REPORT

Nexant

Reimagine tomorrow.

Social Benchmarking Pilot Evaluation

Submitted to Independent Electricity System Operator

November 7, 2016

Principal authors:

Michael Sullivan, Senior Vice President

Candice Potter, Managing Consultant

Aimee Savage, Consultant

Alexandra Wein, Analyst

1 Executive Summary

Over the past decade, social benchmarking programs, and most commonly home energy reports (HERs), have become a component of several utilities' energy efficiency or conservation program portfolios. Social benchmarking programs leverage behavioural psychology and social norms to lower residential energy usage and/or increase consumer awareness of energy use by sending paper or electronic reports that compare a customer's energy consumption to that of similar neighboring households. While the energy savings are small, they may produce substantial aggregate energy savings where they reach a large number of customers. As of 2014, no social benchmarking programs were yet implemented in Ontario, and the Independent Electricity System Operator (IESO) determined this conservation resource should be explored and tested for the Ontario market by piloting the program concept. The IESO then began a procurement process to put forward a call for pilot proposals from Ontario local distribution companies (LDCs). Three proposals were accepted from three LDCs: Hydro One Networks, Inc. (HONI), Horizon Utilities, and Milton Hydro. The overarching goals of the pilots, which began in the fall of 2014, were to:

- Learn about the behavioural responses of Ontarians to social benchmarking interventions and how data availability (and therefore program eligibility) may vary across high/medium/low electricity usage customers;
- Uncover lessons around deploying social benchmarking programs that maintain compliance with Ontario's privacy legislation;
- Respond to market interest in behavioural-based conservation programs; and
- Take a first step towards a market transformation that will provide residential electricity customers with access to near real-time information about their energy usage through in-home devices or social benchmarking tools.

Milton Hydro's Simple Energy program, called the Community Energy Challenge (CEC), launched on September 23, 2014. In this pilot, customers at Milton Hydro were invited to subscribe to the Simple Energy Engagement Platform (SEEP) through a combination of outreach channels, including email messages and outreach through students, teachers, and faculty in local schools. The Horizon Utilities pilot also used Simple Energy's weekly Energy Insights emails, but was offered as an opt-out program. This pilot, named Take Charge • Save Energy • Earn Rewards, launched to nearly 50,000 customers in October 2014. The pilot conducted at HONI delivered Opower paper HERs to more than 50,000 customers starting in November 2014. Table 1-1 summarizes all three pilots with notes about each pilot's experimental design.

Table 1-1: Summary of Social Benchmarking Pilot Designs

Pilot	Design	Treatment Customers	Control Customers	Delivery	Pilot Launch	Notes
Milton Hydro Simple Energy	Opt-in with matched control group	3,198	3,198 (matched control group)	Energy Insights emails	Sep. 2014	Additional school competition component
Horizon Simple Energy	RCT	42,000	8,000	Energy Insights emails	Oct. 2014	Additional treatment customers added later in pilot
HONI Opower HERs	RCT	52,000	20,000	Paper HERs	Nov. 2014	Focused on high energy users

All three pilots achieved statistically significant energy and demand savings during the period of the pilot (with average reductions in energy consumption of 1.35%/year per home). Table 1-2 summarizes the unadjusted[1] energy and demand savings for the full pilot year. Demand savings were estimated for the summer and winter peaks, as defined by IESO.[2]

Table 1-2: Summary of Energy and Demand Savings

Pilot	Treatment Customers	Energy Savings (MWh)	Summer Peak Demand Savings (MW)	Winter Peak Demand Savings (MW)
Milton Hydro	3,198	266.0	0.07	0.14
Horizon	42,335	3,028.1	0.51	0.59
HONI	52,250	11,062.7	1.07	1.30

A survey was administered to customers in both the treatment and control groups from all three LDCs, where only the treatment customers' surveys presented questions pertaining to the social benchmarking pilot. Otherwise, there were questions that were common to both surveys that aimed to assess how the treatment and control customers engage with their respective utility provider, differences in motivations and interest in conserving energy between the control and treatment groups, and any differences between their past, present, and future energy usage habits that can be attributed to the presence of the pilot. Additionally, treatment customers from all three LDCs were asked pilot-specific questions that gauged overall levels of pilot awareness and satisfaction. Table 1-3 summarizes survey participation statistics for all three LDCs.

[1] Savings must be adjusted to account for any double counting in between the Social Benchmarking pilots and the lighting Coupon Initiatives. For more details, see sections 3.1, 4.1, and 5.1.

[2] The summer peak period is defined to be weekdays from 1 PM to 7 PM in June, July, and August. The winter peak period is 6 PM to 8 PM in December, January, and February.

Table 1-3 Aggregate Survey Participation

	Control	Treatment	Combined
Total survey response rate	27.1%	30.8%	29.2%
Total number of customers that completed the survey	n=269	n=406	n=675

Treatment customers that completed the surveys did not differ from those in the control groups on important demographic dimensions (e.g., household size). Both the Horizon and Milton Hydro pilots saw an improvement in customer satisfaction with the range of LDC conservation offerings. Additionally, Horizon and Milton Hydro pilots were both effective at increasing the number of customers going to the utility website to search for energy efficiency ideas and opportunities. The Horizon and HONI pilots were both ineffective in increasing participants' desire to know if their household is using energy efficiently and increasing overall knowledge about ways to save energy. The Milton pilot, on the other hand, did produce an increase in these areas. The Milton pilot also produced differences in motivations for reducing energy between treatment and control customers, while neither the Horizon nor HONI pilots produced differences. However, there were no reported differences in how the treatment and control customers reduced energy usage, or in the appliances that they targeted. Lastly, the HONI pilot experienced the greatest percentage of recall for the personalized energy report, followed by the Horizon pilot, and then the Milton Hydro pilot. Table 1-4 presents some key findings from the survey analysis.

Given the time frame of the social benchmarking pilots, the evaluation team could not assess the persistence of savings attributable to them. It is unclear how long customers who participated in the program will maintain their energy reduction habits in the absence of ongoing program interventions (such as continued receipt of energy consumption reports).

Given that persistence is a key factor in determining the benefits of a program, it will be important to closely monitor and evaluate programs over multiple years in order to understand their ongoing impacts on energy use and associated program cost-effectiveness.

Table 1-4: Key Findings from Survey Analysis

Research Question	Milton Hydro Simple Energy	Horizon Simple Energy	HONI Opower HERs
Do household characteristics differ between Treatment and Control survey respondents?	No	No	No
Do treatment customers have higher levels of satisfaction with their LDC's conservation offerings?	Yes	Yes	No
Do treatment customers access their utility's website more often than control customers?	Yes	No	No
Do treatment customers search for energy efficiency ideas and opportunities on their utility's website more often than control customers?	Yes	Yes	No
What percentage of treatment customers recall receiving a personalized energy report?	54%	61%	89%
Do treatment customers have a stronger desire to know if their household is using energy efficiently?	Yes	No	No
Do treatment customers have different motivations to reduce energy usage?	Yes	No	No
Do treatment customers report reducing energy usage in different ways from control customers?	No	No	No

The remainder of this report details the methodology used to estimate load impacts, the load impacts themselves, and a detailed analysis of the surveys.

2 Load Impact Estimation Methodology

The same methodology was used to estimate energy and demand savings for all three Social Benchmarking pilots. Horizon and HONI's programs were both randomized control trials (RCTs) making impact estimation relatively simple. Milton Hydro's pilot, Community Energy Challenge, was opt-in and as such a control group was not immediately available. To estimate energy and demand savings for the Milton program, a control group was developed using propensity score matching. The fundamental idea behind the matching process was to find customers who did not participate in the program that have similar characteristics to those who did participate. In this procedure, a probit model was used to estimate a score for each customer based on a set of observable variables that were assumed to affect the decision to join Community Energy Challenge. A *probit model* is a regression model designed to estimate probabilities—in this case, the probability that a customer would choose to join the program. Each customer in the program is matched with a customer in the non-participant population that has the closest propensity score. The observable variables used in the matching process were monthly kWh consumption and daily load shapes.

Figure 2-1 illustrates how the treatment group and matched control group have nearly identical load profiles on hot pre-treatment weekdays, especially during the summer peak hours. The difference in demand between the two groups during peak hours is less than 0.07%. Figure 2-2 presents average monthly electricity consumption for the treatment and matched control groups during the pre-treatment period. The difference in consumption between the two groups is less than 1.01% in each month. Once again, this shows that the matched group serves as a good control for the treatment population.

Figure 2-1: Pre-treatment August Weekday Load Profile

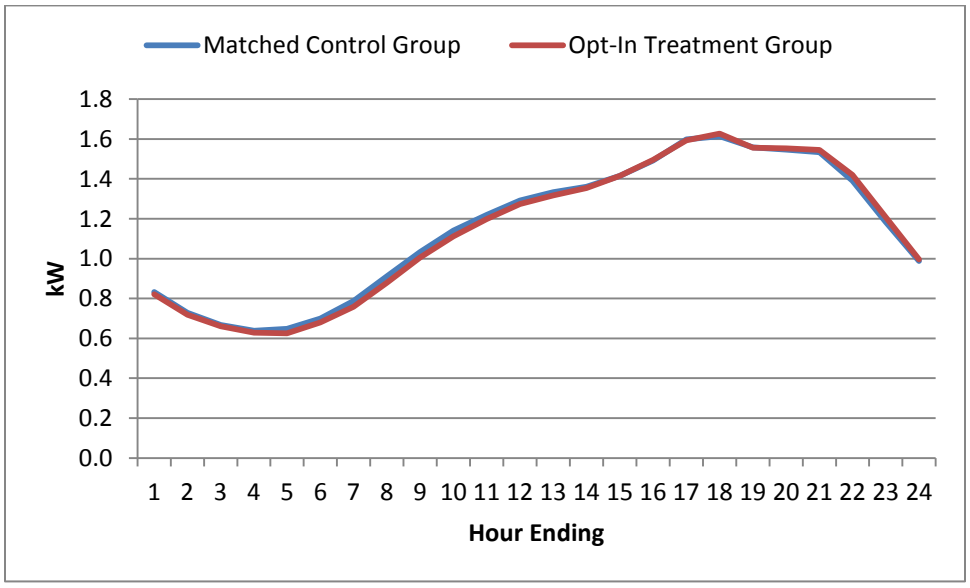
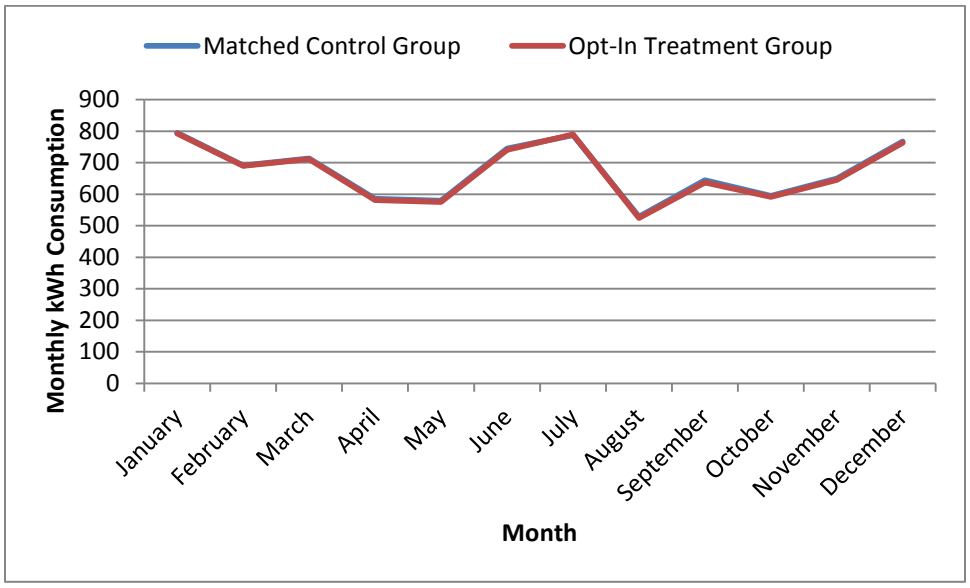


Figure 2-2: Pre-treatment Monthly Consumption



The impacts of the Simple Energy and Opower treatments on energy consumption can be observed by comparing the energy consumption of treatment and control groups before and after they are assigned to comparison groups. In the case of HONI's Opower program, customers' monthly consumption data was provided by Opower. Hourly electricity usage data was used in the analysis of Milton and Horizon's Simple Energy programs. Impacts on electricity consumption were estimated using a monthly fixed effects model in which monthly energy consumption for treatment and control group customers was estimated using an indicator variable for month of the program, a treatment month indicator variable, and a customer-level indicator variable. The regression equation is presented here.

$$kWh_{it} = a + b * Treatment_i * Treatment\ Period_t + \sum_{cust=2nd\ cust}^{last\ cust} c_{cust} * C_i + \sum_{month=2nd\ month}^{last\ month} m_{month} * M_t + \varepsilon_{it}$$

Table 2-1: Energy Savings Model—Variables and Descriptions

Variable	Description
a	an estimated constant
b	the estimated impact
c *and* m	customer and month fixed effects
Treatment	a dummy variable indicating whether or not a customer is in the treatment group (=1) or not (=0)
Treatment Period	a dummy variable indicating whether the day is after program launch (=1) or not (=0)
C	a dummy variable indicating whether an observation belongs to that customer (=1) or not (=0)
M	a dummy variable indicating whether that observation belongs to that month (=1) or not (=0)
cust	indexes all customers, both control and treatment customers.
month	indexes each of the months, both pre-treatment and post-treatment.
ε	the error term

Demand savings were estimated for the IESO peak period using hourly electricity usage data. The summer peak period is defined to be weekdays from 1 pm to 7 pm in June, July, and August. The winter peak period is 6 pm to 8 pm in December, January, and February. Demand savings attributable to the program were estimated using a *difference-in-differences* methodology. This methodology calculates the estimated impacts as the difference in average loads between treatment and control customers during peak hours minus the difference between the two groups during the peak period in the year prior to the program's launch.

