Hydro One Networks, Inc.
Air-Source Heat Pump
Advantage Pilot Evaluation

January 10, 2017

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Executive Summary

As part of the program year 2016 (PY2016) consumer portfolio evaluation, the Cadmus team (Cadmus, and Nielson Opinion Quest) evaluated the Phase 1 Air-Source Heat Pump Advantage Pilot (ASHP Pilot), offered by Hydro One Networks, Inc. (HONI). Through the pilot, HONI provided incentives for the installation of central air-source heat pumps (ASHPs) and ductless heat pumps (DHPs).

For this evaluation, the Cadmus team sought to address the following research objectives:

- Evaluate net energy (kWh) and demand savings (kW)
- Assess the effectiveness of pilot delivery channel and marketing methods
- Gather feedback on participant and market actor experiences
- Document the pilot successes and challenges
- Assess the pilot’s scalability, including design and delivery modifications and target markets
- Identify what, if anything, can be done to improve evaluability

Pilot Description

HONI designed the pilot to target residential customers owning homes that use electric baseboard or furnace as the primary space heating system and customers residing in rural areas where natural gas is not available. HONI offered a rebate of 50% off the installation cost of central ASHPs and DHPs (up to $5,750 and $4,000, respectively) that met the following criteria:

- ENERGY STAR®-certified
- Season Energy Efficiency Ratio (SEER) of 15 or above
- Energy Efficiency Ratio (EER) of 12.5 or above
- Heating Seasonal Performance Factor (HSPF) of 8.5 or above

HONI originally planned to offer customers a 35% discount (rebate) off the installed costs for central ASHPs (up to $4,025) and 30% off DHPs (up to $2,400); however, it increased the rebate before launching the pilot to encourage participation. HONI also planned to offer financing options to participants, but dropped this approach after evaluating the available opportunities from local financial institutions and finding them inadequate for the target market.

HONI provided the rebate to the installation contractors, who were required to pass the savings along to participants by lowering the upfront cost of equipment. HONI ensured that participating customers received reduced pricing for their equipment by requiring contractors to submit invoices showing that they applied the rebate. Once HONI approved the invoice, it paid the rebate to the contractor.

HONI also provided contractors with $200 for each participant they referred to the pilot. If a contractor applied for the rebate on a customer’s behalf, HONI tracked the referral automatically. If a customer applied for the rebate, HONI asked them to identify the contractor who referred them to the pilot.
**Methodology**

The Cadmus team conducted impact and process evaluations.

For the impact evaluation, we determined net energy savings through a billing analysis of participant and nonparticipant consumption data using a difference-in-differences (D-in-D) approach. The D-in-D approach compares the change in consumption between the pre- and post-installation periods in the participant and nonparticipant comparison groups. Incorporating a comparison group accounts for non-pilot consumption changes, such as naturally occurring efficiency. The team estimated the pilot’s overall first-year savings, as well as savings by measure category (central ASHP and DHP) and by region.

To estimate demand savings, we analysed hourly data, applying the Evaluation, Measurement & Verification (EM&V) protocol’s definition\(^1\) of peak demand periods for weather sensitive measures. Using a similar D-in-D approach for the hourly data, we compared the changes in the average peak hour usage pre- and post-installation in the participant and comparison groups.

We gathered insights on the pilot design’s effectiveness and assessed the overall pilot’s operation and performance through a process evaluation. Following a comprehensive review of pilot documents, the team conducted phone interviews with staff from the sponsoring local distribution company (LDC), implementer, two manufacturers and three equipment installation contractors. Additionally, we completed telephone surveys with 51 participants to assess their experience with the pilot.

**Key Findings and Conclusions**

The HONI ASHP Pilot achieved slightly fewer participants than planned (112, as opposed to 120) and did not achieve the expected energy or summer demand savings, although it surpassed its total reported demand savings when winter demand is included.

<table>
<thead>
<tr>
<th>Table 1. Air-Source Heat Pump Advantage Pilot Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Units</strong></td>
</tr>
<tr>
<td>Savings kWh</td>
</tr>
<tr>
<td>kW Summer</td>
</tr>
<tr>
<td>kW Winter</td>
</tr>
<tr>
<td>Realization Rate**</td>
</tr>
<tr>
<td>% (Summer kW)</td>
</tr>
</tbody>
</table>

* Reported demand savings were assumed to be for summer peak.

** Realization rate means the ratio of the gross verified savings and pilot reported savings.

The pilot’s design and delivery approach provided a positive experience for market actors and participants. Both manufacturers said they were very satisfied with the pilot overall. While the interviewed contractors said they understood and tolerated the pilot challenges—such as the time it

\(^1\) Ontario Power Authority. EM&V Protocols and Requirements V2.0.
took to receive their rebate and the drive time to individual customer locations—overall, they generally appreciated the pilot intent and structure. The majority of participating customers (94%) reported being either very satisfied or somewhat satisfied with the pilot due to their experience with the contractor and the new equipment.

The rebate design effectively encouraged customer interest, but the length of time spent by some customers on the waitlist may have impacted their participation in the pilot. More customers applied to participate in the pilot than HONI initially expected. This resulted in a wait list of customers who could not move forward until already approved applicants had the opportunity to go through the pilot participation process. As a result, some waitlist customers, particularly the last to apply who had to wait the longest to find out if they would be approved to participate, lost interest in participating.

The customer referral rebate did not serve as an effective customer recruitment tool for contractors. HONI staff, implementer staff, manufacturers and contractors agreed the $200 referral rebate did not effectively encourage contractors to refer customers to the pilot. Furthermore, contractors remained reluctant to drive long distances to inspect homes in rural, remote areas, knowing they may not even complete the installations.

Targeted email- and contractor-based marketing effectively reached customers. Heavy reliance on email alerts and contractors to drive pilot participation worked well; however, only 30% of HONI customers have valid email addresses, and therefore overreliance on targeted emails may not suffice for a larger program.

The pilot could be modified to maximize savings. The vast majority of survey respondents who did not have air conditioning prior to the installation of their new heat pump reported that they would start using air conditioning (DHP 93%, central ASHP 86%). This finding was supported by the hourly analysis which verified DHP participants added demanded during summer months, which resulted in lower demand savings in the summery (1.7%) than the shoulder (13.3%) or winter (15.5) months. Furthermore, because the pilot did not require the removal of existing heating systems, some respondents said they would very often or all the time use supplemental heat (DHP 41%, central ASHP 17%). Most of these respondents said the supplemental heat source would be electric baseboard (DHP 59%, central ASHP 40%). To maximize savings, HONI could update the design to encourage the use of the heat pump compressor rather than electric resistance heating by providing connected thermostats for the electric baseboard heaters. In this design, the thermostats for the baseboard heaters would be connected to the heat pump thermostat and a lockout temperature could be programmed to ensure the baseboards are not used prematurely. Further analysis could be done to assess the extent to which additional air conditioning use offsets heating savings.
1. **Introduction**

The IESO contracted with the Cadmus team to evaluate the pilots and programs under the 2015–2020 Conservation First Framework. This report describes our evaluation methodology and results for the HONI ASHP Pilot, implemented from November 2015 through July 2016.

The Cadmus team conducted an impact and process evaluation to address the following research objectives:

- Evaluate net energy savings (kWh) and demand savings (kW)
- Assess delivery channel and marketing methods
- Assess participant and market actor experiences (where appropriate), including satisfaction levels and pilot effectiveness
- Document areas of success, challenges and change to the pilot
- Assess the pilot’s scalability, including design and delivery modifications and target markets
- Identify what, if anything, could improve evaluability

1.1 **Pilot Description**

HONI designed the ASHP Pilot to accomplish the following:

- Increase customer awareness and use of heat pump technology
- Encourage manufacturers to invest in heat pump technology
- Investigate the feasibility of including ASHPs in existing province-wide programs

HONI targeted the pilot to residential customers who own homes that use an electric baseboard or furnace as the primary space heating system, and to customers residing in rural areas where natural gas is not available. HONI offered customers a rebate of 50% off the installed cost of central ASHPs and DHPs (up to $5,750 and $4,000, respectively) that met the following criteria:

- ENERGY STAR-certified
- SEER of 15 or above
- EER of 12.5 or above
- HSPF of 8.5 or above

HONI originally planned to offer rebates of 35% off the installation costs for central ASHPs (up to $4,025) and 30% for DHPs (up to $2,400); however, it increased the rebate before launching the pilot. HONI also planned to offer financing options to participants, but dropped this approach after evaluating the

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2 Customers must be in rate classes R1, R2 or UR.
available opportunities from local financial institutions and finding them inadequate for the target market.

HONI provided the rebates to the installation contractors, who were required to pass the savings along to participants by lowering the upfront cost of equipment. HONI ensured that participating customers received reduced pricing for their equipment by requiring contractors to submit invoices showing that they applied the rebate. Once HONI approved the invoice, it paid the rebate to the contractor.

