EVALUATION OF INDIVIDUAL METERING AND TIME-OF-USE PRICING PILOT

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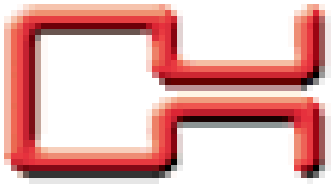

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EXECUTIVE SUMMARY

This report summarizes the design, operation and outcomes of the Oakville Hydro Electricity Distribution Inc. (Oakville Hydro) Individual Metering and Time-of-Use (TOU) pricing pilot study undertaken from January 2006 through the end of October 2007. The pilot project tested the response of condominium residents in three buildings to 1) a change from bulk metering to individual metering and being billed under the Ontario Energy Board's Regulated Price Plan (RPP) tiered pricing and 2) a change from RPP tiered to Time-of-Use rates. A small number of participants in one of the three buildings were also provided with a water heater load control device to automatically control the time when the heating elements in the water heater would be allowed to operate.

Prior to their participation in the pilot, the three buildings were bulk-metered and consumers in the individual units were not separately billed for their electricity consumption. After the change to individual metering, consumers in the individual units were billed separately for their consumption under the Ontario Energy Board's two-tiered Regulated Price Plan (RPP) pricing structure, with a lower price for all consumption under a tier threshold and a higher price for any consumption over the tier threshold. The tier threshold for participants was 600 kWh per month (summer) or 1000 kWh per month (winter).

After the participants switched to time-of-use pricing under the RPP TOU pricing structure, their prices were based on consumption in each of three time-of-use periods. These periods are referred to as Off-Peak, Mid-Peak and On-Peak. The price for consumption in the lowest-priced period (Off-Peak) is below the tier prices, while the prices for consumption in the other two periods (Mid-Peak and On-Peak) are above them. The three prices are related to each other in approximately a 1:2:3 ratio.

Summary Results

The following summary results are based on participants in one of the buildings in the pilot, but are generally representative of what happened in the other two buildings. In the change from bulk metering to individual metering with time-of-use rates:

- The average consumption for each unit went from about 700 kWh per month to about 550 kWh per month, a 22% reduction in consumption.
- Commodity costs decreased significantly from $37 per month to $30 per month, a 20% reduction due largely to the significant reduction in consumption.
- The reduction in consumption was spread more or less evenly over the three time-of-use pricing periods (On-Peak, Mid-Peak and Off-Peak).

- Enabling technologies can help customers to take advantage of time-of-use rates. Pilot participants with timers on their water heaters exhibited a significant shift of consumption from On-Peak and Mid-Peak periods to Off-Peak periods.

Navigant Consulting believes that, based on the structure of and data available from the pilot, the summary characterization given above is a reasonable approximation of the expected behaviour of and impact on condominium residents in switching from bulk metering to individual metering with time-of-use prices.

Detailed Findings

The following detailed findings are drawn from Navigant Consulting's analysis of participant consumption levels and patterns in the change from bulk to individual metering with tiered pricing and subsequently to time-of-use pricing. Note that these findings reflect short-term behaviour changes only and it is expected that the results will change over time.

1. Expressed as a percentage of total consumption and based on a simple average across all three buildings, On-Peak usage increased marginally by 0.5% of overall consumption in the change from tiered pricing to time-of-use pricing and Mid-Peak consumption decreased by 2.0%. This suggests that participants were more willing and able to shift consumption out of Mid-Peak hours. This result should not be misinterpreted to indicate the participants responded poorly to the TOU prices. For example, participants in two of the buildings reduced their On-Peak consumption by 10% and 6% under TOU prices. However, these same participants also achieved a 20% and 13% reduction (essentially double the On-Peak reduction) in consumption during the Mid-Peak periods. It is also notable that the participants in the third building reduced their On-Peak and Mid-Peak usage by 3% and 2%, respectively.

2. Price elasticity was negative for all three buildings in the On-Peak and Mid-Peak periods and negative for one of the buildings in the Off-Peak period. This result indicates that as price increases, consumption decreases and vice-versa. The positive price elasticity observed for two of the buildings in the Off-Peak period was largely driven by a significant reduction in overall consumption by participants in these buildings across all three time-of-use pricing periods.

3. Average aggregate elasticity of substitution was negative across the three buildings, but there were some notable differences when comparing different combinations of time-of-use pricing periods. Elasticity of substitution between Non-Off-Peak (i.e., On- and Mid-Peak) and Off-Peak periods was negative for all three buildings indicating that participants generally shifted their consumption to the less expensive Off-Peak period. However, two of the building exhibited positive

elasticity of substitution between the On-Peak and Non-On-Peak (i.e., Mid- and Off-Peak) periods. These are the same two buildings that exhibited a positive price elasticity in the Off-Peak period. These seemingly counter-intuitive results are essentially driven by participants in these two buildings decreasing their consumption across all three time-of-use periods, but reducing it proportionately more in the Mid-Peak period relative to the other time-of-use periods.

4. Given their consumption patterns, just over 1/3 of participants had lower commodity costs under time-of-use prices than what they would have paid for the same level of consumption under tiered prices. On average, participants in two of the three buildings paid about $1 per month more under time-of-use prices as compared to tiered prices. Participants in the remaining building paid about $1 per month less on average under time-of-use prices as compared to tiered prices.

   These results only reflect the difference in commodity costs based on either tiered or time-of-use pricing given participants' consumption levels and consumption patterns in the TOU period. As such, they do not reflect changes in absolute consumption levels from the pre-TOU period to the TOU period of the pilot.

The impact of time-of-use prices on the average commodity charges experienced by customers is also dependent on the relative percentage of their consumption in each of the two tiers under the RPP tiered pricing structure. Consumers, such as many in this pilot project, with most of their monthly consumption below the tier threshold pay somewhat less under tiered pricing than the average actual cost of electricity. For example, the two buildings with participants having 85% of their monthly consumption falling under the lower Tier 1 RPP price, experienced a slight increase in their unit commodity charges under time-of-use pricing, whereas participants in the third building, with only 65% of their consumption falling under the lower Tier 1 RPP price, experienced a slight decrease in their unit commodity charges under time-of-use pricing.

Lastly, all forms of "flat" (or non-time varying) electricity pricing such as the tiered RPP prices inherently result in cross-subsidies between consumers with different consumption patterns, as the actual cost of power changes on an hourly basis. Two consumers could have identical overall consumption levels, but if one uses most of their electricity during the Off-Peak period and the other uses most during On- and Mid-Peak periods, the cost to supply the latter consumer will be much higher. The time-of-use prices better reflect the true cost of power and significantly reduce such cross-subsidies.

NAVIGANT CONSULTING

CONTENTS

NAVIGANT CONSULTING

LIST OF FIGURES

NAVIGANT CONSULTING

LIST OF TABLES

NAVIGANT CONSULTING

INTRODUCTION

This report summarizes the design, operation and outcomes of the Oakville Hydro Electricity Distribution Inc. (Oakville Hydro) Individual Metering and Time-of-Use (TOU) pricing pilot study undertaken from January 2006 through the end of October 2007. The pilot project tested the response of condominium residents in three buildings to 1) a change from bulk metering to individual metering and being billed under the Ontario Energy Board's Regulated Price Plan (RPP) tiered pricing and 2) a change from RPP tiered to Time-of-Use rates. A small number of participants in one of the three buildings were also provided with a water heater load control device to automatically control the time when the heating elements in the water heater would be allowed to operate.

Results from the pilot study are drawn through quantitative analysis of 1) the conservation impact or reduction in overall consumption in moving from bulk to individual metering and 2) the demand response via load shifting away from On-Peak hours to either Mid-Peak or Off-Peak hours.

Information gathered from this pilot study will enable Oakville Hydro, the Ontario Energy Board and other LDCs to expedite and enhance residential customer response to RPP TOU rates when they are implemented more broadly. The results from the study will also inform policy discussions regarding the implementation of individual metering for condominiums and other multi-residential buildings.

Pilot Objectives

The specific objectives of the Oakville Hydro pilot test are as follows:

1. Estimate the expected percentage reduction in energy consumption for bulk-metered condominium residents moving to individual metering.
2. Compare the consumption patterns of customers on standard Time-of-Use (TOU) Regulated Price Plan (RPP) rates, against their consumption patterns on static (i.e., non- time varying) conventional tiered RPP rates.
3. Test the response of residential customers with enabling technology (i.e., water heater load controls).
4. Estimate the price elasticity of condominium residents on TOU rates.

Ontario Energy Board Approval

On July 28, 2006, the Ontario Energy Board (the "Board" or "OEB") amended the Standard Supply Service Code (the "SSS Code") to allow certain electricity distributors to charge time of use prices for consumers on the Regulated Price Plan (the "RPP") with eligible time-of-

use (or "smart") meters as part of a pilot project. The amended SSS Code requires approval from the Board in order for any new pilot projects to be implemented.

On October 24, 2006, Oakville Hydro submitted a proposal for approval to implement a pilot project involving TOU electricity prices and eligible TOU meters for certain condominium residents that had recently changed from bulk metering to individual metering[1] The Board approved the pilot on December 1, 2006[2].

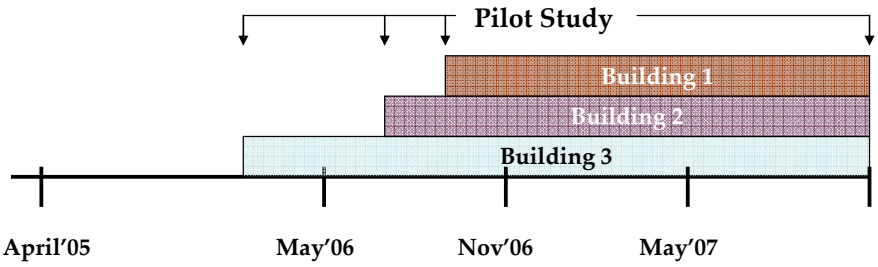
Standard and TOU Rate Structure

Under amendments to the *Ontario Energy Board Act, 1998* (the Act) contained in the *Electricity Restructuring Act, 2004*, the Board was mandated to develop a Regulated Price Plan (RPP) for electricity prices to be charged to consumers that have been designated by regulation. The first prices were implemented under the RPP effective on April 1, 2005, as set out in regulation by the Ontario Government.

The principles that have guided the Board in developing the RPP were established by the Ontario Government. In accordance with legislation, the prices paid for electricity by RPP consumers are based on forecasts of the cost of supplying them and must be set to recover those forecast costs. RPP prices are currently reviewed and adjusted if necessary by the OEB every six months.

During the Oakville Hydro pilot study, customers were exposed to either three or four separate RPP prices (depending on the building) since the OEB reset the prices on May 1st, 2006, November 1st, 2006 and May 1st, 2007. Figure 1 outlines the different RPP periods experienced during the pilot study.

Figure 1: RPP periods experienced during the pilot study



1 Oakville Hydro's proposal is available at: http://www.oeb.gov.on.ca/documents/cases/EB-2004-0205/smartpricepilot/oakvillehydro_tou_proposal_011206.pdf

2 The Ontario Energy Board decision with respect to the Oakville Hydro pilot is available at: http://www.oeb.gov.on.ca/documents/cases/EB-2004-0205/smartpricepilot/oakvillehydro_tou_decision_011206.pdf

Standard Meter Regulated Price Plan

The conventional meter RPP has a two-tiered pricing structure, one price for monthly consumption under a tier threshold and a higher price for consumption over the tier threshold. Until October 31, 2005, the threshold was 750 kWh per month. From November 1, 2005, the tier threshold for residential consumers has changed twice a year on a seasonal basis: to 600 kWh per month during the summer season (May 1 to October 31) and to 1000 kWh per month during the winter season (November 1 to April 30). The threshold for non-residential RPP consumers remains constant at 750 kWh per month for the entire year.

Subsequent to April 2006, the RPP prices were reviewed by the Board every six months and adjusted, if necessary. The RPP prices in effect during this study reflect this resetting frequency and are shown in Table 1.

Table 1: Conventional RPP Prices

Cents per kWh	Apr'05-Apr'06	May'06-Oct'06	Nov'06-Apr'07	May'07-Oct-07
Tier 1	5.0	5.8	5.5	5.3
Tier 2	5.8	6.7	6.4	6.2

TOU Regulated Price Plan Prices

Subsequent to a date to be determined by the Ontario Energy Board, eligible RPP consumers with eligible time-of-use (or "smart") meters that can measure and record electricity consumption for hourly (or shorter) intervals will pay under a time-of-use (TOU) RPP price structure. The prices under this plan are based on three time-of-use periods, as shown in Table 2. These periods are referred to as Off-Peak, Mid-Peak and On-Peak. The lowest (Off-Peak) price is below the tier prices, while the other two are above them. The three prices are related to each other in approximately a 1:2:3 ratio.

The RPP TOU prices are also reviewed and adjusted every six months. The following table outlines the TOU prices in effect during the pilot. Note that TOU prices in effect prior to August 2006 (when TOU prices came into effect for study participants) are not relevant to this study. Our analysis of the pilot participants' response to TOU prices reflects the existing RPP prices for the period being analyzed.

Table 2: Distribution of RPP TOU Prices During the Pilot Study

Cents per kWh	May'06-Oct'06	Nov'06-Apr'07	May'07-Oct-07
Off-Peak	3.5	3.4	3.2
Mid-Peak	7.5	7.1	7.2
On-Peak	10.5	9.7	9.2

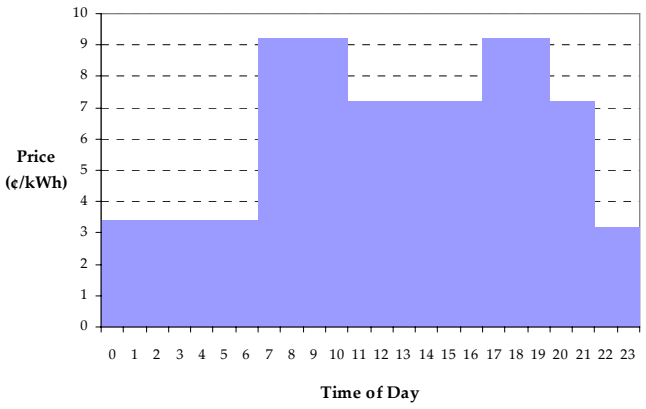
The hours and prices for each of these three time-of-use (TOU) periods are set out in Table 3.

Table 3: Breakdown of RPP TOU Periods for Summer and Winter

Time	Summer Hours (May 1 – Oct 31)	Winter Hours (Nov 1 – April 30)
Off-Peak	10pm – 7am weekdays; all day on weekends and holidays	10pm – 7am weekdays; all day on weekends and holidays
Mid-Peak	7am – 11am and 5pm and 10pm weekdays	11am – 5pm and 8pm – 10pm weekdays
On-Peak	11am – 5pm weekdays	7am-11am and 5pm-8pm weekdays

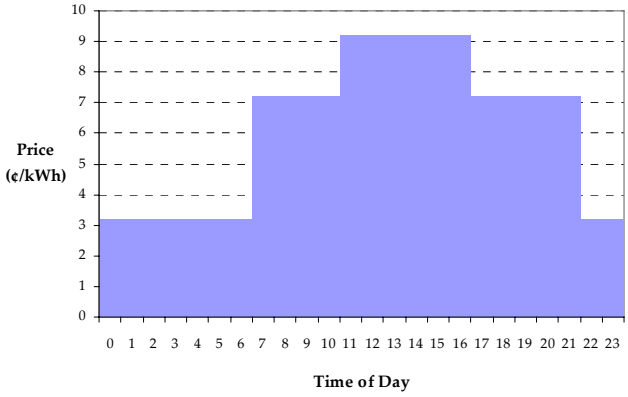
Figure 2 graphically displays the winter TOU prices based on the Board's May 1 2007 RPP price setting, while Figure 3 shows summer TOU prices based on the same price setting.