The difference-in-differences model includes customer and day fixed effects to get the most statistically precise estimate possible given the data structure. Fixed effects are used to account for constant, unobserved differences for each subject. Customer fixed effects account for differences in usage between customers that are fixed across time, for example, some customers live in larger houses than other customers and always use more electricity than the customers in smaller homes. Time fixed effects account for differences in usage between time periods that are fixed across all customers. For example, time effects account for the fact that in general all customers use more electricity during hotter summer months than they do during cooler summer months. Only customers with complete data were included in the analysis.

$$kW_{it} = a + b * Treatment_i * Treatment\ Period_t + \sum_{cust=2nd\ cust}^{last\ cust} c_{cust} * C_i + \sum_{day=2nd\ day}^{last\ day} d_{day} * D_t + \varepsilon_{it}$$

Table 2-2: Demand Savings Model—Variables and Descriptions

Variable	Description
a	an estimated constant
b	the estimated impact
c and d	customer and day fixed effects
$Treatment$	a dummy variable indicating whether or not a customer is in the treatment group (=1) or not (=0)
$Treatment\ Period$	a dummy variable indicating whether the day is after program launch (=1) or not (=0)
C	a dummy variable indicating whether an observation belongs to that cust (=1) or not (=0)
D	a dummy variable indicating whether that observation belongs to that day (=1) or not (=0)
$cust$	indexes all customers, both control and treatment customers.
day	indexes each of the days, both proxy days and event days.
ε	the error term

It is possible that the Social Benchmarking pilots caused increased participation in energy efficiency programs sponsored by IESO and the Utility Providers. Because the energy savings estimate obtained by comparing the energy consumption of the treatment and control group contained the energy savings that resulted from increased participation in other energy efficiency programs, summing the energy savings from Social Benchmarking and other programs will result in double counting. To control for this phenomenon, it is necessary to adjust the savings obtained from the pilots by removing the energy savings attributable to other programs.

Upstream programs, such as LED coupons, present a unique challenge in the estimation of double-counted savings because participation in these programs is not tracked at the customer level and therefore cannot be tied back to Simple Energy treatment and control homes for comparison. In response to this challenge, some assumptions have been made based on a similar HER program, IESO lighting coupon data, and the 2014 Consumer Program Evaluation, to facilitate the measurement of double-counting.[3]

In 2012, PG&E, a utility in northern California, conducted a home inventory survey of HER treatment and control customers. The survey analysis estimated that each HER recipient installed approximately one (0.95) more CFL than control group participants. In 2014, the consulting firm TRC Energy Services[4] used this estimate to estimate double counting of energy savings between the HER program and PG&E's Upstream Lighting Program (ULP). In TRC Energy Services' report, it is assumed that each HER customer purchases approximately one additional efficient bulb (LEDs and CFLs) compared to each control customer during the first year of HER treatment, with 1/12 of the bulbs being purchased each month.

[3] http://www.powerauthority.on.ca/sites/default/files/conservation/2014-Evaluation-Consumer-Initiatives.pdf

[4] TRC. Lighting Savings Overlap in 2014 IOU Residential Behavioral Programs.TRC (June 30, 2015). Revised TRC memo, Proposed Changes to Draft ULP HER Lighting Savings Overlap for 2014, (October 22, 2015).

Additionally, TRC Energy Services assumes that 21% of the excess bulbs among treatment customers are attributable to the ULP. According to the 2014 Consumer Program Evaluation, 91% of specialty LEDs and 80% of general purpose LEDs purchased through the Coupon Initiatives program are installed and generating savings. All other data points and assumptions were provided to Nexant by the IESO. The assumptions and variables used to estimate the savings overlap from the Coupon Initiatives program and the pilots are presented in Table 2-3.

Table 2-3: Upstream Savings Overlap Assumptions

Variable/Assumption	Source of Variable	Specialty LEDs	General Purpose LEDs
kWh savings per bulb	IESO coupon template	21.1	10.3
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.95	0.95
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%

The savings overlap for each month is estimated using the following formula:

$$\begin{aligned} &Additional\ kWh\ savings\ attributable\ to\ coupon\ program \\ &\quad = kWh\ savings\ per\ bulb \times additional\ bulb\ per\ treatment\ customer \times percent\ of\ bulbs\ installed \\ &\quad \times percent\ of\ bulbs\ attributable\ to\ coupon\ program \times percent\ of\ bulbs\ that\ are\ LEDs \\ &\quad \times number\ of\ treatment\ customers \end{aligned}$$

The *peaksaver*PLUS program is open to residential and small commercial consumers who participate by allowing a one-way paging network to control either a programmable communicating thermostat (PCT) or load control switch to curtail electricity demand for central air conditioners, electric water heaters, or pool pumps during the peak period on high electricity demand days. *peaksaver*PLUS also offers participants an in-home display (IHD) that allows customers to monitor their electricity consumption and associated cost in real time. Ontario's LDCs are responsible for procuring the equipment offered and for jointly marketing the program with the IESO.

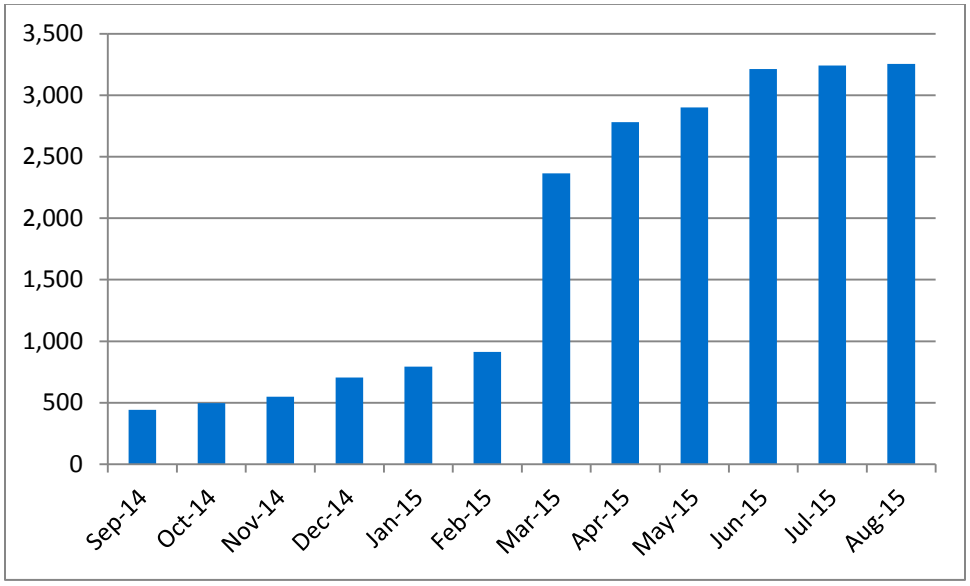
It is possible that enrolment in the pilots motivated customers to enroll in *peaksaver*PLUS. To estimate any possible increases in program enrolment attributable to the pilot, pre- and post-treatment *peaksaver*PLUS enrolment was compared between pilot treatment and control customers. Using this difference-in-differences approach, Nexant was able to estimate the incremental enrolment in *peaksaver*PLUS among treatment customers in the Milton Hydro and Hydro One pilots. The *peaksaver*PLUS enrolment data necessary for this estimate was not available for Horizon pilot customers.

More detail about each pilot and LDC-specific assumptions are included in Sections 3, 4, and 5.

3 Milton Hydro Community Energy Challenge

Milton Hydro's Simple Energy program—Community Energy Challenge (CEC)—launched on September 23, 2014. In this pilot, customers at Milton Hydro were invited to subscribe to the Simple Energy Engagement Platform (SEEP) through a combination of outreach channels, including: email messages and outreach through students, teachers, and faculty in local schools. About 19,300 customers for whom Milton had email addresses received direct email invitations over the course of the program (about 12 months). Others, for whom Milton did not have an email address, were also recruited through schools and social media, community events, and word of mouth. Ultimately, about 3,400 customers opted-in to receiving weekly emails (Energy Insights) and 1,941 customers engaged with the website. Customers did not all join the program at the same time. As shown in Figure 3-1, most customers joined the program in March 2015, the seventh month of the pilot.

Figure 3-1: Enrolled Customers by Month



Those receiving the SEEP service received weekly energy messages with tips called *Energy Insights* along with access to a web portal at which they could explore their energy use, set goals, and compete for rewards for committing to changing their energy consumption or signing up for utility programs. All subscribers received Energy Insights weekly unless they opted out. Two kinds of rewards were offered to those who engaged with the website—rewards to schools for energy savings and participation contributed by parties who elected to sponsor them (as part of the enrolment process); and rewards to individuals for signing up for utility programs and saving energy. The rewards to the schools were substantial (ranging from $500 to $4,000 per school) while the rewards for individual actions were relatively smaller (i.e., gift cards ranging in values from $5 to $10).

3.1 Energy and Demand Savings

Program impacts on electricity consumption were estimated using the propensity score matching process and panel regression described in Section 2. It is important to remember that customers joined the

treatment group throughout the pilot year. Each matched control customer is assumed to have the same treatment start date as their corresponding treatment customer. Only customers with complete pre-treatment and post-treatment consumption data were included in the analysis, which means approximately 200 customers were excluded.

Treatment customers consumed between 0.1 kWh and 1.6 kWh less per day than control customers during the analysis period. Energy savings vary depending on the month, likely due to seasonal changes in weather. These savings are significant for 3 out of the 12 months presented in Table 3-1. During the analysis period, treatment customers consumed approximately 266.0 MWh less than control group customers, in total.

Table 3-1: Milton Hydro Simple Energy—Energy Savings by Calendar Month

Month	Treatment Customers	Days	Treatment Daily kWh	Control Daily kWh	Daily kWh Impact	95% Conf. Interval		% Impact	Aggregate MWh Impact	
2014m9	443	30	22.7	22.7	0.1	-0.90	1.06	0.4%	1.1	
2014m10	496	31	19.3	19.9	0.5	-0.29	1.37	2.7%	8.3	
2014m11	549	30	22.9	23.7	0.8	-0.08	1.60	3.2%	12.5	
2014m12	704	31	24.7	26.3	1.6	0.76	2.35	5.9%	33.9	*
2015m1	793	31	26.2	27.2	1.1	0.26	1.87	3.9%	26.2	*
2015m2	913	28	26.7	27.5	0.8	-0.21	1.76	2.8%	19.8	
2015m3	2,365	31	21.5	22.0	0.5	-0.04	1.00	2.2%	35.1	
2015m4	2,781	30	18.5	18.9	0.4	0.11	0.78	2.3%	37.0	*
2015m5	2,900	31	20.4	20.7	0.3	-0.07	0.65	1.4%	25.7	
2015m6	3,212	30	22.0	22.2	0.3	-0.17	0.67	1.1%	24.1	
2015m7	3,240	31	29.9	30.3	0.3	-0.12	0.79	1.1%	33.6	
2015m8	3,254	23	27.5	27.6	0.1	-0.33	0.56	0.4%	8.6	
Pilot	1,804**	29	23.7	24.1	0.4	0.13	0.69	1.7%	266.0	*

* Indicates significant energy savings

** Average number of customers throughout thecourse of the pilot

Energy savings can also be calculated using the months of treatment rather than the calendar month. In a program with only one treatment start date, the two methods would be identical. This method yields a similar result, 263.8 MW for the year of the pilot program.

Table 3-2: Milton Hydro Simple Energy—Energy Savings by Months of Treatment

Months of Treatment	Treatment Customers	Days	Treatment Daily kWh	Control Daily kWh	Daily kWh Impact	95% Conf. Interval		% Impact	Aggregate MWh Impact	
1	3,198	30	21.6	21.9	0.3	-0.09	0.77	1.5%	32.9	
2	3,189	30	20.7	21.3	0.6	0.18	0.94	2.6%	54.4	*
3	3,195	30	22.1	22.6	0.6	0.19	0.98	2.6%	56.0	*
4	2,918	30	23.4	23.7	0.4	-0.10	0.82	1.5%	31.5	
5	2,823	30	27.0	27.4	0.3	-0.14	0.83	1.3%	28.8	
6	2,398	25	26.2	26.4	0.2	-0.25	0.73	0.9%	14.4	
7	917	30	24.4	25.1	0.7	-0.08	1.55	2.9%	19.9	
8	797	29	23.8	24.0	0.2	-0.51	0.97	1.0%	5.4	
9	710	29	24.2	24.9	0.7	-0.11	1.50	2.8%	14.4	
10	555	29	24.4	24.8	0.4	-0.70	1.57	1.8%	7.1	
11	502	30	30.9	30.7	-0.2	-1.26	0.90	-0.6%	-2.7	
12	448	23	28.4	28.5	0.2	-0.99	1.31	0.6%	1.7	
Pilot	1,804**	29	23.7	24.1	0.4	0.13	0.69	1.7%	263.8	*

* Indicates significant energy savings

** Average number of customers throughout the course of the pilot

Demand savings were estimated for the IESO peak period. The summer peak period is defined to be weekdays from 1 pm to 7 pm in June, July, and August. The winter peak period is 6 pm to 8 pm in December, January, and February. Demand savings attributable to the program were estimated using the difference-in-differences methodology described in Section 2.