HONI also provided contractors with $200 for each participant they referred to the pilot. If a contractor applied for the rebate on a customer’s behalf, HONI tracked the referral automatically. If a customer applied for the rebate, HONI asked them to identify the contractor who referred them to the pilot.

1.2 Pilot Participation Summary
Planning to enroll roughly 120 customers, HONI attained 112 participants by June 2016. HONI chose to end the pilot rather than engage in another round of marketing and recruitment, which could have taken several months. As shown in Figure 1, all installations took place in climate zone 2.

Figure 1. Installation Locations

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3 Original end date was December 2016.
2. Impact Evaluation

2.1 Methodology

Cadmus used billing analysis to develop energy and demand saving for this pilot. The energy savings were analysed at the monthly level (the AMI data was originally provided in the form of hourly consumption) as the IESO requested fast feedback.

2.1.1 Energy Savings

The Cadmus team developed statistical models using HONI customers’ consumption data to determine the verified net pilot energy savings. The models use customers’ data spanning the 12 months prior to pilot participation and 12 months after the pilot measures were installed. For each customer, the model calculates weather-adjusted savings using the difference in consumption between the pre- and post-installation periods. We used a quasi-experimental approach to control for exogenous effects in the region that could affect pilot savings. As such, the team analysed data for pilot participants and a nonparticipant comparison group using a D-in-D approach to develop the net energy savings. D-in-D compares the consumption change between pre- and post-installation periods in the participant and comparison group(s) to account for non-pilot consumption changes, such as naturally occurring efficiency.

In addition to consumption and tracking data for 112 pilot participants, the team reviewed records for the same time period of 100,000 nonparticipants from the HONI service territory, approximately 44,000 of whom had the same postal codes as participants. Pulling from these records, we created a matched comparison group using a Monte Carlo consumption-quartile matching technique to select a nonparticipant comparison group that was statistically equivalent to pilot participants in terms of pre-participation consumption. To do this, we draw random samples from potential comparison homes against each quartile of participant homes (after ordering by average daily consumption and segmenting into quartiles). For example, we draw samples of comparison homes from the bottom 25% quartile range of participant homes and compare average daily consumption during the pre-period. We select the sample of comparison homes with the smallest difference in pre-treatment consumption between the treatment and comparison groups. We repeat this for each quartile. This ensures that not only is the average daily consumption statistically equivalent between the treatment and comparison group as a whole, but also the distribution is similar.

For participant and matched nonparticipant groups, the team used both the Princeton Scorekeeping Method (PRISM) and a conditional savings analysis (CSA) fixed-effects model to estimate average savings per customer.\(^4\) PRISM produced savings for each participant by calculating weather-normalized pre- and post-installation period consumption values (the difference of which we determined outside the model),

whereas the CSA model pooled participants into a single dataset and provided average savings across all participants. CSA provided an alternative weather-normalization methodology and savings estimation method to compare and triangulate with the PRISM-based savings estimates. Although the two approaches calculate savings differently, they typically have similar outcomes.

For both the PRISM and CSA approaches, the team first screened participants and nonparticipants to remove outliers and data points that would bias the model. We removed customers from the analysis if their data showed:

- Insufficient billing days and months
- Usage below 1,240 kWh per year
- Annual usage change of more than 70% during the period analysed
- Additional baseload, cooling or heating consumption in the post-installation period
- Inconsistent or erroneous reads or vacancies in the pre- or post-installation period

As shown in Table 2, 112 HONI customers participated in the ASHP Pilot as of July 2016. The Cadmus team did not have a full 12 months of pre- and post-installation consumption data for all participants, as shown in the final column of Table 2. As a result, we excluded 11 participants with less than 300 days of pre- or post-installation period data from the analysis. We also removed 17 customers due to the above listed criteria, indicative of vacancies or occupancy changes, abnormal load changes or insensitivity to weather. This resulted in a final sample size of 84 participants.

<table>
<thead>
<tr>
<th>Installation Month</th>
<th>Installations</th>
<th>Number of Post-Period Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ductless</td>
<td>Central</td>
</tr>
<tr>
<td>October 2015</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>November 2015</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>December 2015</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>January 2016</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>February 2016</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>March 2016</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>April 2016</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>May 2016</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>June 2016</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>July 2016</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>69</strong></td>
<td><strong>43</strong></td>
</tr>
</tbody>
</table>
The Cadmus team went through the same steps to screen nonparticipant customers, but also excluded those who participated in the Peak Savers Program so as not to confound ASHP Pilot savings estimates. The final nonparticipant group consisted of 364 customers.

In the PRISM model, the team weather-normalized the pre- and post-installation period usage for each customer using a variable degree day PRISM modelling approach, which allowed us to change the heating and cooling reference temperatures (t or tau) for each customer. This approach led to separate account-level models estimated for the pre- and post-installation periods. The team selected the model with the highest R² or fit, which best explained the relationship between usage and weather in the respective periods for each customer. Finally, the team weather-normalized the PRISM model pre- and post-installation period usages to Canadian normal weather conditions or to the most applicable typical meteorological year available.

The Cadmus team used the CSA model to estimate savings parameters from a monthly panel dataset. The fixed-effects estimator was derived through ordinary least squares on deviations from the means for each unit or time period—a relevant approach when one expects averages of the dependent variable to differ for each cross-sectional unit or each time period, while the variance of the errors remains similar. The team used each participant’s monthly pre- and post-installation data and the associated weather to estimate the monthly fixed-effects models.

The CSA model included a separate intercept for each customer and produced weather-normalized overall pilot savings and additional pilot subgroup savings (similar to the PRISM models). The CSA model corrected for weather differences in the pre- and post-installation periods using interactions of heating degree days (HDDs) and cooling degree days (CDDs). Interactions between participation, the post-installation period indicator and HDDs and CDDs allowed for estimating the separate baseload, heating and cooling savings components. The team then used the average HDD and CDD to obtain model-predicted weather-normalized savings estimates under normal weather conditions. After calculating the savings for the participant and nonparticipant groups, the team calculated the D-in-D to arrive at verified net savings.

### 2.1.2 Demand Savings

Similar to the energy savings analysis, the Cadmus team used a quasi-experimental approach to develop demand savings and control for exogenous effects in the region that could affect pilot savings. However, for the hourly demand analysis, we used propensity score matching to construct a comparison nonparticipant group rather than using the same nonparticipant group selected for the energy savings analysis.

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5 The Peak Savers Program ran at the same time as the ASHP Pilot.
6 The Cadmus team used monthly billing records for participating customers for panel data.
7 Because a D-in-D billing analysis produces net savings, the team set the NTG ratio at 1.0 in the impact reporting template.
analysis. Because demand savings analysis focuses on a specific block of peak hours, propensity score matching allowed our team to construct a nonparticipant comparison group that more closely resembled the load profile of participants, particularly within the peak period. This method is particularly applicable as hourly usage has a higher variance between hours within the same household than monthly data, after accounting for seasonal variations.

To select the nonparticipant group for the demand analysis, we used the approximately 44,000 accounts from the same postal codes as participants—the same group used to construct the nonparticipant group for the energy savings analysis.

The Cadmus team first excluded nonparticipants with average hourly consumption that was outside the range observed in the participant group. To determine the range observed in the participant group, we calculated the average hourly consumption for each account during the pre-installation period. For each account, we averaged the consumption during hours 0 through 23 across two periods: the six months between November and March and then between April and October. The team then removed accounts from the pool of potential nonparticipants if the average hourly consumption was above or below the range observed in the participant group. If, for example, the average hourly consumption for participants ranged from 0.85 and 7.5 for hour 10 in the months between November and March, we flagged and removed any nonparticipant accounts with an average hourly consumption below 0.85 or above 7.5.

Next, the team created seasonal profiles to use as inputs to the propensity score model. The profiles included an average of hourly consumption by account for each hour in the day during each season:

- Hours 0 through 23 during the heating season (December through February)
- Hours 0 through 23 during cooling season (July through September, when average hourly temperatures were highest during the pre-period)\(^8\)
- Hours 0 through 23 in the shoulder months (March through June; October through November)

We estimated each customer’s propensity to opt in to the pilot using logistic regression models specified through forward stepwise model selection.\(^9\) We modelled the propensity to opt in as a function of the

\(^8\) Though the cooling season did not align with the peaks as defined in the EM&V protocol, the team only used it for the matching process. We calculated all demand savings using the definition in the EM&V protocol.