Figure 2: Winter TOU Prices (May 1 2007 RPP Price Setting)[3]



[3] The May 1 2007 RPP price resetting covered the subsequent 12 month period through April 30, 2008 and included both summer and winter TOU pricing. The winter TOU prices were reset on November 1, 2007 and became effective on the same date. The November 1, 2007 price setting also included summer TOU pricing, which may get reset by the Ontario Energy Board on May 1, 2008.

Figure 3: Summer TOU Prices (May 1 2007 RPP Price Setting)



The average price a consumer on TOU prices will pay will depend on the consumer's load profile (i.e., how much electricity is used at what time). RPP prices are set so that a consumer with the average RPP consumption level and load profile will pay the same average price under either the tiered or TOU prices, as shown in Table 4. Specifically, this table shows the average RPP prices that were in effect during the May through October 2007 period. This average price is equal to the average RPP supply cost of approximately 5.7¢/kWh.

Table 4: Average RPP Prices (cents per kWh)

Tiered RPP Prices	Tier 1	Tier 2	Average Price
Price	5.3¢	6.2¢	5.7¢
% of RPP Consumption	52%	48%	

TOU RPP Prices	Off Peak	Mid Peak	On Peak	Average Price
Price	3.2¢	7.2¢	9.2¢	5.7¢
% of RPP Consumption	48%	29%	23%	

PILOT PARTICIPANTS

Over the course of the pilot, residents in three condominium buildings in Oakville changed from bulk metering with billing based on the overall building consumption to 1) individual metering and billing under RPP tiered prices and subsequently to 2) individual metering and billing under RPP Time-of-Use prices. In total across the three buildings, 286 residents participated in the pilot.

As shown in Figure 4, the changeover from bulk to individual metering and billing under RPP tiered prices occurred on a different date for participants of each of the three buildings. The period for which participants were billed under RPP tiered prices varied from three to ten months, depending on the building. The changeover from RPP tiered prices to RPP Time-of-Use prices occurred during October 2006 for participants in all three buildings.

Figure 4: Metering and Price Plan for Pilot Participants

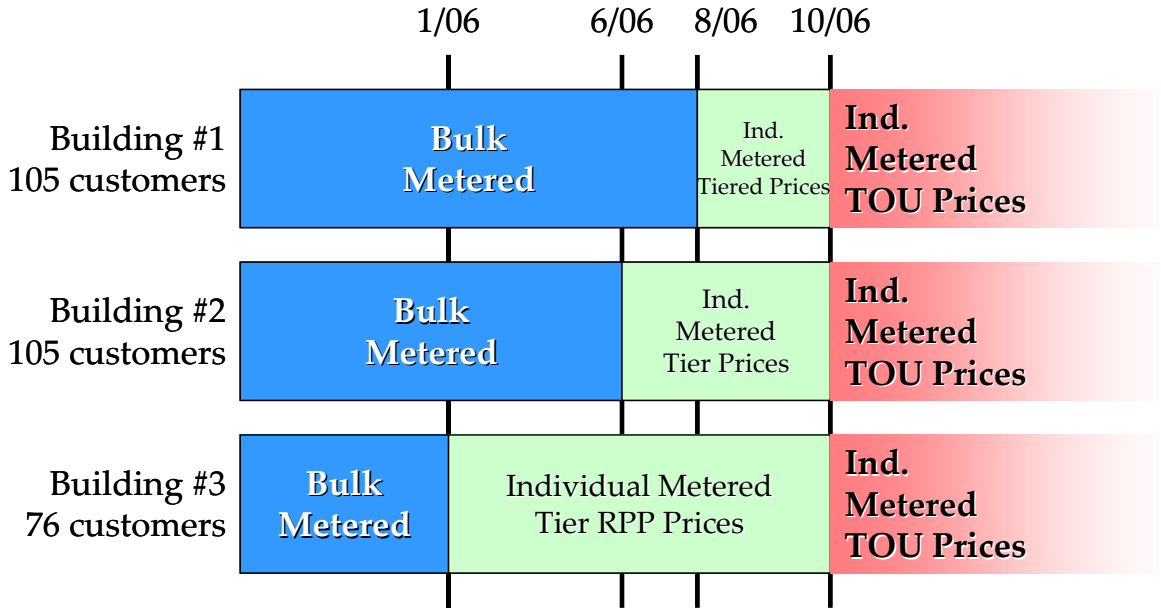


Table 5 provides a summary of the characteristics of each of the three pilot buildings. Building 1 and 2 are essentially identical adult-oriented buildings, housing mainly singles and couples, located adjacent to one another. Each building is heated by a central natural gas boiler feeding a glycol system which is piped into each unit. Each unit has a separate heat pump and supplementary baseboard heaters. The building does not have a central chiller. Domestic hot water for each unit is supplied through a central natural gas-fired hot water tank.

Building 3 is located in a different area of Oakville and is primarily oriented to and occupied by seniors. The building is electrically heated through a combination of electric furnaces

and baseboard heaters in each unit. The building does not have a central chiller. Each unit is also equipped with either a 40 or 60 gallon electric hot water heater, five of which were equipped with programmable timers to shut the tanks off during peak hours.

Table 5: Summary of the Characteristics of the Three Buildings Participating in Pilot Study

	Building 1	Building 2	Building 3
Primary Demographics	Singles and couples		Seniors
Incremental Communication Activities*	General meeting with Q&A session	No general meeting	One-on-one information sessions with each unit
Primary Space Heating Source	Central natural gas		Electric furnace
Supplementary Space Heating Source	Individual heat pump and baseboard heaters		Baseboard heaters
Space Cooling	Individual heat pump		N/A
Domestic Hot Water	Central natural gas-fired hot water tank		Individual electric hot water heaters

* Beyond the introductory recruitment letter and informational insert on smart meters and TOU rates provided to all participants.

Test Structure and Design

Electricity data was provided by Oakville Hydro for each of the three buildings. Specifically, the data provided was as follows:

- Bulk (whole building) meter data on an hourly basis from September 2003 to July 2006 for Building 1 and bulk monthly meter readings for Building 2 from January 2001 to June 2006 and Building 3 from January 2001 to January 2006.
- Individual hourly meter data for each resident and for common services for each of the three buildings. The individual hourly meter data measured each resident's electricity consumption for before and after TOU prices came into effect.

In addition, the account numbers for five participants in Building 3 with water heater load controls were also provided by Oakville Hydro.

Although hourly meter data was provided for all of the condominium units, 60 units (approximately 20% of the participating customers) had to be excluded from the analysis because the unit's occupants had changed during the analysis period or for other reasons. A breakdown of the participants analyzed by building is provided in Table 6.

Table 6: Breakdown of Participants Analyzed by Building

	Number of Customer Analyzed	Percentage of Units
Building 1	74	70%
Building 2	83	80%
Building 3	70	92%

As presented in Table 5, communication activities undertaken by Oakville Hydro varied by building as follows:

- Residents in all three buildings were sent an introductory recruitment letter and an informational insert discussing the benefits of smart meters. A sample recruitment letter and informational insert has been provided in Appendix A. Residents were also encouraged to access their account online where they could monitor their electricity usage, compare their usage with other residents and view tips on how to conserve electricity. An example of an online customer account has also been provided in Appendix A.
- Oakville Hydro hosted a general meeting on October 24 2005 for all residents of Building 1 detailing the process for conversion to individual metering and explaining the benefits of individual metering versus bulk metering, with information on TOU rates and a Q&A session held at the end of the meeting to address any concerns residents had.
- Two-representatives of Oakville Hydro met with individual residents in Buildings 3 in pre-arranged 10 minute one-on-one sessions with the intent of answering any questions or concerns with regards to the new meter system and presenting monthly graphs of the personal hourly energy consumption for each resident during these sessions.

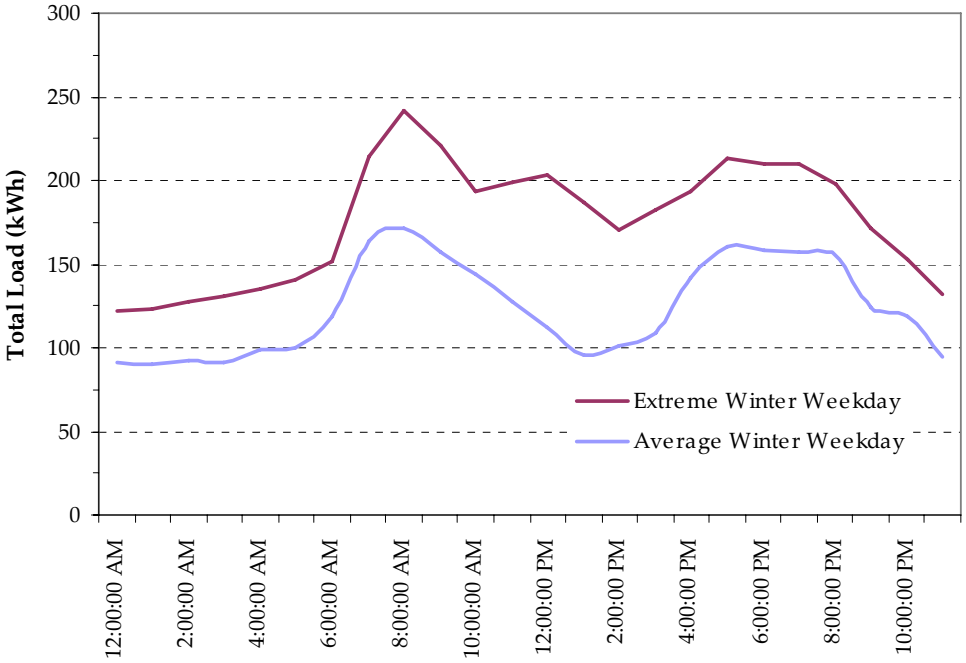
Feedback from one of the participants through an email to Oakville Hydro is provided in Appendix B.

Pre-TOU Consumption Patterns

The following figures represent typical winter and summer weekday load profiles for the analyzed study participants in Building 3 in the pre-TOU period when they were billed under RPP tiered prices (i.e., after conversion to individual metering)[4] [5]. Extreme winter and summer days are also provided for comparison in the figures.

[4] Given the conversion dates to individual metering and billing under RPP tiered prices, winter consumption under tiered prices was not available for buildings 1 and 2.

Figure 5: Pre-pilot Load Shape (Building 3) for Typical and Extreme Winter Weekday

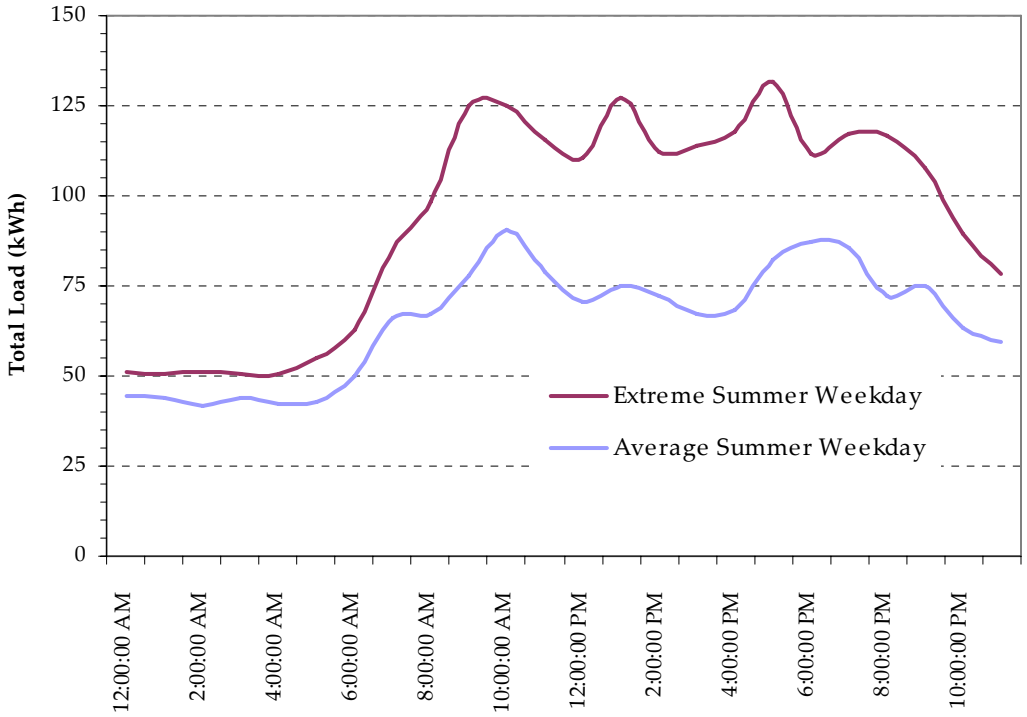


As shown in Figure 5, the total demand for a *typical* winter day for the participants included in the analysis (only data from participants belonging to Building 3 were available during pre-TOU winter) peaks just above 170 kW between 7:00 and 8:00 am and just below 245 kW between that same time during an *extreme* winter day[6].

[5] To facilitate comparison with the winter loadshapes, summer loadshapes are provided for Building 3 only.

[6] An extreme winter day taken Jan 16, 2006 which had 241 heating-degree hours, whereas an average winter weekday, such as Jan 23, 2006, had 171 heating-degree hours.

Figure 6: Pre-Pilot Load Shape (Building 3) for Typical and Extreme Summer Weekday



As illustrated in Figure 6, the total demand for a *typical* summer day for the participants in Building 3 is approximately 90 kW at 10:00 am. The demand profile for an *extreme* summer day[7] follows a similar pattern, however peaks just around 130 kW at 5:00 pm, which is likely due to increased cooling load at that time.

Approximately 78% of study participants' electricity consumption falls below the RPP threshold, and is thus most of the participants' consumption is (or would be) subject to the lower Tier 1 price.

[7] An extreme summer day taken on August 1, 2006, which had 242 cooling-degree hours, whereas an average summer weekday, such as August 10, 206, had 44 cooling-degree hours.

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CUSTOMER DEMAND RESPONSE

The two main questions this study was intended to address were:

1. To what extent do condominium residents reduce their electricity consumption in changing from bulk metering to individual metering; and
2. How and to what extent do condominium residents change their consumption patterns in response to time-of-use rates.

For the first part, it is expected that customers will reduce their energy consumption when switching from bulk metering to individual metering since their electricity costs will be more transparent and they will be able to control their electricity costs, hence providing them with a greater incentive to reduce consumption. For example, the benefits (reduction in electricity costs) of any change in usage are shared with the other residents with bulk-metering, while the resident realizes all of the benefits once the unit is individually-metered. In terms of the time-of-use rates, it is expected that customers will shift consumption away from those periods when electricity is relatively more expensive toward those periods when electricity is relatively less expensive. This chapter provides the results of our analysis with respect to these questions.

It should be noted that this study only captures short-term responses to individual metering and time-of-use rates. These will include primarily changes in behaviour that are relatively easy to make – for example, turning lights off during On-Peak periods. It is expected that additional changes will occur over time as customers further adjust their actions and acquire equipment that helps them control their electricity use – for example, installing more efficient equipment or timers on lights. Residential consumers have also never paid electricity prices that change based on time and it will take some time before they become accustomed to it. Thus, the magnitude of the changes in consumption and consumption patterns observed in this study are expected to increase over time.

Overview

The following sections present Navigant Consulting's detailed analysis of the change from 1) bulk metering to individual metering and billing tiered pricing and then from 2) tiered pricing to time-of-use pricing. Each of these changes are analyzed for each of the three buildings and, in some cases, for individual participants in each of the three buildings.