Only 3,117 out of about 3,400 customers had complete interval data covering the pre-treatment and post-treatment peak periods. Only customers with complete data were included in the analysis and the pre- and post- periods vary by customer. On average, treatment customers' peak demand is 0.04 kW less than their counterparts in the winter and 0.02 kW less in the summer. This is an aggregate impact of 141.5 kW in the winter and 74.2 kW in the summer. These savings are significant.

Table 3-3: Milton Hydro Simple Energy—Peak Demand Savings by Season

Season	Control Customers	Treatment Customers	Average kW Impact	Percent Impact	Aggregate kW Impact	95% Confidence Interval	
Winter	3,117	3,187	0.04	3.0%	141.5	231.2	51.8
Summer			0.02	1.6%	74.2	140.0	8.3

As indicated in Section 2, it is possible that the Simple Energy pilot caused increased participation in energy efficiency programs sponsored by IESO and Milton Hydro. The savings overlap between the LED coupon program was estimated using the methodology described in Section 2, the Milton Hydro-specific assumptions in Table 3-4, and the formula that follows.

Table 3-4: Lighting Coupon kWh Overlap

Variable/Assumption	Source of Variable	Specialty LEDs	General Purpose LEDs	Total LEDs*
kWh savings per bulb	IESO coupon template	21.1	10.3	14.7
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.95	0.95	0.95
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	85%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	36%	52%	88%
Number of treatment customers	IESO Data	3,254	3,254	3,254
Additional kWh savings per treatment customer	Combining above factors	0.75	0.46	1.21
Additional kWh savings	Combining above factors	2,431	1,507	3,937
Social Benchmarking kWh savings per treatment customer	Nexant Analysis	81.75	81.75	81.75
Social Benchmarking kWh savings	Nexant Analysis	266,000	266,000	266,000
% overlap	Additional peak kW savings/Social Benchmarking kW savings	0.9%	0.6%	1.5%

* Weighted averages based on the number of each type of bulb purchased within the LDC

The savings overlap for each month is estimated using the following formula:

$$\begin{aligned} &Additional\ kWh\ savings\ attributable\ to\ coupon\ program \\ &\quad = kWh\ savings\ per\ bulb\ \times additional\ bulb\ per\ treatment\ customer\ \times\ percent\ of\ bulbs\ installed \\ &\quad \times percent\ of\ bulbs\ attributable\ to\ coupon\ program\ \times percent\ of\ bulbs\ that\ are\ LEDs\ \times number\ of\ treatment\ customers \end{aligned}$$

Nexant estimates that the overlap in kWh savings between Community Energy Challenge and the Coupon Initiatives lighting program is approximately 3,937 kWh, which is an adjustment of about 1.5%. The adjusted kWh savings of Community Energy Challenge is 262,063 kWh.

The demand savings overlap for the summer peak period is calculated in a similar way. The estimated kW overlap between Community Energy Challenge and the Coupon Initiatives lighting program is about 0.5 kW, or an adjustment of about 0.6%. The final adjusted kW savings of the pilot is 73.7 kW.

Table 3-5: Lighting Coupon kW Overlap

Variable/Assumption	Source of variable	Specialty LEDs	General Purpose LEDs	Total LEDs*
kW savings per bulb	IESO coupon template	0.0013	0.0006	0.0009
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.63	0.63	0.63
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	87%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	36%	52%	88%
Number of treatment customers	IESO Data	3,254	3,254	3,254
Additional August peak kW savings per treatment customer	Combining above factors	0.0001	0.0001	0.0001
Additional August peak kW savings	Combining above factors	0.3	0.2	0.5
Social Benchmarking peak kW savings per treatment customer	Nexant Analysis	0.02	0.02	0.02
Social Benchmarking peak kW savings	Nexant Analysis	74.2	74.2	74.2
% overlap	Additional peak kW savings/Social Benchmarking kW savings	0.4%	0.2%	0.6%

* Weighted averages based on the number of each type of bulb purchased within the LDC

3.2 Dual Enrolment in *peaksaver*PLUS

The *peaksaver*PLUS program has been available to Milton residential customers since mid-2014, slightly before the launch of the Community Energy Challenge pilot. As shown in the first two rows of Table 3-6, prior to the program, customers who would later enrol in CEC were far more likely to participate in *peaksaver*PLUS. This is not surprising, as both programs are opt-in. After enrolling in CEC, treatment customers were even more likely to enrol in *peaksaver*PLUS than control customers: 23% versus 5% (4th and 5th rows in Table 3-6). It is impossible to say for certain if enrolment in CEC influenced the decision to enrol in *peaksaver*PLUS as rolling enrolment for both programs occurred during a similar time period, but it is clear that customers who opt-in to one energy program are more likely to enrol in another.

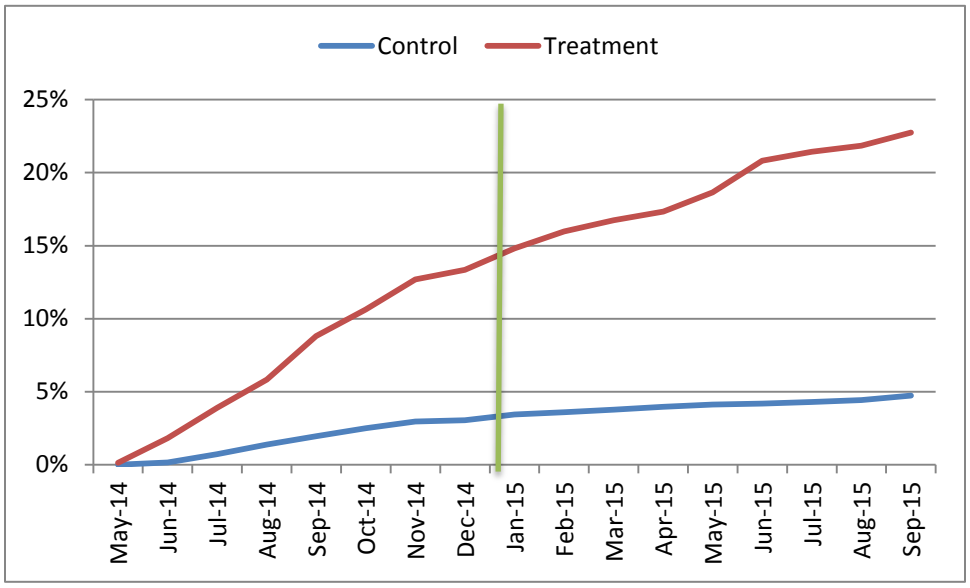
Table 3-6: Pre- and Post-treatment Enrolment in *peaksaver*PLUS

Period	Group	% Enrolled in *peaksaver*PLUS	SE	95% Confidence Interval	
Pre-Treatment	Control	3%	0%	3%	4%
	Treatment	14%	1%	13%	15%
	Difference	11%	1%	9%	12%
Post-Treatment*	Control	5%	0%	4%	5%
	Treatment	23%	1%	21%	24%
	Difference	18%	1%	16%	20%
Diff-in-Diff		7%	1%	5%	9%

* The post-treatment period varies by customer n=3,281 C and 3,281 T

Figure 3-2 presents the percentage of CEC participants enrolled in *peaksaver*PLUS during the pre-treatment period and one year of post-treatment. The green line indicates the first reports mailed to treatment customers.

Figure 3-2: Pre- and Post-treatment Enrolment in *peaksaver*PLUS



4 Horizon Take Charge • Save Energy • Earn Rewards

Horizon's Simple Energy program, Take Charge • Save Energy • Earn Rewards, launched on October 24, 2014. In this pilot, 50,000 residential customers at Horizon Utilities were presented with a combination of weekly energy messages (with tips) called Energy Insights and access to a web portal at which they could explore their energy use, set goals, and compete for rewards by pledging to change their energy consumption. All treatment customers received Energy Insights weekly unless they opted out. To experience the web portal, customers had to voluntarily enrol in the web system. The intervention was provided by Simple Energy using its Engagement Platform. All residential customers for whom Horizon possessed email addresses were eligible for treatment with a small number of technical exceptions. In addition to the treatment group, a group of 8,000 customers was randomly selected from the pool of eligible customers and set aside as a control group. Assignment to treatment and control groups was carried out by Horizon after customers were screened from the pilot based on the foregoing eligibility criteria.

Treatment customers received a welcome email in late October 2014, explaining that they would be receiving Energy Insights weekly alerts and an invitation to the web portal. This was followed by three additional invitations to visit the web portal. Following the welcome message, customers received Energy Insights on a weekly basis. Once at the portal, participants could learn more about how they use energy over time, how their home energy use compares to that of others, and what actions could be taken to use less electricity. Participants whovisited the portal were encouraged to save energy through drawings to win reward miles to be used for airline travel. Participants who were in the top 25% of energy savers on any day were eligible for the drawings.

Initially, only about 42,000 customers were part of the treatment group. Throughout the year following the program launch, additional households were added to the treatment group as they became eligible. Details are presented in Table 4-1. These "uplift" customers do not have a suitable control group, and as such they are not included in the analysis presented here.

Table 4-1: Treatment and Control Assignments

Group	Number of Customers
Control	7,998
Initial Treatment Group	42,788
Uplift 1 (November 2014)	1,924
Uplift 2 (January 2015)	2,274
Uplift 3 (March 2015)	1,814
Uplift 4 (June 2015)	4,023
Uplift 5 (October 2015)	5,376

On January 12, 2015, approximately 3,700 control group households accidentally received a welcome email. Working under the assumption that the welcome email should not have a significant impact on

energy consumption, these customers are still included in the control group for the purposes of this analysis.

4.1 Energy and Demand Savings

Program impacts on electricity consumption were estimated using the panel regression described in Section 2. Treatment customers consumed between 0.0 kWh and 0.5 kWh less per day than control customers during the analysis period. Energy savings vary depending on the month, likely due to seasonal changes in weather. These savings are significant for 8 out of the 12 months presented in Table 4-2. During the analysis period, treatment customers consumed approximately 3,028 MWh less than control group customers, in total.

Table 4-2: Horizon Simple Energy—Energy Savings by Month

Month	Treatment Customers	Days	Treatment Daily kWh	Control Daily kWh	Daily kWh Impact	95% Conf. Interval		% Impact	Aggregate MWh Impact	
2014m10	42,335	31	19.7	19.8	0.0	-0.15	0.21	0.2%	39.6	
2014m11	41,931	30	22.6	22.8	0.2	0.03	0.37	0.9%	246.7	*
2014m12	41,555	31	24.4	24.7	0.2	0.03	0.44	0.9%	299.9	*
2015m1	41,292	31	26.0	26.3	0.3	0.05	0.51	1.1%	353.4	*
2015m2	41,034	28	26.7	27.2	0.5	0.21	0.70	1.7%	521.2	*
2015m3	40,817	31	22.9	23.1	0.3	0.07	0.47	1.2%	339.2	*
2015m4	40,577	30	19.7	20.0	0.3	0.11	0.41	1.3%	319.1	*
2015m5	40,260	31	20.6	20.7	0.2	0.01	0.34	0.9%	222.6	*
2015m6	39,910	30	22.7	23.0	0.2	0.07	0.43	1.1%	297.6	*
2015m7	39,491	31	30.6	30.7	0.1	-0.10	0.31	0.3%	125.2	
2015m8	38,981	31	27.8	28.0	0.1	-0.07	0.32	0.4%	147.8	
2015m9	38,565	30	26.7	26.8	0.1	-0.08	0.28	0.4%	115.9	
Pilot	40,562**	30	24.2	24.4	0.2	0.09	0.32	0.9%	3,028.1	*

* Indicates significant energy savings
** Average number of customers throughout the course of the pilot

Demand savings were estimated for the IESO peak period. The summer peak period is defined to be weekdays from 1 to 7 pm in June, July, and August. The winter peak period is 6 pm to 8 pm in December, January, and February. Demand savings attributable to the program were estimated using the difference-in-differences methodology described in Section 2.

On average, treatment customers' peak demand is 0.02 kW and 0.01 kW less than their counterparts in the winter and summer periods, respectively. This is an aggregate impact of 0.59 MW in the winter and 0.51 MW in the summer. These savings are significant.

Table 4-3: Horizon Simple Energy—Peak Demand Savings by Season

Season	Control Customers	Treatment Customers	Average kW Impact	Percent Impact	Aggregate MW Impact	95% Confidence Interval	
Winter	7,159	38,652	0.02	1.1%	0.59	0.18	1.01
Summer			0.01	1.0%	0.51	0.17	0.85

As indicated in Section 2, it is possible that the Simple Energy pilot caused increased participation in energy efficiency programs sponsored by IESO and Horizon. The savings overlap between the LED coupon program was estimated using the methodology described in Section 2, the Horizon-specific assumptions in Table 4-4, and the formula that follows.

