NAVIGANT CONSULTING

EVALUATION OF TIME-OF-USE PRICING PILOT

Presented to

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EXECUTIVE SUMMARY

This report summarizes the design, operation and outcomes of the Newmarket Hydro Time-of-Use Pricing Pilot undertaken from August 1st, 2006 to October 31, 2007. The pilot project tested residential customer response to 1) Regulated Price Plan (RPP) Time-of-Use rates, and 2) RPP Time-of-Use rates in combination with a remotely controllable thermostat and demand response incentive (Critical Peak Rebate). Participant feedback was also obtained though a customer survey.

The specific objectives of the Newmarket Hydro TOU pilot are as follows:

1. 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.
2. Test the response of residential customers with enabling technology (e.g., remotely controllable thermostats) to either a) a control signal from Newmarket Hydro, or b) a demand response (DR) incentive enabled by a control signal.
3. Estimate residential customer price elasticity and elasticity of substitution.

Participants

Approximately 250 Newmarket Hydro residential customers chose to participate in the pilot, resulting in a participation rate of roughly 63% of eligible customers, with a further three participants choosing to opt-out during the pilot study.

The participating customers had average monthly consumption of 750 kWh and were generally representative of Newmarket Hydro's residential customer base. Participants' average monthly consumption is somewhat less than the average for residential customers elsewhere in Ontario – typically reported as 900-1000 kWh per month. This is likely because 1) the participants' homes are relatively new, and 2) all participants had natural gas heating and water heating. Note that the pilot design was premised on the availability of hourly consumption data during the pre-TOU period, so only those customers with smart meters installed prior to August 2005 were eligible for the pilot.

Hourly meter readings were available from August 1, 2005 through October 31, 2007 for pilot participants. For this study, two 12-month periods were selected for comparison:

- the "Pre-TOU" period, from August 1, 2005 to July 31, 2006, and
- the "TOU" period from October 1, 2006 to September 30th, 2007.

August and September 2006 were taken to be transitional months and so were not included in either period.

Results and Conclusions

Based on Navigant Consulting's analysis of the consumption patterns of the participants in Newmarket Hydro's TOU pricing pilot, the following conclusions can be drawn:

1. Expressed as a percentage of total consumption, weather-corrected on-peak usage decreased by 0.4% and mid-peak consumption decreased by 0.3%. Correspondingly, off-peak consumption expressed as a percentage of total consumption increased by 0.7%, with most of this increase occurring during the weekday off-peak period.

2. Average participant price elasticities based on commodity prices alone range from -1% for the off-peak period and -2% for the on-peak period to -4% for the mid-peak period. The minus sign indicates that as prices increase, demand decreases. When variable distribution, transmission and other variable charges are considered in the analysis, the resulting range of price elasticities increases to -2 % to -5%.

3. The average participant elasticity of substitution[1] between on-, mid- and off-peak electricity ranged from -1.0% to -1.4%. When transmission, distribution and other variable charges are included in the analysis, both the On-Peak vs Non-On Peak and Non Off-Peak vs the Off-Peak elasticity of substitution was found to be -2.4%.

4. The response of participants to TOU prices varied widely. When broken into quartiles based on their responsiveness[2], the average elasticity of substitution of participants in the first quartile (most responsive group) was found to be - 14.9%, in comparison to an average of 9.3% for participants in the fourth quartile.

5. Enabling technologies help customers to take advantage of time-of-use rates, particularly during critical peak periods. Pilot participants with remotely controllable thermostats exhibited greater reductions during critical peak periods than those without. Specifically, these participants reduced their consumption (and average demand) by approximately 31% (or 0.35 kW/customer) during the two critical peak periods when their thermostats were controlled remotely. Additionally, the remote control feature enabled these participants to provide a significant response even under "day-of" notification – achieving a 21% (or 0.23 kW/customer) reduction in their consumption over the critical peak period.

6. The results also highlight the need for "day-ahead" notification for residential consumers without enabling technologies if some form of critical peak pricing is

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[1] The elasticity of substitution of two products is the ratio of (1) the *percent change* in their relative demand (the ratio of demand for the first product divided by the demand for the second product) to (2) the *percent change* in their relative prices.

[2] The average of the On-Peak vs. Non-On-Peak and the Non-Off-Peak vs. Off-Peak elasticities of substitution was taken as a single measure of that customer's elasticity of substitution

implemented in Ontario. For example, participants who did not have remotely controllable thermostats did not provide much if any demand response during the critical peak period based on "day-of" notifications (i.e., same day as the critical peak period). In contrast, these same participants reduced demand throughout the critical peak day, not just during the critical peak period when they were given "day-ahead" notification (ie, on the previous day).

7. On average, TOU prices resulted in slightly (just under 2%) higher commodity charges for participants. As with elasticity, the results for individual participants varied widely, with just over 1/3 of participants paying lower commodity charges under TOU prices compared with tiered prices. Note, however, that a majority of participants' consumption was under the tier threshold. As a result, most of their consumption was priced at the lower Tier 1 rate resulting in a lower average rate than the average RPP consumer . Essentially, participants were paying less than the average RPP price (or less than the average cost to supply RPP consumers) under tiered prices given 1) their relatively low consumption and 2) the design of the RPP tiered prices. They still paid less than the average RPP price under TOU pricing given their usage pattern, but the amount less than the average RPP price under TOU pricing was not as much as the amount less under tiered pricing. This was the primary contributor to the slight increase in commodity charges. It should also be noted that given the pattern of wholesale market prices, pilot participants' commodity charges under TOU prices were more reflective of their "true cost of power" than what they would have been under tiered prices.

8. On average, there was a increase of 1.1% in weather-corrected overall consumption by all participants after changing from RPP tier pricing to TOU pricing. This may seem counter-intuitive but it is important to note that reduced consumption is not the primary goal of TOU pricing. Rather, the primary goal of TOU pricing is to encourage consumers to shift their consumption away from more expensive, peak demand periods when Ontario's electricity system is more likely to be constrained to less expensive, lower demand periods. The results summarized above indicate that this primary goal was achieved. Reduced consumption is expected to be achieved through the portfolio of conservation programs being implemented by LDCs and the Ontario Power Authority (OPA)

9. 64% of participants who responded to the survey said they would recommend the TOU pricing plan to their friends, and 27% of respondents were not sure whether they would recommend the TOU pricing plan to their friends. Some of the reasons given by the more successful participants who were not sure included not knowing if they were actually saving money on their monthly bills since switching to TOU prices and the lack of incentives given to consumers to encourage them to shift their electricity consumption away from on-peak consumption.

10. There was a positive correlation between correctly identifying all the start and end times for the various TOU periods in the survey and the respondent's percentage reduction in on-peak consumption. This suggests that future communication programs should focus on educating consumers about the TOU price schedule. It is also possible that both knowledge of the TOU schedule and success in changing consumption patterns result from the consumer's enthusiasm for the TOU program. This would imply that future communication programs should focus on both motivation and communications under the premise that motivated customers will seek and understand the information provided.

11. The fact that "high achievers" (in terms of elasticity of substitution) who responded to the survey were more likely than other respondents to believe that they had made changes to their electricity consumption suggests that the observed shift in consumption from on-peak and mid-peak periods to the off-peak period is not just a matter of chance but reflects deliberate changes in participants' behaviour.

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INTRODUCTION

This report summarizes the design, operation and outcomes of the Newmarket Hydro Pilot study undertaken from August 1st, 2006 to October 31, 2007. The pilot project tested the customer response to 1) Regulated Price Plan (RPP) Time-of-Use rates, and 2) RPP Time-of-Use rates in combination with a remote controllable thermostat and demand response incentive (Critical Peak Rebate). Participant feedback was also obtained though the use of a customer survey.

Results from the pilot study are drawn through quantitative analysis of 1) the degree of load shifting away from On-Peak hours (and critical peak periods) to either Mid-Peak or Off-Peak hours, 2) electricity conservation and 3) participant survey responses.

Information gathered from this pilot study will enable Newmarket Hydro, the Ontario Energy Board (the "Board") and other LDCs to expedite and enhance customer response to RPP TOU rates when they are more broadly implemented. The results from this pilot will also assist the Board in terms of future decisions regarding whether to augment the RPP TOU price signal with more dynamic signals to reduce demand during critical peak periods.

Ontario Energy Board Approval

On July 28, 2006, the Board 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 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 July 25, 2006, Newmarket Hydro submitted a proposal for approval to implement a pilot project involving TOU electricity prices and eligible TOU meters in anticipation of those SSS Code amendments being finalized.[3] After reviewing the proposal, the Board approved Newmarket Hydro's pilot project. In its decision, the Board noted that the Newmarket Hydro TOU pilot would complement the Board's TOU pricing pilot project and enable the testing of RPP TOU prices and critical peak rebates in conjunction with load control devices (i.e., remote controllable thermostats), something not included in the Board's TOU pricing pilot project.[4] The Board also suggested obtaining participant feedback through survey and/or focus groups.

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[3] Newmarket Hydro Ltd. Request for Approval: Pilot Project Relating to Eligible Time of Use Meters, from Mr. Paul Ferguson, President of Newmarket Hydro, to Kirsten Walli, Board Secretary, Ontario Energy Board, July 25, 2006.

[4] Ontario Energy Board Letter of Approval from Kirsten Walli, Board Secretary, to Mr. Paul Ferguson, President Newmarket Hydro Ltd via EMAIL, on August 17, 2006.

Pilot Objectives

The specific objectives of the Newmarket Hydro TOU pilot are as follows:

1. 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.
2. Test the response of residential customers with enabling technology (e.g., remotely controllable thermostats) to either a) a control signal from Newmarket Hydro, or b) a demand response (DR) reward / incentive[5] enabled by a control signal.
3. Estimate residential customer price elasticity and elasticity of substitution.

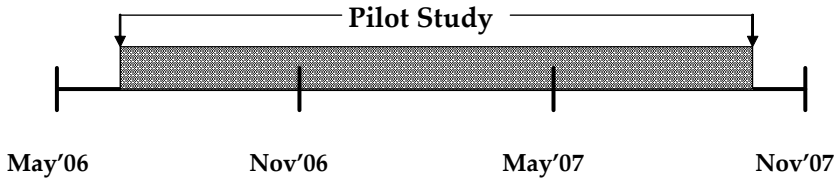
Standard and TOU Rate Structure

Under amendments to the Ontario Energy Board Act, 1998 (the Act) contained in the Electricity Restructuring Act, 2004, the Ontario Energy 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 Ontario Energy 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 Newmarket Hydro pilot study, customers were exposed to three separate sets of prices since the OEB reset the prices on November 1st, 2006 and again on May 1st, 2007. Figure 1 illustrates the different RPP periods experienced by participants during the pilot.

Figure 1: RPP Price Resetting during the Pilot



[5] The reward was based on difference between the participant's baseline developed using a methodology similar to that used in the IESO's Transitional Demand Response Program and the Ontario Power Authority's DR I program and their consumption during critical peak periods.

Standard Regulated Price Plan Prices

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. 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	May'06-Oct'06	Nov'06-Apr'07	May'07- Oct-07
Tier 1	5.8	5.5	5.3
Tier 2	6.7	6.4	6.2

TOU Regulated Price Plan Prices

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) price structure. The prices under this plan are based on three time-of-use periods. 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 if necessary 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 hours for both the summer and winter period

Time	Summer Period (May 1 – Oct 31)	Winter Period(Nov 1 – April 30)
Off-Peak	10pm – 7am weekdays and all day on weekends and holidays	10pm – 7am weekdays and all day on weekends and holidays
Mid-Peak	7am – 11am and 5pm – 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 price setting effective November 2006 through April 2007, while Figure 3 shows summer TOU prices based on the May 2007 – October 2007 price setting.