\(^9\) Stepwise selection is an automated model selection procedure that tests the statistical significance of each new variable added to the model and only selects variables for inclusion that improve the model to a statistically significant extent.
seasonal hourly profiles and the total cooling and heating degree hours by postal code for each account using the scoring recommended in Imbens and Rubin (2015).10

After selecting the final model, the Cadmus team predicted propensity scores for each participant and nonparticipant account. We created one-to-one matched pairs of participants and nonparticipants using the nearest-neighbor-matching-without-replacement method. That is, for each participant, we selected a nonparticipant with the propensity score closest to that participant’s score. “Without replacement” means that only one nonparticipant account can be matched to one participant account. In the end, we were unable to match five participant accounts to comparison nonparticipant accounts because we had already matched the 10 closest scores for these accounts to other participants.11

Next, the team developed statistical models using customers’ hourly consumption data to determine the verified net pilot demand savings. The models utilized data from 105 participants and 105 nonparticipants. Because the model estimated average hourly consumption, rather than total annual consumption, it was not necessary for households to have data for 300 or more days in both the pre- and post-periods. Therefore, we included participant accounts with hourly observations across at least two months in both the winter and summer seasons, and four months in the shoulder seasons.

Finally, similar to the energy savings analysis, we used a CSA fixed-effects model to estimate average hourly savings per customer. For each customer, the model calculated savings using the difference in weather-adjusted consumption between the pre- and post-installation periods. Then, the team used a D-in-D approach to develop the net demand savings.

### 2.2 Findings

This section presents the verified net pilot impacts, net impact by equipment type and saving by region and manufacturer.

#### 2.2.1 Verified Net Impacts

Table 3 presents the verified energy savings by equipment type. The pilot realized 203,083 kWh in total, or approximately 31% of the reported 660,450 kWh.

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11 The team considered allowing more than the top 10 matches to increase the likelihood that all participants had an assigned nonparticipant match. This may have potentially led to a slight increase in the precision of the demand savings estimates. However, the improved precision may have been offset by bias due to lower-quality matches.
Table 3. Verified and Reported Energy Savings by Equipment Type

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number Installed</th>
<th>Verified Energy Savings (kWh)</th>
<th>Reported Energy Savings</th>
<th>Realization Rate (% of kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central ASHP</td>
<td>43</td>
<td>177,969</td>
<td>279,500</td>
<td>64%</td>
</tr>
<tr>
<td>DHP (single-head)</td>
<td>22</td>
<td>1,071</td>
<td>82,500</td>
<td>1%</td>
</tr>
<tr>
<td>DHP (multi-head)</td>
<td>47</td>
<td>24,041</td>
<td>298,450</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td>112</td>
<td>203,083</td>
<td>660,450</td>
<td>31%</td>
</tr>
</tbody>
</table>

Table 4 Error! Reference source not found. savings by season and equipment type. Overall, the demand savings during the summer peak was significantly less than winter peak demand savings. In the case of the DHP participants, they appeared to be adding load (cooling), which aligns with survey results indicating customers previously did not have cooling (see the process findings in the Participant Experience section) Pilot Impact.

Table 4. Verified and Reported Peak Demand Savings by Equipment Type

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number Installed</th>
<th>Peak Summer Demand Savings (kW)</th>
<th>Peak Winter Demand Savings (kW)</th>
<th>Reported Summer Demand Savings (kW)</th>
<th>Realization Rate (% of Summer kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central ASHP</td>
<td>43</td>
<td>9.19</td>
<td>35.73</td>
<td>16.16</td>
<td>57%</td>
</tr>
<tr>
<td>DHP</td>
<td>69</td>
<td>-1.15</td>
<td>22.09</td>
<td>22.02</td>
<td>-5%</td>
</tr>
<tr>
<td>Total</td>
<td>112</td>
<td>8.03</td>
<td>57.81</td>
<td>38.18</td>
<td>21%</td>
</tr>
</tbody>
</table>

Unit Energy Savings
At the pilot level, the team found a 16.8% decrease in consumption within the participant population (Table 5). The average decrease for nonparticipants was 8.8%—a much higher amount than expected, and especially high compared to average unit savings of 4,153 kWh for participants. As a result, the net savings are 7.9% or 1,963 kWh per participant. We calculated the relative precision for each group, presented in Table 5, by using formulas described in the Uniform Methods sampling protocol section.

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12 In other studies, Cadmus typically observes nonparticipant usage changes ±3%.

7.2. We then applied the formulas in Uniform Methods section 7.4, for estimating differences, for the combined precision.\textsuperscript{14}

Our information on nonparticipants’ usage behaviours was limited to their billing data. After discussions with the IESO, the Cadmus team determined that the relatively high nonparticipant savings rate may result from other factors that encourage energy savings (such as fuel switching and market forces). HONI confirmed that the nonparticipants did not show up as participants of other efficiency programs.

| Table 5. Pilot-Level PRISM Results for Mean Consumption and Per-Unit Savings |
|-------------------------------------------------|--------|------------------|------------------|-----------------|-----------------|-----------------|
| Model                                          | Number of Customers | Pre-Period Consumption (kWh/year) | Post-Period Consumption (kWh/year) | Annual Savings (kWh/year) | Percentage Savings | Savings Relative Precision (90%) |
| Participants                                    | 84     | 24,790           | 20,638           | 4,153           | 16.8%           | ±16%            |
| Nonparticipants                                 | 336    | 24,828           | 22,636           | 2,192           | 8.8%            | ±15%            |
| Net Impacts                                     |        |                  |                  | 1,963           | 7.9%            | ±38%            |

**Demand Savings**  
Cadmus estimated the average hourly usage for both the participants and nonparticipants within each season in the pre- and post- periods.\textsuperscript{15} Summer and winter seasons were defined according to the months specified in the EM&V protocol.

As shown in Table 6, both groups’ average hourly usage was greater in the winter than summer. The values in Table 6 represent the averages across all weekday hours in each season and are not limited to peak hours (peak hours follow in Table 8).\textsuperscript{Error! Reference source not found.}

\textsuperscript{14} Overall precision bounds are wider than the bounds around each groups’ separate estimate. This is because the ratio of the standard error to the mean is the primary factor in the relative precision calculation. For the participant and nonparticipant groups, the mean is the change between the pre- and post- periods. The combined mean for the net savings is the difference between the mean of the two groups, which is smaller than either groups’ mean, making the combined standard error larger relative to the combined mean. Additionally, the combined standard error includes uncertainty from both the estimate for the participant group and the nonparticipant group. This makes the combined standard error larger than either groups’ individually.

\textsuperscript{15} The team focused the hourly analysis on weekday and non-holidays, when peaks occur. This focused period resulted in a maximum of 6,072 hours rather than a full 8,760.
### Table 6. Average Hourly Results by Season

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Summer Mean Hourly Pre-kW</th>
<th>Summer Mean Hourly Post-kW</th>
<th>Summer Mean Hourly Delta</th>
<th>Winter Mean Hourly Pre-kW</th>
<th>Winter Mean Hourly Post-kW</th>
<th>Winter Mean Hourly Delta</th>
<th>Shoulder Mean Hourly Pre-kW</th>
<th>Shoulder Mean Hourly Post-kW</th>
<th>Shoulder Mean Hourly Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>1.337</td>
<td>1.336</td>
<td>0.1%</td>
<td>3.689</td>
<td>2.967</td>
<td>19.6%</td>
<td>1.689</td>
<td>1.561</td>
<td>7.6%</td>
</tr>
<tr>
<td>Nonparticipants</td>
<td>1.393</td>
<td>1.429</td>
<td>-2.6%</td>
<td>3.812</td>
<td>3.599</td>
<td>5.6%</td>
<td>1.771</td>
<td>1.859</td>
<td>-5.0%</td>
</tr>
<tr>
<td><strong>Net</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.7%</td>
<td>14%</td>
</tr>
</tbody>
</table>

The average hourly usage increased in the post-period for both groups in the summer months. However, the participant group increase was smaller, yielding a net change of 2.7% of average hourly usage in the summer. In the winter, we found both groups decreased consumption; the decrease was much larger in the participant group resulting in a net change of 14%. The shoulder months also resulted in net demand savings for the pilot as participants decreased average hourly usage by 7.6% while nonparticipants increased by 5%.

Across all hours included in the analysis, the average decrease in the post period for participants was 17.8% and the average decrease for nonparticipants was 6.8% with a net program decrease of approximately 11%.

The average demand savings for the participant group was very similar to that in the energy savings analysis (17.8% compared to 16.8%, respectively). The average demand savings for the nonparticipant group was slightly lower than the energy savings (6.8% compared to 8.8%, respectively). However, while the magnitude of the nonparticipant group savings differs between the energy and demand savings analyses, both results show a substantial decrease in usage among the nonparticipant group.

It is also important to note that the nonparticipant group samples differed between the two analyses. We selected the energy savings sample to match participants pre-period annual consumption while we selected the demand analysis smaller sample based on similar peak hour seasonal profiles. Additionally, the hourly analysis excluded weekend and holiday hours.