Table 4-4: Lighting Coupon kWh Overlap

Variable/Assumption	Source of variable	Specialty LEDs	General Purpose LEDs	Total LEDs
kWh savings per bulb	IESO coupon template	21.1	10.3	14.8
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.95	0.95	0.95
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	85%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	37%	51%	88%
Number of treatment customers	IESO Data	40,562	40,562	40,562
Additional kWh savings per treatment customer	Combining above factors	0.76	0.46	1.22
Additional kWh savings	Combining above factors	30,946	18,500	49,446
Social Benchmarking kWh savings per treatment customer	Nexant Analysis	74.65	74.65	74.65
Social Benchmarking kWh savings	Nexant Analysis	3,028,100	3,028,100	3,028,100
% overlap	Additional peak kW savings/Social Benchmarking kW savings	1.0%	0.6%	1.6%

The savings overlap for each month is estimated using the following formula:

$$\begin{aligned} &Additional\ kWh\ savings\ attributable\ to\ coupon\ program \\ &\quad = kWh\ savings\ per\ bulb\ \times additional\ bulb\ per\ treatment\ customer\ \times\ percent\ of\ bulbs\ installed \\ &\quad \times percent\ of\ bulbs\ attributable\ to\ coupon\ program\ \times percent\ of\ bulbs\ that\ are\ LEDs\ \times number\ of\ treatment\ customers \end{aligned}$$

Nexant estimates that the overlap in kWh savings between the pilot and the Coupon Initiatives lighting program is approximately 49,446 kWh, which is an adjustment of about 1.6%. The adjusted kWh savings of the Simple Energy treatment is 2,978,654 kWh.

The demand savings overlap for the summer peak period is calculated in a similar way. The estimated kW overlap between Community Energy Challenge and the Coupon Initiatives lighting program is about 5.3 kW, or an adjustment of about 1.0%. The final adjusted kW savings of the pilot is 503.4 kW.

Table 4-5: Lighting Coupon kW Overlap

Variable/Assumption	Source of variable	Specialty LEDs	General Purpose LEDs	Total LEDs
kW savings per bulb	IESO coupon template	0.0013	0.0006	0.0009
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.63	0.63	0.63
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	87%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	37%	51%	88%
Number of treatment customers	IESO Data	40,562	40,562	40,562
Additional August peak kW savings per treatment customer	Combining above factors	0.0001	0.0000	0.0001
Additional August peak kW savings	Combining above factors	3.3	2.0	5.3
Social Benchmarking peak kW savings per treatment customer	Nexant Analysis	0.01	0.01	0.01
Social Benchmarking peak kW savings	Nexant Analysis	508.6	508.6	508.6
% overlap	Additional peak kW savings/Social Benchmarking kW savings	0.6%	0.4%	1.0%

5 Hydro One Opower Home Energy Reports

Hydro One's Opower Home Energy Report (HER) Social Benchmarking pilot was launched in November 2014. In this pilot, 50,000 residential customers in the top two usage quartiles for Hydro One Networks, Inc. (HONI) were presented with periodic comparisons of their household electricity consumption with that of other similar households. The intervention was provided by Opower using its Home Energy Reports (HERs) product. All residential customers with usage in the top two quartiles were eligible for treatment with a number of technical exceptions. In addition to the treatment group, another group of 20,000 randomly selected customers in the top two quartiles was set aside as a control group. Assignment to treatment and control groups was carried out by Opower after customers were screened from the pilot based on the foregoing eligibility criteria.

The first reports were sent in November 2014, and customers received five reports on average. Treatment customers generally received three monthly reports at the outset of the treatment—between late November and late January. In February a pause was requested by HONI in the report delivery process during which several production issues were resolved. Reporting resumed in July and customers were provided with reports for two more months. The exact timing of the reports' arrivals at customer households is unknown.

5.1 Energy and Demand Savings

Program impacts on electricity consumption were estimated using the panel regression described in Section 2. Treatment customers consumed between 0.1 kWh more and 1.1 kWh less per day than control customers during the analysis period. There was a single month where the treatment customers, on average, used more electricity than the control customers, which was the first month of the pilot, however that increase in usage is not statistically significant. Energy savings vary depending on the month, likely due to seasonal changes in weather. These savings are significant for most months presented in Table 5-1. During the analysis period, treatment customers consumed approximately 11,063 MWh less than control group customers, in total.

Table 5-1: Hydro One Opower—Energy Savings by Month

Month	Treatment Customers	Days	Treatment Daily kWh	Control Daily kWh	Daily kWh Impact	95% Conf. Interval		% Impact	Aggregate MWh Impact	
2014m11	52,250	30	61.4	61.4	-0.1	-0.33	0.19	-0.1%	-106.3	
2014m12	51,967	31	72.8	73.1	0.2	-0.10	0.59	0.3%	398.7	
2015m1	51,830	31	82.2	82.9	0.7	0.33	1.07	0.8%	1124.1	*
2015m2	51,653	28	84.8	86.0	1.1	0.73	1.53	1.3%	1625.8	*
2015m3	51,504	31	68.7	69.6	1.0	0.64	1.29	1.4%	1537.6	*
2015m4	51,322	30	51.7	52.4	0.6	0.40	0.87	1.2%	979.2	*
2015m5	51,090	31	42.5	43.0	0.5	0.33	0.69	1.2%	808.1	*
2015m6	50,817	30	43.6	44.0	0.5	0.29	0.63	1.0%	700.2	*
2015m7	50,469	31	46.9	47.4	0.5	0.32	0.67	1.1%	776.2	*
2015m8	50,031	31	47.2	47.8	0.6	0.43	0.78	1.3%	938.5	*
2015m9	49,610	30	43.7	44.4	0.7	0.54	0.89	1.6%	1055.0	*
2015m10	49,257	31	43.3	44.1	0.8	0.62	0.99	1.8%	1225.8	*
Pilot	50,983**	30	57.6	58.2	0.6	0.43	0.70	1.0%	11062.7	*

* Indicates significant energy savings
** Average number of customers throughout the course of the pilot

Demand savings were estimated for the IESO peak period. The summer peak period is defined to be weekdays from 1 pm to 7 pm in June, July, and August. The winter peak period is 6 pm to 8 pm in December, January, and February. Demand savings attributable to the program were estimated using the difference-in-differences methodology described in Section 2. Only customers with complete data were included in the analysis.

On average, treatment customers' peak demand is 0.03 kW less than their counterparts in both the summer and winter periods. This is an aggregate impact of 1,300 MW in the winter and 1,077 MW in the summer. These savings are statistically significant.

Table 5-2: Hydro One Opower—Peak Demand Savings by Season

Season	Control Customers	Treatment Customers	Average kW Impact	Percent Impact	Aggregate kW Impact	95% Confidence Interval	
Winter	19,839	49,613	0.03	0.7%	1,300.1	436.5	2,163.8
Summer			0.02	1.0%	1,076.5	647.4	1,505.6

As indicated in Section 2, it is possible that the Opower pilot caused increased participation in energy efficiency programs sponsored by IESO and Horizon. The savings overlap between the LED coupon program was estimated using the methodology described in Section 2, the Hydro One-specific assumptions in Table 5-3, and the formula that follows.

Table 5-3: Lighting Coupon kWh Overlap

Variable/Assumption	Source of variable	Specialty LEDs	General Purpose LEDs	Total LEDs
kWh savings per bulb	IESO coupon template	21.1	10.3	14.9
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.95	0.95	0.95
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	85%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	38%	52%	90%
Number of treatment customers	IESO Data	50,983	50,983	50,983
Additional kWh savings per treatment customer	Combining above factors	0.78	0.46	1.25
Additional kWh savings	Combining above factors	39,933	23,606	63,539
Social Benchmarking kWh savings per treatment customer	Nexant Analysis	216.99	216.99	216.99
Social Benchmarking kWh savings	Nexant Analysis	11,062,700	11,062,700	11,062,700
% overlap	Additional peak kW savings/Social Benchmarking kW savings	0.4%	0.2%	0.6%

The savings overlap for each month is estimated using the following formula:

$$\begin{aligned} &Additional\ kWh\ savings\ attributable\ to\ coupon\ program \\ &\quad = kWh\ savings\ per\ bulb \times additional\ bulb\ per\ treatment\ customer \times percent\ of\ bulbs\ installed \\ &\quad \times percent\ of\ bulbs\ attributable\ to\ coupon\ program \times percent\ of\ bulbs\ that\ are\ LEDs \times number\ of\ treatment\ customers \end{aligned}$$

Nexant estimates that the overlap in kWh savings between the pilot and the Coupon Initiatives lighting program is approximately 63,539 kWh, which is an adjustment of about 0.6%. The adjusted kWh savings of the Opower treatment is 10,999.1 MWh.

The demand savings overlap for the summer peak period is calculated in a similar way. The estimated kW overlap between HERs and the Coupon Initiatives lighting program is about 6.1 kW, or an adjustment of about 0.6%. The final adjusted kW savings of the pilot is 1070.4 kW.

Table 5-4: Lighting Coupon kW Overlap

Variable/Assumption	Source of variable	Specialty LEDs	General Purpose LEDs	Total LEDs
kW savings per bulb	IESO coupon template	0.0013	0.0006	0.0009
Extra efficient bulb per treatment customer	PG&E Home Inventory	0.63	0.63	0.63
Percent installed	2014 Consumer Program Evaluation (page 13)	91%	80%	87%
Percent of excess bulbs attributable to coupon program	TRC Estimate (PG&E HER)	21%	21%	21%
Percent of coupon-attributable bulbs that are LEDs	Coupon template	38%	52%	90%
Number of treatment customers	IESO Data	50,983	50,983	50,983
Additional August peak kW savings per treatment customer	Combining above factors	0.0001	0.0000	0.0001
Additional August peak kW savings	Combining above factors	3.9	2.3	6.1
Social Benchmarking peak kW savings per treatment customer	Nexant Analysis	0.02	0.02	0.02
Social Benchmarking peak kW savings	Nexant Analysis	1,076.5	1,076.5	1,076.5
% overlap	Additional peak kW savings/Social Benchmarking kW savings	0.4%	0.2%	0.6%

5.2 Dual Enrolment in *peaksaver*PLUS

The *peaksaver*PLUS program has been available to HONI residential customers since 2007, well before the launch of the Opower HER pilot. Prior to the first HER mailings, approximately 2.8% and 3.1% control and treatment customers were enrolled in *peaksaver*PLUS, respectively. In the year following the initial mailers, the enrolment in *peaksaver*PLUS for both groups grew by about 0.2%. There was no significant incremental enrolment in *peaksaver*PLUS due to HER treatment, as shown in Table 5-5.

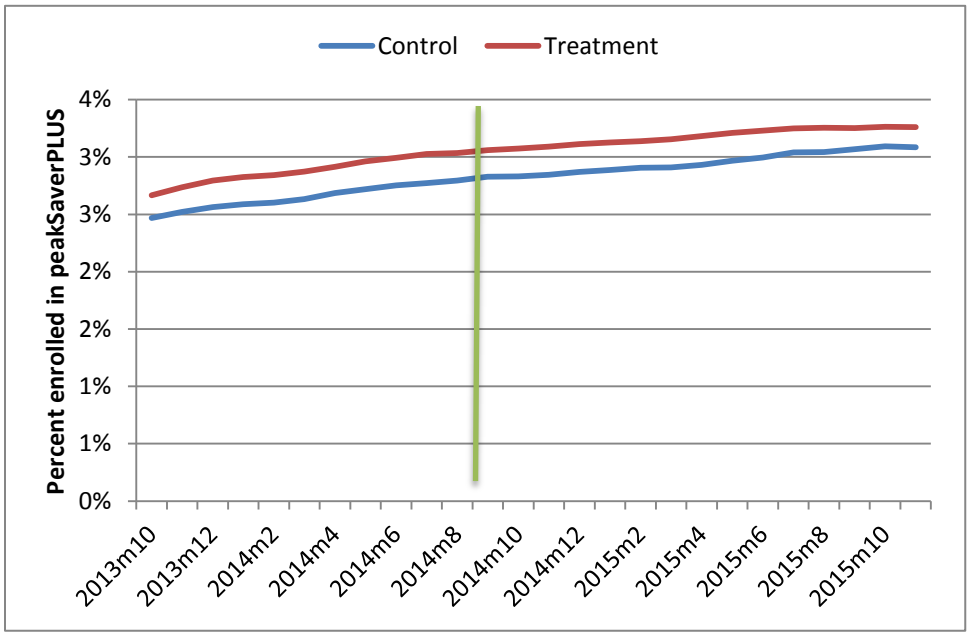
Table 5-5: Pre- and Post-treatment Enrolment in *peaksaver*PLUS

Period	Group	% Enrolled in *peaksaver*PLUS	SE	95% Confidence Interval	
Pre-Treatment	Control	2.8%	0.1%	2.6%	3.1%
	Treatment	3.1%	0.1%	2.9%	3.2%
	Difference	0.2%	0.1%	0.0%	0.5%
Post-Treatment	Control	3.0%	0.1%	2.8%	3.3%
	Treatment	3.3%	0.1%	3.1%	3.4%
	Difference	0.2%	0.1%	-0.1%	0.5%
Diff-in-Diff		0.0%	0.2%	-0.4%	0.4%

n=52,000 T, 20,000 C

Figure 5-1 presents the percentage of Opower HER recipients enrolled in *peaksaver*PLUS during one year of pre-treatment and one year of post-treatment. The green line indicates the first reports mailed to treatment customers. There is no significant increase in the rate of *peaksaver*PLUS enrolment after the first mailer.