Figure 2: Winter TOU Prices (Nov'06 – Apr'07 RPP Price Setting)

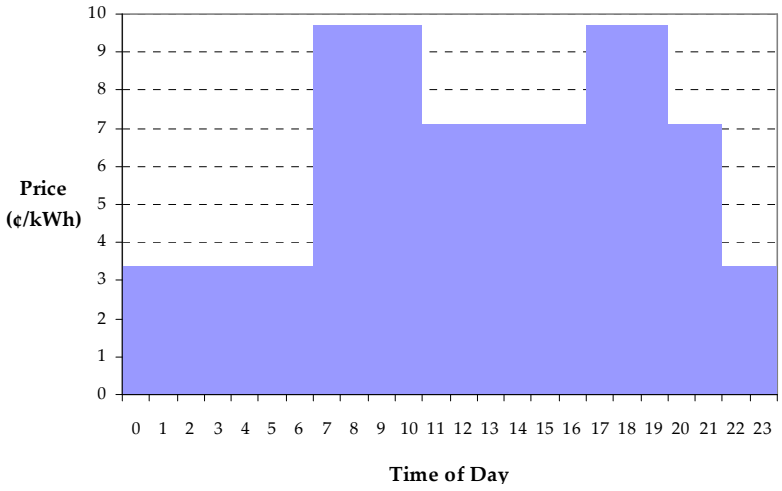
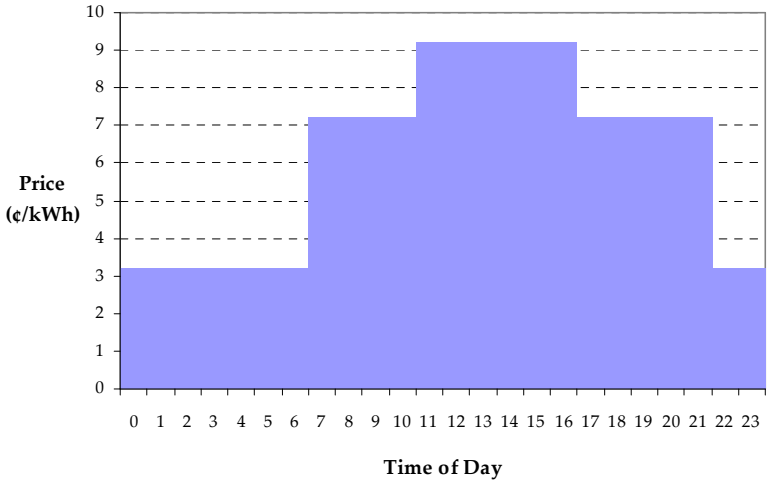


Figure 3: Summer TOU Prices (May'07 – Oct'07 RPP Price Setting)



The average price paid by a consumer on TOU prices will depend on the consumer's consumption pattern or load profile (i.e., how much electricity is used at what time). RPP prices are set so that a consumer with an average 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 RPP prices that were in effect during the last RPP period of the pilot. This average price is equal to the average RPP supply cost of 5.7¢/kWh.

Table 4: Average RPP Prices (May'07 – Oct'07)

Tiered RPP Prices	Tier 1	Tier 2	Average Price
Price	5.3¢	5.2¢	5.7¢
% of RPP Consumption	53%	47%	

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%	

Critical Peak Rebate

For this pilot, the critical peak rebate was set at 30 cents per kWh, more than three times the On-Peak price. This rebate level was based upon the effective rebate levels applicable to other demand response programs in Ontario at the time for demand response of a similar low frequency nature (i.e., less than 50 hours per year). Pilot participants subject to the critical peak rebate received a credit on their next bill equal to the reduction (in kWh) from their baseline during critical peak periods multiplied by the 30 cents per kWh critical peak rebate. The baseline was derived from each participant's consumption in the five most recent working weekdays (excluding any critical peak days) adjusted to match the weather for the critical peak day. The weather adjustment was based on the average weather "elasticity" for the participant group and used hourly temperature data from a weather station at Buttonville Airport, approximately 20 km south of Newmarket.

PILOT PARTICIPANTS

The participant selection and recruitment process started with approximately 500 eligible customers for whom hourly data was available from prior to August 2005. Of these, 100 customers who had either 1) chosen to take commodity supply from a competitive retailer (instead of remaining on the RPP) or 2) moved into the house after August 2005 were excluded, leaving 400 eligible customers. These exclusions were necessary to ensure accurate longitudinal analysis of customers who had 1) paid RPP tiered prices prior to the pilot and 2) continuously occupied their premises for the entire analysis period.

Invitation letters were sent to the remaining eligible customers informing them they had been selected to participate in the pilot. The invitation letter also indicated that customers could opt-out of the pilot within a specified time period if they chose not to participate. Approximately 250 customers chose to participate, resulting in a participation rate of roughly 63% of eligible customers, with a further three participants choosing to opt-out during the pilot study.

The participating customers had average monthly consumption of 750 kWh and were generally representative of Newmarket Hydro's residential customer base. Participants' average monthly consumption is somewhat less than the average for residential customers elsewhere in Ontario – typically reported as 900-1000 kWh per month. This is likely because 1) the participants' homes are relatively new, and 2) all participants had natural gas heating and water heating. Note that the pilot design was premised on the availability of hourly consumption data during the pre-TOU period, so only those customers with smart meters installed prior to August 2005 were eligible for the pilot.

Test Structure and Design

Participating customers were divided into two streams in this study:

- Customers on TOU rates combined with enabling technology (i.e., remotely controllable thermostats); and
- Customers on TOU rates only, without enabling technology.

Each of these two streams were further broken down into two groups:

- Customers eligible for the critical peak rebate who received notification of system power emergencies and critical local peak situations (called "Critical Peak Notification"); and
- Customers who were not eligible for the critical peak rebate.

Table 5 provides a summary of the characteristics of each treatment groups, along with the number of participants in each group. The initial pilot design had subdivided customers in each of the two streams into two additional groups – those who were invited to attend an education seminar on TOU rates and critical peak rebates – but very few participating

customers came to these sessions (less than 10 customers attended either of the sessions). Due to the low attendance at the sessions, there was no basis for segregation of these participants in subsequent analysis and they were amalgamated into Group 2 or Group 4 according to whether they had enabling technologies for analytic purposes.

Table 5: Summary of Treatment Characteristics for Participating Customers Analyzed

Group	TOU Rates	Remotely controllable thermostats	Critical Peak Notification	Number of Participants
Group 1	√	√		32
Group 2	√	√	√	68
Group 3	√			39
Group 4	√		√	91
Total				***220***

Time-of-use meter data was available for all participating customers, both before and after TOU prices came into effect. However, due to participants moving during the pilot period and renewal of price protected retail contracts, some of the hourly meter data was excluded from the analysis. In total, 220 out of the 247 participating customers were analysed, representing 93% of the participant meter data made available for the analysis.

Hourly meter readings were available from August 1, 2005 through October 31, 2007 for pilot participants. For this study, two 12-month periods were selected for comparison:

- the "Pre-TOU" period, from August 1, 2005 to July 31, 2006, and
- the "TOU" period from October 1, 2006 to September 30th, 2007.

August and September 2006 were taken to be transitional months and so were not included in either period.

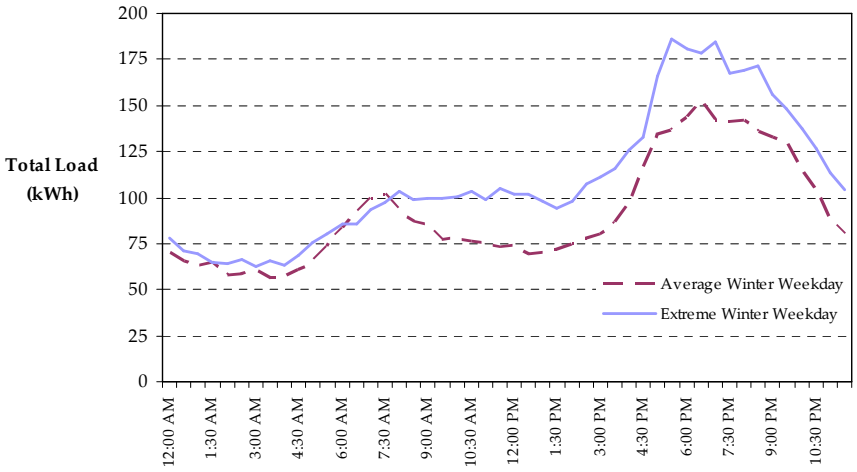
Pre-TOU Consumption Patterns

The following figures represent typical winter and summer weekday load profiles for all of the analyzed study participants in the pre-TOU period. Extreme winter and summer days are also provided for comparison in the figures.

As shown in Figure 4, the total load for the participating customers analyzed peaks just above 150 kW at 6:30 pm for a *typical* winter day and at 185 kW at 5:30 pm for an *extreme* winter day[6].

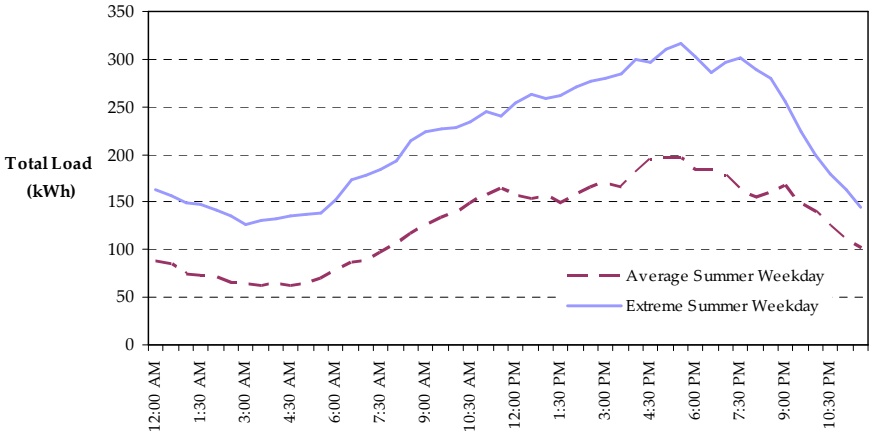
[6] Extreme winter day taken as December 12, 2005, when the daytime low was -14°C.

Figure 4: Pre-TOU Loadshapes for Typical and Extreme Winter Weekdays



As illustrated in Figure 5, the residential demand for a *typical* summer day peaks just below 200 kW, occurring between 5-6pm. The demand profile for an *extreme* summer day[7] follows a similar pattern, but peaks at 310 kW primarily due to increased cooling load.

Figure 5: Pre-TOU Loadshapes for Typical and Extreme Summer Weekdays



As noted above, the average consumption for pilot participants is somewhat less than the average residential RPP customer, likely due to house size and vintage, and the preponderance of natural gas space and water heating among participants. Just over 75% of study participants' electricity consumption falls below the RPP threshold, and is thus subject to the lower Tier 1 price, whereas the average RPP consumer would have only 53% of consumption at the lower Tier 1 price.

[7] The extreme summer day taken to be July 17, 2006, with a daytime high of 31°C.

CUSTOMER DEMAND RESPONSE

One of the main questions this study was intended to address was how and to what extent customers will change their consumption patterns in response to time-of-use rates. It is expected that customers will shift consumption away from on-peak periods (which are relatively more expensive under TOU rates) and toward off-peak periods (which are relatively less expensive under TOU rates). Total consumption could increase or decrease. This chapter estimates the magnitudes of these responses.

It should be noted that this study only captures short-term responses to time-of-use rates. This will include primarily changes in behaviour that are 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 timers on lights. Thus, the magnitude of the changes in consumption observed in this study are expected to increase over time.

Analytic Approach

The approach taken in this study was to compare electricity consumption patterns before and after customers were subject to time-of-use rates. One of the challenges faced in this study was to make sure that the pre-TOU and TOU periods were truly comparable.

In order to create two datasets – pre-TOU and TOU – that were as directly comparable as possible, two twelve-month periods were selected: 1) August 1, 2005 – July 31, 2006 for the pre-TOU period and 2) October 1, 2006 – September 30, 2007 for the TOU period. August and September 2007 were excluded to avoid the transitional period when participants first became aware that they were subject to TOU rates and began to change their consumption patters.

Due to the difference in weather experienced by participants in the pre-TOU period compared with the TOU period, Navigant Consulting developed a regression model for all the analyzed participants 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 all the participants analyzed in each of the four treatment groups.

For the pre-TOU and TOU period, total consumption was calculated for four periods: on-peak, mid-peak, off-peak weekdays, and weekends/holidays. This calculation was done for each individual customer, for total consumption within each of the four groups, and for all customers combined. Critical peak response was analysed by comparing each customer's load

for each day when a critical peak was declared against their average load for the 10 highest cooling degree days in the post-pilot period with no critical peak notification.

Findings

Changes in Consumption Patterns

Figure 6 through Figure 9 show average hourly consumption by the study participants for both an average winter weekday and weekend and an average summer weekday and weekend, during both the pre-TOU and TOU periods. In winter, off-peak consumption (both off-peak weekday and all day on weekends) appears to be lower in the TOU period. In summer, early evening consumption (mid-peak on weekdays, off-peak on weekends) appears to be lower. Other differences are too small to be evident in these graphs.