Specifically, the following results are presented in subsequent sections:

- Impact of change in consumption from bulk to individual metering
- Impact of change from tiered prices to time-of-use prices

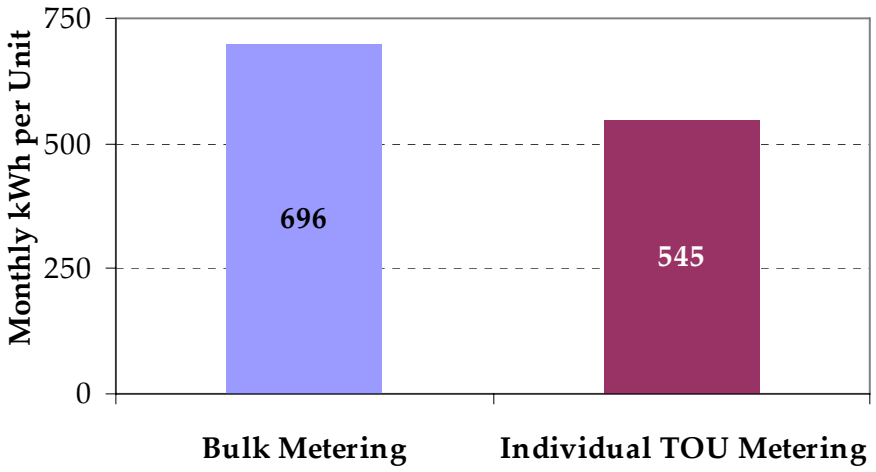
- Changes in consumption patterns from tiered prices to time-of-use prices, including elasticity impacts, and
- Commodity cost impacts – time-of-use prices versus tiered prices.

Navigant Consulting recognizes that some readers may just want a quick synopsis of what happened in the pilot and may not have time to delve into all of the detailed results. The following summary results are intended for these readers. The summary results are based on participants in Building 1, but are generally representative of what happened in the other buildings. For a more in-depth understanding of the specific changes occurring at each stage of the pilot and differences between the buildings, readers are encouraged to carefully review the detailed results provided in the subsequent sections of this chapter.

Summary Results

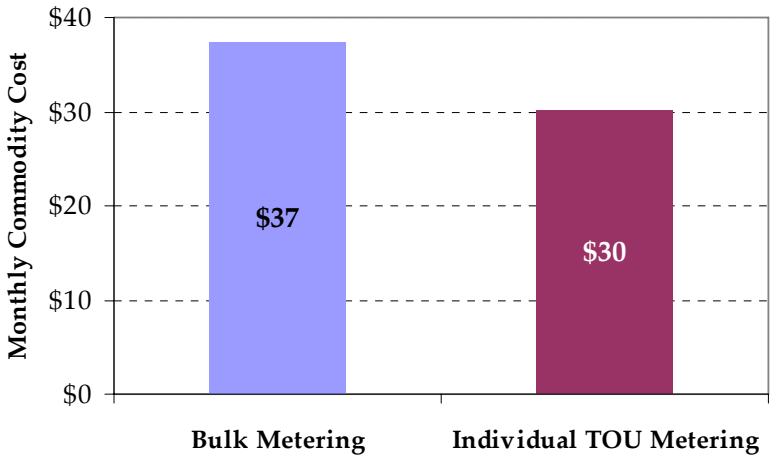
In the change from bulk metering to individual metering with time-of-use rates, the average consumption for each unit went from about 700 kWh per month to about 550 kWh per month, a 22% reduction in consumption. This is shown in Figure 7.

Figure 7: Change in Consumption from Bulk to Individual Metering with TOU Rates



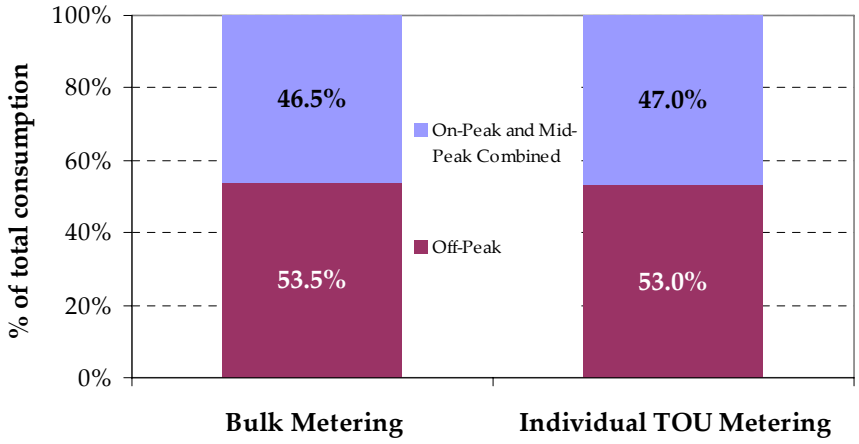
Commodity costs decreased significantly from $37 per month to $30 per month, a 20% reduction due largely to the significant reduction in consumption. Note that under bulk metering, the $37 per month would have represented the cost to the building owner or manager and that this cost would be expected to flow through to the unit residents through some cost allocation or cost sharing method. It is also interesting to note that even though a significant portion of the unit residents consumption under bulk metering fell under the lower Tier 1 price, the commodity cost under time-of-use rates was lower, again largely due to the significant reduction in consumption. This is shown in Figure 8.

Figure 8: Change in Monthly Commodity Cost from Bulk to Individual Metering with TOU Rates



The reduction in consumption was spread more or less evenly over the three time-of-use pricing periods (On-Peak, Mid-Peak and Off-Peak). Expressed as a percentage of their total consumption, the amount of consumption in the On-Peak and Mid-Peak periods combined increased slightly from 46.5% while participants were bulk metered to 47% under time-of-use rates. This is shown in Figure 9.

Figure 9: Change in Consumption Patterns from Bulk to Individual Metering with TOU Rates



Please note that these results may appear somewhat inconsistent with specific detailed results given in the following sections. This is largely because the results in the following sections reflect the changes occurring between the different stages of the pilot – first the change from bulk to individual metering with tiered prices and then the change from tiered prices to time-of-use prices – and are provided on a building-by-building basis. The summary results given above ignore the intervening individual metering with tiered prices period and jump directly from bulk metering to individual metering with time-of-use prices. As a result, Navigant Consulting believes that, based on the structure of and data

available from the pilot, the summary characterization given above provides a reasonable approximation of the expected behaviour of and impact on condominium residents in switching from bulk metering to individual metering with time-of-use prices.

Individual Metering Impact

The first step in estimating the change in consumption for participants going from bulk metering to individual metering was to develop a regression model for each building's daily consumption in the period prior to the implementation of individual metering. This regression model included heating degree days and cooling degree days[8] as independent variables. Time was also added to the regression equation as an independent variable to determine whether there was a steady upward or downward trend in consumption. The results of the regression equation provided a very good match with each building's actual consumption.[9]

The regression models were then used to estimate each building's consumption in the period after implementation of individual metering based on actual weather in the post-individual metering period. This estimate was then compared with actual consumption and adjusted as necessary to include common area usage[10] and the difference between the estimates and actual was identified.

Note that given the varying periods in which participants in the three buildings were billed on tiered prices versus time-of-use prices, our primary analysis did not differentiate between bulk metering to individual metering with tiered prices and bulk metering to individual metering with time-of-use prices. Rather, our primary analysis was on the impact of the change from bulk to individual metering, without consideration of whether participants were billed under tiered prices or time-of-use prices. We did estimate the change in consumption for pilot participants going from tiered pricing to time-of-use pricing and present these results later in this report, but given the relatively short period for

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8 Temperature data was available on an hourly basis, so we compared the weather in the pre-TOU and TOU periods on a degree-hour basis, with a degree-hour representing the difference between the base temperature and the actual temperature for each hour in the analysis period. Heating or cooling requirements are often reported on a degree-day basis, typically using the average temperature for the day as the basis for comparison. In most cases (except for mild weather conditions), 24 degree-hours would be equivalent to 1 degree-day.

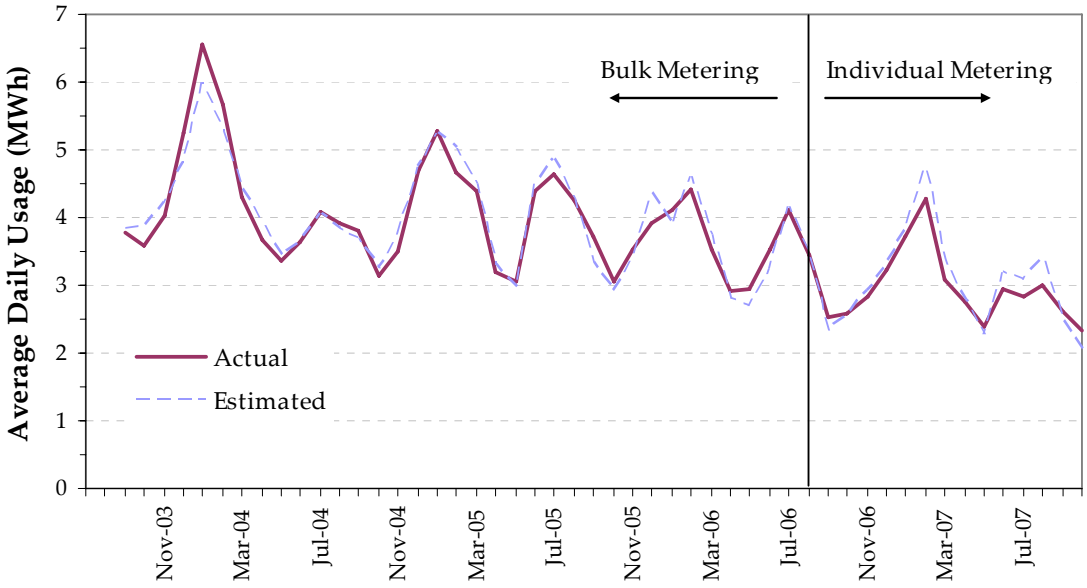
9 The regression model was developed internally by Navigant Consulting for the purposes of this pilot study. Bulk monthly consumption data provided by Oakville Hydro for the three buildings was regressed against heating degree days, cooling degree days, and time.

10 For example, if pre-individual metering data was available for the entire building, this consumption would include common area usage as well. For comparison purposes, this common area usage was also included in the post-individual metering consumption.

which many of the pilot participants were exposed to tiered prices, these results should be viewed with caution.

Figure 10 shows the actual average daily consumption patterns by month for Building 1 since 2003 and the estimated average daily consumption based on the results of the regression model developed for Building 1 using actual weather. As discussed, the estimated average daily consumption from the regression model tracks the actual consumption quite closely in the period prior to the switch to individual metering in August 2006.

Figure 10: Comparison of Actual and Estimated Average Daily Consumption for Building 1



Similar patterns are observed for Buildings 2 and 3, as seen in Figure 11 and Figure 12.

Figure 11: Comparison of Actual and Estimated Average Daily Consumption for Building 2

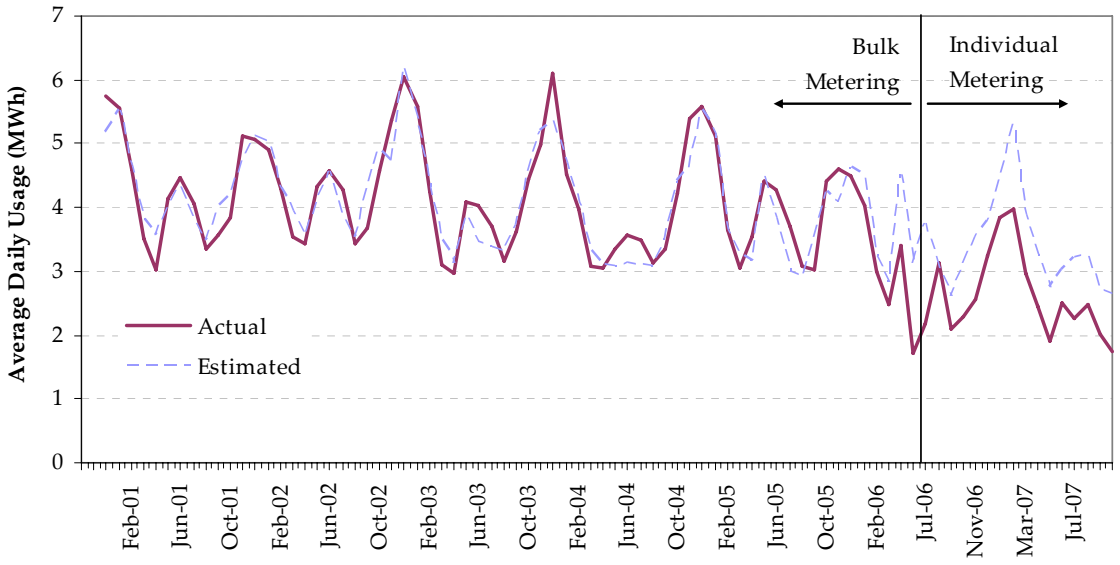
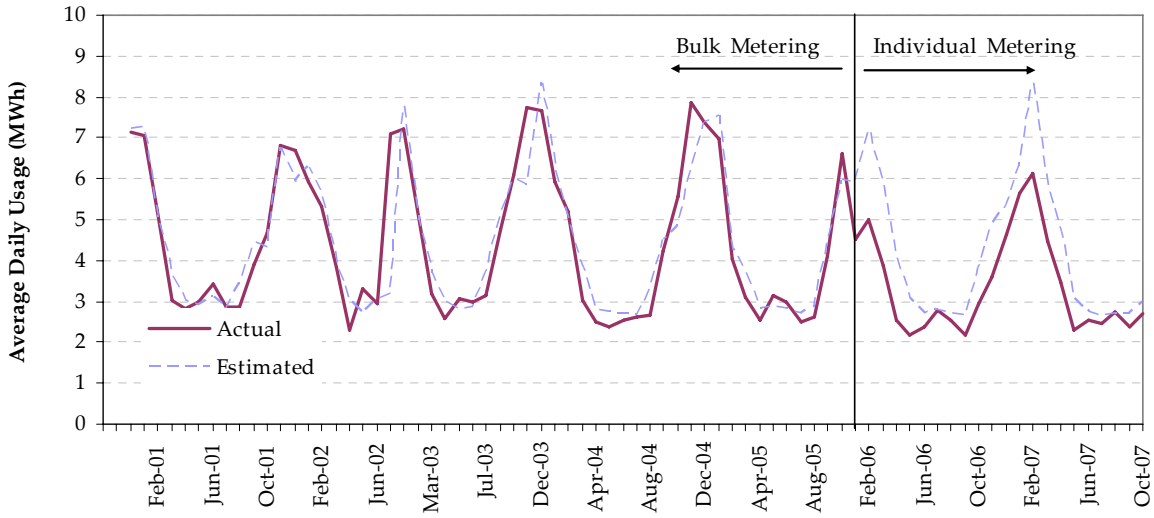


Figure 12: Comparison of Actual and Estimated Average Daily Consumption for Building 3



The conservation effect for the entire building due to the switch from bulk to individual metering was determined by subtracting the actual average daily consumption in the period after implementation of individual metering from the estimated average daily consumption based on the regression model using actual weather data from the post-individual metering period.

For Buildings 2 and 3, the average decrease in consumption from bulk metered to individual metered was estimated to be 24% and 19% respectively. This reduction is evident in Figure 11 and Figure 12 above. Interestingly, consumption in Building 1 was found to decrease by only 2%, which is significantly less than the other two buildings. However, it should be

noted that, based on the results from the regression model, the overall consumption for Building 1 was found to decline by 11% annually from 2003 through 2006[11]. This trend may have been partially influenced by Oakville Hydro's January 2006 communication of the pending pilot to residents in this building (residents in the other two buildings were not provided with as much advance notice). Given our analytic approach, this downward trend in consumption was carried forward into the post-individual metering period, which would reduce the estimated post-individual metering consumption.