Figure 5-1: Pre- and Post-treatment Enrolment in *peaksaver*PLUS



6 Process Evaluation—Reported Customer Experience

This section summarizes the study of customer reactions to the products and information provided to them during the Social Benchmarking pilots. To assess the impact of the Energy Insights emails and Home Energy Reports (HERs) on customers, Nexant conducted two customer surveys, administered to a sample of both treatment and control customers from the pilots conducted Milton Hydro, Horizon and HONI. The results of the surveys are presented below.

6.1 Key Findings

As part of the evaluation of the social benchmarking pilots, surveys were administered to a random sample of treatment and control customers from the pilots of all three LDCs, Horizon, HONI, and Milton Hydro. There were questions common to both surveys that aimed to assess how the treatment and control customers engage with their respective LDC, differences in motivations and interest in conserving energy between the control and treatment groups, and any differences between their past, present, and future energy usage habits that can be attributed to the presence of the pilot. Additionally, treatment customers from all three LDCs were asked pilot-specific questions that gauged overall levels of pilot awareness and satisfaction.

- Across all three surveys, the treatment customers that completed the surveys did not significantly differ from those in the control groups across demographic dimensions such as age of household head(s), household size, income, family structure, and presence of children in school.
- While Horizon and HONI showed no differences between how often the treatment and control participants accessed their LDC's website, the Milton Hydro pilot saw noticeable differences between groups in this area: Milton Hydro treatment customers are more than twice as likely to visit the Milton website to obtain household energy usage information as their control group counterparts.
- Only the Milton Hydro pilot intervention produced an increase in customer interest in energy efficiency actions and their self-rated knowledge of how to save energy, when comparing treatment customers to control customers.
- Both Horizon and Milton Hydro treatment customers are more likely to use their LDC's website to search for energy efficient ideas and opportunities than the control customers.
- Of several possible rationales for reducing energy usage (reducing energy bills, helping the environment, setting an example for others, and avoiding waste) neither the Horizon nor the HONI pilot impacted how important these motivations were to treatment customers in comparison to control customers. In contrast, Milton Hydro's treatment customers reported that all of the provided motivations for reducing energy usage were significantly more important to them as opposed to control customers.

The survey issued to the treatment groups included questions specific to each intervention that were aimed at evaluating the effectiveness of the program, what communicatory channels were effective in inspiring participation, what aspects of the website successfully engaged participants, and recommendations on how to improve the program. Some of the key findings include:

- HONI customers were significantly more dissatisfied with the energy reports that they received when compared to either Horizon or Milton Hydro treatment customers: 15% of HONI treatment customers said they were "very dissatisfied" with their reports while 3% of Horizon treatment customers and 1% of Milton Hydro treatment customers reported being "very dissatisfied" with their reports.
    - However, 19% of HONI customers reported learning more about their household's energy use through the pilot, while 15% of Horizon customers and 8% of Milton Hydro customers reported learning more about their household energy usage from the Energy Insights emails.
- Respondents were also asked to recall energy-saving tips that they had seen in their reports or emails. HONI customers experienced the highest recall (and most consistency in recalling) of these tips, followed by Horizon treatment customers, and lastly Milton Hydro customers.
    - HONI HER's also experienced the highest proportion of the recollection of receiving the reports, followed by Horizon and then Milton Hydro. HONI Home Energy Reports were also opened more frequently than the Energy Insights emails offered by Horizon and Milton Hydro.
- Milton Hydro's use of earning point or badges for gift cards was the incentive technique that garnered the highest engagement.
- Respondents from all three LDCs provided similar recommendations on how to improve the pilots:
    - Improve the accuracy of the "home to home" energy usage comparisons;
    - Present a breakdown of energy usage by appliance or end-use; and
    - Improve the effectiveness and/or better tailor tips to individual customers. Customers reported that it is frustrating to implement tips and continue to see electricity bills go up.

6.2 Survey Methodology

An important objective of IESO's evaluation of the social benchmarking pilots is to obtain insights into residential customer preferences and attitudes towards social benchmarking interventions. The principal sources of information used for learning about the project participants' engagement with the reports are datasets collected through surveys administered to random samples of both treatment and control customers.

Nexant developed and deployed a mixed-mode survey of treatment and control group customers that collected data via the web and used direct mail and email recruitment. This approach lead with a letter on letterhead cobranded with the IESO and relevant LDC's logos containing a pre-incentive of $2 CAD, information about the study, and a survey URL encouraging recipients to log in and complete the survey

online. Customers for whom email addresses were available received a reminder by email with a live link to the same URL. The surveys were open for four weeks from June 29, 2016 to July 27, 2016.

The treatment customer survey included 26 questions, some of which were open-ended and optional. The average completion times were as follows: 12 minutes for the Horizon treatment customers, 13 minutes for HONI treatment customers, and 11 minutes for Milton Hydro. In terms of response rates, Milton Hydro experienced the highest rate at 41.0%, followed by Horizon at 27.1%, and then lastly HONI with a 18.7% completion rate.

The control customer survey containing 18 questions was administered during the same time frame. This survey was shorter since it did not include questions directly related to the pilots. The average completion rates for the control customer survey were also shorter for all three pilots: 9 minutes for Horizon, HONI, and Milton Hydro customers. As shown in Table 6-1, the overall completion rates were 31.6% for Milton Hydro, 29.2% for Horizon, and 18.6% for HONI.

Table 6-1: Survey Response Rates

	Milton Hydro	Horizon	HONI
Treatment	41.00%	27.10%	18.70%
	n=410	n=269	n=182
Control	24.50%	30.80%	18.60%
	n=327	n=406	n=242
Combined	31.60%	29.20%	18.60%
	n=737	n=675	n=424

The treatment survey inquired about the participants' engagement with their respective utility provider, their past, present, and future energy use, motivations and interests in conserving energy, as well as pilot awareness and satisfaction. The control survey included all categories present in the survey issued to those in the treatment group but without the questions inquiring about pilot experience. Both surveys also included demographics to be used to assess the comparability of the treatment and control survey responders.

This section presents the results from both of these survey types for all three pilots, including comparisons of results where applicable. Survey results are presented in the following four topical areas: customer engagement with the utility provider, energy usage habits, motivations or interest in conserving energy, and for the participants enrolled in the program, pilot satisfaction.

6.3 Customer Engagement in Utility Provider

Survey participants were first asked to rate their satisfaction with their LDC's energy-efficiency offerings, "Very Dissatisfied" to "Very Satisfied," using a five point scale. The aspects included in this question were 1) information made available about the providers' energy efficiency programs; 2) the LDC's commitment to promoting energy efficiency and the wise use of electricity, and 3) information provided by the LDCs to

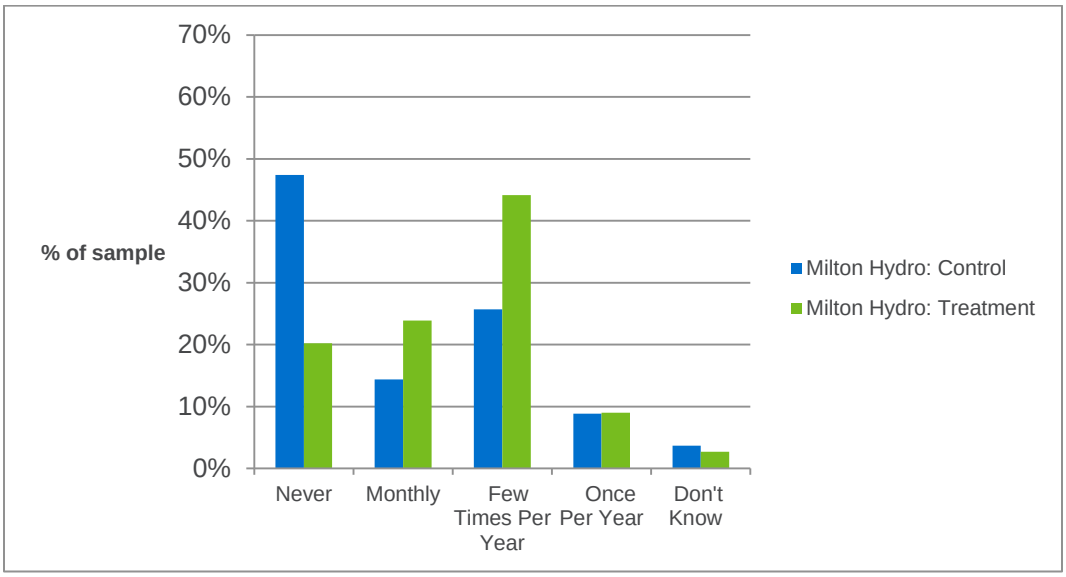
help customers save on energy bills. For Milton Hydro, Horizon, and HONI, the pilot's interventions did not change customer satisfaction with the utility provider's conservation offerings; there was no statistically significant difference in the levels of satisfaction for any of the three aforementioned aspects between the treatment and control respondents for all three utility providers.

However, when examining the "Top-2 Box" (percentage of customers that answered in the top most positive answer choices), we see that both Horizon and Milton Hydro shows statistically significant differences between treatment and control survey respondents. After the pilot, the Horizon treatment customers were more satisfied with all three aspects of Horizon's energy efficiency offerings— the information available on energy efficiency programs, Horizon's commitment to promote energy efficiency, and the information Horizon provided to help save money on energy bills. The treatment customer top-two box scores are 73%, 72%, and 73%, respectively, while the control group customers' top-two box scores are about ten points lower, at 60%, 64%, and 62%, respectively.

Similarly, Milton Hydro's treatment customers were more satisfied with both the information available on energy efficiency programs (70% vs. 64%) and Milton Hydro's commitment to promote energy efficiency (76% vs. 69%), but not with the information provided to help save money on energy bills. There were no significant differences between HONI's treatment and control customers with regards to customers' satisfaction with energy efficiency offerings. HONI's top-two box scores were also significantly lower than those of Milton Hydro and Horizon Utilities, ranging between 45% and 55%.

Both the treatment and control customers were asked how often they access their LDC's website to search for information about their household's energy usage. While Horizon and HONI showed no differences between how often the treatment and control participants accessed the website, the Milton Hydro pilot saw noticeable differences between treatment and control respondents. As shown in Figure 6-1, treatment customers are more than twice as likely to visit the Milton website to obtain household energy usage information as their control counterparts.

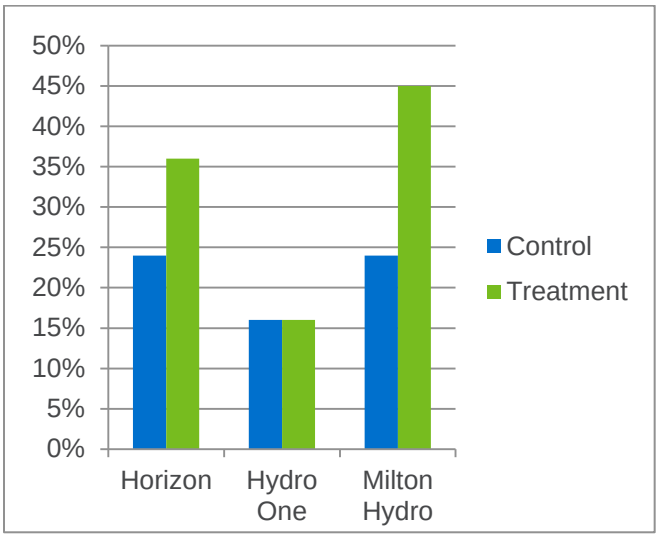
Figure 6-1: "How often do you access your LDC's website to search for information about your household's energy use?"



6.4 Energy Savings Behaviour

The surveys attempted to discern the changes in behaviour that reduce overall energy usage, as measured by the load impact evaluation. Towards this end, both surveys first asked customers what actions they take when they log in to their LDC's website. Customers were asked to report whether they have never logged on to their LDC website, and if they have logged in, whether they have paid their bill online and whether they look for information on energy efficiency opportunities. None of the pilots inspired additional website activity among treatment customers in reported number of logins or online bill paying, however, at both Horizon Utilities and Milton Hydro, treatment customers are much more likely to report visiting their provider's website to look for energy efficient opportunities or ideas, as illustrated in Figure 6-2.

Figure 6-2: "When you log in to your account, do you look for energy efficiency opportunities or ideas?" (% Reporting Affirmatively)



Both surveys then presented questions aimed at detecting differences in prior and anticipated changes in energy usage behaviours and energy savings actions between treatment and control customers. First, both groups were asked to describe how their energy savings behaviours have changed in the last 12 months. This question was structured slightly differently on the HONI survey than it was on the other two surveys[5]. For HONI, customers were asked whether or not they "never," "occasionally," or "always" performed specific energy savings actions. The actions listed were: line-drying washed clothing, turning off lights in unused or outdoor areas, using cold water to wash clothing, shutting down household electronics not in use, and turning down heating to 20 ^{o}C. The Milton Hydro and Horizon surveys asked whether customers have taken any actions to lower the energy use of specific appliances, and if they had, to describe what action had they had specifically taken. The listed appliances similarly included clothing washer and dryer, indoor and outdoor lights, electronics, and HVAC systems. If the customers had reported taking action, they wrote in their action.