Figure 6: Total Customer Demand for Winter Weekday (kW)

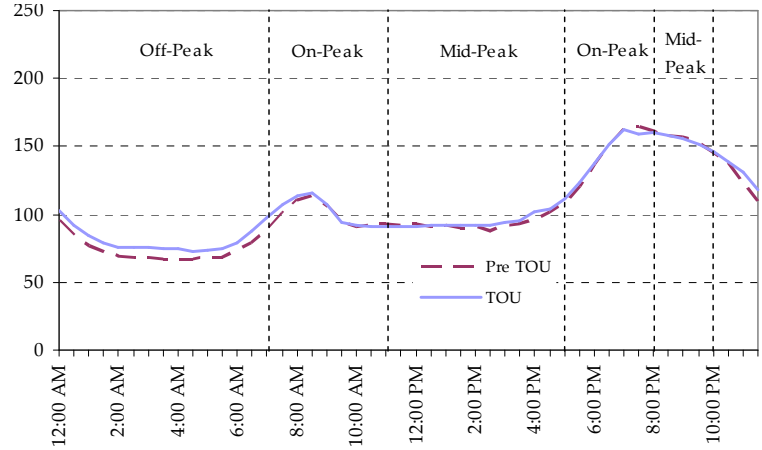


Figure 7: Total Customer Demand for Winter Weekend (kW)

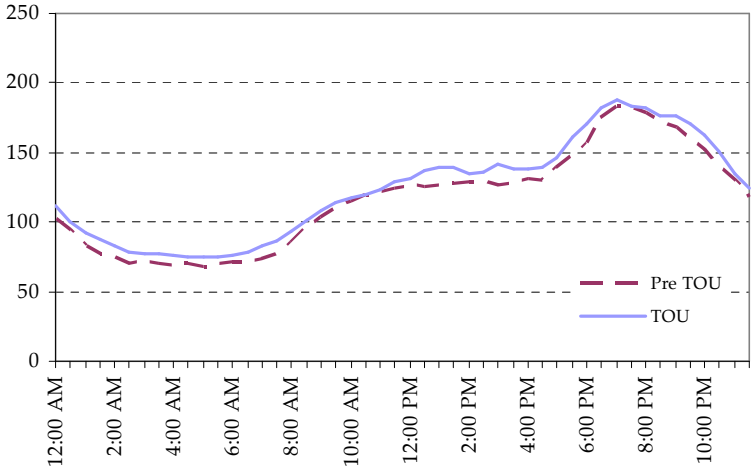


Figure 8: Total Customer Demand for Summer Weekday (kW)

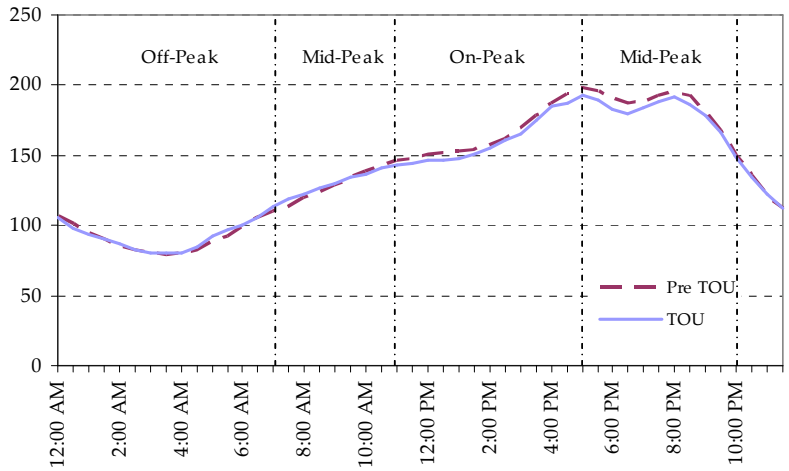
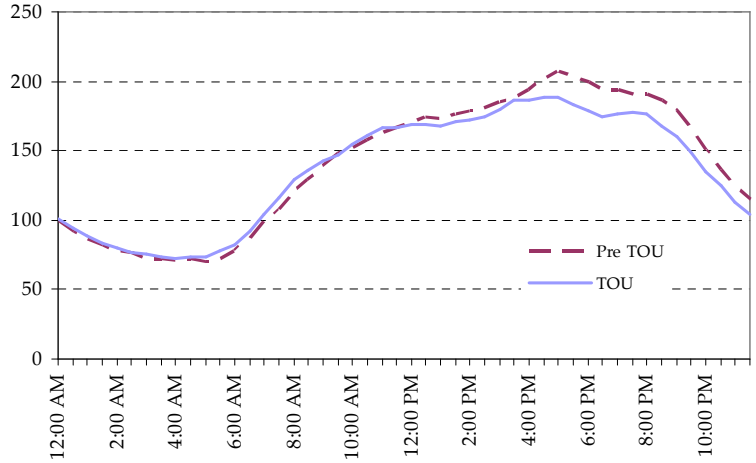


Figure 9: Total Customer Demand for Summer Weekday (kW)



Conservation Effect

Other studies of time-of-use rates have found an overall conservation effect; not only do consumers shift their consumption from high-price to low-price periods, but they reduce their overall consumption, perhaps because of an increased awareness of their electricity use. Figure 10 shows total weather corrected consumption by all participants during the two study periods. Total consumption is slightly higher in the TOU period – 19 MWh/year for the entire group or 1.1% overall. There is thus no evidence that the TOU rates had a significant impact on the overall consumption of all study participants combined.

Figure 10: Total Consumption by Study Participants (MWh/year)

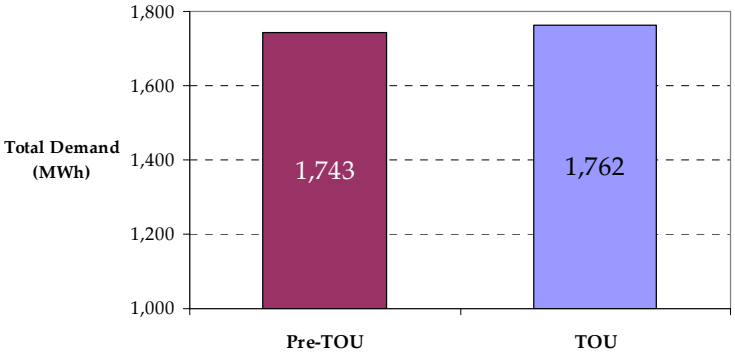
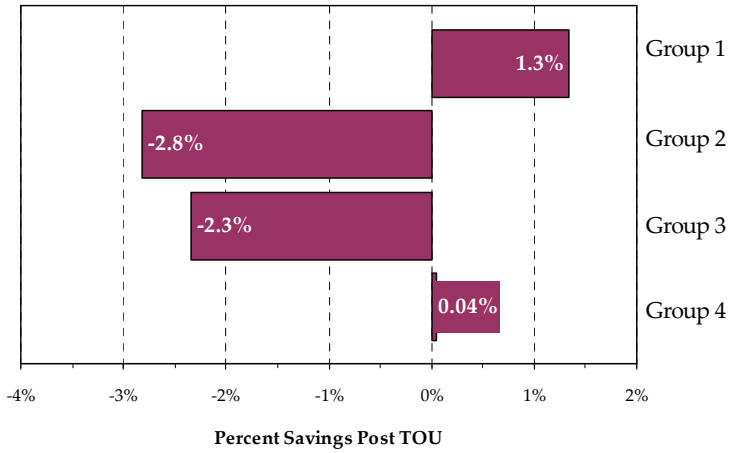


Figure 11 illustrates the breakdown of the customer's conservation effect for each group analyzed in the pilot study using the same weather corrected data and time period as stated above.

Figure 11: Change in Total Consumption by Group



As shown in Figure 11, customers in treatment Group 1 had the greatest reduction in electricity consumption during the TOU period with customers on average reducing their overall electricity consumption by 1.3%. It is surprising to see that Group 2, the group which received the most encouragement to conserve through use of remote controllable thermostats and critical peak notification, and which therefore could be expected to reduce its consumption the most, had on average the largest *increase* in overall electricity consumption, with an increase in 2.8% over their pre-TOU load. Group 3 also had an increase of consumption, 2.3%, and Group 4 consumed marginally less during the TOU period than in the corresponding pre-TOU period.

Load Shifting

Figure 12 shows the percent of total consumption during each of the four periods (with the off-peak period divided into weekdays and weekends). There is a small reduction in the share of consumption that occurs during on-peak (0.4% of total load) and mid-peak hours (0.3% of total load), and a corresponding (0.5%) shift to increased consumption during off-peak weekday (but not weekend) hours.

Figure 12: Pre-TOU and TOU Period Consumption by TOU period

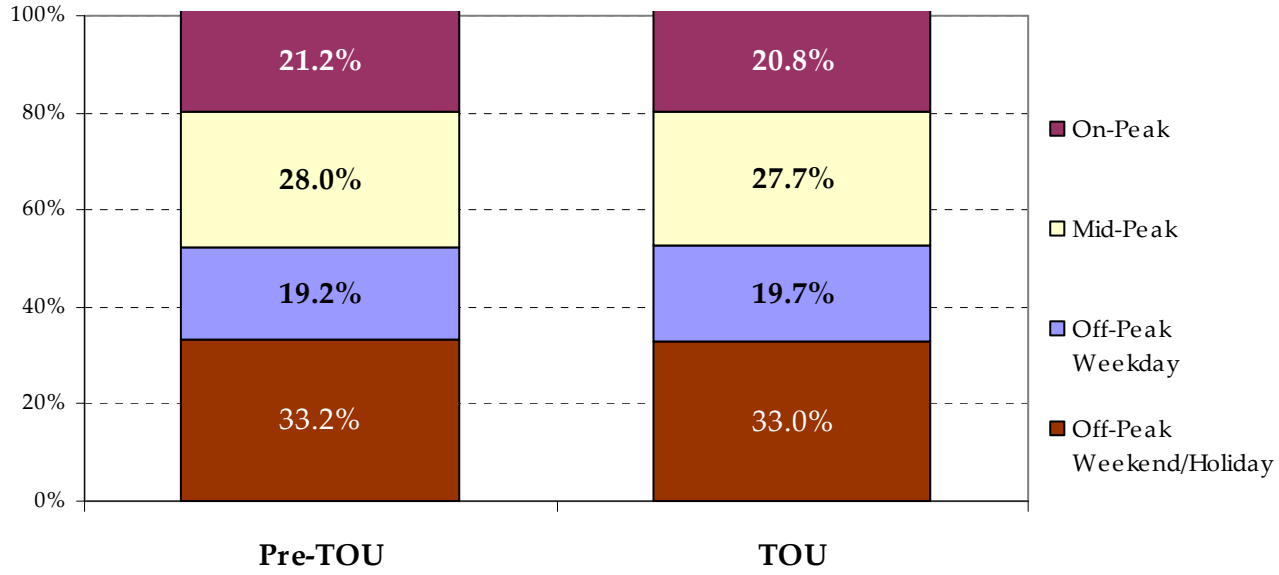


Table 6 analyzes load-shifting by group and clearly indicates that there was a shift away from on-peak and mid-peak consumption to weekday off-peak consumption. Other interesting findings shown in Table 6 include:

- Three out of the four groups show a decrease in on-peak consumption, averaging 3%, with participants in Group 3 having the largest decrease of 4%.
- Only two groups show a decrease in mid-peak consumption, while participants in Groups 3 and 4 had a marginal increase in their mid-peak consumption.
- Participants in all four groups show an increase in off-peak weekday consumption during the weekdays, however off-peak weekend consumption remains relatively unchanged.

Table 6: Change in Consumption by Group and TOU Period

	On-Peak	Mid-Peak	Off-Peak			Total
			Weekday	Weekend	Combined	
Actual Consumption (relative to consumption in corresponding pre-TOU period)[8]						
Group 1	0.9%	1.4%	1.0%	1.7%	1.5%	-1.3%
Group 2	0.1%	1.4%	8.7%	2.6%	4.7%	2.8%
Group 3	-2.4%	3.5%	5.7%	2.4%	3.7%	2.4%
Group 4	-0.4%	0.3%	1.4%	-0.9%	-0.1%	0.0%
All	**-0.7%**	**0.0%**	**3.5%**	**0.4%**	**1.5%**	**1.1%**
Change in percentage of total consumption[9], expressed as a percentage						
Group 1	0.5%	-0.1%	0.3%	-0.4%	-0.1%	
Group 2	-2.6%	-1.4%	5.7%	-0.2%	1.8%	
Group 3	-4.7%	1.1%	3.3%	0.1%	1.3%	
Group 4	-0.4%	0.3%	1.4%	-0.9%	0.0%	
All	**-1.7%**	**-1.1%**	**2.4%**	**-0.7%**	**0.5%**	

Elasticity

Total consumption by all participants combined decreased during on-peak and mid-peak periods when TOU prices were higher than tier prices, and increased during off-peak times when TOU prices were lower. 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

[8] 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 900 kWh and the average on-peak consumption in the pre-TOU period was 1,000, the result would be -10% (i.e., [900 – 1,000]/1,000 = -10%)

[9] 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.

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 their clothes dryers late at night. In this case, electricity used at different times of the day are considered to be separate products.