As discussed, the results presented above are for entire buildings, not individual units within these buildings. In order to determine the average change in consumption for each unit within a building, common area usage was subtracted from the estimated and actual metering data. After making these adjustments, the estimated reduction for the individual units within each of the three buildings is as follows:

- 3% average decrease in consumption for units in Building 1. Note that this decrease is net of the 11% annual reduction in consumption observed for this building in the period prior to implementation of individual metering described above. If the continuation of the 11% annual reduction in annual consumption for Building 1 is attributed to the change to individual metering, the average reduction in consumption for units in this building would be 14%. Also note that, as discussed above, participants in this building were given more advance notice of the switch to individual metering than participants in the other two buildings
- 34% average decrease in consumption for units in Building 2, and
- 23% average decrease in consumption for units in Building 3.

Using 3% as the average reduction in annual consumption for units in Building 1, the average reduction in unit consumption for all the three buildings was 20%. Using 14% as the average reduction in annual consumption for units in Building 1 (i.e., attributing the continuation of the observed downward trend in consumption for this building to the change to individual metering), the average reduction in unit consumption for all three buildings was 24%.

[11] The 11% annual decrease in consumption was determined through the regression model. When the regression equation included a time trend variable, the value of R-squared (i.e., indication of how much of the variation in consumption can be explained by the regression equation) was 0.92, indicating a very good fit. When the time trend variable was excluded, the R-squared value from the regression model was only 0.73. The time trend coefficient was statistically significant.

Change in Consumption under TOU Prices

Some other studies of time-of-use rates have found an overall conservation effect: not only do consumers shift their consumption from higher priced periods to lower priced periods, they also reduce their overall consumption, perhaps because of an increased awareness of their electricity use.

Estimates of the change in consumption for pilot participants going from tiered pricing to time-of-use pricing are presented below. Note that given the relatively short periods for which many of the pilot participants were exposed to tiered prices, these results should be viewed with caution. Also, note that the changes presented below are included in the results given above for the change in consumption from bulk to individual metering (i.e., they are NOT incremental to the savings given above for individual metering).

According to the analysis, Building 1 experienced the largest decrease – 14% – in consumption under time-of-use prices as compared to the three month period under tiered pricing. Note, however, that the period under tiered pricing for residential in Building 1 was very short and that, as discussed above, the overall consumption for this building had been declining by 11% annually in the period prior to implementation of individual metering. The overall consumption of Building 2 declined by 10% under time-of-use prices as compared to the five month period under tiered pricing. Finally, the overall consumption of Building 3 increased by 2% under time-of-use prices as compared to the ten month period under tiered pricing. This wide variability across these three buildings reinforces the previous statement that these results should be viewed with caution.

Time-of-Use Rates and Elasticity Impact

Depending on which building they lived in, pilot participants had different periods on tiered RPP prices before going to time-of-use prices. The length of time on tiered RPP prices varied from only three months for participants in Building 1 and five months for participants in Building 2 to ten months for participants in Building 3. In comparing the consumption patterns of participants under tiered RPP prices with their patterns under time-of-use prices, our analysis focused on periods covering the same months of the year for each of the three buildings. For example as shown in Table 7, the pre-TOU period for Building 1 was August through October 2006 and the corresponding TOU period for Building 1 was August through October 2007.

Table 7: Summary of Analysis Periods for the Three Buildings

	Pre-TOU Period	TOU Period
Building 1	August 1– October 31, 2006	August 1 – October 31, 2007
Building 2	June 1 – October 31, 2006	June 1 – October 31, 2007
Building 3	January 1 – October 31, 2006	January 1 – October 31, 2007

The weather experienced by participants differed markedly in the pre-TOU period compared with the TOU period. To correct for this, Navigant Consulting developed a regression model for each building to estimate the aggregate consumption for all of the analyzed participants in each of the four time-of-use periods (On-Peak, Mid-Peak, Off-Peak weekdays and Off-Peak weekends) based on heating and cooling degree days.

Using the regression model, the actual meter data was adjusted to reflect "average" weather as experienced in the period from 2001 through 2007 for both the pre-TOU and TOU periods. Within these two periods, the resultant weather-corrected consumption was calculated for each of the four time-of-use periods. This calculation was done for each individual participant in each of the three buildings.

Pre-TOU Period versus TOU Period Consumption Patterns

Figure 13 and Figure 14 show the total average hourly consumption for all analyzed participants in Buildings 2 and 3 for a typical summer weekday and weekend[12] in the pre-TOU and TOU periods. On weekdays, morning consumption (Off-Peak and during the first half of the morning Mid-Peak period) appears to be slightly higher in the TOU period compared with the pre-TOU period and slightly lower in the afternoon and early evening hours (On-Peak and evening Mid-Peak period). Morning and afternoon consumption on weekends is marginally higher in the TOU period in comparison to the pre-TOU period, but remains slightly lower during the evening hours.

It is important to note that the consumption pattern of Buildings 2 and 3 in the pre-TOU period differs from the typical consumption pattern for Ontario RPP consumers. As shown in Figure 13, pilot participants' consumption in the pre-TOU period was highest during the two Mid-Peak periods, whereas the typical RPP consumers' consumption tends to be highest in the On-Peak period. In the TOU period, the pilot participants' "peaks" in the Mid-Peak period were markedly reduced, resulting in a somewhat "flatter" consumption pattern which is the objective of TOU pricing.

12 Due to the limited pre-TOU summer data information available for Building 1, only data from the participants in Buildings 2 and 3 are presented in Figure 13 and Figure 14 (common service consumption was also removed for each building).

Figure 13: Typical Total Summer Weekday Demand

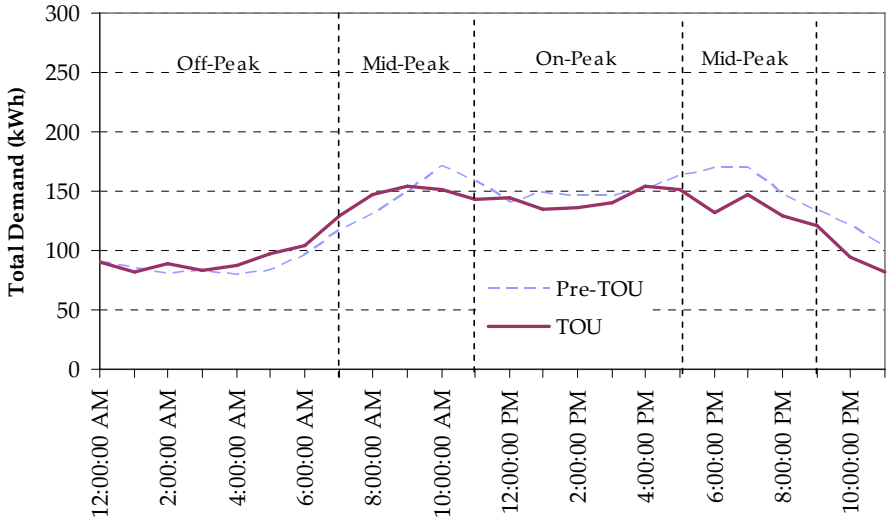


Figure 14: Typical Total Summer Weekend Demand

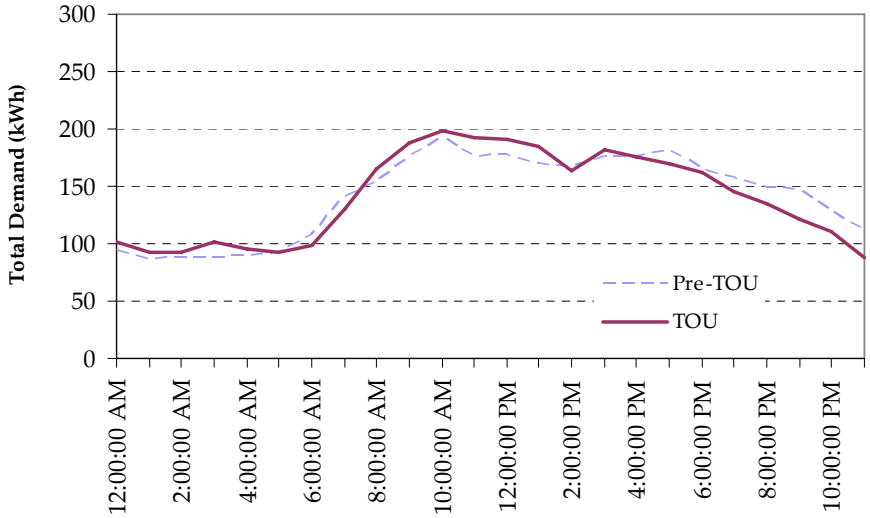
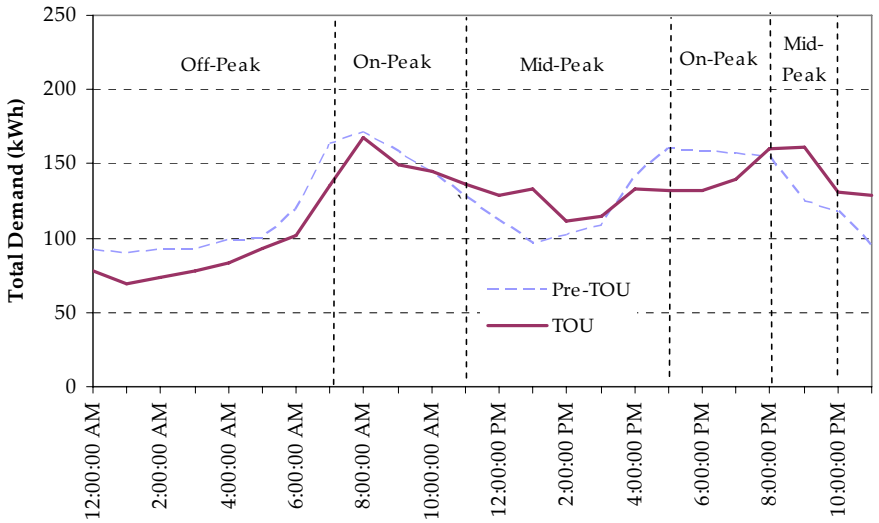


Figure 15 show the total consumption of participants in Building 3 for a typical winter weekday in the pre-TOU and TOU period.[13] Interestingly, weekday consumption in the morning Off-Peak period (before 7 am) tends to be marginally lower in the TOU period than in the pre-TOU period and significantly lower during the evening On-Peak period, while Mid-Peak and late evening consumption is higher in the TOU period. The shift in the

[13] Due to the limited pre-TOU winter data information available for Buildings 1 and 2, only data from the participants in Buildings 3 are presented Figure 15 (common service consumption and participants with timers for their water heaters were removed from this analysis).

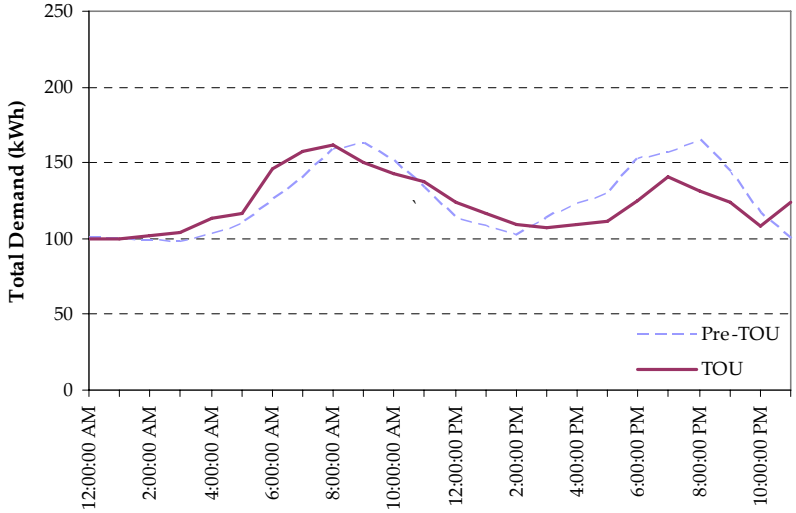
evening from On-Peak to Mid-Peak may be a result of shifting activities such as running the dishwasher later in the evening rather than immediately after dinner.

Figure 15: Typical Total Winter Weekday Demand



As shown in Figure 16, winter weekend consumption tends to be higher during the morning and early afternoon hours in the TOU period, however remains lower for all subsequent hours of the day.

Figure 16: Typical Total Winter Weekend Demand



Load Shifting

Table 8 summarizes the absolute change in actual consumption in the TOU period relative to the pre-TOU period for each of the three time-of-use price periods (i.e., On-Peak, Mid-

Peak and Off-Peak). To better understand how Off-Peak consumption changed, the Off-Peak period has been broken into weekday and weekend periods (although both periods are subject to the same Off-Peak price). Interesting findings are highlighted below:

- As mentioned previously, overall consumption for Buildings 1 and 2 decreased by 14% and 10% respectively when switching from tier pricing to TOU pricing. Consumption in each of the three time periods decreased, with the greatest decrease occurring in the Mid-Peak period.
- Overall consumption increased by 2% for Building 3, with slight reductions in consumption during the On-Peak and Mid-Peak periods more than offset by increased consumption in the Off-Peak period.

Table 8: Change in Actual Consumption by Group and TOU Period

Group	On-Peak	Mid-Peak	Off-Peak			Total
			Weekday	Weekend	Combined	
Actual Consumption (relative to consumption in corresponding pre-TOU period)[14]						
Building 1	**-10.4%**	**-20.1%**	**-15.0%**	**-10.4%**	**-12.1%**	**-14.1%**
Building 2	**-6.4%**	**-13.0%**	**-12.6%**	**-8.7%**	**-10.1%**	**-10.2%**
Building 3	**-2.8%**	**-1.9%**	**9.9%**	**4.5%**	**6.5%**	**2.2%**

While Table 8 summarizes the change in absolute consumption, Table 9 presents the change in consumption in each of the three time-of-use pricing periods expressed as a percentage of the total consumption in the pre-TOU and TOU periods. This presentation essentially ignores changes in overall consumption levels. Instead, it focuses on the degree of load shifting or the degree to which the percentage of total consumption in each of the three time-of-use pricing changed in the TOU period compared with the pre-TOU period. Interesting findings are highlighted below:

- All three buildings exhibited an increase in Off-Peak consumption as expressed as a percentage of total consumption. It is interesting to note that the relative increase – 4.2% for Building 3, 2.4% for Building 1 and 0.2% for Building 2 – mirrors the relative "intensity" of Oakville Hydro's communications activities with residents in these buildings (i.e., one-on-one sessions with residents in Building 3, general information and Q&A sessions with residents in Building 1 and no specific information sessions for

[14] Calculated as [average consumption (kWh) in TOU period – average consumption (kWh) in pre-TOU period] divided by average consumption (kWh) in pre-TOU period and expressed as a percentage. For example, if the average On-Peak consumption in the TOU period was 90 kWh and the average On-Peak consumption in the pre-TOU period was 100, the result would be -10% (i.e., [90 – 100]/100 = -10%).

residents in Building 2). This observation suggests that utility communication efforts can have a significant impact on the degree of load shifting in response to TOU rates.