For all three LDCs, despite the varying question structure, no significant differences were found between treatment and control customers' frequencies of types of actions taken or in types of actions reported to be taken to reduce energy use. For the Horizon and Milton Hydro surveys, the open-ended questions were analyzed and then binned by category in order to best understand the most common types of responses. Some of the most common energy-saving behaviours being implemented were using appliances during off-peak times, upgrading appliances to more energy efficient models, and turning the appliances off when not in use. The types of action being taken were almost identical for treatment and control customers for both Horizon and Milton Hydro. This is not an uncommon finding in surveys of social benchmarking program participants which are often unable to pinpoint exactly what changes the customers make to drive small, but consistent, energy savings. Accordingly in Table 6-2, there are no statistically significant differences in the percentages of respondents' reported actions taken between between control and treatment groups across all of the pilots. For example, while 47% of treatment customer respondents report that they have taken action to reduce the energy they use through their

[5] This difference was due to a revision in the survey instrument subsequent to the design of the HONI survey instrument.

clothes washer, and 43% of control customers report the same, the 4% increase is not statistically significant and cannot reasonably be ascribed to the treatment as opposed to only arising by chance.

In the case of the HONI survey, 75% of control customer respondents stated that they have turned down their heating system to 20 ºC or lower to save energy, while 65% of treatment customers reported the same. The difference of 10 percentage points is statistically significant at the 10% level of confidence. However, as an isolated instance of control customers self-reported energy-savings actions outpacing treatment customers' self-reported energy savings actions, this finding does not present strong support for the notion that the HONI HERs caused customers to take fewer energy savings actions.

Table 6-2: Comparison of Actions Taken by Utility Provider

Horizon

% Do Have Appliance, Took Action	Clothes Washer	Clothes Dryer	Outdoor Lights	Indoor Lights	Misc. Household Electronics	Heating System	Cooling System
Control: (n=406)	43%	47%	41%	66%	32%	38%	51%
Treatment: (n=269)	47%	50%	42%	66%	34%	41%	51%

Milton Hydro

% Do Have Appliance, Took Action	Clothes Washer	Clothes Dryer	Outdoor Lights	Indoor Lights	Misc. Household Electronics	Heating System	Cooling System
Control: (n=173)	53%	54%	47%	68%	31%	46%	53%
Treatment: (n=209)	51%	54%	47%	72%	36%	51%	59%

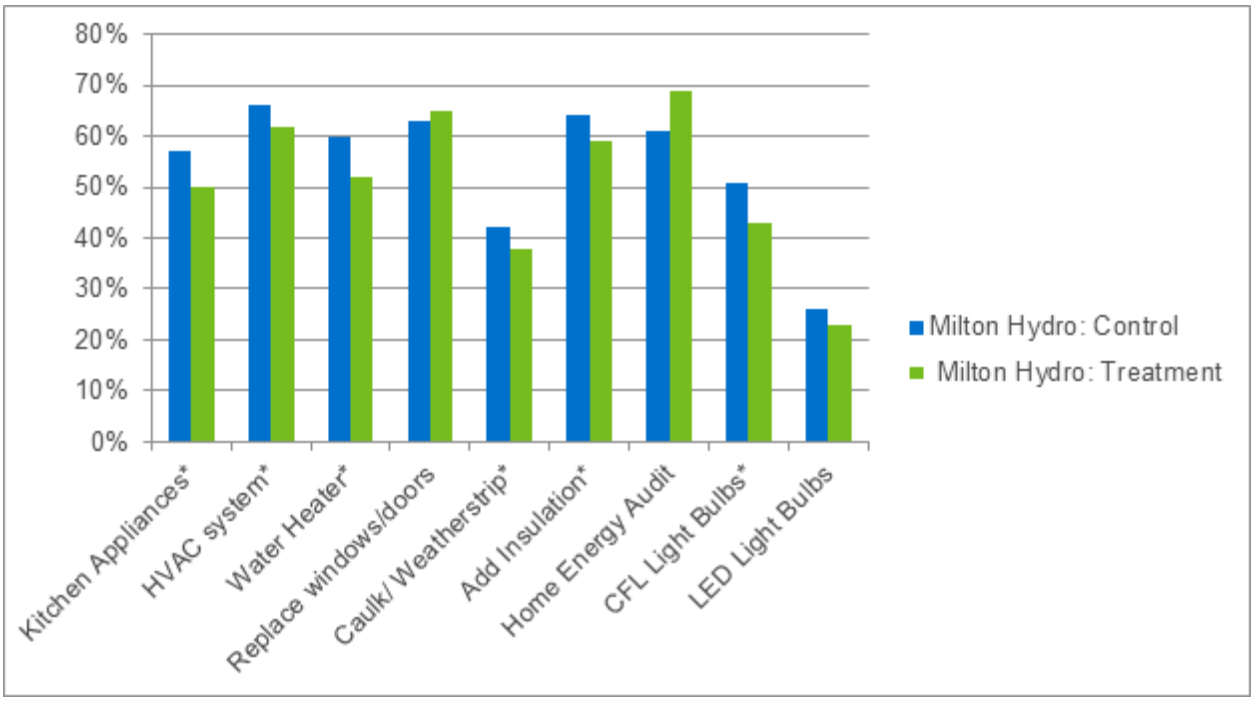
HONI

% That Regularly Took Action	Turned heating system to 20 ºC or lower to save energy	Shut down electronics while not in use	Line dried washed clothing	Turned off lights in unused or outdoor areas	Used cold water to wash clothes
Control: (n=406)	75%*	60%	40%	95%	70%
Treatment: (n=269)	65%*	54%	41%	91%	66%

*Statistically significant difference at 90% confidence (p-value 0.05)

Both the treatment and control customers were also asked about their future energy usage and their likeliness to make specified energy efficient investments or improvements to their home, including purchasing energy efficient kitchen appliances, HVAC systems, and insulation or weather stripping. Across all pilots, there were no discernable differences in the number of respondents saying that they were very likely (i.e., there were no statistically significant differences in the top-two box scores) to make these energy efficient improvements in their homes. However, the Milton Hydro pilots showed significantly *fewer* treatment customers reporting that they are "very unlikely" (i.e., bottom-two box scores) to make improvements in six of the nine possible home investments. This suggests that the pilot's intervention did influence many of the Milton Hydro treatment customers to at least consider making energy efficient investments, although it did not completely convince them to make a commitment, as seen in Figure 6-3.

Figure 6-3: "In the next 12 months, how likely are you to make each of the following energy efficient improvements?" (Likelihood scale of 0 to 10)
% of "Very Unlikely" (0 or 1) Responses



* Statistically significant difference at 90% level of confidence

6.5 Motivations for Reducing Energy Use

Both the treatment and control group surveys included questions to explore whether the intervention changed motivations, knowledge, and interest in reducing energy usage. First, both surveys inquired about the how important it is to the respondent to know whether their household is using energy wisely, using a scale of 1 to 10, where 1 means "not at all important" and 10 means "extremely important". Both the Horizon and HONI pilots did not produce any difference between treatment and control customers' value placed on understanding whether their household is using energy wisely. In contrast, the Milton Hydro pilot did increase how important it was for the treatment customers to know if their

household is using energy wisely. While only 48% of Milton Hydro's control customers reported that it was 'Extremely Important' for them to know if their household is using energy wisely, more than 60% of Milton Hydro's treatment customers reported that knowing whether or not their household is using energy efficiently is 'important'. Next, the surveys asked about the customers' knowledge on the ways they could save energy. This question was asked with a scale, where a "1" indicated that the customer was not at all knowledgeable about different ways that they can save energy in their home, up to "10," which indicated that they were extremely knowledgeable. Here again, where neither Horizon nor HONI saw increases in treatment customers' self-assessed knowledge of different ways that they can save energy in their homes, the intervention at Milton Hydro did produce a statistically significant difference between treatment and control customers. While 16% of the Milton Hydro control respondents categorized themselves as very knowledgeable (giving a rating of 9 or 10), 23% of treatment customers rated themselves as very knowledgeable.

Additionally, the treatment and control surveys aimed to learn about how the interventions may have changed the rationale and motivations that customers have for saving energy. All customers were asked to report on how important the following reasons for reducing energy usage were to them: reducing energy bills, helping the environment, setting an example for others, and avoiding waste. Neither the Horizon nor HONI pilots significantly changed treatment customers' motivations for reducing energy usage. In contrast, at Milton Hydro, treatment customers reported that all of the aforementioned reasons for reducing energy usage were significantly more important to them as opposed to control customers. Table 6-3 represents the percentage of treatment customers from each utility provider that affirmed that a given reason was an important reason for reducing energy use. The increase in importance for all provided reasons for reducing energy usage demonstrates an overall uptick in caring about reducing energy usage for the Milton Hydro customers. These results signify that the presence of the Milton Hydro pilot had a significant positive impact on attitude towards energy reduction.

Table 6-3: Motivations for Reducing Energy Usage

	Milton Hydro Control	Milton Hydro Treatment	Horizon Control	Horizon Treatment	HONI Control	HONI Treatment
Reducing Energy Bills	71%*	82%*	75%	73%	80%	82%
Helping the Environment	54%*	62%*	52%	51%	52%	51%
Setting an Example	28%*	35%*	25%	25%	33%	29%
Avoiding Waste	56%*	66%*	55%	51%	60%	57%

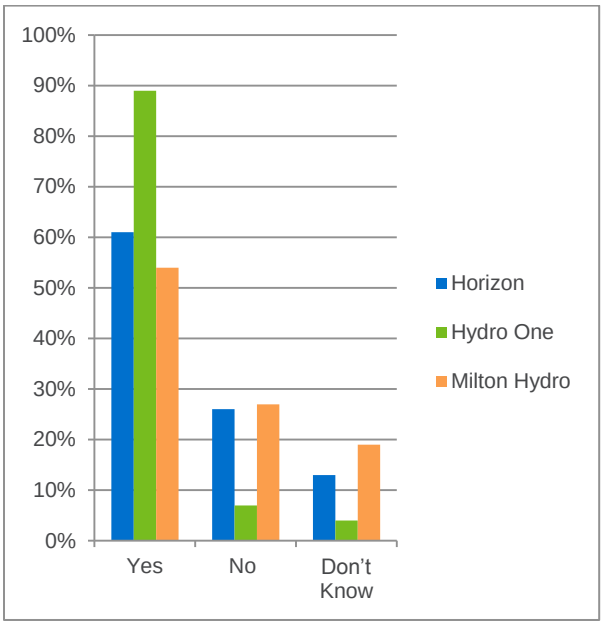
* Statistically significant difference at 95% confidence

6.6 Engagement and Satisfaction with Social Benchmarking Reports

The survey sent to treatment customers included a number of questions that were not included in the control customers' survey that centered on customer recall, customer engagement, and overall

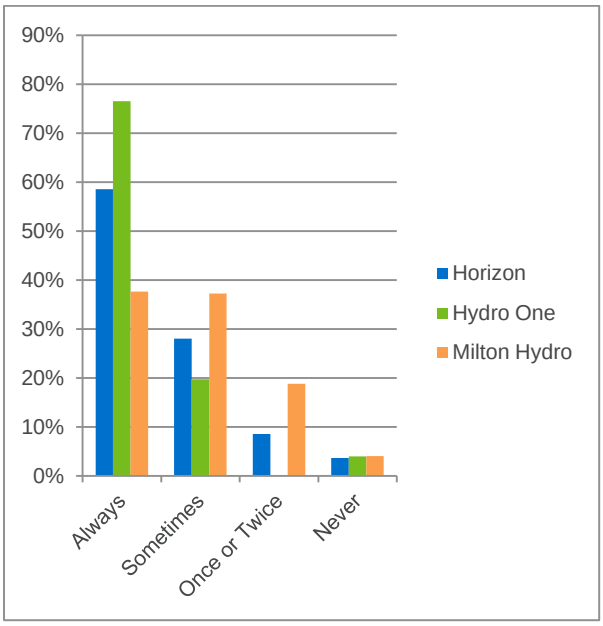
understanding of the intervention specific to each pilot. The first question asked whether or not they can recall receiving the Home Energy Reports/Energy Insights emails. HONI customers reported the highest recall rates, with 89% of treatment customers reporting "Yes" that they recalled receiving Home Energy Reports. In contrast, 61% Horizon treatment customers reported that they recalled receiving the Energy Insights emails, while 54% of Milton Hydro treatment customers recalled receiving the emails. Since the HONI Home Energy Reports are printed on paper and mailed to customers receiving the treatment, and the Energy Insights reports are emailed, these findings suggest that paper HERs are more likely to actually be viewed by their intended recipients than the email reports. Figure 6-4 presents the percentage of respondents in each response category, by LDC.

Figure 6-4: "Your LDC sends personalized energy reports to some households. These reports provide customers with information on how their home's electric energy usage compares with that of similar homes. Have you seen these reports?"