Which of these 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, as in the clothes dryer example above. 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 this section of the study, the TOU period was redefined as the 12-month period from September 2006 through August 2007, rather than October through September. This was done because complete meter data was only available through August 2007.

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. The majority of the analysis present below is based on the commodity cost, exclusive of variable distribution, transmission and other regulated charges. However, since variable costs represent essentially a fixed increment on the commodity charge for both pre-TOU and during the pilot period, a separate analysis was carried-out to include the variable cost and analyze its effect on the resultant elasticity estimates[10]. For customers under tier pricing, the marginal price depends on whether monthly consumption is above or below the threshold level. In the pre-TOU period, 51% of participants had monthly consumption that exceeded the threshold – hence the marginal rate for just over half of the participants was the higher Tier 2. The average marginal cost of electricity for the participants is thus:

51% x Tier 2 Price + 49% x Tier 1 Price

Over the 12-month pre-TOU period, this works out to 5.74¢/kWh. Note that this *marginal* price for each kWh increment or decrement in participants' consumption is higher than the *average* price of 5.48¢/kWh for their total consumption.

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

[10] Newmarket Hydro's variable distribution, transmission, other regulated charges and GST (of 6%) total $0.0416/kWh.

weighted average of consumption during the TOU period. The relevant commodity prices are shown in Table 7.

Table 7: Electricity Prices for Elasticity Calculations (Commodity Prices Only)

(¢/kWh)	Sept-Oct 2005	Nov '05 - Apr '06	May - Jul '06	Average
Tier Prices				
Tier 1 Price	5.00	5.00	5.80	
Tier 2 Price	5.80	5.80	6.70	
Threshold (kWh/month)	750	1,000	600	
Average Marginal Price	5.32	5.23	6.53	**5.74**
	Sep-Oct '06	**Nov '06 - Apr '07**	**May - Aug '07**	**Average**
TOU Prices				
On-Peak Price	10.50	9.70	9.20	**9.62**
Mid-Peak Price	7.50	7.10	7.20	**7.19**
Off-Peak Price	3.50	3.40	3.20	**3.34**
Non-Off-Peak Price	8.57	8.36	7.99	**8.25**
Non-On-Peak Price	5.00	4.56	4.77	**4.70**

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 based on commodity prices alone, shown in Table 8, range from -1% to -4%. (The minus sign indicates that as prices increase, demand decreases. This is true for most products).

Table 8: Electricity Prices for Elasticity Calculations (Commodity Charges only)

Time Period	Change in Demand	Change in Price	Elasticity
On-Peak	-1.2%	67%	-2.2%
Mid-Peak	-1.0%	25%	-3.9%
Off-Peak	0.4%	-42%	-0.9%

When variable distribution, transmission and other regulated charges are considered in the analysis, the resulting range of price elasticities increases to -2 % to -5%.

The *elasticity of substitution* of two products is the ratio of (1) the *percent change* in their relative demand (the ratio of demand for the first product divided by the demand 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 12, the elasticities of substitution between on-, mid- and off-peak electricity range from -1.0% to -1.4%. 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 (Non On-Peak), or compare off-peak electricity to on- and mid-peak electricity combined (Non Off-Peak). This is shown in the last two columns of Table 9. The results are similar to the previous results.

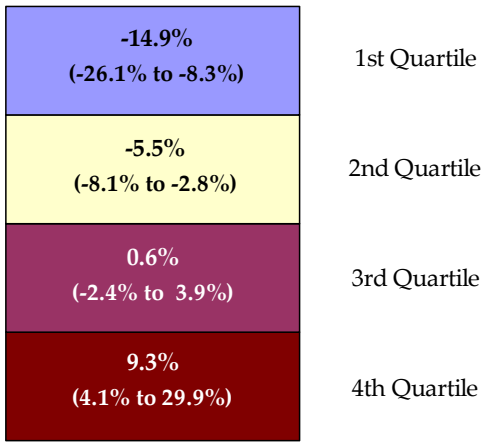
Table 9: Elasticities of Substitution for Commodity Prices Only

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	0.76	0.42	0.55	0.27	0.97
TOU	0.75	0.41	0.54	0.247	0.95
Change	-0.5%	-1.8%	-1.4%	-1.4%	-1.6%
Ratio of Prices					
Pre-TOU	1.00	1.00	1.00	1.00	1.00
TOU	1.34	2.88	2.16	2.05	2.47
Change	33.7%	188.2%	115.67%	104.6%	147.7%
Elasticity	**-1.4%**	**-1.0%**	**-1.2%**	**-1.3%**	**-1.1%**

Similarly, when the transmission and distribution charges are included in the analysis, the range of elasticities of substitution increases to -2.4% and -2.7%. Interestingly, both the On-Peak vs Non-On Peak and Non Off-Peak vs Off-Peak elasticity of substitution were -2.4%.

Elasticities of substitution were calculated for each customer individually, and the average of the On-Peak vs. Non-On-Peak and the Non-Off-Peak vs. Off-Peak elasticities of substitution was taken as a single measure of that participant's elasticity of substitution. The results varied widely from -26% to +30%. As shown in Figure 13, the average elasticity of participants in the first quartile (most responsive customers) is -14.9%, in comparison to an average of 9.3% for participants in the fourth quartile.

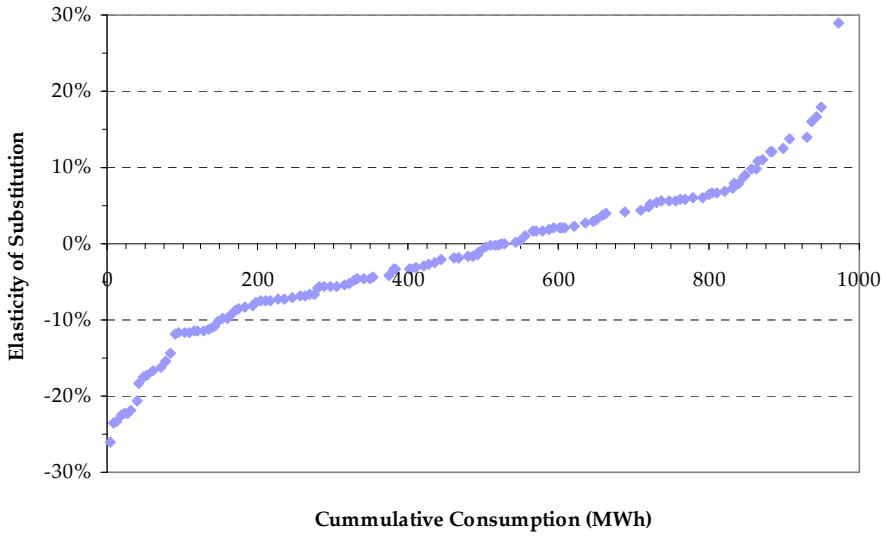
Figure 13: Breakdown of Participants into Quartiles based on Elasticity of Substitution



It is interesting to note that, on average, 69% of consumption for participants in the first quartile falls under the Tier 1 threshold, in comparison to 78% for participants in the fourth quartile. This suggests that customers who use more electricity are more likely to respond to the TOU prices, possibly because they have more uses of electricity and more ways to shift their load. In contrast, customers who use less electricity may have fewer opportunities to shift because more of their usage is for "basic" consumption, such as refrigerator usage, lighting, etc.

A scatter plot of individual participant's elasticity of substitution plotted against their cumulative consumption is given in Figure 14. This provides another perspective on the quartiles shown in Figure 13. Note that just over half the participants exhibit negative elasticities of substitution (as would be expected), but also that a significant number of the participants exhibit positive elasticities of substitution (which is counter-intuitive).

Figure 14: Scatter Plot of Participant Elasticity of Substitution vs Cumulative Consumption



It should be noted that the elasticities estimated in this section are short-term elasticities reflecting changes in demand over approximately one year. The demand response during a short period such as this is limited primarily to behaviour changes that consumers can make easily, such as changing the settings on their programmable thermostat if they already have one. Over the long term, the demand response is expected to increase as consumers not only continue to change their own behaviour, but also invest in equipment that allows them to time-shift their electricity consumption, such as programmable thermostats and clothes dryers with timers.

Critical Peak Period Impact

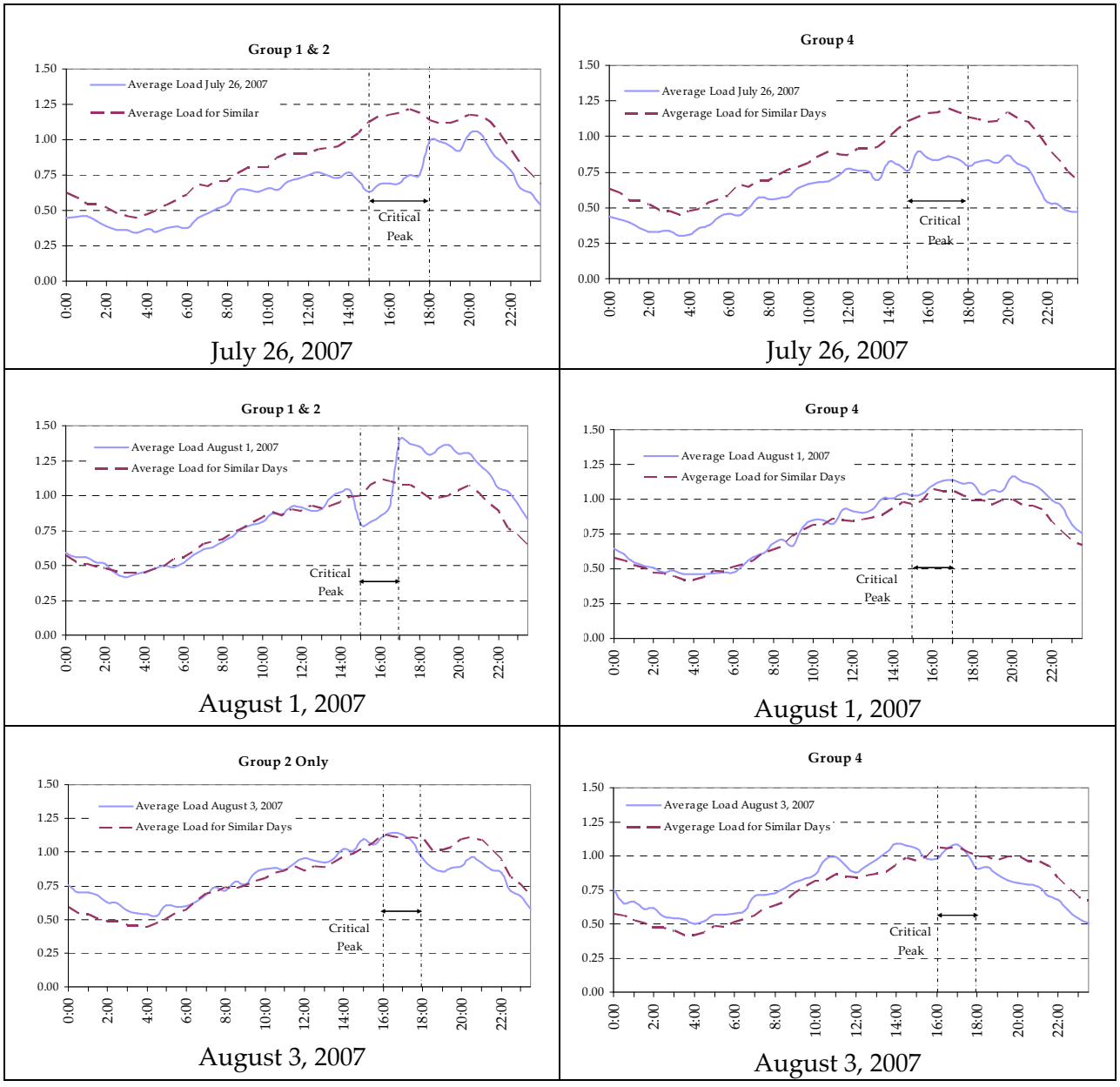
Three summer critical peak events occurred during the period of the pilot study based on day-ahead forecasts that exceeded the thresholds. The average temperature and humidex on these days are provided in the following Table. One winter critical peak event was called on November 9 for testing purposes only and its results were not analysed in this report.

Table 10: Critical Peak Events

Date	Event Time (EST)	Type of Event	Average during Event	
			Temp (°C)	Humidex (°C)
July 26, 2007	3pm – 6pm	"day-ahead" with thermostat control	25	31
August 1, 2007	3pm – 5pm	"day-of" with thermostat control	33	38
August 3, 2007	4pm – 6pm	"day-ahead" *without* thermostat control	31	37

Figure 15 shows customers' consumption on the days of the three summer critical peaks, and compares that to other similar days. Groups 1 and 2 were equipped with remotely controllable thermostats which responded automatically to critical peak events on July 26 and August 1, 2007. Groups 2 and 4 were the only groups to receive "day-ahead" notifications (July 26, 2007 and August 3, 2007) and "day-of" notifications (August 1 2007) of critical peaks, so they could take additional measures to reduce their demand. Group 3 did not receive any notice of critical peak events.