- All three buildings exhibited a reduction in the percentage of overall consumption during the Mid-Peak period, with the greatest decrease experienced by Building 1 with a 7% reduction.
- Only one of the buildings, (Building 3) experienced a reduction in the percentage of overall consumption during the On-Peak period (5%), whereas Buildings 1 and 2 experienced a slight increase in On-Peak consumption of approximately 4%. As discussed, Building 3 has individual electric furnaces in each unit, whereas the other two buildings do not. Further, participants in Building 3 are primarily seniors, whereas participants in the other two buildings are primarily singles and couples. These differences may contribute to the different On-Peak responses observed.

Table 9: Change in Percentage of Total Consumption by Group and TOU Period

Group	On-Peak	Mid-Peak	Off-Peak			Total
			Weekday	Weekend	Combined	
Change in percentage of total consumption[15], expressed as a percentage						
Building 1	**4.3%**	**-6.9%**	**-1.0%**	**4.4%**	**2.4%**	
Building 2	**4.2%**	**-3.1%**	**-2.7%**	**1.7%**	**0.2%**	
Building 3	**-4.9%**	**-4.0%**	**7.6%**	**2.2%**	**4.3%**	

When considering the impact of TOU rates, it is important to consider both the absolute change in consumption (as given in Table 8) and changes in consumption patterns (as given in Table 9). For example, participants in Buildings 1 and 2 exhibited a significant reduction in absolute consumption across all three time-of-use price periods in the TOU period relative to the pre-TOU period, but proportionately more of their reduction was in the Mid-Peak period. Hence, even though their On-Peak consumption decreased in absolute terms, it increased as a percentage of their total consumption in the TOU period. In contrast, participants in Building 3 also decreased their absolute consumption in the On-Peak and Mid-Peak periods but increased their absolute consumption in the Off-Peak period. As a

[15] Calculated as [percentage of total consumption in TOU period – percentage of total consumption in pre-TOU period] divided by percentage of total consumption in pre-TOU period and expressed as a percentage. For example, if On-Peak consumption represented 19% of overall consumption in the TOU period and 20% of the total consumption in the pre-TOU period, the result would be 5% (i.e., [19% – 20%]/20% = 5%). In the example given, On-Peak consumption expressed as a percentage of total consumption decreased by 5% – 20% x 0.95 = 19%. Note that results presented are a percentage of a percentage (5% of 20%), not the absolute change in percentage.

result, their On-Peak and Mid-Peak consumption decreased as a percentage of total consumption.

Moving from the response of participants in each of the three buildings to the entire group of participants, Figure 14 shows the breakdown of total consumption for all participants into each of the time-of-use price periods (with the Off-Peak period further subdivided into weekday Off-Peak and weekend Off-Peak sub-periods). The proportion of consumption during On-Peak hours actually increased marginally by 0.5%, while Mid-Peak consumption decreased by 2.0%. Correspondingly, there is a small 0.2% shift of overall consumption to Off-Peak weekday and an additional 1.1% shift to weekends/holidays. Put a different way, the amount of On-Peak consumption expressed as a percentage of total consumption increased by 3.0% (i.e., [19.9% – 19.4]%/19.4% = 2.6%), while Mid-Peak consumption decreased by 6.5%. Off-peak weekday consumption and weekend/holiday consumption both increased by 1.5% and 3.5%, respectively. The results are consistent with the "average' across the three buildings as shown in Table 9 above.

Figure 17: Breakdown of Consumption by TOU period for All Three Buildings

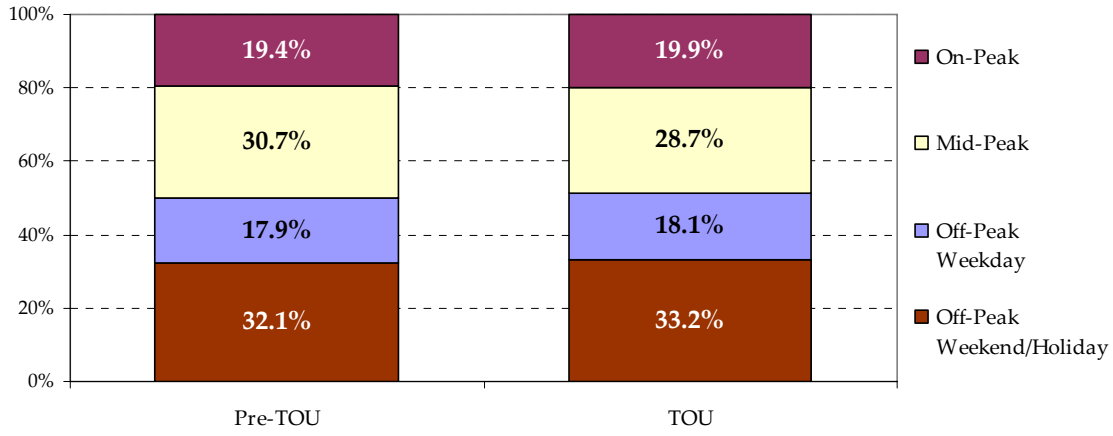
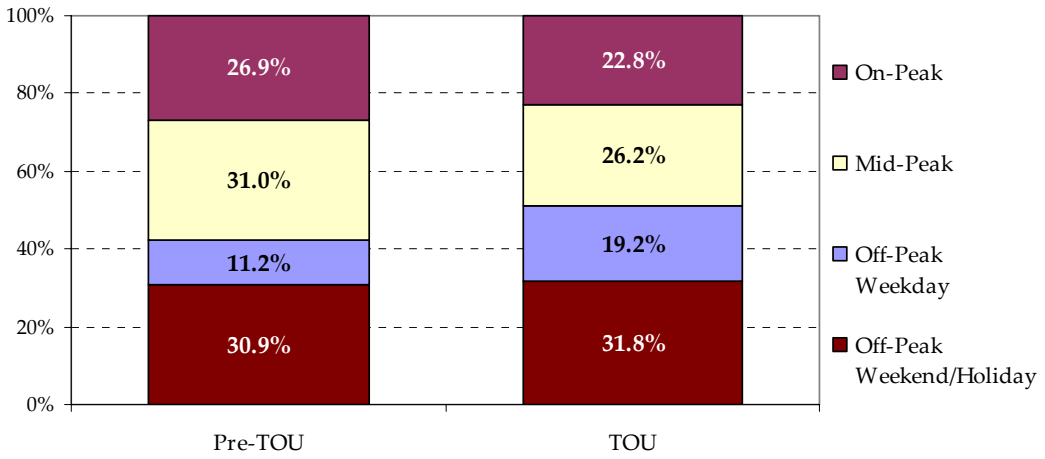


Figure 18 illustrates the breakdown in of total consumption for all the analyzed customers with electric water heater controllers/timers. There is a significant reduction in both On-Peak and Mid-Peak usage (each representing a 15% decrease) combined with an increase in Off-Peak usage, primarily to weekday Off-Peak usage. This shift is likely due to the controllers/timers shifting the reheating period for the water heaters away from On-Peak and Mid-Peak periods rather than allowing the water heaters to reheat throughout the day based on hot water usage.

Figure 18: Breakdown of Consumption by TOU period for Participants with Water Heater Timers



Elasticity

The relationship between price and consumption can be quantified in two ways: as price elasticities or as elasticities of substitution.

Price elasticity refers to how much consumption of one product changes as its price changes, without regard for the price of other products. For example, as the price of electricity increases, consumers are likely to run their air conditioners less. *Elasticity of substitution* refers to how demand for two products changes as their relative prices change. For example, if electricity late at night is much less expensive than electricity during the early evening, then consumers may choose to run high consumption appliances late at night. In this case, electricity used at different times of the day are considered to be separate products.

Which of these two measures is appropriate depends on whether the product has a good and easily available substitute. For some uses, electricity use can be shifted from one time to another. For other uses, substitution is less effective; for example, running an air conditioner at night when the outside temperature is cool is not a good substitute for running it in the afternoon when temperatures are high.

In this section, both price elasticities and elasticities of substitution are calculated. No assumption is made about which one is more appropriate.

For both types of elasticities, the relevant price is the *marginal price* of electricity – i.e., the price of increasing consumption by one more unit. Our analysis is based on the commodity cost, exclusive of variable distribution, transmission and other regulated charges[16]. For

[16] Had these other variable costs been taken into consideration, the resultant elasticity estimates would have been higher since these costs represent essentially a fixed increment on the commodity charges both pre-TOU and during the pilot period.

customers under tier pricing, the marginal price depends on whether monthly consumption is above or below the threshold level. In the pre-TOU period, for example, 44% of the participants in Building 1 had monthly consumption in excess of the threshold. Their average marginal cost of electricity was thus:

44% x Tier 2 Price + 56% x Tier 1 Price

Over the 3-month pre-TOU period, this works out to be on average 6.20¢/kWh. Note that this *marginal* price (for an incremental kWh consumed) is higher than the *average* price of 5.93¢/kWh for these participants.

During the TOU period, the marginal prices are simply the TOU prices, as the price (within a TOU period) does not change as the level of consumption changes. For some purposes, it will be necessary to use the average price of electricity during the combined Mid-Peak and Off-Peak periods, or during the combined On-Peak and Mid-Peak periods. This is calculated as the weighted average of consumption during the TOU period. The relevant prices are shown for each of the three buildings in Table 10 through Table 12.

Table 10: Electricity Prices for Elasticity Calculations in Building 1

(¢/kWh)	Aug - Oct'06	Average
Tier Prices		
Tier 1 Price	5.80	
Tier 2 Price	6.70	
Threshold (kWh/month)	600	
Average Marginal Price	6.20	**6.20**
	Aug – Sep '07	**Average**
TOU Prices		
On-Peak Price	9.20	**9.20**
Mid-Peak Price	7.20	**7.20**
Off-Peak Price	3.20	**3.20**
Non-Off-Peak Price	8.00	**8.00**
Non-On-Peak Price	4.68	**4.68**

Table 11: Electricity Prices for Elasticity Calculations in Building 2

(¢/kWh)	June - Oct'06	Average
Tier Prices		
Tier 1 Price	5.80	
Tier 2 Price	6.70	
Threshold (kWh/month)	600	
Average Marginal Price	6.21	**6.21**
	June – Sep '07	**Average**
TOU Prices		
On-Peak Price	9.20	**9.20**
Mid-Peak Price	7.20	**7.20**
Off-Peak Price	3.20	**3.20**
Non-Off-Peak Price	8.00	**8.00**
Non-On-Peak Price	4.68	**4.68**

Table 12: Electricity Prices for Elasticity Calculations in Building 3

(¢/kWh)	Jan '06 - Apr '06	May - Oct'06	Average
Tier Prices			
Tier 1 Price	5.00	5.80	
Tier 2 Price	5.80	6.70	
Threshold (kWh/month)	1,000	600	
Average Marginal Price	5.66	6.46	**6.03**
	Feb - Apr '07	**May – Sep '07**	**Average**
TOU Prices			
On-Peak Price	9.70	9.20	**9.50**
Mid-Peak Price	7.10	7.20	**7.14**
Off-Peak Price	3.40	3.20	**3.32**
Non-Off-Peak Price	8.28	8.10	**8.21**
Non-On-Peak Price	4.63	4.53	**4.59**

Price elasticity is defined as the percentage change in the quantity demanded compared to the percentage change in the price. On-peak, Mid-Peak and Off-Peak electricity can be treated as three separate products. In the pre-TOU period, the price was the same for all three. The resulting price elasticities, shown in Table 13 through Table 15 , range from -124%

to 25%. (The minus sign indicates that as price increases, demand decreases. This is true for most products.)

Table 13: Electricity Prices for Elasticity Calculations for Building 1

Time Period	Change in Demand	Change in Price	Elasticity
On-Peak	-10.4%	48.5%	-21.5%
Mid-Peak	-20.1%	16.2%	-123.9%
Off-Peak	-12.1%	-48.4%	24.9%

Table 14: Electricity Prices for Elasticity Calculations for Building 2

Time Period	Change in Demand	Change in Price	Elasticity
On-Peak	-6.4%	48.1%	-13.3%
Mid-Peak	-13.0%	15.9%	-81.7%
Off-Peak	-10.1%	-48.5%	20.8%

Table 15: Electricity Prices for Elasticity Calculations for Building 3

Time Period	Change in Demand	Change in Price	Elasticity
On-Peak	-2.8%	57.6%	-4.9%
Mid-Peak	-1.9%	18.4%	-10.4%
Off-Peak	6.5%	-44.9%	-14.6%

The elasticity of substitution of two products is the ratio of (1) the *percent change* in their relative consumption (the ratio of consumption for the first product divided by the consumption for the second product) to (2) the *percent change* in their relative prices. In the pre-TOU period, prices for all three "types" of electricity (On-Peak, Mid-Peak and Off-Peak) were the same, so the price ratio was 1. This changed under TOU prices.

As shown in Table 16 through Table 19, the elasticities of substitution between On-, Mid- and Off-Peak electricity range from -20% to 44%. The calculation is complicated by dealing with three products instead of two; for example, the change in the demand for Mid-Peak electricity could be a result of its lower price compared to On-Peak electricity, its higher price compared to Off-Peak electricity, or both. A simpler approach is to collapse the three products into two: i.e., compare On-Peak electricity to Mid- and Off-Peak electricity combined, or compare Off-Peak electricity to On- and Mid-Peak electricity combined. This is shown in the last two columns of Table 16 through Table 19. The result is an elasticity of substitution of ranging between -20% and 6%.

Table 16: Elasticities of Substitution for Building 1

Time Period	On-Peak vs Mid-Peak	On-Peak vs Off-Peak	Mid-Peak vs Off-Peak	On-Peak vs Non On-Peak	Non Off-Peak vs Off-Peak
Ratio of Consumption					
Pre-TOU	0.66	0.40	0.60	**0.25**	**0.99**
TOU	0.74	0.40	0.54	**0.26**	**0.95**
Change	12.1%	1.9%	-9.1%	**5.5%**	**-4.7%**
Ratio of Prices					
Pre-TOU	1.00	1.00	1.00	**1.00**	**1.00**
TOU	1.28	2.88	2.25	**1.97**	**2.50**
Change	27.8%	187.5%	125.0%	**96.5%**	**149.9%**
Elasticity of Substitution	**43.6%**	**1.0%**	**-7.3%**	**5.7%**	**-3.2%**

Table 17: Elasticities of Substitution for Building 2

Time Period	On-Peak vs Mid-Peak	On-Peak vs Off-Peak	Mid-Peak vs Off-Peak	On-Peak vs Non On-Peak	Non Off-Peak vs Off-Peak
Ratio of Demand					
Pre-TOU	0.67	0.40	0.60	**0.25**	**1.00**
TOU	0.72	0.42	0.58	**0.26**	**1.00**
Change	7.6%	4.1%	-3.2%	**5.3%**	**-0.3%**
Ratio of Prices					
Pre-TOU	1.00	1.00	1.00	**1.00**	**1.00**
TOU	1.28	2.88	2.25	**1.97**	**2.50**
Change	27.8%	187.5%	125.0%	**96.5%**	**149.9%**
Elasticity of Substitution	**27.2%**	**2.2%**	**-2.6%**	**5.5%**	**-0.2%**

Table 18: Elasticities of Substitution for Building 3

Time Period	On-Peak vs Mid-Peak	On-Peak vs Off-Peak	Mid-Peak vs Off-Peak	On-Peak vs Non On-Peak	Non Off-Peak vs Off-Peak
Ratio of Consumption					
Pre-TOU	0.83	0.44	0.53	**0.29**	**0.97**
TOU	0.82	0.40	0.49	**0.27**	**0.89**
Change	-0.9%	-8.8%	-7.9%	**-6.2%**	**-8.3%**
Ratio of Prices					
Pre-TOU	1.00	1.00	1.00	**1.00**	**1.00**
TOU	1.33	2.86	2.15	**2.07**	**2.47**
Change	33.1%	186.1%	115.0%	**107.1%**	**147.2%**
Elasticity of Substitution	**-2.9%**	**-4.7%**	**-6.9%**	**-5.8%**	**-5.6%**