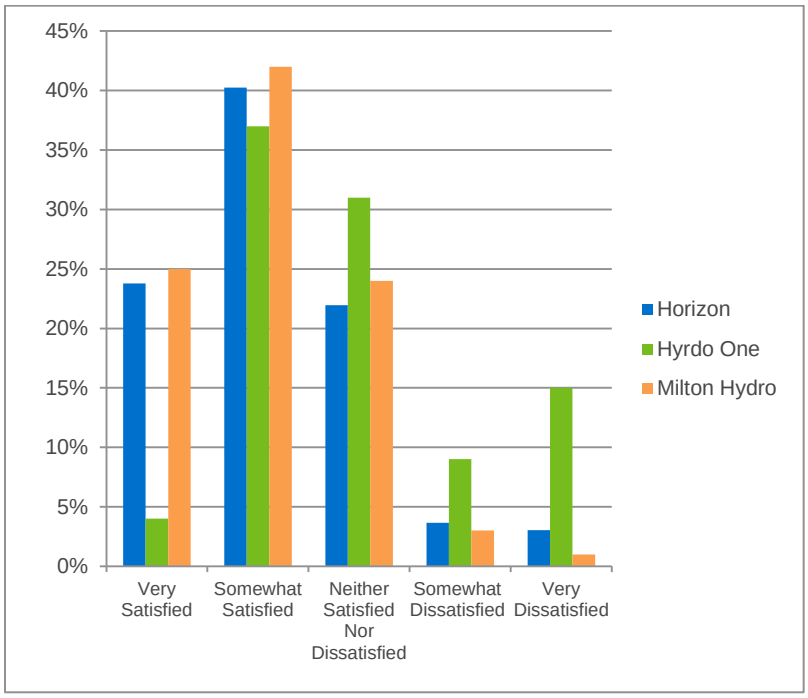
The customers who responded that they had seen the reports were next asked how often they read them. HONI customers reported the highest read rates with 77% of respondents answering that they "Always" open their Home Energy Reports while only 59% of Horizon treatment customers "Always" open their Energy Insights emails, and only 38% of Milton Hydro customers "Always" open their Energy Insights emails. Figure 6-5 summarizes these survey responses by LDC.

Figure 6-5: "Which of the following best describes how often you open the reports?"



The treatment customers were also asked to rate their level of satisfaction with the Home Energy Reports or Energy Insights emails, using a five-point scale ranging from "Very Dissatisfied" to "Very Satisfied." HONI customers were significantly more dissatisfied with Home Energy Reports compared to both Horizon and Milton Hydro treatment customers. In Figure 6-6, HONI saw 4% of its respondents reply with "Very Satisfied" in contrast to 23% of Horizon customers and 25% of Milton Hydro customers. Similarly, 15% of HONI customers report being "Very Dissatisfied" with their Home Energy Reports, while only 3% of Horizon customers and 1% of Milton Hydro customers report being "Very Dissatisfied" with their Energy Insights Emails.

Figure 6-6: "Please rate your satisfaction with the information on the Home Energy Reports/Energy Insights emails that you have received"



Horizon, HONI, and Milton Hydro treatment customers were also asked their opinion on qualities of the Home Energy Reports and Energy Insights emails. Specifically, treatment customers were asked whether they learned about their households energy use, if the reports show how they are doing at saving energy, whether the tips are appropriate for their home, if they would like more detailed information about their home's energy use, whether they have discussed these reports with friends, and if they have done anything to reduce their home's energy usage that they were not doing before receiving the HERs/ Energy Insights Emails.

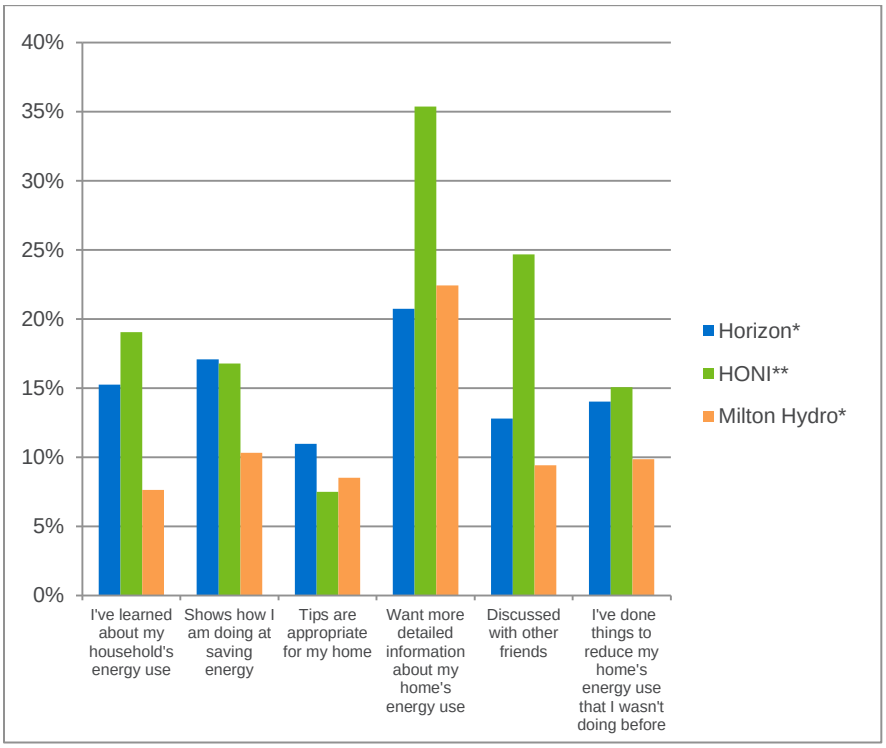
The first question, which addressed learning about household's energy use, demonstrated varying amounts of improved knowledge. Nineteen percent of HONI customers strongly agreed (using the top-two box scores) that they have learned about their household's energy use through the pilot, while 15% of Horizon customers and 8% of Milton Hydro customers reported learning more about their household energy usage from the Energy Insights emails.

Additionally, when asked if the energy-saving tips provided were appropriate for their home, only 7% of HONI customers strongly agreed that the tips were appropriate; and in a similar vein, 35% of HONI's treatment customers strongly agreed that they desired more detailed information about their respective home energy use, which was the highest reported value across all three pilots.

Horizon and Milton Hydro customers responded in a similar manner when asked whether or not the tips are appropriate for their home: 11% of Horizon customers and 9% of the Milton Hydro strongly agreed that the tips were appropriate. Likewise, 21% of Horizon customers and 22% of Milton Hydro customers

strongly agreed with the statement that they want more information about their home's energy use, which is still substantially less than the 35% of HONI customers that requested more information. Figure 6-7 presents these varying differences in agreement with the six aforementioned statements about the interventions across the three different surveys.

Figure 6-7: Strong Customer Agreement with Statements about the Home Energy Reports and Energy Insights Emails



* The structure of this question was first Agree/Disagree then how strongly you feel on a scale of 1 to 10
** The structure of this question was a scale 0 (Strongly Disagree) to 10 (Strongly Agree)

All three treatment surveys included two open-ended questions: the first question asked for suggestions for improving Home Energy Reports or Energy Insights emails and the second question asked what tips or information the respondents recall seeing in the reports and emails. With regards to improvements or suggestions, the responses were fairly consistent across the three pilots, where common complaints were that the "home to home" comparisons were ineffective or inaccurate. Specifically, customers questioned the accuracy of the comparisons, claiming that their house is different from their neighbours' homes in some cases, and in others, respondents noted that they were never given an opportunity to provide more accurate information about their home or heating habits. As one customer put it, "They don't know my home, they don't know my neighbour's home. They should be more personalized based on one's actual home. My home was built in 2010, but they don't know that. They're giving me general tips that don't apply to me. They don't know my heat source, what my hot water source is. They should be more personalized to the actual home, then give me tips." The second and third most common criticisms were a desire to see the breakdown of their energy usage by appliance, and frustration that electric bills continue to increase, despite implementing energy-saving tips and tricks. Many of these commenting responders reported generic, inappropriate home tips that were ill-fitted to their home, and even after

implementing many of them, the treatment customers reported feeling demotivated as their energy bills continue to rise. One customer stated that they "would like to know which appliances in my home are using the most electricity," while another customer requested that their utility "stop sending the same tips all the time (e.g., install energy efficient light bulbs, turn down thermostat when not at home)" and that these tips "are things that either I have done or have zero interest in doing—personalize the emails to the individual [and give] actual useful tips to help [each customer] save money." These comments were similar across three pilots (Horizon, HONI, and Milton Hydro).

The second free-response style question asked the customers what information they recalled seeing in the report. HONI treatment customers recalled tips most frequently, with 56% recalling an energy-saving suggestion. Next, 24% of Horizon customers were able to remember a provided tip, and lastly, 15% of Milton Hydro customers were able to recount an energy suggestion. When analyzing the most frequently remembered tips, the results varied across pilots. For Horizon treatment customers, the most common answers were lightbulb upgrades (to CFL or LED), understanding the time of use concept, and the home-to-home comparison. These answers were consistent with nearly all Horizon customers answered with one of the three aforementioned responses. When analyzing the Milton Hydro customers, we see much less commonality amongst answers: some of the most frequent responses included learning about "phantom power" and appliance upgrades, but again of those Milton Hydro customers that did respond the variety of answers was quite expansive. Lastly, of the large percentage of HONI customers that did recall tips, the most recurring answers were consistently the home-to-home comparison, appliance upgrades, and learning about time-of-use pricing structures. Not only were HONI customers most frequently remembering tips, but they were recalled by the respondents with the greatest consistency. In contrast, the Milton Hydro customers infrequently recalled tips, and of those that did, customers were recalled a wide variety of them. The rates at which customers were able to remember tips are in-line with report recall.

6.7 Engagement with Online Portal

All pilots offered an online portal as a secondary resource to participants. For the purposes of the pilots, only the Horizon and Milton portals were evaluated. Only treatment customers of the Horizon and Milton Hydro pilots had access to the portals, the links to which were provided via the weekly Energy Insights emails. The portals provided the treatment customers with energy savings ideas while also allowing them to see how their savings compare to other community members and to redeem prizes for implementing energy savings actions and tips. The portal associated with the Horizon pilot was named the "Horizon Take Charge" website while the Milton Hydro portal was called the "Community Energy Challenge Dashboard."

The Horizon and Milton treatment customer surveys first inquired about the frequency of visits, and then secondly what activities were completed on the portal. The Horizon survey asked how often the customer visited the website while the Milton Hydro pilot asked customers whether or not they have visited the website at all. The results were similar, with 64% of Horizon customers reported that they have visited the website at least once and 51% of Milton Hydro customers answering "Yes" that they had visited the website, as shown in Figure 6-8 and Figure 6-9.

Figure 6-8: "The Energy Insights emails provide a link to visit the Horizon Take Charge website. Which of the following best describes how often you visit the Take Charge website by clicking on the link in your Energy Insights emails?"

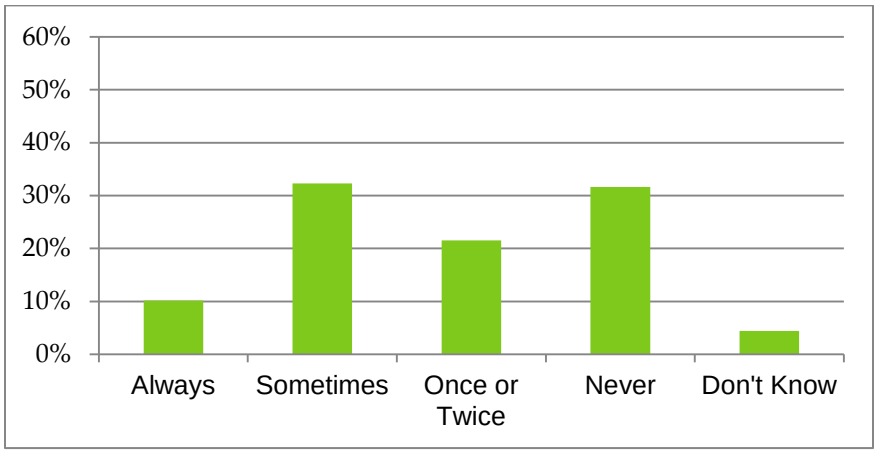
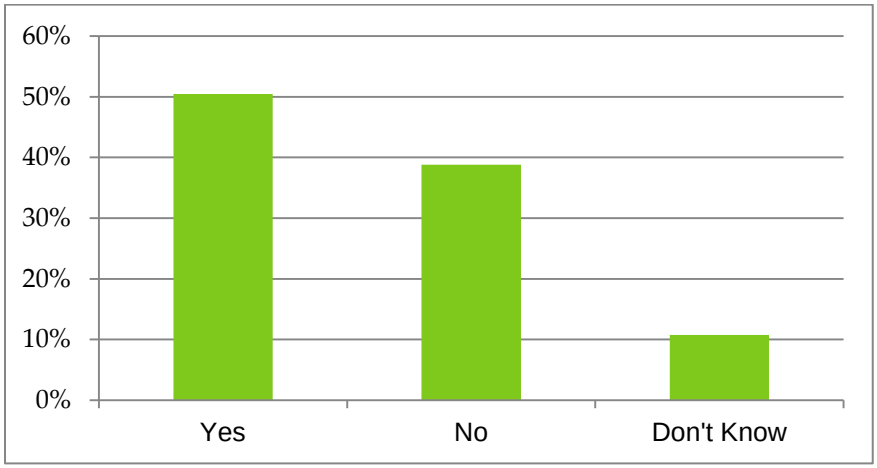


Figure 6-9: "Customers receiving Energy Insights emails can visit the Community Energy Challenge online dashboard. Have you ever visited the Community Energy Challenge online dashboard?"