Figure 15: Average Participant Response to Critical Peak (kW/customer)



For Groups 1 and 2 who were equipped with remotely controllable thermostats, the response to the critical peaks is evident on two days that their thermostats were controlled, but especially on August 1. Not only did demand decline significantly during the critical peak period, it also increased immediately afterwards, to a significantly higher level than the comparator day, and remained higher for the rest of the evening. This suggests that any critical peak program that uses automatic equipment will need to be designed in such a way as to avoid creating new peaks immediately following the critical peak period – for example, by staggering the end of the critical peak period for subsets of participants.

It appears that Group 4, which did not have remotely controllable thermostats, did not provide much if any demand response during the critical peak period based on the "day-of" notifications on August 1 and August 3. It is interesting to note that the relative lack of response by this group is similar to that for Group 2 on August 3 – the day participants in Group 2 were given "day-of" notification of a critical peak period, but without remotely controlling their thermostats. Note, however, the load of Group 4 was lower throughout the day on July 26. They had received notification of the critical period on the previous day and their demand is lower throughout the day, not just during the critical peak period. This suggests that with sufficient notification lead time, customers without enabling technologies could respond to critical peak periods. Given the apparent need for day-ahead notification for customers without enabling technologies, the critical peak periods would similarly have to be forecast on a day-ahead basis.

As expected, those customers with remotely controllable thermostats (Groups 1 and 2) showed the greatest reduction in demand during critical peak periods. Specifically, these participants reduced their consumption (and average demand) by approximately 31% (or 0.35 kW) during the two critical peak periods when their thermostats were controlled remotely. Additionally, the remote control feature enabled these participants to provide a significant response even under "day-of" notification– achieving a 21% (or 0.23 kW) reduction in their consumption over the critical peak period.

Estimated Bill 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 traditional two-tiered RPP prices.

The bill impact was calculated for each customer by taking the electricity consumption for each month during the TOU period and estimating the commodity charges associated with each participant under both pricing plans: what they paid under TOU prices and what they would have paid had they stayed on the two-tiered RPP prices. As in the previous section, the TOU period was redefined for this section of the study as the 12-month period from September 2006 through August 2007, rather than October through September. This was done because complete meter data was only available through August 2007.

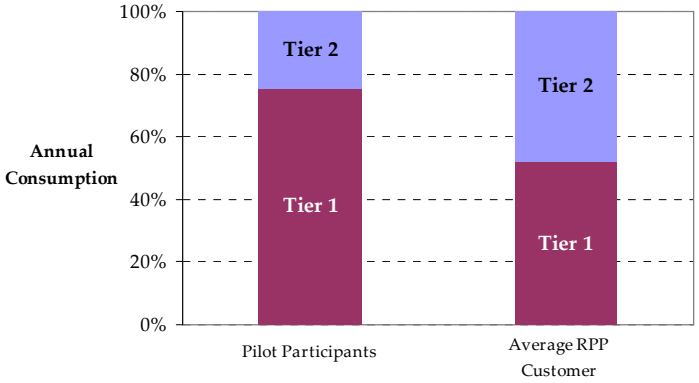
For the TOU price estimates, an average distribution of on-peak, mid-peak and off-peak usage was taken for each participant based on their usage patterns during the TOU period. Note that both TOU and tier prices were calculated based on consumption during the TOU period only, not during the pre-TOU period.

The bill impacts 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. Note, however that the study participants have consumption patterns that do not exactly match those of the average RPP customer. In particular:

- More of the study participants' consumption falls under the threshold: 78%, compared to approximately 50% for the average RPP customer. This difference is illustrated in Figure 16. This indicates that the average price paid by participants under tier prices would be slightly lower than the average RPP price.

Figure 16: Consumption by Tier – Study Participants and Average RPP Customer



- Slightly less of the study participants' consumption falls in the on-peak TOU period (21% vs. 23% for the average RPP customer) and slightly more falls in the off-peak period (51% vs. 48%). This indicates that the average price paid by study participants under TOU prices would be slightly lower than the average RPP price.

While study participants will pay less on average for their commodity charge than the average RPP prices under either set of prices, the difference is slightly larger under tier prices, meaning that the average price paid would be slightly less under tiered prices than TOU prices.

Table 11 shows the commodity charge impacts for each of the groups. There was no noticeable difference between the groups. Impacts ranged from a commodity charge reduction of 7% to a commodity charge increase of 13%. 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.

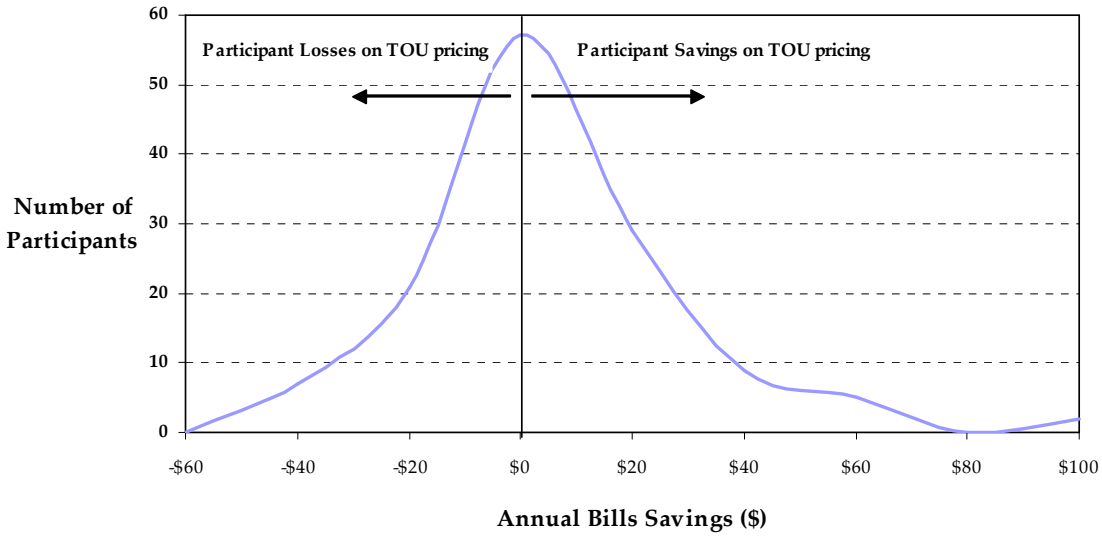
Table 11: Average Annual Commodity Charge Saving/Losses from TOU Pricing Plan by Treatment Group

	Group 1	Group 2	Group 3	Group 4
Average Saving (%)	-1.4%	-1.8%	-2.0%	-1.8%
Largest Saving (%)	4.0%	6.5%	7.4%	7.0%
Largest Loss (%)	-8.3%	-11.1%	-13.1%	-13.4%
% of Participants Saving on TOU	34.6%	35.7%	23.5%	40.5%

On average, TOU prices resulted in slightly higher commodity charges for all groups. 34% of all participants paid less for their commodity charges under TOU prices, with Group 4 participants having the highest percentage of participants paying less for their commodity charges under TOU prices (41%).

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 commodity charges given the tiered pricing structure they were exposed to pre-TOU. In other words, customers with most (or all) of their consumption at the lower Tier 1 price pay less than the actual cost to supply them under tiered pricing, while TOU prices better reflect the true cost of their usage. As Figure 17 shows, the impact of the switch from tiered to TOU prices was small for most study participants, though a few, presumably those with atypical consumption patterns, saw large increases or decreases.

Figure 17: Distribution of Annual Commodity Savings under TOU Pricing



Note that the above analysis assumes no change in consumption patterns. Under TOU prices, customers have the opportunity to reduce their electricity costs by shifting consumption from on-peak and mid-peak to off-peak times. Some shifting occurred during the study period, as discussed above. Based on the prices in effect during the TOU period of the study, participants would on average need to do approximately five times as much load shifting as they actually did to reduce their average bill to below what it would have been under tier prices. Given the relatively limited load shifting observed, this appears to be an attainable goal.

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 250,0000 kWh per year). This would 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 bills of customers like the study participants and pre-TOU and TOU bill impacts are not known at this time.

NAVIGANT CONSULTING

PARTICIPANT SURVEY

A participant survey was conducted as part of the pilot study. Participants were given a hardcopy survey, which also contained a separate link to an online survey encouraging participants to complete the survey online.

The purpose of the survey was to gather direct information and feedback from the participants on how they are responding to the pilot study. Areas the survey focused on were as follows:

- Knowledge and response to different pricing plans
- Customer electricity consumption patterns
- Communication preferences
- Electricity demand from appliances
- Customer demographics

As an incentive to encourage response, all participants who completed the survey would benefit from a $20 credit on a future hydro bill for successful completion of the survey, provided they included their Newmarket Hydro account number.

A copy of the survey is provided in Appendix A.

As shown in Table 12, only 66 surveys were completed via internet or mailed or faxed in by the cut-off date of October 5, 2007, for an overall response rate of 28%. With 66 respondents, the margin of error (at 95% confidence) would be approximately ±10%, based on a binomial (e.g., yes/no) question with an equal probability of either response, and assuming all respondents answered. If the question was more complicated (e.g., with multiple possible responses), or if some respondents did not answer, the margin of error for that question would be correspondingly larger. The low participation and/or completion rate of the participant survey should be noted for future pilot studies with further consideration of greater incentives or promotion of the survey.

Table 12: Survey Distribution

Customer Type	Responses	Percentage of Group
Group 1	13	40%
Group 2	22	32%
Group 3	10	26%
Group 4	12	13%
No Group*	9	n/a
Total	*66*	*30%*

* 9 participants did not provide an account number on their completed survey

On average, 75% of respondents' consumption falls below the tier threshold which is slightly less than the average of 78% for all participants. In terms of their reduction in on-peak consumption in the TOU period in relation to the pre-TOU period, survey respondents had an average reduction of 4.5%, versus the 1.2% average reduction for all participants. Furthermore, the average elasticity of substitution for the survey participants was - 4.5%, roughly double the average of - 2.4% for all participants. This indicates that survey respondents were generally more responsive than the average participant. This response bias should be considered when reviewing the results given below.

Survey Results

Survey responses, in addition to being tabulated, were also compared to the respondent's actual behavior using regression analysis. For each study participant, the percentage change in on-peak consumption as a share of total consumption was calculated. (For example, if 20% of that respondent's consumption was on-peak during the pre-TOU period, and 19% during the TOU period, the percentage change was 1%/20% = 5%, regardless of whether total annual electricity consumption increased or decreased.) 57 out of the 66 survey respondents provided account numbers which could be matched against meter reading data.

For these respondents, survey responses were compared to the percent change in on-peak consumption using single-variable regression analysis. For example, if a question asked which of 5 categories the respondent preferred, then five regressions were performed: percentage change in on-peak consumption vs. choosing category 1, vs. choosing category 2, etc. The results are discussed below along with the tabulation of survey results.

Communications Feedback

One of the primary objectives of the survey was to get feedback from participants on the various elements of communication materials provided to the pilot participants. As shown in Figure 18 and Figure 19, approximately half the survey respondents agreed that the monthly electricity bill was the most helpful resource to understand the time-of-use prices, with 60% of the customers finding the tabular format for displaying the different time periods the easiest to understand. Note, however that more than 30% of respondents found the graphical format easier to understand, suggesting that both formats should be provided in the future to address the disparate information needs of customers.