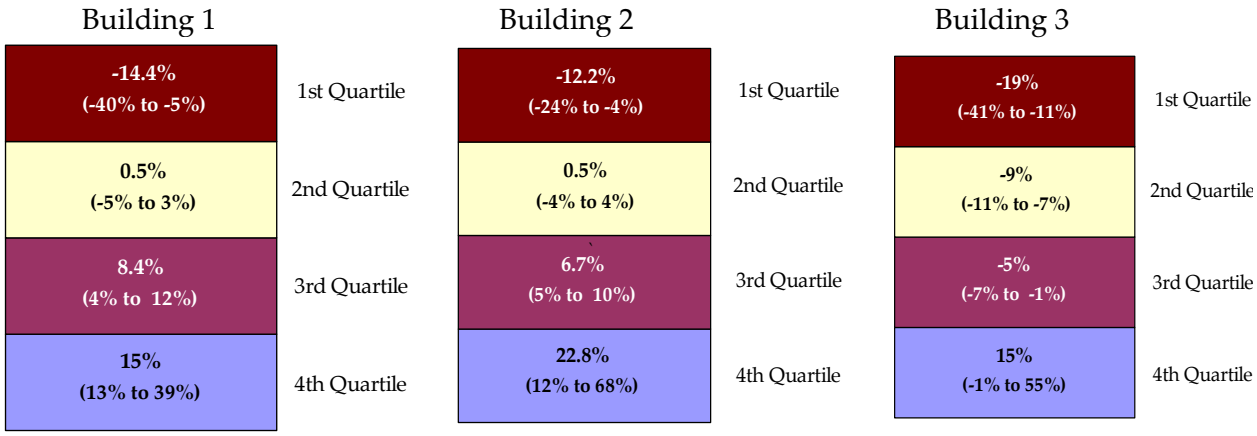
Table 19: Elasticities of Substitution for Participants with Water Heater Timers

Time Period	On-Peak vs Mid-Peak	On-Peak vs Off-Peak	Mid-Peak vs Off-Peak	On-Peak vs Non On-Peak	Non Off-Peak vs Off-Peak
Ratio of Consumption					
Pre-TOU	0.87	0.64	0.74	**0.37**	**1.37**
TOU	0.87	0.45	0.51	**0.30**	**0.96**
Change	0.4%	-29.9%	-30.2%	**-19.6%**	**-30.0%**
Ratio of Prices					
Pre-TOU	1.00	1.00	1.00	**1.00**	**1.00**
TOU	1.33	2.86	2.15	**2.07**	**2.47**
Change	33.1%	186.1%	115.0%	**107.1%**	**147.2%**
Elasticity of Substitution	**1.2%**	**-16.1%**	**-26.2%**	**-18.3%**	**-20.4%**

As an aid to exploring individual participant's response to time-of-use prices, aggregate elasticities of substitution – representing the average of the On-Peak vs. Non-On-Peak and

the Non-Off-Peak vs. Off-Peak elasticity of substitution – were calculated for each participant. The aggregate elasticity of substitution varied widely from -41% to +68% (where a positive elasticity of substitution means that the ratio of consumption between two TOU periods *increases* as the ratio of price increases). As shown in Figure 19, the average aggregate elasticity of substitution in the first quartile (i.e., the most price-responsive participants) ranges from -19% for participants in Building 3 to -12% for participants in Building 1. The average aggregate elasticity of substitution in the fourth quartile (i.e., the least price responsive participants) ranges from 15% for participants in Buildings 1 and 3 to 22% for participants in Building 2.

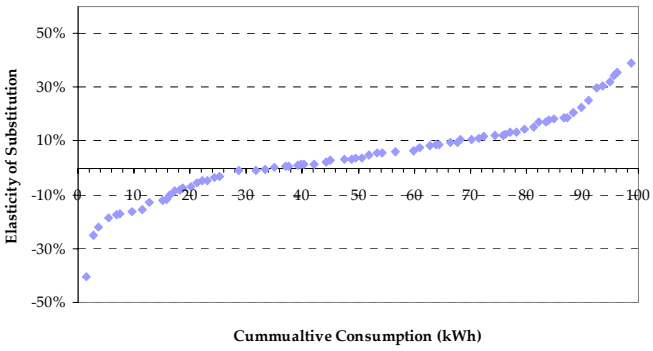
Figure 19: Breakdown of Individual Participant's Aggregate Elasticity of Substitution by Building



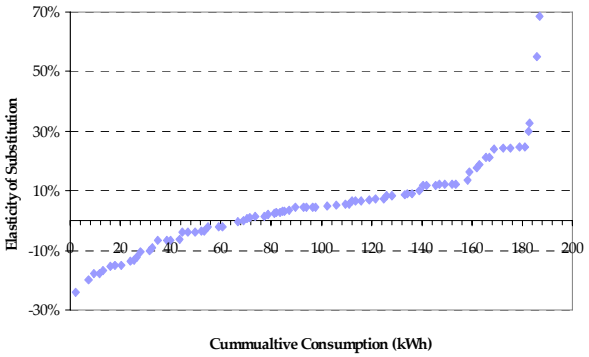
Separate scatter plots of each participant's aggregate elasticity of substitution plotted against the cumulative consumption of all participants in the building are given in Figure 20 for each of the three buildings. This provides another perspective on the distribution of aggregate elasticity of substitution across the participants in each of the buildings. Note that the majority of participants in Building 3 exhibit negative elasticities of substitution (as would be expected), but also that a significant number of the participants (specifically in Buildings 1 and 2) exhibit positive elasticities of substitution. Given that the aggregate elasticity of substitution was calculated as the average of the On-Peak to Non-On Peak and Non-Off Peak to Off-Peak elasticities of substitution, it is perhaps not surprising that many of the participants in Buildings 1 and 2 would exhibit positive aggregate elasticities of substitution. These two buildings exhibited marked reductions in consumption in all periods, but as shown in Table 8 on page 22, the largest reduction was in the Mid-Peak period, which resulted in a positive On-Peak to Non-On Peak elasticity of substitution for these buildings (as shown in Table 16 and Table 17). This positive On-Peak to Non-On Peak elasticity of substitution biases the aggregate elasticity for participants in these two building towards a positive value.

Figure 20: Scatter Plot of Participant Aggregate Elasticity of Substitution versus Cumulative Consumption

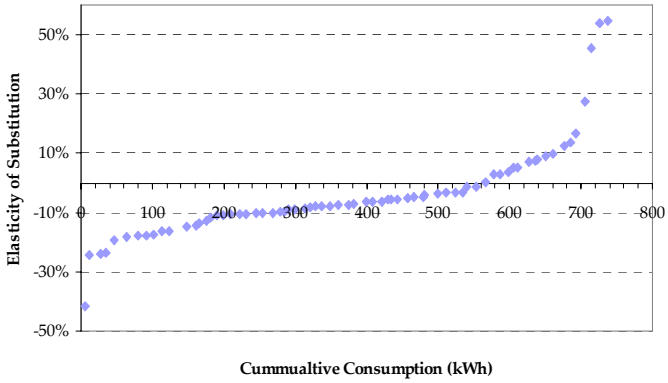
Building 1



Building 2



Building 3



Taking the simple average of the aggregate elasticity of substitution for all the pilot participants, we see that in general, participants were marginally responsive to the price changes, with an average aggregate elasticity of substitution of -0.6%, as shown in Table 20.

Table 20: Simple Average of Elasticities of Substitution for all Participants

Time Period	On-Peak vs Non On-Peak	Non Off-Peak vs Off-Peak	Aggregate
Building 1	5.7%	-3.2%	1.3%
Building 2	5.5%	-0.2%	2.7%
Building 3	-5.8%	-5.6%	-5.7%
Simple Average	**1.8%**	**-3.0%**	**-0.6%**

It should be noted that the elasticities estimated in this section are short-term elasticities reflecting changes in demand over relative short periods. The response during such short periods are limited primarily to behaviour changes that consumers can make easily, such as

changing the settings on their programmable thermostats or installing timers on their light fixtures. Over the long term, the response is expected to increase as consumers not only continue to change their own behaviour, but also invest in equipment that allows them to shift their electricity consumption from higher-priced periods to lower-priced periods, as seen with the participants with timers on their water heaters.

Estimated Commodity Cost Impacts

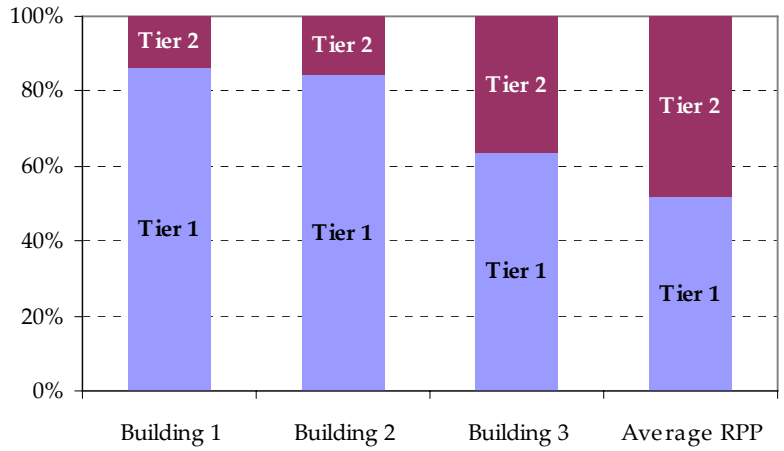
One of the factors that is most important to consumers is how TOU pricing will affect their monthly bills relative to what they would have paid had they remained on the two-tiered RPP prices.

The commodity cost impact was calculated for each resident by taking their electricity consumption for each month during the full TOU period and estimating their commodity charge (excluding distribution charges and other regulated charges) under both pricing plans: what they paid under TOU prices and what they would have paid had they remained on the tiered RPP prices. For the TOU price estimates, an average distribution of On-Peak, Mid-Peak and Off-Peak usage was taken for each customer based on their usage patterns during the TOU period. Similar to the load shifting and elasticity analysis presented above, only participants with complete electricity consumption data were used in this analysis. Note that commodity costs under TOU and tier prices were calculated based on consumption during the TOU period only.

The estimated bill impacts presented below are related to the way in which the tier and time-of-use prices are set under the Regulated Price Plan. Both are set so that the *average* price paid by the *average* RPP customer will be the same. Condominium residents such as those participants analyzed in the three buildings have consumption patterns that do not exactly match those of the average RPP customer. In particular:

- Much more of the participants' consumption falls under the threshold: 86%, 84% and 63% for Buildings 1, 2 and 3, respectively, compared to approximately 50% for the average RPP customer. This difference is illustrated in Figure 21. This means that the average commodity charge paid by study participants under tiered RPP prices would be slightly lower than the average RPP price.
- Slightly less of the study participants' consumption falls in the On-Peak period (20% vs. 23% for the average RPP customer) and slightly more falls in the Off-Peak period (51% vs. 48%). This means that the average price paid by study participants under TOU prices would be slightly lower than the average RPP price.

Figure 21: Consumption by Tier – Building Residents and Average RPP Customer



While study participants will on average pay less than the average RPP prices under either set of prices, the difference is slightly greater under tier prices, meaning that the average price paid would be slightly lower under tiered prices.

Table 21 shows the commodity cost impacts for participants in each of the three buildings on TOU rates in comparison to what they would have paid had they remained on two-tiered pricing over the analyzed TOU period. TOU prices resulted in slightly higher commodity costs for participants in Buildings 1 and 2, while commodity costs decreased, on average, for participants in Building 3. Commodity cost impacts ranged from a savings (commodity cost reduction) of 17% to an increase of 25%. Note that this is based only on the commodity portion of the bill, which accounts for only approximately half of a typical residential customer's bill and *does not* reflect changes in overall consumption in the TOU period relative to the pre-TOU period.

Table 21: Average Commodity Cost Savings under TOU Prices by Group

	Building 1	Building 2	Building 3	All
Average Saving (%)	-3.5%	-5.5%	0.8%	**-2.7**
Largest Saving (%)	17.1%	10.2%	9.2%	**17.1%**
Largest Increase (%)	-17.8%	-24.8%	-14.6%	**-24.8%**
% of Participants Saving on TOU	31%	20%	60%	**37%**

Just over one-third of study participants experienced lower commodity costs under TOU prices compared to tier prices, while two-thirds paid slightly more. Under tier prices, customers who consume less in a given month will tend to have a lower average price than customers who consume more, because more (or all) of their consumption will fall under the lower Tier 1 price. Prices will also vary under TOU prices, depending on the mix of On-

Peak, Mid-Peak and Off-Peak consumption, but this variation is not necessarily related to a customer's total consumption. Thus, when comparing bills under TOU versus tier prices, it appears that customers who consume less are more likely to see a slight increase in their average price given the tiered pricing structure they are exposed to pre-TOU. As Figure 22 through Figure 24 shows, the impact of the switch from tier to TOU prices was small for most study participants, though a few, presumably those with atypical consumption patterns, saw relatively large increases or decreases. The median average monthly change over the TOU period was determined to be an $0.91 and $0.96 increase for participants in Buildings 1 and 2 respectively and a $1.03 savings for participants in Building 3. In other words, the median average change was within $1 per month across all three buildings.

As noted, it is important to keep in mind that these results essentially reflect the difference in commodity costs based on either tiered or time-of-use pricing given participant's consumption levels and consumption patterns in the TOU period. As such, they do not reflect changes in absolute consumption levels from the pre-TOU period to the TOU period of the pilot. For Building 3, this would be relatively minor since absolute consumption actually increased slightly (2% increase). However, the conservation effect was significant for participants in Building 1 and 2 who experienced a decrease of 14% (Building 1) and 10% (Building 2) in absolution consumption under time-of-use prices. A comparison of what the pilot participants actually paid under tiered prices compared with what they paid under TOU prices would show this impact, but given how the commodity cost impacts were estimated (i.e., commodity costs under the two pricing structures based on consumption in the TOU period), this conservation effect is not reflected.

It is also important to keep in mind these commodity cost impacts cover the TOU period only and therefore do not reflect the bill savings associated with reductions in consumption in the change from bulk to individual metering.