The remaining questions centered on customer engagement with the online portal, focusing on reward activities completed on the website. Horizon customers were offered the following activities and asked to report which of them they engaged in: check contest entry status, take a quiz to earn AIRMILES, enrol in a Horizon Program to earn AIRMILES, or complete a tip to earn AIRMILES. Nearly 50% of the customers reported having done "None of the above." Only 10% of Horizon portal users checked their contest entry status. About 25% of Horizon portal users report that they enrolled in a Horizon program or took a quiz to earn AIRMILES, and about 40% of respondents said that they completed tips to earn AIRMILES.

Similarly, the Milton Hydro customers were prompted to report whether or not they have engaged in the following portal activities: redeeming points for gift cards; tracking school ranking on the school challenge leaderboard; tracking personal ranking on the community challenge leaderboard; joining a school team; earning points for reducing energy usage; or earning badges for implementing energy-saving behaviours. Of the survey respondents who visited the Milton Hydro portal, 82 %report engaging in one or more

activities. The three most popular activities were "Earning badges for taking energy saving actions," then "earning points for reducing energy usage," and then "joining a school team;" between 55% and 65% of respondents reported taking both of those actions. Figures 6-10 and 6-11 present the percentages of respondents reporting having engaged in each online portal activity for Horizon and Milton Hydro.

Figure 6-10: Have you ever done any of the following activities on Horizon's Take Charge website?

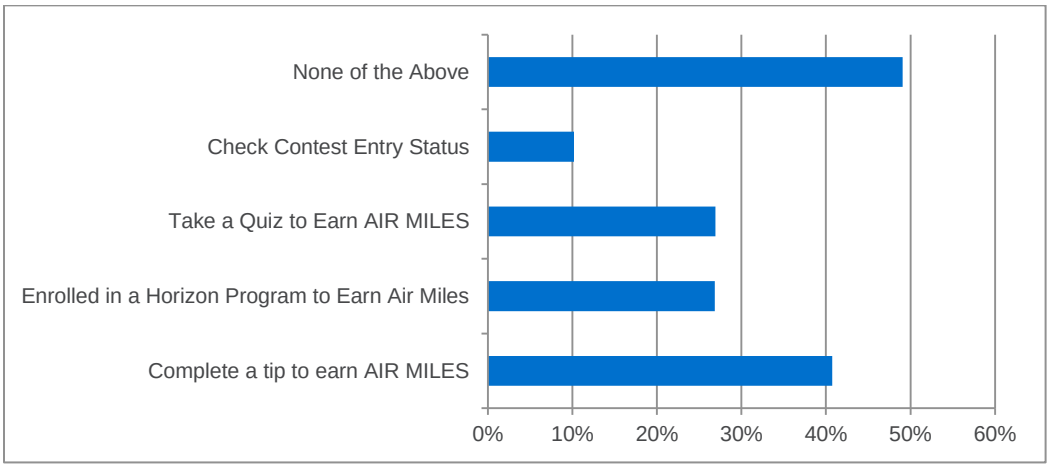
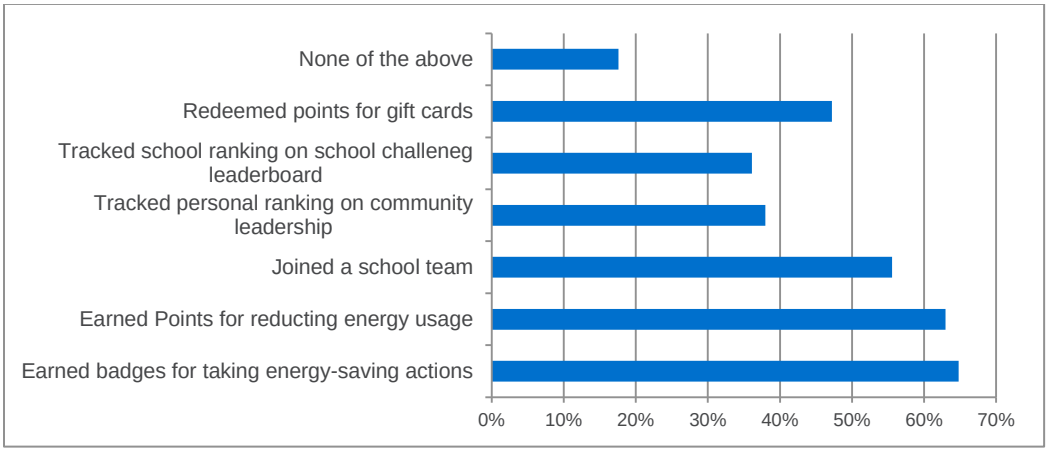


Figure 6-11: Have you ever done any of the following activities on Milton Hydro's Community Energy Challenge website?



6.8 Milton Hydro School Employee Interviews

As part of the Milton Hydro CEC pilot, schools led customer recruitment to the Simple Energy Engagement Platform (SEEP) though a variety of outreach initiatives that engaged students, teachers, and faculty. Nexant contacted participating schools to collect feedback on schools' experiences and to assess:

- The strategies used to engage teachers and students in the program;
- What teachers thought worked and didn't work; and
- Their recommendations for how to make such a program more effective.

Contact information was provided for 15 public and private schools in Milton, where telephone numbers were available for 4 of the schools, and where both email and telephone numbers were provided for 11 schools. Nexant contacted all 15 schools by either telephone or email at least twice; Table 6-4 summarizes the response rate to Nexant's outreach. Overall, interviews were completed with staff from 7 schools.

Table 6-4: Summary of Interview Response Rates by Contact Information Type

Contact Information Type	Total Number of Schools	Number Contacted via Email	Number of Responses from Emailing	Number Contacted via Phone	Number of Responses from Phone Calls
Both email address and phone number	11	11	4	7	2
Only phone number	4	N/A	N/A	4	1
Total Number of Responses					**7**

6.8.1 Outreach Strategies and Their Effectiveness

Three of the seven teachers interviewed said that their school ultimately didn't participate in or promote the program. One school's reason for not participating was that there wasn't enough interest to have a school-wide eco team during the year the program took place. For the other two schools that didn't promote the program, the reason was a mix of competing challenges and initiatives the school was already focused on and external politics. For example, one of the non-participating schools was already "a successful Eco School [and was] focused on other stewardship and curriculum connected activities." Additionally, during the year the program took place, that school had their start of the year eco celebrations and networking sessions cancelled due to teachers' work-to-rule and strike actions.

Although these three schools did not participate in the program, one teacher said her school would participate in a future Community Energy Challenge. For future programs, she suggested it would be helpful to receive a full package on the program with dates, a contact number or email address, and pre-made materials, such as announcement text and posters.

The remaining four schools promoted the program to varying degrees. One school only went as far as to put up the posters they had received, but did not promote the program beyond that. The other three schools promoted the community energy challenge through a variety of channels such as school newsletters, parent council meetings, morning announcements, school bulletin boards, and emails to parents encouraging them to sign up. Overall, the teachers interviewed did not have much insight into which strategies were more or less effective because there was no formal feedback mechanism from Milton Hydro or Simple Energy, nor was there any way for schools to monitor program sign-ups from their respective community members. One teacher felt that the program was successful at their school, attributing their success to momentum: her school had recently won another energy challenge, so from her perspective, it was easier to convince parents to sign up for another opportunity to engage in an

energy reduction challenge. As a teacher who's been actively involved with energy and eco challenges at the school, she says, "there's some momentum from the school to be more eco-friendly." With respect to her school's success with the program, she says, "I don't know if it was the push at the end of the year with school announcements and email blasts versus a lot of momentum that's been developing for about four years prior to that—I think it was a combination."

6.8.2 Recommendations for Making Future Programs More Effective

There are three primary recommendations from school staff for improving on this type of school-supported program:

- Provide pre-made content and materials to make it easier for schools to promote the program;
- Increase information sharing and collaboration; and
- Increase visibility of the school's participation in the program to students and teachers.

Provide pre-made materials and content

Since each school's Eco Team is comprised of volunteer teachers, faculty, and students, several schools interviewed suggested having more pre-made content ready to go, in addition to the posters that were provided. For example, one teacher mentioned it would be helpful to have prepared text for morning announcements and emails to parents. This could be especially helpful to schools with smaller eco teams. For example, one school opened two years ago and in their first year, they only had two staff members on the Eco Team. According to the teacher interviewed, this "created a lot of additional work load to keep track of and manage programs, but now with more staff on the team, the work load is more manageable."

Increase information sharing and collaboration

During the course of the program, there were no formal channels for participating schools to share information or ideas. One teacher suggested that Milton host a workshop at the beginning of the program and invite each school's eco representatives to discuss the program and share ideas on ways to get more families involved. In her interview, she said, "I think it would be helpful for teachers to have some sort of workshop with Milton Hydro to discuss how we can engage the schools more that ultimately engage a big part of the community in Milton—to me, I think that would be really effective."

Another aspect of increased information sharing is feedback from Milton Hydro or Simple Energy to schools on the status of participant recruitment. As mentioned above, most teachers did not have any insights into which outreach strategies were more or less effective because they received no information on how many people signed up, even at the end of the program. One teacher suggested creating accounts for each school that would enable teachers to monitor recruitment progress throughout the program. Additionally, she suggested creating two additional fields on the program sign up website where participants could list which school they are affiliated with and how they heard about the program. A tool like this would allow teachers to monitor recruitment progress and allow schools to provide challenge updates to parents and generate or maintain momentum.

Increase visibility of schools' participation in the program

The final set of recommendations is around increasing the visibility of the program both inside the school and within the wider community. For increasing the visibility of the program within the school, specifically among students, one teacher recommended creating an incentive that is more relatable to students. For example, she led the school in another campaign aimed at recycling batteries, where the prize for most batteries recycled was a school-wide pizza party. In her opinion, "it would be nice to have an incentive program that kids see immediately, like a school-wide pizza party, versus just a sum of money for the school."

Another component of improving the program is making the wider community more aware of the challenge and the school's outreach initiatives. Most of the schools interviewed used newsletters and/or email blasts to recruit parents; however, one teacher noted that these communication methods were easily overlooked or forgotten. She suggested including a small prize drawing for each school district that parents and other participants get entered into when they sign up for the program.

Overall, the feedback suggests that schools are interested in programs like the Community Energy Challenge, but want more support and feedback channels in the future. This is further supported by the recommendations to help reduce the workload of the schools' teachers and staff to participate in the program, creating channels for collaboration and idea sharing among schools, and helping schools to better engage their communities.

7 Conclusions and Recommendations

While the energy savings associated with social benchmarking programs are small, when introduced to large populations of residential customers, they can produce measurable aggregate energy savings. However, the persistence of these savings is unknown and requires further evaluation. The three pilots implemented in Ontario by HONI, Horizon Utilities, and Milton Hydro represent an important foray into this segment of residential conservation program offerings.

- The paper mail and email delivery home energy report pilots provided an important first application and test bed for the implementation of a third-party provided social benchmarking program that operates in compliance with Ontario's privacy legislation. Interval electric usage data quality and completeness and its effect on program delivery were also tested by these three pilots.

- The three pilots tested covered a range of delivery mechanisms and social benchmarking strategies, and were also demonstrated in both large and small LDC business settings. These pilots tested both paper mail delivery and email delivery of neighbor comparison reports and also tested varying gamification program design components – some pilots featured no rewards or competition components, and others did, where the reward components also varied: opportunities to earn community-based rewards were used in one pilot, while rewards directed at the individual customer were also used in two of the pilots.

- Energy savings ranged from 266 MWh for the smallest pilot which reached 3,198 customers at Milton Hydro to 3,028 MWh at Horizon Utilities which reached 42,335 customers. HONI enrolled 52,250 customers in its pilot which resulted in 11,063 MWh saved – it should be noted that HONI enrolled its highest usage customers in their pilot: high usage being an important driver of energy savings per participant.

- Surveys of pilot treatment and control customers at all three LDCs could not identify any measurable effects on energy saving actions taken during the pilots or stated intentions to take action or make energy savings household investments or upgrades in the future that can be attributed to the pilot's treatment intervention. Put another way, while the pilots produced measurable energy savings, the surveys could not detect any differences between households' behaviours and stated intentions for the future that could explain those energy savings.

- Participants in two email delivery pilots were much more satisfied with the pilot than the paper mail delivery pilot. However, it must be noted that pilot satisfaction also reflects the tenor of overall customers' satisfaction with their LDC and thus satisfaction metrics should only be compared across LDCs or jurisdictions with caution. On the other hand, the paper delivery pilot had the strongest customer recall rate, and survey respondents who received their reports by paper also could recall energy savings tips much more often and with greater consistency than the respondents who received their reports by email.

- These pilots and similar forthcoming programs in Ontario introduce opportunities for evaluating a number of research questions following from this evaluation of first-year social benchmarking

offerings. The literature shows that social benchmarking programs reach peak performance in their second or third year of implementation, and these pilots, if continued, could have the opportunity to increase capacity to deliver more energy savings per participant. Similarly, Ontario also has an opportunity to study the persistence of social benchmarking energy savings; the energy savings delivered by the program may or may not continue for a certain period of time even after report delivery is suspended. Evaluation of future years of these pilots can provide valuable information on both of these program delivery aspects that are crucial for long run cost-effectiveness.