Figure 18: Most Helpful Resource in Understanding TOU prices

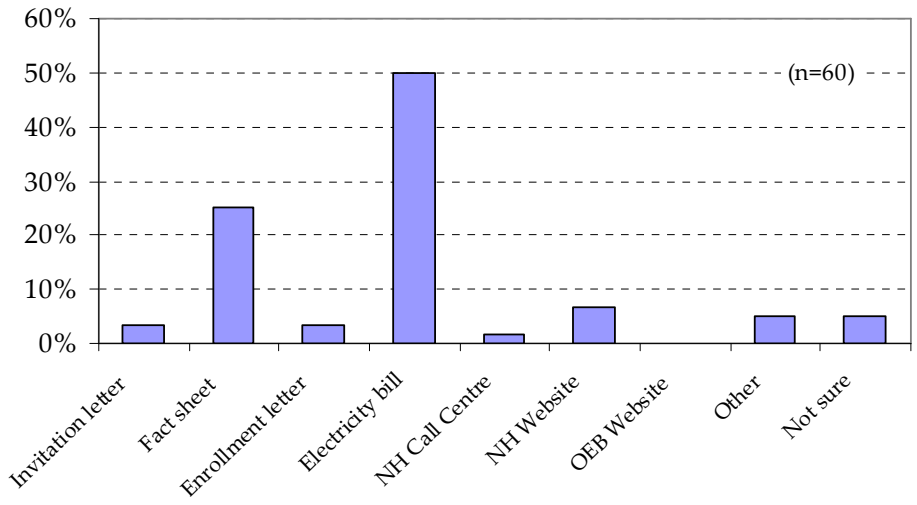
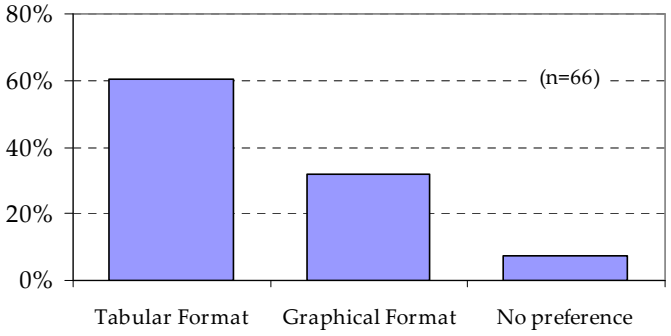


Figure 19: Which TOU Pricing Structure Format is Easiest to Understand



Other notable results with respect to communication material include:

- Almost all participants wanted to receive their electricity bill by mail.
- 76% of survey respondents did not use the online customized electronic reporting tool.

- Survey respondents who were successful in reducing their peak demand under the TOU prices were more likely than those who were less successful to prefer e-mail or internet for notification of critical peaks. However, they were less likely to find the Newmarket Hydro and the OEB websites useful, preferring traditional resources such as the invitation letter, fact sheet and call center more helpful. They preferred different communication mediums for different purposes: for receiving general information, a preference for the internet had a 7% correlation with high acheivement, compared to a 28% correlation for receiving critical peak notification.
- Mail was reported by respondents to be the most popular way of receiving notification of critical peaks with 46% of responses preferring it. However, Newmarket Hydro did not send any of the critical peak notifications through the mail due to the obvious fact that mail would not provide timely reponse given delivery times. E-mail was the next most popular means of critical peak notification, with 31% of respondents preferring it.

These results imply that LDCs should use electronic media (e.g., e-mails, websites, etc.) in combination with more traditional media (e.g., hardcopy bills, bill inserts, call centers, etc.) when communicating with their customers since different approaches appear to appeal to different types of customers.

Electricity Consumption and Understanding of the TOU Pricing Plan

The survey respondents gave information on their consumption behaviour and on their understanding of TOU prices. As seen in Figure 20, most participants agreed that they were "very likely" or "likely" to change how they use their electricity behaviour in the future. Likewise, 57% of responses agreed that the current difference between On-Peak prices and Off-Peak prices is large enough to provide incentive for them to shift their electricity consumption to Off-Peak, as shown in Figure 20.

Figure 20: Likelihood of Changing Electricity Behaviour in the Future

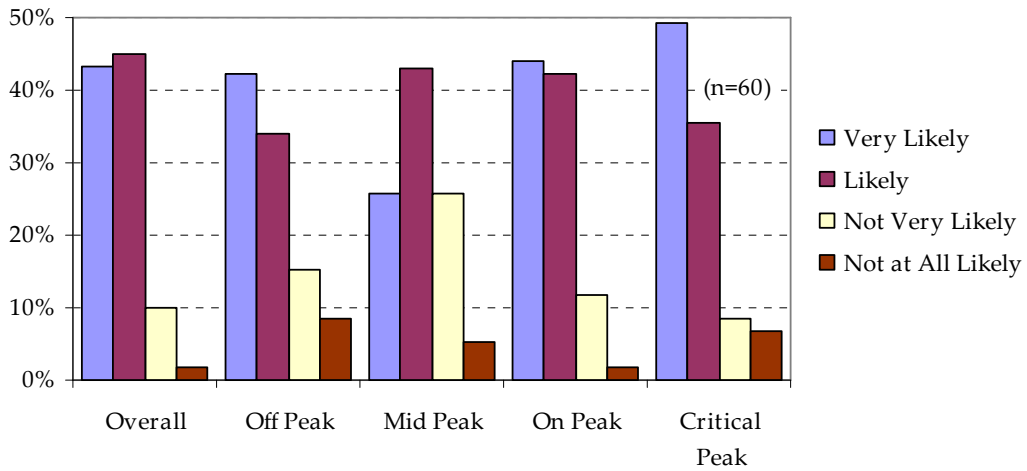
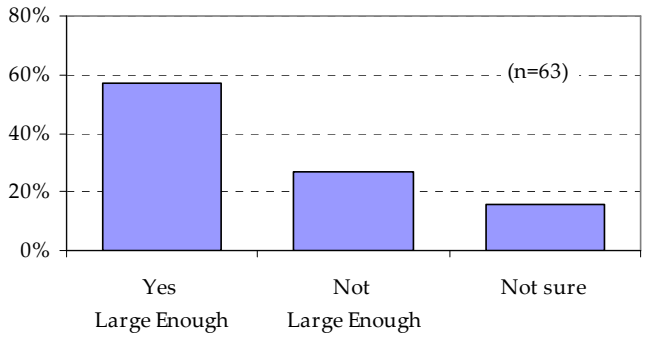


Figure 21: Percentage of Survey Responses who Feel the Current Difference in TOU Prices is Large Enough to Provide Incentive to Shift Electricity Consumption



Other electricity consumption results and consumer's understanding of the TOU pricing plan are summarized below:

- Only 16% of responses could correctly identify that the price changed four times during a summer weekday and five times during a winter weekday. In terms of correctly identifying the start and end times of On-Peak and Off-Peak periods, participants were more successful in recalling Off-Peak periods than On-Peak: only 42% of suvey respondants correctly identified 11 a.m. as the start of the summer On-Peak period, whereas 60% surcessfuly recalled the start of the Off-Peak period. Perhaps not surpringly, there was a strong correlation between correctly identifying all the start and end times in the survey with reduction in on-peak consumption.

  It is not clear whether this correlation is cause or effect. Knowledge of the TOU pricing schedule is necessary for changing consumption patterns and suggests that future communication programs should focus on educating consumers about this schedule. On the other hand, it is also possible that understanding of the TOU schedule and success in changing consumption patterns result from the consumer's enthusiasm for TOU pricing. This view would suggest that future communication programs should focus on both motivation and communications under the premise that motivated customers will seek and understand the information provided. Navigant Consulting believes this latter view is more appropriate and that communications should be focused on both motivation AND understanding.

- Success in reducing on-peak consumption had a higher correlation with a belief that the respondent had made changes to their *off-peak* electricity usage, rather than changes to their *on-peak* usage. This suggests that encouraging changes to off-peak consumption patterns should be part of the communications message along with encouraging reductions in on-peak consumption rather than focusing exclusively on reductions in on-peak consumption.

- The fact that "high achievers" (in terms of elasticity of substitution) who responded to the survey were more likely than other respondents to believe that they had made changes to their electricity consumption suggests that the observed shift in consumption from on-peak and mid-peak periods to the off-peak period, are not just a matter of chance but reflect deliberate changes in participants' behaviour.

Program Satisfaction

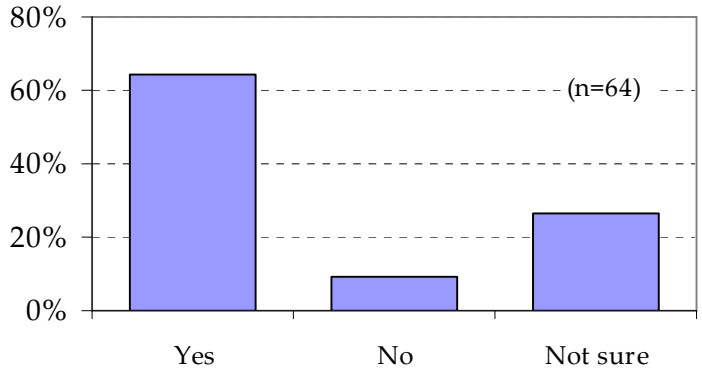
Based on the survey results as seen in Table 13, the main benefits of TOU pricing plans to consumers are (a) becoming more aware of "when" they use their electricity, (b) becoming more conscious about what they can do to control and reduce their electricity bill.

Table 13: Responses to "*What is the Main Benefit TOU Pricing Plan Offers to Electricity Customers?*"

What is the Main Benefit TOU Pricing Offers Consumers?	Number of Respondents	Percentage of Respondents
More conscious about what they can do to reduce their electricity bill	23	37%
More aware of "when" they use electricity	16	25%
Greater control over their electricity costs	10	16%
More conscious about "peak" electricity usage	9	15%
Benefits the environment	2	3%
More aware of their "total electricity consumption"	2	3%
Total	***62***	***100%***

Furthermore, as shown in Figure 22, the majority (64%) of respondents said they would recommend the TOU pricing plan to their friends if the pilot project is expanded, whereas only 9% would definitely not. It is interesting to note the relatively high percentage (27%) of respondents who were not sure whether they would recommend the TOU pricing plan to a friend.

Figure 22: Likelihood of Participant Recommending TOU pricing to Friends



Surprisingly, a 16% correlation was observed between those respondents who were most successful in reducing the on-peak consumption and those who were "not sure" if they would recommend the TOU pricing to their friends. Some of the reasons given by the more successful participants included not knowing if they were actually saving money on their monthly bills since switching to TOU prices and the lack of incentives given to consumers to encourage them to shift their electricity consumption away from on-peak consumption.

CONCLUSIONS

Based on Navigant Consulting's analysis of the consumption patterns of the participants in Newmarket Hydro's TOU pricing pilot, the following conclusions can be drawn:

1. Expressed as a percentage of total consumption, weather-corrected on-peak usage decreased by 0.4% and mid-peak consumption decreased by 0.3%. Correspondingly, off-peak consumption expressed as a percentage of total consumption increased by 0.7%, with most of this increase occurring during the weekday off-peak period.

2. Average participant price elasticities based on commodity prices alone range from -1% for the off-peak period and -2% for the on-peak period to -4% for the mid-peak period. The minus sign indicates that as prices increase, demand decreases. When variable distribution, transmission and other variable charges are considered in the analysis, the resulting range of price elasticities increases to -2 % to -5%.

3. The average participant elasticity of substitution[11] between on-, mid- and off-peak electricity ranged from -1.0% to -1.4%. When transmission, distribution and other variable charges are included in the analysis, both the On-Peak vs Non-On Peak and Non Off-Peak vs the Off-Peak elasticity of substitution was found to be -2.4%.

4. The response of participants to TOU prices varied widely. When broken into quartiles based on their responsiveness[12], the average elasticity of substitution of participants in the first quartile (most responsive group) was found to be - 14.9%, in comparison to an average of 9.3% for participants in the fourth quartile.

5. Enabling technologies help customers to take advantage of time-of-use rates, particularly during critical peak periods. Pilot participants with remotely controllable thermostats exhibited greater reductions during critical peak periods than those without. Specifically, these participants reduced their consumption (and average demand) by approximately 31% (or 0.35 kW/customer) during the two critical peak periods when their thermostats were controlled remotely. Additionally, the remote control feature enabled these participants to provide a significant response even under "day-of" notification– achieving a 21% (or 0.23 kW/customer) reduction in their consumption over the critical peak period.

---

[11] The elasticity of substitution of two products is the ratio of (1) the *percent change* in their relative demand (the ratio of demand for the first product divided by the demand for the second product) to (2) the *percent change* in their relative prices.

[12] The average of the On-Peak vs. Non-On-Peak and the Non-Off-Peak vs. Off-Peak elasticities of substitution was taken as a single measure of that customer's elasticity of substitution

6. The results also highlight the need for "day-ahead" notification for residential consumers without enabling technologies if some form of critical peak pricing is implemented in Ontario. For example, participants who did not have remotely controllable thermostats did not provide much if any demand response during the critical peak period based on "day-of" notifications (i.e., same day as the critical peak period). In contrast, these same participants reduced demand throughout the critical peak day, not just during the critical peak period when they were given "day-ahead" notification (ie, on the previous day).