#### 2.2.2 Impacts by Equipment Type

Table 7 shows the derivation of the unit savings for each equipment category. Starting with the participant pre- and post-installation results, the Cadmus team subtracted 8.8% (the nonparticipant savings) to obtain the net percent savings. From there, we applied the percent savings to the pre-consumption kWh to get the net per-unit energy savings (kWh).
Table 7. Unit Savings by Equipment Type

<table>
<thead>
<tr>
<th></th>
<th>Central ASHP</th>
<th>Ductless Multi-Head</th>
<th>Ductless Single-Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Customers Billing Analysis</td>
<td>35</td>
<td>31</td>
<td>18</td>
</tr>
<tr>
<td>Pre-Consumption (kWh)</td>
<td>27,604</td>
<td>22,612</td>
<td>23,069</td>
</tr>
<tr>
<td>Pre/Post Percentage Savings</td>
<td>23.8%</td>
<td>11.1%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Nonparticipant Percentage Savings</td>
<td>8.8%</td>
<td>8.8%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Net Percentage Savings</td>
<td>15.0%</td>
<td>2.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Net Energy Savings (kWh)</td>
<td>4,139</td>
<td>512</td>
<td>49</td>
</tr>
</tbody>
</table>

Consistent with the EMV protocol’s alternative definition of peak demand and the monthly weights provided in the protocol, the team repeated the same process comparing the weighted average maximum demand pre- and post-installation during winter and summer season peak hours.

First, the team calculated the weighted average maximum for each participant by season. Then the team averaged the participant and nonparticipant comparison group results across accounts.

Table 8 shown the peak hour demand change by season and equipment type.

Table 8. Peak Hour Demand Change by Season and Equipment Type

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number Installed</th>
<th>Summer Peak Hour</th>
<th>Winter Peak Hour</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average Pre-Period Demand (kW)</td>
<td>Average Post-Period Demand (kW)</td>
<td>Percent Change</td>
<td>Average Pre-Period Demand (kW)</td>
</tr>
<tr>
<td>Central ASHP</td>
<td>43</td>
<td>2.137</td>
<td>2.098</td>
<td>2%</td>
<td>5.934</td>
</tr>
<tr>
<td>DHP*</td>
<td>69</td>
<td>1.672</td>
<td>1.816</td>
<td>-9%</td>
<td>5.335</td>
</tr>
<tr>
<td>Nonparticipant</td>
<td>NA</td>
<td>1.913</td>
<td>2.061</td>
<td>-8%</td>
<td>5.707</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.02</td>
<td></td>
<td></td>
<td>0.21</td>
</tr>
</tbody>
</table>

* Differences between single and multi-head ductless units were not statistically significant.

The final per-unit net peak demand savings by season and equipment type is shown in Table 9.

Table 9. Per Unit Net Peak Demand Savings by Equipment Type

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number Installed</th>
<th>Peak Summer Demand Savings (kW)</th>
<th>Peak Winter Demand Savings (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central ASHP</td>
<td>43</td>
<td>0.21</td>
<td>0.83</td>
</tr>
<tr>
<td>DHP</td>
<td>69</td>
<td>-0.02</td>
<td>0.32</td>
</tr>
</tbody>
</table>

As shown in Table 8, the central air-source heat pumps showed a decrease in peak hour demand in both the winter and summer seasons. However, the team found that households with ductless units showed an increase in peak hour demand in the summer of 0.02 kW, resulting in negative summer demand savings. The central ASHPs showed some demand savings in the summer, but savings were much smaller.
than in the winter. This finding is consistent with survey respondents who did not have air conditioning prior to the pilot using their heat pumps for air conditioning (see the process findings in Pilot Impact section for further details). Demand decreased in the winter for homes with ductless units, though demand savings for ductless units were substantially less than savings for central ASHPs, 0.32 and 0.83 respectively.

### 2.2.3 Saving by Region and Manufacturer

The Cadmus team explored differences in savings between climate regions and equipment manufacturers. However, given the small number of homes in the participant population, we could not identify any statistically significant differences between groups.

The tables in this section present the average unadjusted savings (the difference in consumption between the pre- and post-installation periods) for participant homes. Because the nonparticipant homes cannot be broken out into similar subgroups, and therefore do not vary between groups, the tables do not account for changes in consumption observed in the nonparticipant group.

Table 10 shows a comparison of unadjusted savings estimates between climate regions for the participant group, with precision and confidence intervals. While the point estimates differed between climate zones, we cannot detect statistical differences given the small number of customers in the north. Consequently, the confidence interval for customers in the north encompassed the entire confidence interval for non-north customers.

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Customers</th>
<th>Pre-Period Consumption (kWh/year)</th>
<th>Total Savings (kWh/year)*</th>
<th>Percentage Savings</th>
<th>Relative Precision at (90%)</th>
<th>Confidence Interval (90%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>11</td>
<td>26,381</td>
<td>3,226</td>
<td>12%</td>
<td>±83%</td>
<td>561 5,891</td>
</tr>
<tr>
<td>Non-North</td>
<td>73</td>
<td>24,551</td>
<td>4,292</td>
<td>17%</td>
<td>±16%</td>
<td>3,628 4,956</td>
</tr>
</tbody>
</table>

*Total savings is the difference in normalized annual consumption between the pre- and post-installation period within the participant group only, and does not account for changes in the nonparticipant group.

Table 11 shows the results by manufacturer. Though savings appeared to vary between manufacturers (as with climate zones), comparing savings by manufacturer proved limited.
Table 11. Participant PRISM Results by Equipment Manufacturer

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Central ASHP</th>
<th>DHP</th>
<th>Mean PreNAC (Pre-Period Consumption) (kWh/year)</th>
<th>Mean Total Savings (kWh/year)*</th>
<th>Percentage Savings</th>
<th>Relative Precision (90%)</th>
<th>Confidence Interval (90%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>0</td>
<td>28,379</td>
<td>9,566</td>
<td>33.0%</td>
<td>±40.5%</td>
<td>5,688 13,444</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>0</td>
<td>29,732</td>
<td>6,680</td>
<td>22.7%</td>
<td>±58.5%</td>
<td>2,775 10,585</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>39,014</td>
<td>8,161</td>
<td>20.9%</td>
<td>-</td>
<td>2,775 -</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>11</td>
<td>22,748</td>
<td>3,961</td>
<td>17.5%</td>
<td>±32.3%</td>
<td>2,680 5,241</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>38</td>
<td>24,386</td>
<td>3,627</td>
<td>13.1%</td>
<td>±19.9%</td>
<td>2,904 4,350</td>
</tr>
</tbody>
</table>

* Total savings is the difference in normalized annual consumption between the pre- and post-installation period within the participant group only, and does not account for changes in the nonparticipant group.
3. Process Evaluation

3.1 Methodology
The Cadmus team reviewed pilot documentation; conducted phone interviews with one HONI and one pilot implementer staff member,16 two manufacturers and three contractors; and surveyed 51 customer participants. These data collection activities offered insights into pilot operations and helped the team understand contractor and participant experiences, including motivations to participate, participation barriers, overall satisfaction and pilot successes and challenges.

See Appendix B, Appendix C and Appendix D for the data collection instruments.

3.1.1 Document Review
Table 12 lists the documents we reviewed to inform our development of the data collection instruments. The IESO provided these documents on behalf of HONI.

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memorandum</td>
<td>Heat Pump Advantage—Energy Savings Research Objectives</td>
</tr>
<tr>
<td>Forms</td>
<td>Pre-/Post-Installation Inspections</td>
</tr>
<tr>
<td>Reports</td>
<td>Air Source Heat Pump—Residential Space Heating: Innovation Fund; Pilot Midpoint Report</td>
</tr>
</tbody>
</table>

3.1.2 Stakeholder In-Depth Interviews
The team conducted one interview with HONI staff and one with Summerhill staff to gather information on the pilot design, delivery, successes and challenges, as well as the future plans of administrative and implementation staff.

3.1.3 Market Actor In-Depth Interviews
The Cadmus team conducted one telephone interview with two heat pump manufacturers and three interviews with installation contractors serving the pilot in order to assess these market actors’ understanding of the pilot, their motivations to participate, their perceptions of customers’ awareness of and demand for heat pump technology and the pilot successes and challenges they experienced.

16 When the pilot started, the implementer was GoodCents. The Summerhill Group assumed GoodCents’ implementation duties mid-pilot. Except where noted, the team refers to both implementers singularly as the implementer.
3.1.4 Participant Surveys
The team surveyed 51 pilot customer participants by telephone to assess their awareness of and demand for heat pump water heater technology, decision making, satisfaction, home characteristics and demographics.