Figure 22: Distribution of Average Monthly Commodity Cost Savings for Building 1

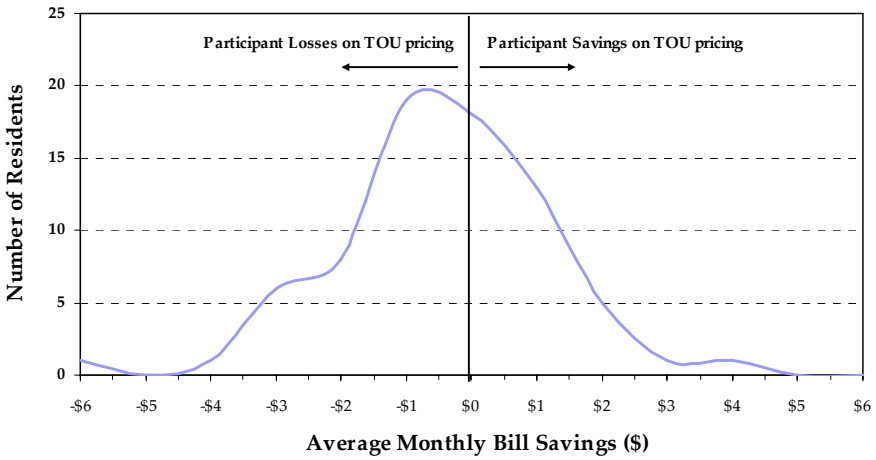


Figure 23: Distribution of Annual Commodity Cost Savings for Building 2

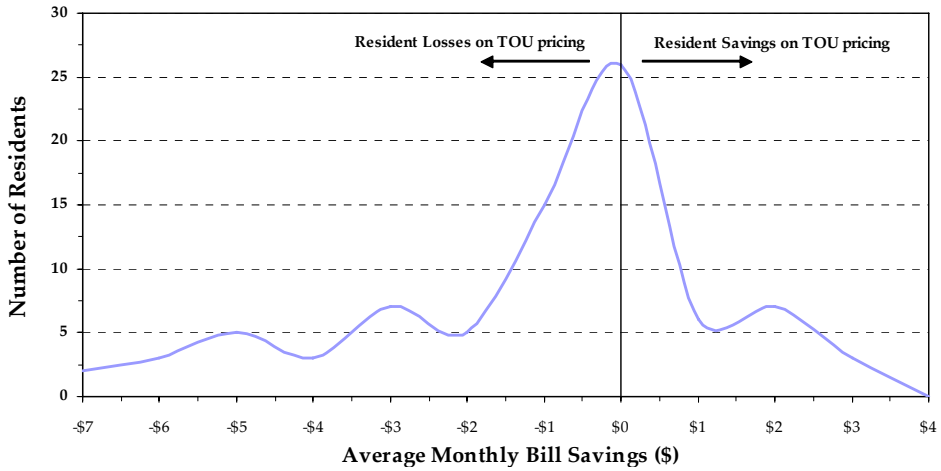
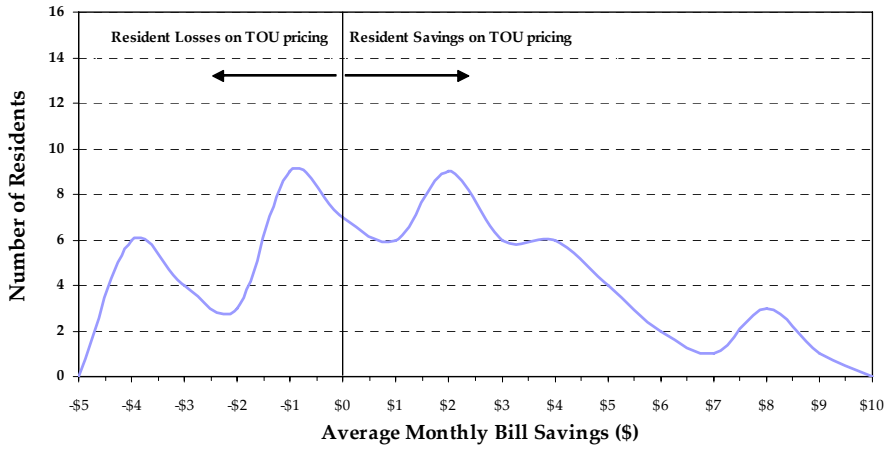


Figure 24: Distribution of Annual Commodity Cost Savings for Building 3



While most RPP customers are single family households, like the study participants, RPP customers also include small businesses as well as public buildings such as municipalities, universities, schools and hospitals (the "MUSH" sector). MUSH customers in particular are likely to be larger than single-family households, and to use more electricity during On-Peak and Mid-Peak periods. It is expected that as of May 1, 2009, MUSH consumers will no longer be eligible for RPP prices (unless their annual usage is less than 250,000 kWh per year). This will change the allocation of consumption between Tier 1 and Tier 2, and between on-, mid- and Off-Peak, as used in setting RPP prices. The effect of this change on the commodity costs of customers like the study participants under either tiered or time-of-use pricing are not known at this time.

CONCLUSIONS

Based on Navigant Consulting's analysis of the consumption patterns of the participants in Oakville Hydro's individual metering and TOU pricing pilot, the following conclusions can be drawn. Note that these results reflect short-term behaviour changes only and it is expected that the results will change over time.

1. On average, over the three buildings analyzed, there was a 20% reduction in consumption by participants after changing from bulk to individual metering. One of the three buildings had experienced an 11% annual reduction in consumption in the period prior to implementation of individual metering. If continuation of this downward trend in the post-individual metering period is attributed to the change to individual metering, the average reduction over the three building was 24%.

2. Expressed as a percentage of total consumption and based on a simple average across all three buildings, On-Peak usage increased marginally by 0.5% of overall consumption under time-of-use prices and Mid-Peak consumption decreased by 2.0%. This suggests that participants were more willing and able to shift consumption out of Mid-Peak hours. This result should not be misinterpreted to mean the participants responded poorly to the TOU prices. For example, participants in two of the buildings reduced their On-Peak consumption by 10% and 6% under TOU prices. However, these same participants also achieved a 20% and 13% reduction (essentially double the On-Peak reduction) in consumption during the Mid-Peak periods. It is also notable that the participants in the third building also reduced their On-Peak and Mid-Peak usage by 3% and 2%, respectively.

3. Price elasticity was negative for all three buildings in the On-Peak and Mid-Peak periods and negative for one of the buildings in the Off-Peak period. This result indicates that as price increases, consumption decreases and vice-versa. The positive price elasticity observed for two of the buildings in the Off-Peak period was largely driven by a significant reduction in overall consumption by participants in these buildings across all three time-of-use pricing periods. These participants' reduction in the Off-Peak period consumption resulted in the positive elasticity – as price decreased, consumption also decreased.

4. Average aggregate elasticity of substitution was negative across the three buildings, but there were some notable differences when comparing different combinations of time-of-use pricing periods. Elasticity of substitution between Non-Off-Peak (i.e., On- and Mid-Peak) and Off-Peak periods was negative for all three buildings indicating that participants generally shifted their consumption to the less expensive Off-Peak period. However, two of the building exhibited positive elasticity of substitution between the On-Peak and Non-On Peak (i.e., Mid- and Off-Peak)

periods. These are the same two buildings that exhibited a positive price elasticity in the Off-Peak period. These seemingly counter-intuitive results are essentially driven by participants in these two buildings decreasing their consumption across all three time-of-use periods, but reducing it proportionately more in the Mid-Peak period relative to the other time-of-use price periods.

5. Enabling technologies can help customers to take advantage of time-of-use rates. Pilot participants with timers on their water heaters exhibited a significant shift of consumption from On-Peak and Mid-Peak periods to Off-Peak periods and, correspondingly, significant negative price elasticities and elasticities of substitution. Specifically, On-Peak usage declined from 27% to 23% of overall consumption, Mid-Peak consumption decreased from 31% to 26%, and Off-Peak usage increased from 42% to 51%.

6. Given their consumption patterns, just over 1/3 of participants had lower commodity costs under time-of-use prices in the TOU period than what they would have paid for the same level of consumption under tiered prices. On average, participants in two of the three buildings paid about $1 per month more under time-of-use prices as compared to tiered prices. Approximately 85% of consumption for participants in these two buildings was under the lower Tier 1 RPP price, indicated that the price they would pay under tiered pricing would have been below the actual cost to supply them. Participants in the remaining building paid about $1 per month less under time-of-use prices as compared to tiered prices. Approximately 65% of consumption for participants in this building was under the lower Tier 1 RPP price.

It is important to keep in mind that these results essentially reflect the difference in commodity costs based on either tiered or time-of-use pricing given participants' consumption levels and consumption patterns in the TOU period. As such, they do not reflect changes in absolute consumption levels from the pre-TOU period to the TOU period of the pilot. The conservation effect was significant for participants in Building 1 and 2 who experienced a decrease of 14% (Building 1) and 10% (Building 2) in absolution consumption under time-of-use prices. With the conservation effect, it therefore appears that two of three buildings experienced a reduction in commodity costs in going from tiered to time-of-use pricing.

All forms of "flat" (or non-time varying) electricity pricing such as the tiered RPP prices inherently result in cross-subsidies between consumers with different consumption patterns, as the actual cost of power changes on an hourly basis. Two consumers could have identical overall consumption levels, but if one uses most of their electricity during the Off-Peak period and the other uses most during On- and Mid-Peak periods, the cost to supply the latter consumer will be much higher. The time-of-use prices better reflect the true cost of power and significantly reduce such cross-subsidies.

In addition, the impact of time-of-use prices on the average commodity charges experienced by customers is also dependent on the relative percentage of their consumption in each of the two tiers under the RPP tiered pricing structure. Consumers, such as many in this pilot project, with most of their monthly consumption below the tier threshold pay somewhat less under tiered pricing than the average actual cost of electricity. For example, the two buildings with participants having 85% of their monthly consumption falling under the lower, Tier 1 RPP price experienced a slight increase in their unit commodity charges under time-of-use pricing, whereas participants in the third building with only 65% of their consumption falling under the lower, Tier 1 RPP price experienced a slight decrease in their unit commodity charges under time-of-use pricing.

APPENDIX A: SAMPLE RECRUITMENT LETTER AND INSERT

A-1 Sample Recruitment Letter

Oakville Hydro
Electricity Distribution Inc.
P. O. Box 1900
861 Redwood Square
Oakville ON L6J 5E3
Telephone: 905-825-9400
Fax: 905-825-4447
email: hydro@oakvillehydro.com
www.oakvillehydro.com

Mr. John Sample
Account #00000000-00
1234 Any Street, Unit 123
Oakville, ON A1A 1A1

The conversion to Smart Meter billing has begun...
and we're giving you $50 to let us know what you think

Dear John Sample,

From gasoline that powers our cars to electricity that keeps our house lights on, it's clear that we are in a new era of higher energy prices. But one thing we can do to save money, our resources and the environment is to manage our energy consumption.

That's why the Government of Ontario has mandated the installation of "smart meters" in all homes by 2010. As you are one of our first customers to have a smart meter installed in your home, you are one of the first to be introduced to our new billing and customer care system.

To show you our appreciation for helping us introduce smart meters in Oakville, you'll be receiving a $50 credit on your next bill!

Unlike a traditional meter that can only tell you how much electricity you've used over a one or two-month period, a smart meter records "time of use" which is how much energy is used and when it was used on a daily and hourly basis. This will give you more control over your electricity spending by switching the time you do certain activities away from peak to off-peak hours so you can take advantage of lower rates for electricity during different times of the day.

For example, one way you can save energy and money is by setting the timer on your dishwasher to run overnight rather than during the day. Another is to do the laundry on the weekend and wash in cold water.

Once you've had the opportunity to experience the smart meter system, there are three ways you can give us your feedback:
email xxxxxxxxxxxx@oakvillehydro.com, call 1-XXX-XXX-XXXX
or write to us at 1234 Any Street, Oakville, ON A1A 1A1

With the smart meter billing system you'll also have online access to a wealth of new and valuable information. You'll be able to view how much energy you are using each day and the different rates you are being charged by the time of day. In addition, you can look up your past

Please turn over...

bills, compare your energy usage with other homes in your area and get handy energy savings tips. For more details, please see the enclosed insert.

Thank you for being an Oakville Hydro customer. Once again, **to thank you for your participation and your feedback on our new smart meter system, we're giving you a $50 credit** on your next bill. I encourage you to let us know what you think about the new system so that we can make any necessary improvements to make it even better. If you have any questions, please call Name at 1-XXX-XXX-XXXX.

Sincerely,

Firstname Lastname
Title

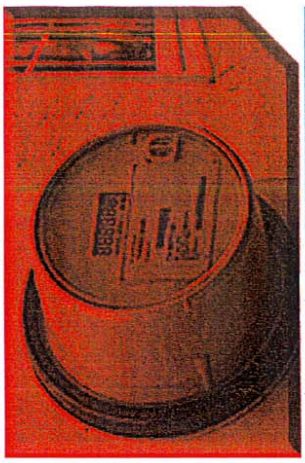
P.S. To access your account online, simply visit www.oakvillehydro.com/xxxxxxx. Login with your account number and temporary PIN XXXXX (you can change your PIN after you login for the first time under the "Main" menu).

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat.

A-2 Sample Recruitment Letter Insert

oakvillehydro

Making the switch to **smart meter billing**



See how you can take control of your electricity spending... inside

A Bright Idea from oakvillehydro

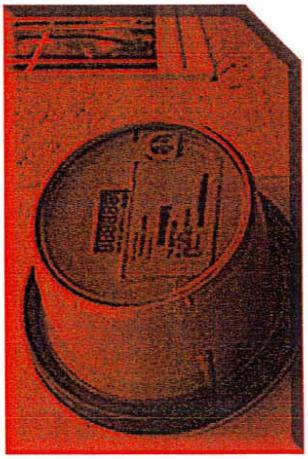
The introduction of smart meter billing will give you more control over how much you spend on electricity by switching the time you do certain activities – like laundry and dish washing – away from peak to off-peak hours. This way, you can take advantage of lower rates and conserve energy.

Help us make the smart meter system even better

We'd like your feedback on the smart meter system to make it even better for the residents of Oakville. Once you've had the opportunity to experience it, there are three ways you can contact us:

Email xxxxxxxxxxxx@oakvillehydro.com
Call 1-XXX-XXX-XXXX or write to us at 1234 Any Street, Oakville, ON A1A 1A1

Thank you in advance for your patience, understanding and participation.



oakvillehydro

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy.

The conversion to **smart meter billing** has begun

In an effort to help manage electricity usage and encourage energy conservation across the province, the Ontario government has committed to smart meter billing.

What is a smart meter?

A smart meter records "time of use" which is how much energy is used and when it was used on a daily and hourly basis.

Why do we need smart meters?

Oakville Hydro can't stock up on energy the way you can with laundry detergent on special at your local store. So we have to pay our suppliers more for electricity during high-demand or peak times, like weekday business hours. Smart meters encourage more usage during off-peak hours, when electricity costs much less, such as evenings, weekends and holidays.

Advantages of smart meters

The detailed consumption information that smart meters gather gives you the ability to:

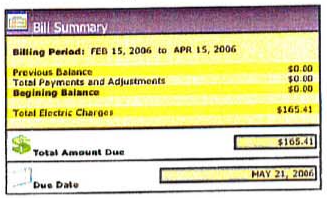
- Monitor your electricity usage
- Manage your costs on a daily basis
- Compare your usage with other homes
- Access a wealth of valuable information

If you have any questions about smart meters, please call Name at 1-XXX-XXX-XXXX.

Smart Meters, Smart Benefits

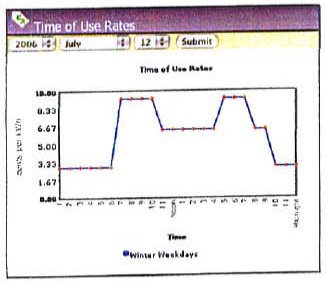
With the new smart meter billing system you'll now have online access to a wealth of valuable tools and information that can help you control your electricity usage.

Your energy bill



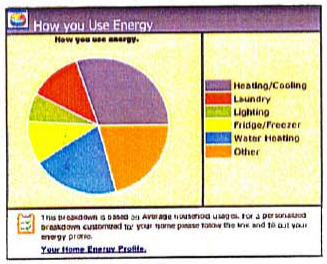
At a glance you can see your account balance, the amount of your current bill and when your next bill is due.

Time of use rates



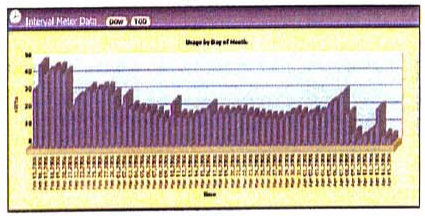
See exactly how much your electricity costs on an hourly and daily basis.

Energy usage breakdown



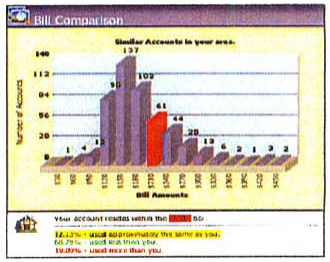
You can customize your own usage pattern by completing your household energy profile.