7. On average, TOU prices resulted in slightly (just under 2%) higher commodity charges for participants. As with elasticity, the results for individual participants varied widely, with just over 1/3 of participants paying lower commodity charges under TOU prices compared with tiered prices. Note, however, that a majority of participants' consumption was under the tier threshold. As a result, most of their consumption was priced at the lower Tier 1 rate resulting in a lower average rate than the average RPP consumer . Essentially, participants were paying less than the average RPP price (or less than the average cost to supply RPP consumers) under tiered prices given 1) their relatively low consumption and 2) the design of the RPP tiered prices. They still paid less than the average RPP price under TOU pricing given their usage pattern, but the amount less than the average RPP price under TOU pricing was not as much as the amount less under tiered pricing. This was the primary contributor to the slight increase in commodity charges. It should also be noted that given the pattern of wholesale market prices, pilot participants' commodity charges under TOU prices were more reflective of their "true cost of power" than what they would have been under tiered prices.

8. On average, there was a increase of 1.1% in weather-corrected overall consumption by all participants after changing from RPP tier pricing to TOU pricing. This may seem counter-intuitive but it is important to note that reduced consumption is not the primary goal of TOU pricing. Rather, the primary goal of TOU pricing is to encourage consumers to shift their consumption away from more expensive, peak demand periods when Ontario's electricity system is more likely to be constrained to less expensive, lower demand periods. The results summarized above indicate that this primary goal was achieved. Reduced consumption is expected to be achieved through the portfolio of conservation programs being implemented by LDCs and the Ontario Power Authority (OPA)

9. 64% of participants who responded to the survey said they would recommend the TOU pricing plan to their friends, and 27% of respondents were not sure whether they would recommend the TOU pricing plan to their friends. Some of the reasons given by the more successful participants who were not sure included not knowing if they were actually saving money on their monthly bills since switching to TOU prices and the lack

of incentives given to consumers to encourage them to shift their electricity consumption away from on-peak consumption.

10. There was a positive correlation between correctly identifying all the start and end times for the various TOU periods in the survey and the respondent's percentage reduction in on-peak consumption. This suggests that future communication programs should focus on educating consumers about the TOU price schedule. It is also possible that both knowledge of the TOU schedule and success in changing consumption patterns result from the consumer's enthusiasm for the TOU program. This would imply that future communication programs should focus on both motivation and communications under the premise that motivated customers will seek and understand the information provided. The findings also suggest that encouraging changes to off-peak consumption patterns should be part of the communications message along with encouraging reductions in on-peak consumption rather than focusing exclusively on reductions in on-peak consumption.

11. The fact that "high achievers" (in terms of elasticity of substitution) who responded to the survey were more likely than other respondents to believe that they had made changes to their electricity consumption suggests that the observed shift in consumption from on-peak and mid-peak periods to the off-peak period is not just a matter of chance but reflects deliberate changes in participants' behaviour.

APPENDIX A: PARTICIPANT SURVEY

Newmarket Hydro
Time of Use Pilot Survey

We are Navigant Consulting, a professional consulting firm actively providing advice and guidance to many Ontario electric industry participants including the Ontario Energy Board, the Independent Electricity System Operator and local electric utilities. As a participant in the Newmarket Hydro TOU Pilot, we are looking for your opinions and views on your experiences with the pilot program to date on behalf of Newmarket Hydro. The pilot program was approved by the Ontario Energy Board (OEB) in July 2006.

In the near future, all utilities such as Newmarket Hydro will charge time-of-use prices to all consumers with a smart meter. Before that occurs, Newmarket Hydro and the OEB want to use this pilot to help determine how customers react to those prices. Your participation and your feedback on this survey is therefore very important. **Your input will be used in making some important decisions that will ultimately affect all residential consumers in Newmarket and across Ontario.**

The purpose of this survey is to directly capture your feedback and gather information from you, for example, on how you are responding to the time-of-use prices such as how you have changed the way you use electricity.

Please take 10 to 15 minutes to provide us with your input by answering this short survey.

*Please return your completed survey no later than **October 5, 2007**.*

This survey can also be completed online at:

www.nmhydro.ca/toupilotsurvey

Q1A. Do you recall receiving an invitation to enroll in the Newmarket Hydro TOU Pilot program in July / August 2006?

- ❍ Yes ***[GO TO Q2A]***
- ❍ No ***[CONTINUE]***
- ❍ Not Sure ***[CONTINUE]***

In July 2006, you received notification of enrolment in the Newmarket Hydro TOU Pilot program.

We would like to get input from the person in your household who received and read this notification. Please have that person complete the remainder of this survey.

- ❍ Continue ***[HAVE THE APPROPRIATE PERSON CONTINUE WITH SURVEY]***
- ❍ No one in household recalls the invitation ***[PLEASE DO NOT COMPLETE THIS SURVEY]***

Q1D. Do you recall receiving an invitation to enroll in the Newmarket Hydro TOU Pilot program in July / August 2006?

- ❍ Yes ***[GO TO Q2A]***
- ❍ No ***[PLEASE DO NOT COMPLETE THIS SURVEY]***
- ❍ Not Sure ***[PLEASE DO NOT COMPLETE THIS SURVEY]***

GENERAL QUESTIONS:

To start, we would like to capture your general opinions about the time-of-use pricing plan and the Newmarket Hydro TOU Pilot program.

Q2A. What benefits do you feel the time-of-use pricing plan offers to electricity consumers? ***[MARK ALL THAT APPLY]***

- ❍ Allows participants to become more aware of "when" they use electricity during the day or week
- ❍ Allows participants to become more aware of their "total electricity consumption" regardless of the time of day or week you use it
- ❍ Makes participants more conscious about what they can do to reduce their electricity bill (e.g., turning off lights or other devices when not in use, shifting usage to cheaper periods)
- ❍ Makes participants more conscious about "peak" electricity usage (when all consumers use the most electricity which are called critical peak days)
- ❍ Gives participants greater control over their electricity costs
- ❍ Benefits the environment
- ❍ Other benefits *[PLEASE ANSWER Q2C]*
- ❍ No benefits *[GO TO Q3A]*

Q2B. What is the **MAIN** benefit the time-of-use pricing plan offers to electricity customers? Please choose one only from benefits you marked in Q2A. ***[CHOOSE ONE ONLY]***

- ❍ Allows participants to become more aware of "when" they use electricity during the day or week
- ❍ Allows participants to become more aware of their "total electricity consumption" regardless of the time of day or week you use it
- ❍ Makes participants more conscious about what they can do to reduce their electricity bill (e.g., turning off lights or other devices when not in use, shifting usage to cheaper periods)
- ❍ Makes participants more conscious about "peak" electricity usage (when all consumers use the most electricity which are called critical peak days)
- ❍ Gives participants greater control over their electricity costs
- ❍ Benefits the environment
- ❍ Other benefits
- ❍ No benefits

[IF Q2A = OTHER BENEFITS:]

Q2C. What other benefits do you feel the time-of-use pricing plan offers to electricity customers?

_____

_____

Q3A. Would you recommend the time-of-use pricing plan to your friends if the pilot project was expanded?

- ❍ Yes
- ❍ No
- ❍ Not sure

Q3B. Why or why not?

_____

_____

Q3C. Do you feel the current difference between the "Off-peak" price and "On-peak" price is large enough to provide you with the necessary incentive to shift your electricity consumption to "Off-peak" periods?

- ❍ Yes (keep difference about the same)
- ❍ No (increase "On-peak" price and reduce "Off-peak" price)
- ❍ Not sure

PRICING PLANS:

As part of this pilot study, we are testing several different pricing plans and no decision has been made on what pricing plan(s) will be offered in the future. You may or may not have been enrolled into one of these plans.

Q4A. What type of pricing plan (the amount you are charged for electricity consumption) is of most interest to you? ***[CHOOSE UP TO TWO]***

- ❍ ***Regular two-tier prices:*** prices for electricity remains the same regardless of the time of day and only changes (increases) when your usage exceeds a monthly consumption threshold; then you pay a higher price (as charged by Newmarket Hydro before the pilot project)
- ❍ ***Time-of-use prices*:** prices for electricity consumption differs by the time of day, day of week (weekday vs. weekend)
- ❍ ***Critical peak "prices":*** prices for electricity consumption are much higher during "critical peak periods" (typically, a few hours on about twelve days per year) combined with a reduced "off-peak" price during all off-peak periods
- ❍ ***Critical peak "rebates"*:** during "critical peak periods", consumers get a credit for using less electricity than they typically use but the "off-peak" price is not reduced
- ❍ Not sure / No opinion

Q4B. What resources did you find useful in helping you understand the time-of-use (or "smart") prices? ***[SELECT ONE PER ROW]***

	Very useful	Somewhat useful	Was not useful	Did not receive / use
i) Invitation letter	❍	❍	❍	❍
ii) Fact sheet (from beginning of pilot)	❍	❍	❍	❍
iii) Enrollment letter	❍	❍	❍	❍
iv) Electricity bill (each month)	❍	❍	❍	❍
v) Newmarket Hydro call centre	❍	❍	❍	❍
vi) Newmarket Hydro website	❍	❍	❍	❍
vii) Ontario Energy Board website	❍	❍	❍	❍
viii) Other resources (specify: _____)	❍	❍	❍	❍

[IF YOU DID NOT FIND MORE THAN ONE RESOURCE MENTIONED ABOVE VERY OR SOMEWHAT USEFUL, GO TO Q5A]

Q4C. Which resource was the most useful? Please choose one only from resources you found very or somewhat useful in Q4B. ***[CHOOSE ONE ONLY]***

- ❍ Invitation letter
- ❍ Fact sheet (from beginning of pilot)
- ❍ Enrollment letter
- ❍ Electricity bill (you received each month)
- ❍ Newmarket Hydro call centre
- ❍ Newmarket Hydro website
- ❍ Ontario Energy Board website
- ❍ Other resources
- ❍ Not sure

Q5A. Thinking about the time-of-use prices, **how many times** does the **price** change during a **summer weekday** (May 1st to October 31st)…? ***[PLEASE DO NOT LOOK AT ANY INFORMATION PROVIDED TO YOU BY NEWMARKET HYDRO]***

Specify: _____

Q5B. Thinking about the time-of-use prices, **how many times** does the **price** change during a **winter weekday** (November 1st to April 30th)…? ***[PLEASE DO NOT LOOK AT ANY INFORMATION PROVIDED TO YOU BY NEWMARKET HYDRO]***

Specify: _____

Q5C. Do you recall the **specific hours** for the following time periods for **weekdays** in the **summer** (May 1st to October 31st)…? ***[PLEASE DO NOT LOOK AT ANY INFORMATION PROVIDED TO YOU BY NEWMARKET HYDRO]***

On-Peak Period: Starts: _____ AM / PM Ends: _____ AM / PM

Off-peak Period: Starts: _____ AM / PM Ends: _____ AM / PM

Q5D. Do you recall the **specific hours** for the following time periods for **weekdays** in the **winter** (November 1st to April 30th)…? ***[PLEASE DO NOT LOOK AT ANY INFORMATION PROVIDED TO YOU BY NEWMARKET HYDRO]***

On-Peak Period (am): Starts: _____ AM / PM Ends: _____ AM / PM

On-Peak Period (pm): Starts: _____ AM / PM Ends: _____ AM / PM

Off-peak Period: Starts: _____ AM / PM Ends: _____ AM / PM

Q6. The illustrations attached ***[SEE LAST PAGE]*** show two different formats for displaying the different time periods and associated time-of-use prices. Which format do you find easier to understand?

- ○ Format A – Tabular Format
- ○ Format B – Graphical Format
- ○ No preference ***[GO TO Q7A]***

Q6B. Why do you prefer this format?

_____

_____

Q6C. Also, are there any changes you would suggest should be made to the other format that would make it more helpful?

_____

_____

INFORMATION ON YOUR ELECTRICITY CONSUMPTION PATTERNS:

As a participant in the Newmarket Hydro TOU Pilot, you received customized monthly electricity bills that provided details about your daily electricity consumption in the periods of the day/week with different prices.

Q7A Do you **recall** receiving customized electricity bills?

- ❍ Yes
- ❍ Do not recall receiving customized electricity bills ***[GO TO Q7D]***

Q7B. Did you **read** the customized electricity bills you received?

- ❍ Yes
- ❍ Did not read the customized electricity bills ***[GO TO Q7D]***

Q7C. Thinking about the last customized electricity bill that you received and read, **to what extent** do you agree with each of the following statements? ***[SELECT ONE PER ROW]***

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
i) The information provided was easy to understand	❍	❍	❍	❍	❍
ii) The information provided was helpful in your understanding "how much" electricity you use during the periods with different prices	❍	❍	❍	❍	❍
iii) The information provided was helpful in understanding how to "shift" your electricity usage to cheaper periods of the day or week	❍	❍	❍	❍	❍
iv) The information provided was helpful in understanding how to "conserve" or "reduce" your total electricity usage across all periods	❍	❍	❍	❍	❍
v) The information provided was helpful in understanding how to save on your electricity bill	❍	❍	❍	❍	❍
vi) The information was provided at the right time (e.g., when you expected to see it)	❍	❍	❍	❍	❍

As a participant in the Newmarket Hydro TOU Pilot, you were provided access to a customized electricity reporting tool on the internet that provided details about your daily electricity consumption in the periods of the day/week with different prices.