3.2 Findings
This section provides findings from the stakeholder and market actor interviews, along with results from participant surveys that addressed the following:

- Pilot design and delivery
- Awareness and motivation
- Stakeholder, market actor and participant experiences
- Pilot successes, challenges and future plans

3.2.1 Pilot Design and Delivery
This section discusses the pilot’s design and delivery, including participation, marketing, customer interactions and stakeholder communications.

HONI staff reported that the primary goals of the pilot were to test ASHP market readiness and help mitigate energy costs for customers who own electrically heated homes.

Overall, HONI staff reported two changes from the original business case. First, staff increased the rebate from 35% to 50% off the installation costs for central ASHPs (from up to $4,025 to up to $5,750) and from 30% off to 50% off the installation for DHPs (from up to $2,400 to up to $4,000) that met the following criteria:

- ENERGY STAR-certified
- SEER of 15 or above
- EER of 12.5 or above
- HSPF of 8.5 or above

Second, HONI did not include pilot financing offers due to concerns that low-income participants would not qualify and qualified participants would find the interest rates unattractive. Despite this, five of 51 participant survey respondents (10%) reported securing private financing independently through loans or credit lines to pay for the out-of-pocket equipment cost.

Participation
Though HONI staff set an enrollment target of 120 customers, as stated in the original business case, the pilot ultimately enrolled 112 participants. HONI and implementer staff said the pilot fell short of this target due to time and cost constraints.

Due to the high volume of early interest, HONI staff created a wait list, then contacted customers on the list as other applicants declined to participate after receiving their equipment quotes. The lengthy
process resulted in some customers being on the wait list for months. HONI staff reported that some interested customers became non-responsive when they were finally contacted to be moved from the waitlist to the approved status because the process was taking too long and they lost interest. Even though not meeting the participation target, HONI staff determined that marketing the pilot to enroll eight more customers did not justify the marginal costs or efforts.

**Marketing**
HONI staff reported using load shape analysis to identify homes with electric heat, then approaching 6,500 customers exclusively via email. Of these customers, 520 applied for and 380 were approved to participate in the pilot. HONI staff said approved customers then accepted or declined the offer based on quotes that the implementer requested from contractors. Staff noted that some customers did not respond in a timely manner or at all, which dragged out the pilot and contributed to it not reaching its participation target.

HONI relied on contractors’ customer referrals in addition to its targeted email marketing, with contractors recruiting roughly 20% of participants to the pilot (short of the 50% expected in the original business plan). Although HONI acknowledged offering a nominal referral rebate to contractors, staff expressed reluctance to attribute recruitment success to the rebate, noting that per-unit profit margins provided “rebate enough” to actively market the pilot to customers.

Both the interviewed manufacturers agreed that the pilot’s marketing effectively encouraged participation. However, while one manufacturer thought the rebate was sufficient, the other thought the price was still too high and suggested low-interest loans to more effectively encourage participation in place of or in addition to the upfront rebate.

**Customer Interaction**
Implementer staff reported handling all communications with customers, including scheduling appointments, requesting quotes, assessing homes and processing rebates. Implementer staff also reported that, as the final qualification step, they inspected customers’ homes, during which they verified the use of electric heat.

The implementer reported that they allowed participants to choose their own contractors, if they preferred. Assuming these contractors were not part of HONI’s contractor network, the implementer asked contractors if they wanted to join. Implementer staff required new network contractors to submit proper documentation, including insurance coverage, licensing and Electrical Safety Authority permits, as well as requiring that they were qualified to install the products, which, for certain heat pump brands, could include training directly from the manufacturers. If customers did not cite a preferred contractor, they were assigned to contractors already enrolled in the pilot network. This was the case for the vast

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17 HONI disqualified customers who resided outside its service territory or lacked sufficient metre data.
majority of participating customers. In areas where a contractor was not available, the implementer passed leads to manufacturers that chose contractors from their respective dealer networks.

HONI staff reported that contractors removed the air conditioner unit if they installed a central ASHP. HONI also stated that contractors recommended that participants remove air conditioners if they installed a DHP, but that it was not mandated. This aligns with what HONI planned in its original business case.

**Stakeholder Communication**
HONI and implementer staff held weekly phone calls to discuss the pilot successes or any issues with inspections, installations or recruitment. Implementer staff reported tracking participant progress through a spreadsheet, which it disseminated weekly to HONI staff.

3.2.2 Pilot Awareness and Motivation
This section discusses how manufacturers, contractors and participants became aware of the pilot and why they chose to participate.

**Awareness**
As shown in Figure 2, 45% of respondents (n=47) learned of the pilot via a HONI email. Another 28% learned about the pilot from the installation contractor, and the rest learned about it via bill inserts, direct mail, word of mouth, TV advertisements and through HONI and other websites.

![Figure 2. How Respondents First Learned About the Pilot](image)

Source: Participant Survey Question B1. “How did you first learn that Hydro One Networks was offering rebates on new heat pumps?” (n=47; multiple response)
Both manufacturers reported high demand for ASHPs in Ontario. One manufacturer, who did not conduct marketing specific to HONI’s service territory, said the pilot increased awareness of the technology and its benefits. Notably, 62% of participants—32 of 50—reported knowing of energy-efficient heat pump technology prior to participating in the pilot.

**Motivation**

All three contractors expressed wanting to participate in the pilot to help them better understand ASHPs, with two stating they wanted to determine the following:

- “Challenges we need to face and what expertise we might need” regarding cold-climate heat pump technology
- The “kinds of savings [that] can be generated for the customer by going to heat pumps from electric or baseboard furnaces”

When asked what motivated them to purchase a new heat pump, survey respondents primarily sought to save money (76%), save energy (33%) or claim the pilot rebate (27%). Another 22% wanted to improve home comfort. As shown in Figure 3, only 2% of respondents said a contractor influenced their decision.

![Figure 3. Respondent Motivations for Pilot Participation](image)

Source: Participant Survey Question B3. “What motivated you to purchase your new heat pump?” (n=51; multiple response)

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The other manufacturer reported marketing the pilot specifically to contractors, as customers “don’t shop for heating until they absolutely need it.”
3.2.3 Participant and Market Actor Experience
This section discusses participant, manufacturer and contractor experiences, including successes and challenges they encountered as well as their overall satisfaction with the pilot.

Participant Experience
The Cadmus team administered a survey to measure participant satisfaction, the importance of pilot elements, the pilot’s impact on equipment purchasing timing, energy usage including supplemental heat and air condition, energy-saving actions, suggestions for improvements and demographic information (described in Appendix A). Where appropriate, we explored differences in responses by equipment type (central ASHP and DHP). Fifty-one participants responded to the survey.

Satisfaction
Almost all survey respondents (n=51) were very satisfied or somewhat satisfied with their new equipment (98%), their installation contractor (94%) and the pilot overall (94%; Figure 4). The seven respondents who were either a little satisfied or not at all satisfied with one of these pilot elements reported paying higher energy bills (n=3) or having problems with contractors and their heat pump installations (n=4).

Figure 4. Respondent Satisfaction with Pilot Elements

![Satisfaction chart]

Source: Participant Survey Questions D1-D5. “How satisfied are you with . . . ?” (n=51)

More respondents who installed a central ASHP reported being very satisfied with their new equipment (94%; 16 of 17) than those who purchased a DHP (76%; 25 of 33). Conversely, more respondents who installed a DHP said they were very satisfied with the contractor who installed their new equipment (88%; 30 of 34) than those who installed a central ASHP (71%; 12 of 17). Ultimately, all respondents who
installed a central ASHP (n=17) were either very satisfied (76%) or somewhat satisfied (24%) with the pilot overall compared to 91% of respondents who installed a DHP (n=34).

Importance of Pilot Components
At least 80% of respondents considered each pilot component as very important or somewhat important in contributing to their pilot experience, as shown in Figure 5. Respondents most frequently rated the rebate as very important (26 of 32; 81%), followed by educational materials about the new heat pump (20 of 32; 63%), the pilot marketing/advertising (17 of 31; 55%) and the contractor’s recommendation (16 of 30; 53%).

Figure 5. Importance of Pilot Components to Respondents

Pilot Impact
Equipment purchasing timing: Thirty of 32 respondents (94%) who had electric baseboard heat reported replacing it with a DHP, and 13 of 14 respondents (93%) reported replacing the electric baseboard heat with a central ASHP. All 32 survey respondents said they could have repaired or postponed their purchase.
Energy usage: Respondents reported that, on average, their primary heating source provided 91% of their home’s heat prior to installing their new heat pumps (n=51). Respondents who installed a central ASHP (69%) reported being almost twice as likely as respondents who installed a DHP (35%) to use their new equipment to heat their entire home. In addition, they reported that their new equipment heated a higher average percentage of their home than those of respondents who installed a DHP (84% compared to 73%, respectively). Accordingly, 13 of 22 respondents (59%) who installed a DHP said they were very likely or somewhat likely to use a supplemental heat source.