Household energy usage



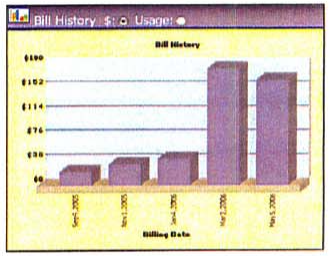
You can view your household energy usage by the day of week and time of day.

Compare your consumption



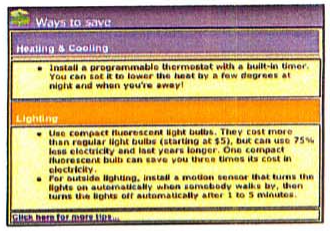
See how your household energy consumption compares with other homes in your area.

Your bill history



You can look up your past bills and compare your usage from month to month.

Energy savings tips

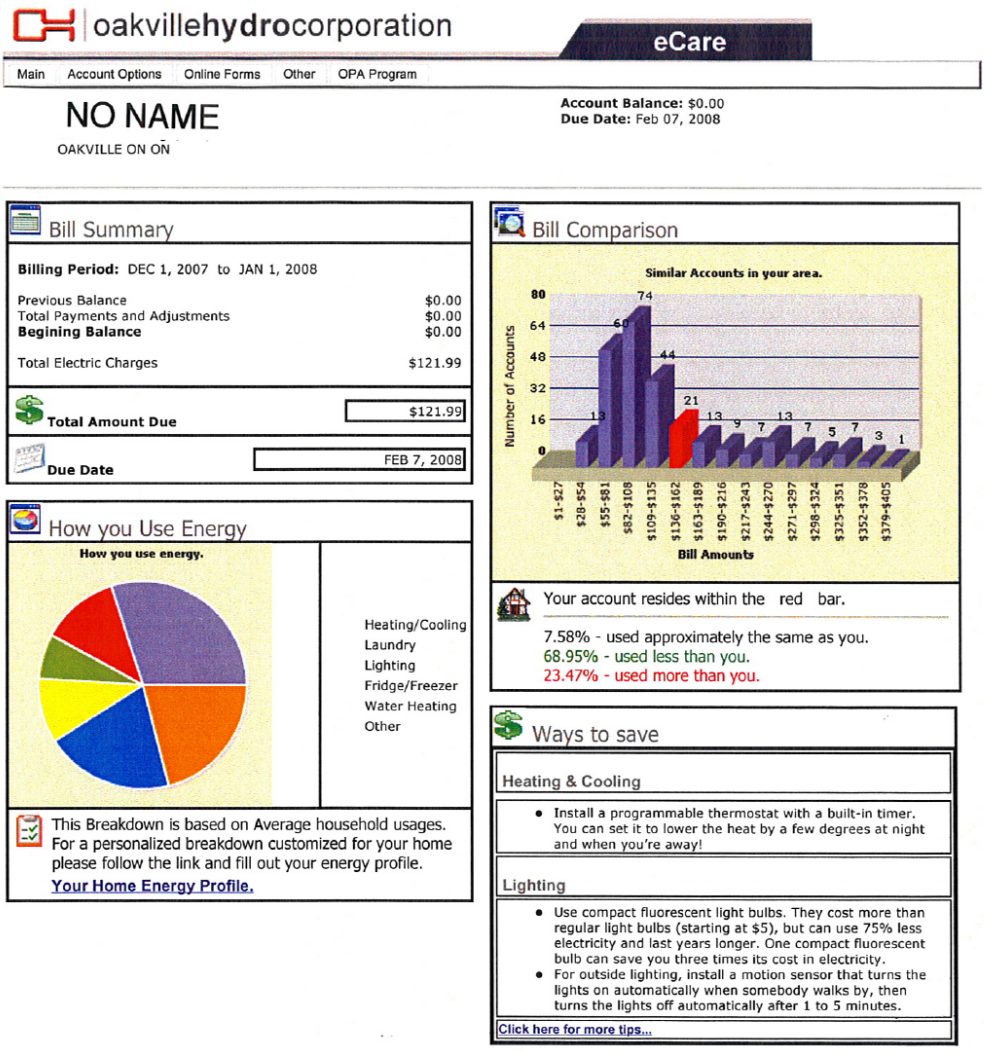


Here you'll find many helpful tips and suggestions on how you can conserve energy and save money.

Experience the advantages of the smart meter system today
Access your account online at **www.oakvillehydro.com/xxxxxxx**

NAVIGANT CONSULTING

A-3 Sample eCare Customer Online Consumption Sheet



oakvillehydrocorporation eCare

Main | Account Options | Online Forms | Other | OPA Program

NO NAME
OAKVILLE ON ON

Account Balance: $0.00
Due Date: Feb 07, 2008

Bill Summary

Billing Period: DEC 1, 2007 to JAN 1, 2008

Previous Balance	$0.00
Total Payments and Adjustments	$0.00
Begining Balance	$0.00
Total Electric Charges	$121.99
Total Amount Due	$121.99
Due Date	FEB 7, 2008

How you Use Energy

How you use energy.

Heating/Cooling
Laundry
Lighting
Fridge/Freezer
Water Heating
Other

This Breakdown is based on Average household usages. For a personalized breakdown customized for your home please follow the link and fill out your energy profile.
Your Home Energy Profile.

Bill Comparison

Similar Accounts in your area.

Number of Accounts: 80, 64, 48, 32, 16, 0
13, 60, 74, 44, 21, 13, 9, 7, 13, 7, 5, 7, 3, 1
$1-$27, $28-$54, $55-$81, $82-$108, $109-$135, $136-$162, $163-$189, $190-$216, $217-$243, $244-$270, $271-$297, $298-$324, $325-$351, $352-$378, $379-$405
Bill Amounts

Your account resides within the red bar.

7.58% - used approximately the same as you.
68.95% - used less than you.
23.47% - used more than you.

Ways to save

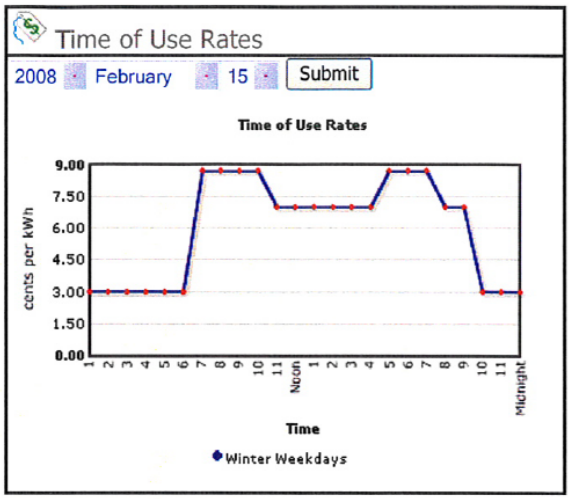
Heating & Cooling

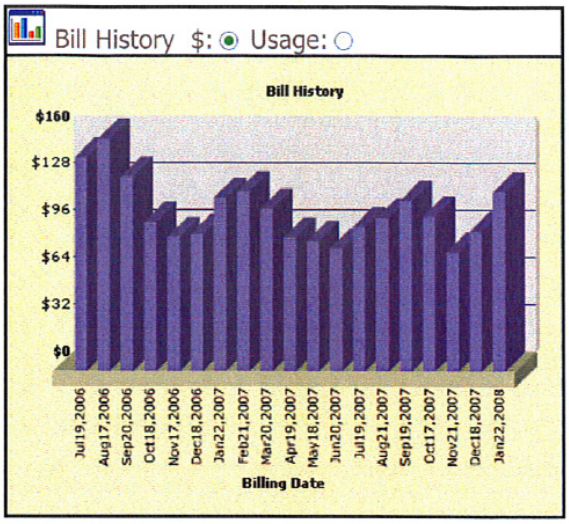
- Install a programmable thermostat with a built-in timer. You can set it to lower the heat by a few degrees at night and when you're away!

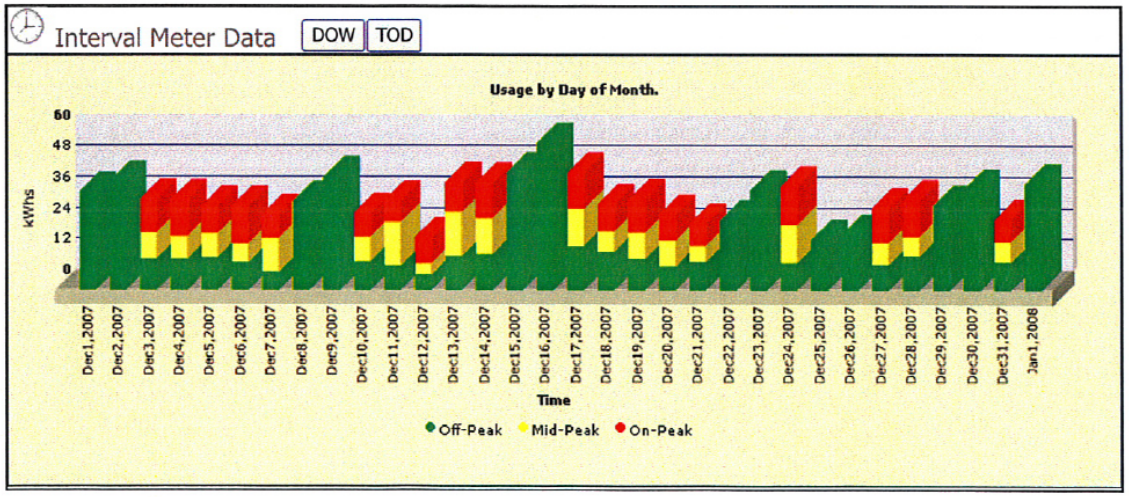
Lighting

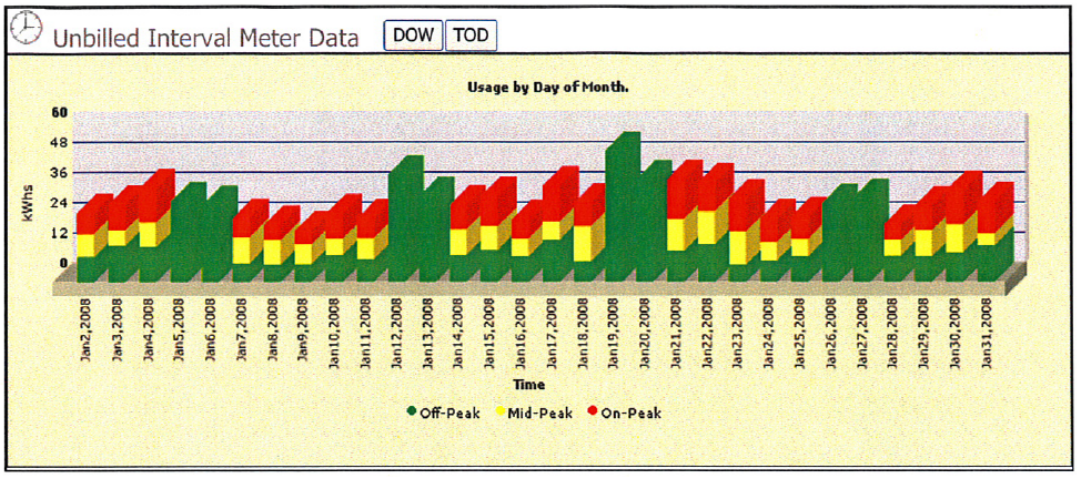
- Use compact fluorescent light bulbs. They cost more than regular light bulbs (starting at $5), but can use 75% less electricity and last years longer. One compact fluorescent bulb can save you three times its cost in electricity.
- For outside lighting, install a motion sensor that turns the lights on automatically when somebody walks by, then turns the lights off automatically after 1 to 5 minutes.

Click here for more tips...


Time of Use Rates
2008 February 15 Submit
Time of Use Rates
cents per kWh
9.00
7.50
6.00
4.50
3.00
1.50
0.00
Noon
Midnight
Time
Winter Weekdays


Bill History $: Usage:
Bill History
$160
$128
$96
$64
$32
$0
Jul19,2006
Aug17,2006
Sep20,2006
Oct18,2006
Nov17,2006
Dec18,2006
Jan22,2007
Feb21,2007
Mar20,2007
Apr19,2007
May18,2007
Jun20,2007
Jul19,2007
Aug21,2007
Sep19,2007
Oct17,2007
Nov21,2007
Dec18,2007
Jan22,2008
Billing Date


Interval Meter Data
DOW
TOD
Usage by Day of Month.
kWhs
60
48
36
24
12
0
Dec1,2007
Dec2,2007
Dec3,2007
Dec4,2007
Dec5,2007
Dec6,2007
Dec7,2007
Dec8,2007
Dec9,2007
Dec10,2007
Dec11,2007
Dec12,2007
Dec13,2007
Dec14,2007
Dec15,2007
Dec16,2007
Dec17,2007
Dec18,2007
Dec19,2007
Dec20,2007
Dec21,2007
Dec22,2007
Dec23,2007
Dec24,2007
Dec25,2007
Dec26,2007
Dec27,2007
Dec28,2007
Dec29,2007
Dec30,2007
Dec31,2007
Jan1,2008
Time
Off-Peak
Mid-Peak
On-Peak


Unbilled Interval Meter Data
DOW
TOD
Usage by Day of Month.
kWhs
60
48
36
24
12
0
Jan2,2008
Jan3,2008
Jan4,2008
Jan5,2008
Jan6,2008
Jan7,2008
Jan8,2008
Jan9,2008
Jan10,2008
Jan11,2008
Jan12,2008
Jan13,2008
Jan14,2008
Jan15,2008
Jan16,2008
Jan17,2008
Jan18,2008
Jan19,2008
Jan20,2008
Jan21,2008
Jan22,2008
Jan23,2008
Jan24,2008
Jan25,2008
Jan26,2008
Jan27,2008
Jan28,2008
Jan29,2008
Jan30,2008
Jan31,2008
Time
Off-Peak
Mid-Peak
On-Peak

APPENDIX B: CUSTOMER FEEDBACK

B-1 Sample Customer Feedback

Stew Lawson

From: NO NAME
Sent: [illegible] 0:30 PM
To: Smart Meter
Subject: Smart Meter Account #

Reference Address: CONFIDENTIAL
Oakville, Ontario

Residents: NO NAME

To whom it may concern,

We appreciate the opportunity to be test subjects for the Smart Meter program.

When you think of the amount of energy consumed by a typical household in the course of one day, week, month and year the numbers are quite astounding. The Smart Meter is a brilliant piece of technology that allows you to track, down to the second, the total consumption per household. It allows you to rate houses and place them in categories. As consumers we benefit from energy rates during off-hour periods. It also allows you the ability to highlight and penalize households that are energy "pigs." We try to run our appliances at off-hours whenever possible. This provides us with a level of savings we would not have been allotted in the past.

The Smart Meter also highlights the households consumption in a clearer fashion than past bills. In the past we have received bills that charged our household on projected or historical consumptions. These where generally received during periods that people could not go house to house to read the meter. At those times we would call to question the accuracy of these bills. The provider was always assuring us that if we overpaid now that it would balance out later. This sounds logical, but the money is better spent in my own pocket than in pre-paying a constantly used utility. I appreciate your accuracy.

Lastly I appreciate the accessibility you have given home owners to view they're own usage on line, and see first hand the level they consume. This is a great tool and can be turned into a household challenge that all occupants can participate and view on-line. Who knows, we may have just created the "Energy Game." You may want to market that concept.

Once again we appreciate the opportunity to be test subjects for the Smart Meter program.

Yours truly,

NO NAME

9/26/2006