Q7D Do you **recall** accessing the customized electricity reporting tool provided on the internet for your use by Newmarket Hydro?

- ❍ Yes
- ❍ Do not recall accessing the customized electricity reporting tool ***[GO TO Q8A]***

Q7E. Approximately how many times have you used the customized electricity reporting tool on the internet?

Specify: _____

Q7F. Thinking about the customized electricity reporting tool provided on the internet for your use by Newmarket Hydro, **to what extent** do you agree with each of the following statements? ***[SELECT ONE PER ROW]***

	Strongly Agree	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Disagree**
i) The information provided was easy to understand	❍	❍	❍	❍	❍
ii) The information provided was helpful in your understanding "how much" electricity you use during the periods with different prices	❍	❍	❍	❍	❍
iii) The information provided was helpful in understanding how to "shift" your electricity usage to cheaper periods of the day or week	❍	❍	❍	❍	❍
iv) The information provided was helpful in understanding how to "conserve" or "reduce" your total electricity usage across all periods	❍	❍	❍	❍	❍
v) The information provided was helpful in understanding how to save on your electricity bill	❍	❍	❍	❍	❍
vi) It was easy to customize the reporting for my specific needs	❍	❍	❍	❍	❍

CHANGES IN YOUR ELECTRICITY CONSUMPTION PATTERN:

Q8A. **To what extent** have you (or others in your household) made a change in how you use electricity? ***[SELECT ONE PER ROW]***

	Significantly changed how you use electricity	Slightly changed how you use electricity	Did not change how you use electricity	Not sure / No answer
i) Overall	❍	❍	❍	❍
ii) During off-peak hours	❍	❍	❍	❍
iii) During mid-peak hours	❍	❍	❍	❍
iv) During on-peak hours	❍	❍	❍	❍
v) During critical peak periods	❍	❍	❍	❍

Q8B. **How likely** are you to change how you use electricity in the future? ***[SELECT ONE PER ROW]***

	Very Likely	Likely	Not Very Likely	Not at All Likely
i) Overall	❍	❍	❍	❍
ii) During off-peak hours	❍	❍	❍	❍
iii) During mid-peak hours	❍	❍	❍	❍
iv) During on-peak hours	❍	❍	❍	❍
v) During critical peak periods	❍	❍	❍	❍

COMMUNICATIONS:

Q9A. Thinking about the different communications you received as part of the smart price pilot program, please indicate your **preferred method** of receiving this information. ***[SELECT ONE PER ROW]***

	Sent by Mail	Sent by Fax	Sent by Email	Automated Telephone System	Provided Online
i) General communications about the Time-of-Use Pilot (e.g., fact sheet)	❍	❍	❍	❍	❍
ii) Electricity bill	❍	❍	❍	❍	❍
iii) Notification of critical peak periods	❍	❍	❍	❍	❍

Q9B. Thinking about the different communications you received as part of the time-of-use pilot program, is there any **additional information** you think would help you to benefit more from the time-of-use prices?

_____

_____

APPLIANCE HOLDINGS:

The following questions ask about the different appliances or equipment you may have in your home. This information will help us to better understand your electricity needs and usage.

Air Conditioning:

Q10A.Do you **pay** for **air conditioning** for your home?

- ❍ Yes ***[CONTINUE]***
- ❍ No, part of rental / condo fee ***[GO TO Q10A]***
- ❍ No, do not have air conditioning ***[GO TO Q10A]***

Q10B. What **type** of **air conditioning** systems do you have in your home? ***[SELECT ALL THAT APPLY]***

- ❍ Central air conditioning
- ❍ Window air conditioning
- ❍ Wall air conditioning
- ❍ Don't Know

Q10C. Which of the following statements best describes how you usually **operate** your **main air conditioning system**? ***[CHOOSE ONE ONLY]***

- ❍ Maintain the thermostat setting at a constant temperature
- ❍ Raise the thermostat setting when no one is at home
- ❍ Thermostat setting automatically changes at different times
- ❍ Manually turn on / off as needed
- ❍ Rarely use
- ❍ Don't Know

Heating:

Q11A.Do you **pay** to **heat your home**?

- ○ Yes ***[CONTINUE]***
- ○ No, part of rental / condo fee ***[GO TO Q11A]***
- ○ No, do not have a heating system ***[GO TO Q11A]***

Q11B. What type of heating systems do you have in your home? ***[SELECT ALL THAT APPLY]***

- ○ Natural gas – forced-air furnace
- ○ Natural gas – other gas heating system
- ○ Electric – forced-air system (air circulates hot air through ducts)
- ○ Electric – Resistance (baseboard/ceiling/floor/wall)
- ○ Electric – other electric system
- ○ Other fuel (specify: _____)
- ○ Don't Know

Q11C. Which of the following statements best describes how you usually **operate** your **main heating system**? ***[CHOOSE ONE ONLY]***

- ○ Maintain the thermostat setting at a constant temperature
- ○ Lower the thermostat setting when no one is at home
- ○ Thermostat setting automatically changes at different times
- ○ Manually turn on / off as needed
- ○ Rarely use
- ○ Don't Know

Water heating:

Q12A.Do you **pay** for **heating water** at your home?

- ○ Yes ***[CONTINUE]***
- ○ No, part of rental / condo fee ***[GO TO Q12A]***
- ○ No, do not have a water heating system ***[GO TO Q12A]***

Q12B. What type of water heating systems do you use in your home? ***[SELECT ALL THAT APPLY]***

- ○ Natural gas
- ○ Electric
- ○ Other (specify: _____)
- ○ Don't Know

Appliances:

Q13A. How many of the following appliances or equipment do you **use** in your home? ***[SELECT ONE PER ROW]***

	0	1	2	3+
a) Washing machine	❍	❍	❍	❍
b) Natural gas clothes dryer	❍	❍	❍	❍
c) Electric clothes dryer	❍	❍	❍	❍
d) Cooktop, stove or range	❍	❍	❍	❍
e) Oven(s) – Natural Gas	❍	❍	❍	❍
f) Oven(s) – Electric	❍	❍	❍	❍
g) Stand-alone freezer	❍	❍	❍	❍
h) Dishwasher	❍	❍	❍	❍
i) Computer	❍	❍	❍	❍
j) Printer, scanner, copier	❍	❍	❍	❍
k) Dehumidifier	❍	❍	❍	❍
l) Fan(s) – portable or ceiling mount	❍	❍	❍	❍
m) Spa / Hot tub	❍	❍	❍	❍
n) Heated swimming pool	❍	❍	❍	❍

Q13B. How often are the following appliances or equipment **used** on **weekdays** between **11 am and 8 pm**? ***[SELECT ONE PER ROW]***

	Never	Rarely (1 day / week)	Sometimes (2-3 days / week)	Often (4+ days / week)
a) Washing machine	❍	❍	❍	❍
b) Natural gas clothes dryer	❍	❍	❍	❍
c) Electric clothes dryer	❍	❍	❍	❍
d) Cooktop, stove or range	❍	❍	❍	❍
e) Oven(s) – Natural gas	❍	❍	❍	❍

	Never	Rarely (1 day / week)	Sometimes (2-3 days / week)	Often (4+ days / week)
f) Oven(s) – Electric	❍	❍	❍	❍
g) Stand-alone freezer	❍	❍	❍	❍
h) Dishwasher	❍	❍	❍	❍
i) Computer	❍	❍	❍	❍
j) Printer, scanner, copier	❍	❍	❍	❍
k) Dehumidifier	❍	❍	❍	❍
l) Fan(s) – portable or ceiling mount	❍	❍	❍	❍
m) Spa / Hot tub	❍	❍	❍	❍
o) Heated swimming pool	❍	❍	❍	❍

YOUR HOME AND DEMOGRAPHICS:

To end, we have a few final questions about you and your home. Please be assured that this information will remain confidential and no individual responses will be shared with the client.

Q14A. What type of dwelling is your home?

- ❍ Single-family detached house
- ❍ Single-family semi-detached house
- ❍ Townhouse, duplex, or row house
- ❍ Apartment
- ❍ Condominium
- ❍ Other (specify: _____)

Q14B. Do you own or rent your home?

- ❍ Own
- ❍ Rent / lease
- ❍ Don't know

Q14C. In what year was your home built?

- ❍ Before 1970
- ❍ 1970 – 1979

- ○ 1980 – 1989
- ○ 1990 – 1999
- ○ 2000 – 2005
- ○ 2006
- ○ Don't know

Q14D. How many square feet of living space is there in your home (including kitchen, rooms, bathrooms, foyers and hallways)? The square footage of homes is often quoted to exclude the basement. Please include the basement in the estimate if it is finished living space.

- ○ Less than 1000 sq. ft.
- ○ 1001 to 1500 sq. ft.
- ○ 1501 to 2000 sq. ft.
- ○ 2001 to 2500 sq. ft.
- ○ 2501 to 3000 sq. ft.
- ○ 3001 to 3500 sq. ft.
- ○ 3501 to 4000 sq. ft.
- ○ More than 4000 sq. ft.
- ○ Don't know

Q14E.Does this estimate include the basement?

- ○ Yes *[IF YES:]* -> Approximate sq. ft. of basement: _____
- ○ No

Q15A.How many people (including yourself) usually live in your home?

_____

Q15B.How many (including yourself) are 18 years of age or older?

_____

YOUR NEWMARKET HYDRO ACCOUNT NUMBER:

As a token of our appreciation for your time taken to complete the survey, should you opt to provide your Newmarket Hydro account number below, ***you will receive a $20.00 credit on a future hydro bill****. Please be assured that this information will remain confidential and no individual responses will be shared with the client.*

Q16A Please provide the 10-digit Newmarket Hydro account number from your most recent electricity bill. ***[THIS INFORMATION WILL ONLY BE USED FOR THE PURPOSE OF PROVIDING THE $20 CREDIT AND ANALYZING CUSTOMER RESPONSE TO TOU PRICES. PROVISION OF THIS INFORMATION IS OPTIONAL]***

- ❍ Newmarket Hydro Customer Account Number:
- ❍ __ __ __ __ __ __ __ __ – __ __
- ❍ Don't know / Prefer not to answer

On behalf of Newmarket Hydro, we would like to thank you for taking the time to complete this survey.

Please return your questionnaire no later than ***October 5, 2007*** *to:*

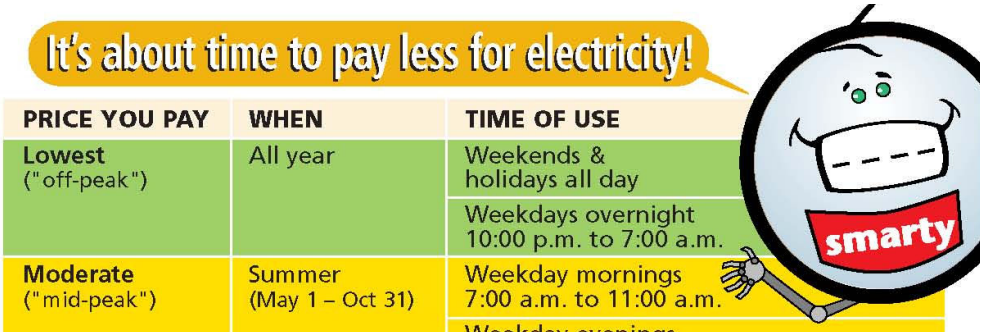
Navigant Consulting
Attention: **Newmarket Hydro TOU Pilot Survey**

One Adelaide Street East, Suite 2601
Toronto, ON M5C 2V9

Or fax it to us at:

416 777 2441

FORMAT A (TABULAR FORMAT)



PRICE YOU PAY	WHEN	TIME OF USE
Lowest ("off-peak")	All year	Weekends & holidays all day
		Weekdays overnight 10:00 p.m. to 7:00 a.m.
Moderate ("mid-peak")	Summer (May 1 – Oct 31)	Weekday mornings 7:00 a.m. to 11:00 a.m.
		Weekday evenings 5:00 p.m. to 10:00 p.m.
	Winter (Nov 1 – April 30)	Weekday late mornings & afternoons 11:00 a.m. to 5:00 p.m.
		Weekday mid-evenings 8:00 p.m. to 10:00 p.m.
Highest ("on-peak")	Summer (May 1 – Oct 31)	Weekday late mornings & afternoons 11:00 a.m. to 5:00 p.m.
	Winter (Nov 1 – April 30)	Weekday mornings 7:00 a.m. to 11:00 a.m.
		Weekday early evenings 5:00 p.m. to 8:00 p.m.

FORMAT B (GRAPHICAL FORMAT)