Respondents equally reported having used air conditioning prior to purchasing a central ASHP (59%, 10 of 17) or DHP (58%, 19 of 33). However, more DHP respondents reported having used a room air conditioner (89%, 17 of 19) than ASHP respondents (30%, three of 10) prior to the installation of their new equipment. Among respondents who said they had not previously used air conditioning, nearly all (91%, 20 of 22) said they planned to use or had already used their new equipment to provide air conditioning.

Energy-efficient actions: Twenty-two of 51 respondents reported making one or more additional energy-efficient upgrades to their homes after pilot participation:

- Lighting products (41%)
- Windows (27%)
- New or more insulation (18%)
- Energy-saving doors (14%)
- Additional heating and cooling equipment (14%)

Eight respondents received rebates for lighting products, one received a rebate for a programmable thermostat and one received a rebate for “other” equipment. Twelve of 21 respondents (57%) considered the pilot very important or somewhat important in their decision to make the additional upgrades, while eight (38%) said it was a little important or not at all important.

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19 The Cadmus team determined these percentages using zero for answers of “less than 25%.”

20 One respondent (5%) did not know whether they received a rebate for making additional energy-efficient upgrade(s).
**Potential Improvements**

When asked for suggestions to improve the pilot, 38 respondents most frequently cited better communication from implementation staff or market actors (24%), more promotion and customer eligibility (18%), more accurate payback estimates (16%), more technology options (13%), higher-quality equipment or service (13%) and larger rebates (11%; Figure 6). The two “other” responses (5%) were:

- “Need to have fixed prices”
- “Not sure if efficient enough for a large space”

![Figure 6. Respondent Suggestions to Improve Pilot](image)

Source: Participant Survey Question D7. “If you could offer one suggestion for Hydro One Networks to improve the Heat Pump Pilot next year, what would you recommend?” (n=28; open-ended with responses categorized by the Cadmus team)

**Manufacturer Experience**

Although the manufacturers did not report communication issues with HONI, they did experience delays when communicating with GoodCents, the original pilot implementer (from whom Summerhill assumed implementation duties). The manufacturers also said they generally did not communicate with contractors except when customers expressed dissatisfaction with their products. For example, one manufacturer reported receiving notice about malfunctioning equipment from a customer and alerted the installing contractor, who visited the home to resolve the problem. The other manufacturer experienced a similar issue, but the contractor reportedly refused to fix the problem. Ultimately, this manufacturer sent its own staff to resolve the problem.

Both manufacturers rated themselves as *very satisfied* with the pilot, with one manufacturer noticing “a small but significant boost” in its sales during the pilot period. The same manufacturer reported that, aside from the equipment cost, customers in Ontario’s northern regions might experience participation barriers due to limited HVAC dealers in the areas.
Contractor Experience
HONI staff provided the Cadmus team with a roster of 83 contractors who signed up to participate in the pilot, 44 of whom had completed at least one installation. Of these, we spoke to three of the active contractors.

Overall, the contractors said their interactions with HONI and implementation staff were smooth. None of the contractors reported marketing the pilot independently of HONI, instead relying entirely on leads provided by the implementers or manufacturers.

Contractors reported two challenges during their pilot participation:

- **Rebate timing:** One contractor said having to wait for the rebate until after the installation strained his cash flow, though he characterized this as “nothing severe.” Another contractor agreed, saying that waiting six to eight weeks proved “very, very difficult,” and he “could see other contractors having trouble making that investment.”

- **Driving time:** One contractor cited distance as the greatest participation barrier for installing systems in homes in sparsely populated areas, noting that most customers “probably want to deal with someone close to home and not wait hours or even the next day.” This contractor also said he drove an hour each way just to price out an installation that never happened. Another contractor also noted that although he provided more pricing quotes than usual by participating in the pilot, they did not necessarily materialize into installations.

In addition, all three contractors agreed with HONI and the two manufacturers that the customer referral rebate minimally affected their motivation for pilot participation. Overall, the contractors supported the pilot despite the challenges, and acknowledged the growing pains inherent in launching a new pilot.

3.2.4 Successes, Challenges and Future Planning
This section outlines areas of pilot success (such as participant satisfaction), challenges (such as the lack of an application deadline) and future planning considerations.

**Successes**
The implementer reported that providing the rebate to customers as an upfront discount greatly boosted their participation in and satisfaction with the pilot. HONI staff reported that the rebate was reasonably set to encourage participation.

**Challenges**
HONI staff cited the length of time from application to installation as the largest pilot challenge. This, combined with the larger than expected number of applications initially received, led to lengthy wait times for some participants; however, application deadlines were put in place and enforced shortly after the initial launch.
HONI and the implementer recounted several contractor-related concerns:

- **Poorly installed equipment.** HONI and implementation staff, as well as the manufacturers, reported hearing about poorly installed equipment in only two cases. In the first case, the contractor installed the wrong type of heat pump. In this case, the contractor and customer agreed on financial compensation without replacing the unit. In the second case, a customer reported quality concerns and HONI staff asked the contractor to revisit the home to ensure satisfactory reinstallation of the unit.

- **Lack of sizing requirements.** HONI staff said contractors offered customers with similar home sizes heat pumps that ranged widely in size and price. Ultimately, staff did not consider the variance a serious issue, and thought it could be resolved by requiring contractors to use a uniform software program or a predefined methodology to recommend unit sizes to customers.

- **Uncertain installation costs.** HONI staff said contractors’ installation cost estimates occasionally exceeded applicants’ expectations. The staff suspected that some contractors may have absorbed part of the rebate by marking up equipment more than they would have in the pilot’s absence. In one case, implementation staff asked a contractor to revise the cost estimate as HONI considered it unreasonably high.

HONI and implementer staff reported that one manufacturer presented challenges. Though HONI staff commended the quality of the manufacturer’s equipment, they lamented the manufacturer’s lack of timeliness when communicating with customers. Staff said several customers who wanted the manufacturer’s products eventually lost interest and chose another manufacturer.

One manufacturer thought high equipment costs may have discouraged some customers from participating, and suggested offering financing options through low-interest loans; however, this manufacturer acknowledged, as did HONI staff, that rates were too high to make such financing economical.

Even though the manufacturers benefited from the pilot rebate, they expressed reluctant support of the pilot, citing that customers’ prolonged exposure to the rebate would distort the market as “people get used to the lower price”—an issue from which the market would struggle to recover. One contractor echoed a similar sentiment about market saturation: “If there’s too much rebate in one year, it takes away from business in future years.” He thought the pilot could have done as well with a smaller upfront customer rebate.

**Future Planning**

HONI staff reported planning to participate in the provincial Heating and Cooling Program which offers central ASHP and DHP equipment. In hindsight, HONI staff noted several lessons learned, including that they could have emailed more customers initially to increase pilot awareness, though they only have email addresses on file for 20% to 30% of its customers. In addition, staff noted in the future they may include direct marketing such as bill inserts to increase awareness. Customer survey respondents considered these two marking efforts as key, with nearly half (45%) recalling that they learned about the
pilot through the email advertisement and another 28% saying they learned of it from their equipment contractor.

One manufacturer said the pilot could benefit from improved contractor awareness of existence of the pilot, and of the procedures outlined for pilot participation.

One contractor recommended introducing a referral rebate for participants who refer other customers to the pilot, either in addition or in place of the contractor referral rebate.
4. Conclusions and Recommendations

The pilot’s design and delivery approach provided a positive experience for market actors and participants. Both manufacturers said they were very satisfied with the pilot overall. While the interviewed contractors said they understood and tolerated the pilot challenges—such as the time it took to receive their rebate and the drive time to individual customer locations—overall, they generally appreciated the pilot intent and structure. The majority of participating customers (94%) reported being either very satisfied or somewhat satisfied with the pilot due to their experience with the contractor and the new equipment.

The rebate design effectively encouraged customer interest, but the length of time spent by some customers on the waitlist may have impacted their participation in the pilot. More customers applied to participate in the pilot than HONI initially expected. This resulted in a wait list of customers who could not move forward until already approved applicants had the opportunity to go through the pilot participation process. As a result, some waitlist customers, particularly the last to apply who had to wait the longest to find out if they would be approved to participate, lost interest in participating.

- **Recommendation:** For future pilots develop a mechanism to keep participant applications in motion. Remove customers who fail to accept or decline price quotes after a set amount of time.

The customer referral incentive did not serve as an effective customer recruitment tool for contractors. HONI staff, implementer staff, manufacturers and contractors agreed the $200 referral incentive did not effectively encourage contractors to refer customers to the pilot. Furthermore, contractors remained reluctant to drive long distances to inspect homes in rural, remote areas, knowing they may not even complete the installations.

