made to use data for 2008 to establish *hourly patterns* in customer loads and market costs, as 2008 had more typical weather than 2009, and is the most recent year that was not strongly affected by the recent economic slowdown. The hourly patterns of market costs were then scaled to reflect expected future levels based on available forward contract prices.

IPL supplied data to Christensen Associates Energy Consulting, LLC:

- IPL residential class load research hourly load shapes for individual customers for year 2008.
- IPL 2008 hourly system loads.
- MISO ISO real-time and day-ahead wholesale locational marginal prices (LMPs) at the CIN hub.
- Forecast of Cinergy hub peak and off-peak forward prices for 2010-2014.
- Historical weather data

Results:
As stated on page 19 (Assessment of Time-Based Pricing at Indianapolis Power and Light) peak-period usage decreases by 5.1 percent under the TOU rate, while off-peak usage increases by 5.0 percent. While total usage is nearly unchanged, the demand response produces a 1.3 percent reduction in the average monthly bill, which translates into a comparable reduction in revenue to IPL. However, because of the comparatively low energy costs in the off-peak period, some of this bill/revenue reduction is offset by a reduction in the cost to serve. We can calculate the approximate change in the energy cost to serve the average customer by using the average marginal costs by pricing period that were the starting point (pre-scaling) for the TOU rates. These marginal costs (2.02 cents/kWh in the off-peak hours; 4.19 cents/kWh in the shoulder hours; and 6.02 cents/kWh in the peak hours) are multiplied by the change in usage by time period to obtain a $0.65 per month reduction in costs to serve. Once we account for the change in the cost to serve, the reduction in net revenues is 0.4% of the RS bill.

Table 4.1 Effect of Demand Response on Usage by TOU Period and the Average Monthly Bill[1]

TOU Period	RS Rate	TOU Rate	Percentage Change
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Avg. Monthly Bill	$70.45	$69.50	-1.3%

[1] Note that the RS and TOU bills that are calculated from the billing determinants shown in Table 4.1 will not produce the average monthly bills shown in Table 4.1. This is the case because the average monthly bills are a sample-weighted average across the 105 load research sample customers, some of whom pay the lower customer charge of $6.70. That is, the bill at average usage is higher than the average of the customer-level bills because of the blocked customer-charge structure.

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Verified Statement of Indianapolis Power & Light Company (IPL)

Concerning Notification of Customers Affected by the Experimental Residential Time of Use Rate

Indianapolis Power & Light Company complied with the Notice Requirements under 170 IAC 1-6-6 in the following manner:

- beginning on May 10, 2010 and continuing through the filing date, the attached notice was posted in the Customer Service Office at 2102 N. Illinois Street

- beginning on May 10, 2010 and continuing through the filing date, the same notice was posted on IPL's website under the Pending section of the Rates, Rules and Regulations area

- a legal notice placed in the Indianapolis Star on May 11, 2010 as evidenced by the attached Publishers Affidavit; and

- beginning on the filing date, a copy of the Experimental Time of Use 30 day filing will be included on IPL's website under the Pending section of the Rates, Rules and Regulations area

I affirm under penalties for perjury that the foregoing representations are true to the best of my knowledge, information, and belief.

Dated this 18th day of May, 2010.

Ken Flora

Ken Flora
Director, Regulatory Affairs

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LEGAL NOTICE

Notice is hereby given that on or about May 18, 2010, Indianapolis Power & Light Company expects to submit an Experimental Tariff entitled Rate RTX – Experimental Time of Use Service, ("Rate RTX"). The Rate RTX will affect only those eligible residential customers who volunteered to participate and have been selected and enrolled in the Experimental TOU pilot program. IPL anticipates approval of the filing on or before June 30, 2010. The TOU rate will be in place for a three-month pilot period, July 1 through September 30, after which time those residential customers on the TOU rate will revert back to Rate RS.

This notice is provided to the public pursuant to 170 IAC 1-6-6. The contact information, to which an objection should be made, is as follows:

Secretary
Indiana Utility Regulatory Commission
101 W. Washington Street, Suite 1500 East
Indianapolis, Indiana 46204
Telephone:(317) 232-2700
Fax: (317) 232-6758
Email: info@urc.in.gov

Office of Utility Consumer Counselor
115 W. Washington Street, Suite 1500 South
Indianapolis, Indiana 46204
Telephone:(317) 232-2484
Toll Free: 1-888-441-2494
Fax: (317) 232-5923
Email: uccinfo@oucc.in.gov

Dated May 7, 2010.

83633-5648389

PUBLISHER'S AFFIDAVIT

LEGAL NOTICE

Notice is hereby given that on or about May 18, 2010, Indianapolis Power & Light Company expects to submit an Experimental Tariff entitled Rate RTX - Experimental Time of Use Service, ("Rate RTX"). The Rate RTX will affect only those eligible residential customers who volunteered to participate and have been selected and enrolled in the Experimental TOU pilot program. IPL anticipates approval of the filing on or before June 30, 2010. The TOU rate will be in place for a three-month pilot period, July 1 through September 30, after which time those residential customers on the TOU rate will revert back to Rate RS.

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Secretary
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101 W. Washington Street, Suite 1500 East
Indianapolis, Indiana 46204 Telephone:(317) 232-2700
Fax: (317) 232-6758
Email: info@urc.in.gov

Office of Utility Consumer Counselor
115 W. Washington Street, Suite 1500 South
Indianapolis, Indiana 46204 Telephone:(317) 232-2484 Toll Free: 1-888-441-2494
Fax: (317) 232-5923
Email: uccinfo@oucc.in.gov

Dated May 7, 2010.
(S - 5/11/10 - 5648389)

State of Indiana SS:
MARION County

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Personally appeared before me, a notary public in and for said county and state, the undersigned **Kerry Dodson** who, being duly sworn, says that SHE is clerk of the INDIANAPOLIS NEWSPAPERS a DAILY STAR newspaper of general circulation printed and published in the English language in the city of INDIANAPOLIS in state and county aforesaid, and that the printed matter attached hereto is a true copy, which was duly published in said paper for **1** time(s), between the dates of:

05/11/2010 and **05/11/2010**

Kerry Dodson
Clerk
Title

Subscribed and sworn to before me on **05/11/2010**

Louise M Powell
Notary Public

My commission expires:

LOUISE M. POWELL
NOTARY PUBLIC
SEAL
STATE OF INDIANA
MY COMMISSION EXPIRES February 28, 2013

Form 65-REV 1-88