- **Recommendation:** Replace the customer referral incentive with a guaranteed nominal incentive for contractors who agree to inspect homes in designated hard-to-reach areas. This will help offset the opportunity costs of those inspections and drive times, thereby encouraging involvement from contractors and customers who otherwise might not have participated.

Targeted email- and contractor-based marketing effectively reached customers. Heavy reliance on email alerts and contractors to drive pilot participation worked well; however, only 30% of HONI customers have valid email addresses, and therefore overreliance on targeted emails may not suffice for a larger program.

- **Recommendation:** Market a future program using additional marketing tactics. Stakeholders and market actors recommended using targeted mail, such as bill inserts, along with email alerts and contractor promotions.

The pilot could be modified to maximize savings. The vast majority of survey respondents who did not have air conditioning prior to the installation of their new heat pump reported that they would start using air conditioning (DHP 93%, central ASHP 86%). This finding was supported by the hourly analysis.
which verified DHP participants added demanded during summer months, which resulted in lower demand savings in the summery (1.7%) than the shoulder (13.3%) or winter (15.5) months. Furthermore, because the pilot did not require the removal of existing heating systems, some respondents said they would very often or all the time use supplemental heat (DHP 41%, central ASHP 17%). Most of these respondents said the supplemental heat source would be electric baseboard (DHP 59%, central ASHP 40%).

- **Recommendation:** In future heat pump offerings, to maximize savings, HONI could revise the design to encourage the use of the heat pump compressor rather than relying on the backup electric resistance heating by providing connected thermostats for the electric baseboard heaters. In this design, the thermostats for the baseboard heaters would be connected to the heat pump thermostat and a lockout temperature could be programmed to ensure the heat pump remains the primary heating unit when it’s able to meet the heating load.
Appendix A. Hydro One Networks Inc. Heat Pump Advantage Pilot Participant Demographics

The following section presents primary languages, education levels, household incomes and ownership status of survey respondents, as well as home characteristics.21

Most respondents (98%) speak English as their first language compared to 79% of Ontario residents. Also, as shown in Figure 7, 98% of respondents graduated from high school and 47% graduated from university, compared to 78% and 20%, respectively, of Ontario residents.

![Highest Level of Education Completed](image)

Source: Participant Survey Question G2. “What is the last level of education that you have completed?” (n=51) Source for population of Ontario: Statistics Canada. 2006 Census of Population. “Population 15 years and over by highest degree, certificate or diploma, by province and territory (Quebec, Ontario, Manitoba, Saskatchewan).” Last modified July 29, 2009.

DHP respondents were more likely to have at least graduated from university (50%, 17 of 34) than those who purchased a central ASHP (41%, seven of 17).

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21 Unless noted otherwise, the Cadmus team based all participant survey demographic information on the full sample of 51 respondents.
In PY2016, 81% of households earned at least $60,000, compared to roughly 26% of Ontario residents. As shown in Figure 8, the median household earned $80,000 to less than $100,000, and the largest percentage of households earned $120,000 or more.

![Figure 8. Household Income Levels](image)

Source: Participant Survey Question G12. “Please tell me which of the following categories applies to your total household income for the year 2016.” (n=42) Source for population of Ontario: Statistics Canada. 2006 Census of Population. “Population 15 years and over by highest degree, certificate or diploma, by province and territory (Quebec, Ontario, Manitoba, Saskatchewan).” Last modified July 29, 2009.

Central ASHP respondents (92%, 12 of 13) were more likely to have an annual household income of $60,000 or more compared to those who purchased a DHP (76%, 22 of 29).

All respondents own their home (n=50), compared to 68% of Ontario residents. Ninety-two percent of homes are single-family detached (n=48), and 96% have at least three bedrooms and 76% have at least two bathrooms, compared to 66% and 52% for Ontario residents, respectively. Eighty-eight percent were at least one or two stories tall (n=51). More than half of respondents’ homes are smaller than 2,000 square feet (55%), with a mode household size of two people. Ninety-eight percent of homes have wireless Internet (n=51).

Central ASHP respondents were more likely than those who purchased a DHP to have larger homes in terms of both square footage (53% versus 31% with homes larger than 2,000 square feet, respectively) and number of stories (65% versus 47% with two stories or more, respectively).

As shown in Figure 9, two-thirds of respondents characterized their home as between 27 and 52 years old, with only 8% built in 1995 or later.
Figure 9. Home Vintage, in Years

Source: Participant Survey Question G9. “How old is your home? An estimate is fine.” (n=51)
# Appendix B. Hydro One Networks Inc. Heat Pump Advantage Pilot Market Actors Interview Guide

<table>
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<tr>
<th>Research Objectives</th>
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<td>Identify roles and responsibilities</td>
<td>A2</td>
</tr>
<tr>
<td>Document design process including purpose</td>
<td>A3</td>
</tr>
<tr>
<td>Assess delivery and marketing methods</td>
<td>A1, A4, A6-A11</td>
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<tr>
<td>Assess participant and market actor experience including satisfaction and effectiveness of rebate levels</td>
<td>A12-A16, A18, B1-B2</td>
</tr>
<tr>
<td>Document areas of success, challenges and lessons learned</td>
<td>A5, A17, C1-C2</td>
</tr>
<tr>
<td>Assess scalability including design and delivery modifications and target markets</td>
<td>C3-C6</td>
</tr>
</tbody>
</table>

**Audience:** Supporting market actors (contractors and manufacturers)

**Purpose:** Identify key roles and responsibilities, determine program delivery and assess participant and market actor satisfaction, what is working well and areas where challenges exist, scalability of pilot and ways to improve evaluability.

The Cadmus team scheduled and conducted these interviews. We did not read the interview guide verbatim, but used it to guide the conversation.

**Target Audience:** The team conducted two interviews with contractors and three interviews with manufacturers.

**Email Invitation**

**To:** [EMAIL]  
**From:** [YOUREMAIL]  
**Subject:** Evaluation Interview about the Hydro One Networks Inc. Heat Pump Pilot

Hello [XXX],

As part of the PY2016 consumer evaluation, which includes certain pilot programs, the Cadmus team (Cadmus, Apex and Econoler) is conducting in-depth interviews with key supporting contractors and manufacturers for the Hydro One Networks Inc. Heat Pump Pilot.

The purpose of these interviews is to make sure we have a thorough understanding of the pilot delivery, document your experience and identify lessons learned. We’ll also get your perspective on things that are working well or any challenging areas.

Please let me know if you are available during any of the following times: [LIST OPTIONS]. I expect this interview to take about 15 to 20 minutes, but we can always schedule a follow-up if we need more time. If these times and dates do not work well, let me know what availability you have next week and I’ll schedule a time for us to speak then.

I appreciate your time and help with this. I look forward to speaking with you.
Calendar Invite

To: [EMAIL]
From: [YOUREMAIL]
Subject: Interview about the Hydro One Networks Inc. Heat Pump Pilot

Hello [XXX],

Thank you for agreeing to speak with me about the Hydro One Networks Inc. Heat Pump Pilot. Our call is scheduled for [INSERT TIME AND DATE OF CALL] and will take about 15 to 20 minutes.

Thank you. I look forward to speaking with you.

Introduction

Thank you for making the time to speak with me. As part of the Hydro One Networks Inc. Heat Pump Pilot evaluation, the Cadmus team is conducting in-depth interviews with supporting contractors and manufacturers. The purpose of these interviews is to get your feedback on what worked well, what could have been improved and identify lessons learned. We will use the information you provide to inform our understanding of the pilot so that we can provide well-rounded and balanced observations and recommendations.

A. Awareness, Motivation and Delivery

A1. To start, how did you first learn about the Heat Pump Pilot? [PROBE: HOW WERE YOU RECRUITED TO SUPPORT THE PILOT?]

A2. What were your main roles and responsibilities as part of the pilot?

A3. In your opinion, what is the purpose or intent of the Hydro One Networks Inc. Heat Pump Pilot?

A4. During the pilot, how would you characterize your communication with ...
   1. Hydro One Networks, the sponsoring utility?
   2. GoodCents, the implementer?
   3. [ASK IF DISCUSSED IN A2] Manufacturers?
   4. [ASK IF DISCUSSED IN A2] Contractors?

A5. What challenges did you encounter in your interactions and coordination with [HYDRO ONE NETWORKS, GOODCENTS, MANUFACTURERS OR CONTRACTORS]?  
   1. How did you resolve these challenges or issues?

A6. Now, thinking about [FOR MANUFACTURERS, SAY “THE RESIDENTIAL MARKET”/FOR CONTRACTORS, SAY “YOUR CUSTOMERS”]. Do you think there is demand for air-source heat pumps in Hydro One Networks’ territory?  
   1. What makes you say that? [PROBE: GENERAL POPULATION AWARENESS]
A7.  [MANUFACTURERS ONLY] How do you approach sales in your Ontario territory?

A8. How much of an impact do you think the pilot had on customer awareness of and demand for heat pumps?
   1. What makes you say that?

A9. Did you promote or market the pilot independently of Hydro One Networks?
   1. [IF YES] What did you do?

A10. What do you think was the most effective way of promoting the pilot? [PROBE: CUSTOMER EDUCATION]
    1. What makes you say that?

A11. Did you cross-promote the pilot with other Hydro One Networks programs?
    1. [IF YES] Which one(s)?

A12. How did the upfront rebate [FOR CONTRACTORS, SAY “YOU”/FOR MANUFACTURERS, SAY “CONTRACTORS”] offered [YOUR/THEIR] customers through the pilot affect [YOUR/THEIR] typical rate of sales?

A13. [MANUFACTURERS ONLY] Hydro One provided contractors with a $200 customer referral rebate. How do you think this rebate affected contractor participation in the pilot? [PROBE: DO YOU THINK THE REFERRAL WAS NEEDED TO ENCOURAGE PARTICIPATION?]

A14. [MANUFACTURERS ONLY] Did you offer participating contractors any sort of rebate to encourage them to promote the pilot?

A15. [MANUFACTURERS ONLY (NOT MITSUBISHI)] Hydro One Networks observed that Mitsubishi made up a disproportionate number of heat pump sales through the pilot. How do you think the pilot can better accommodate local and small market manufacturers in the future?

A16. [CONTRACTORS ONLY] I understand that Hydro One Networks offered a $200 bonus for every customer referral to the pilot. Similarly, some manufacturers offered rebates to contractors independently of the pilot. How did each of these bonuses influence your decision to participate in the pilot?
    1. Hydro One Networks:
    2. Manufacturer: [DOCUMENT MANUFACTURER NAME AND AMOUNT]

A17. What challenges did you encounter with the delivery of the pilot?
    1. How could these challenges be addressed?

A18. Overall, how satisfied are you with your pilot participation experience?
    1. What makes you say that?
B. Customer Experience

Now, I’d like to talk about the customers’ experience with the pilot.

B1. My understanding is that customers received an upfront 50% rebate on the retail cost of their air-source heat pump. How effective do you think the discount was at encouraging participation?
   1. What makes you say that?

B2. Aside from the initial equipment cost, did you observe any other barriers that may have prevented customers from participating in the pilot?
   1. [IF YES] What were they?
   2. How might they be resolved?

C. Successes, Challenges and Future Planning

For this last set of questions, I’d like to discuss the pilot overall.

C1. Which elements of the pilot would you say worked particularly well?

C2. What were the key lessons you learned from your participation in the pilot?

C3. Do you think the pilot should be expanded?
   1. [IF YES] How should it be expanded?
   2. [IF NO] What makes you say that?

C4. [SKIP IF C2=2] What adjustments would you make to the pilot if it were to be continued or expanded?

C5. If the pilot were expanded, what challenges do you think participating [CONTRACTORS/MANUFACTURERS] or the sponsoring utilities might encounter?
   1. How could these challenges be addressed?

C6. If the pilot were expanded into a regional or province-wide program, would you participate?
   1. [IF NO] What makes you say that?
   2. [IF YES] How should other [CONTRACTORS/MANUFACTURERS] be recruited?

D. Closing

Thank you for your responses. That wraps up our interview for today. Before we finish...

D1. Is there anything else about the pilot you would like to discuss today that I did not mention?

We appreciate your input. Have a nice day.
Appendix C. Hydro One Networks Inc. Heat Pump Advantage Pilot Participant Survey

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen for valid participants</td>
<td>A1-A3, B4</td>
</tr>
<tr>
<td>Assess delivery and marketing methods</td>
<td>B1-B3</td>
</tr>
<tr>
<td>Assess participant experience</td>
<td>C1-C11, D1-D7</td>
</tr>
<tr>
<td>Evaluate net energy savings (kWh) and demand savings (kW)</td>
<td>E1-E7, F1-F9</td>
</tr>
<tr>
<td>Collect demographic information</td>
<td>G1-G12</td>
</tr>
</tbody>
</table>

Target Quota=census (Due to the limited sample frame [n=120], we will call a census of the sample to achieve as many completes as possible, up to a maximum of 70)

**Pilot Description:** The Heat Pump Advantage Pilot was targeted to Hydro One Networks Inc. residential customers who own existing homes with an electric baseboard or an electric furnace as the primary space heating system. The pilot also targeted to customers residing in rural areas where natural gas is not available.

Through the pilot, Hydro One offered the following rebates for central and ductless ENERGY STAR-certified ASHPs with a SEER of 15 or above, an EER of 12.5 or above and a HSPF of 8.5 or above:

- 50% of the installed cost for a central ASHP, up to $5,750
- 50% of the installed cost for a ductless ASHP, up to $4,000

Hydro One provided rebates as an upfront rebate to the contractor totaling up to 50% of the installed cost. In addition, Hydro One paid contractors $200 for each customer they referred to participate in the pilot. Contractors referred roughly 15% to 20% of participants to the pilot.

**General Instructions**

- Interviewer instructions are in green [LIKE THIS]
- CATI programming instructions are in red [LIKE THIS]
- Items that should not be read by the interviewer are in parentheses like this ( ).

### A. Introduction

[IF A CELL PHONE NUMBER, ASK IF RESPONDENT IS IN A SAFE PLACE TO COMPLETE THE SURVEY]

**A1.** May I speak with [CONTACT NAME]? OR [IF NO NAME] May I speak with the head of household?

[IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR THEIR NAME AND PHONE NUMBER AND START AGAIN]

1. (Yes)
2. (No or not a convenient time) [ASK TO ARRANGE A MORE CONVENIENT TIME OR TRY TO LEAVE A MESSAGE FOR A MORE APPROPRIATE PERSON)
98. (Don’t know) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
99. (Refused) [THANK AND TERMINATE]
A2. Hello, I’m [INSERT NAME] calling on behalf of the Independent Electricity System Operator, or IESO. We are conducting an important survey today about the Hydro One Networks Heat Pump Advantage Pilot program. Our records show that you recently received a rebate for an air-source heat pump from Hydro One Networks. Is this correct?

- [IF RESPONDENT ASKS HOW LONG, SAY “APPROXIMATELY 15 MINUTES.”]
- [IF NEEDED, STATE “THIS SURVEY IS FOR RESEARCH PURPOSES ONLY AND THIS IS NOT A SALES CALL. THIS IS THE PRIMARY WAY FOR CUSTOMERS TO PROVIDE INPUT INTO THE REBATE PROGRAMS HYDRO ONE NETWORKS OFFERS. YOUR PERSPECTIVES HELPS HYDRO ONE DECIDE WHAT ENERGY EFFICIENCY PROGRAMS TO OFFER.”]
- [ONLY IF ASKED FOR A [CLIENT] CONTACT TO VERIFY THE SURVEY AUTHENTICITY, OFFER [CONTACT NAME AND NUMBER]]

A3. Have you ever been employed by or affiliated with Hydro One Networks or any other utility?

1. (Yes) [THANK AND TERMINATE]
2. (No)
3. (Don’t know) [THANK AND TERMINATE]
4. (Refused) [THANK AND TERMINATE]

B. Awareness and Motivation

B1. To get started, please tell me how you first learned that Hydro One Networks was offering rebates on new heat pumps? [SELECT ALL THAT APPLY]

1. (Hydro One Networks representative)
2. (Hydro One Networks email)
3. (Hydro One Networks website)
4. (Bill inserts)
5. (Contractor who installed heat pump)
6. (Family/friends/word of mouth)
7. (Other) [SPECIFY: _____________]
8. (Don’t know)
9. (Refused)

B2. Prior to your participation in the heat pump pilot, were you aware of energy-efficient heat pump technology?

1. (Yes)
2. (No)
3. (Don’t know)
4. (Refused)
B3. Overall, what motivated you to purchase your new heat pump? [DO NOT READ LIST - SELECT ALL THAT APPLY]
   1. (Replace broken appliance)
   2. (Upgrade existing but working equipment)
   3. (Claim program rebate)
   4. (Save energy)
   5. (Save money)
   6. (Improve home comfort)
   7. (Reduce maintenance costs)
   8. (Help protect the environment)
   9. (Influenced by another Hydro One Networks program)
   10. (Influenced by contractor)
   11. (Influenced by my family, friend, neighbour or co-worker)
   12. (Other) [SPECIFY: ____________]
   98. (Don’t know)
   99. (Refused)

B4. Which the following was your primary heat source before getting your new heat pump? Was it...
[READ LIST]
   1. Electric baseboard
   2. Electric furnace
   3. Wood stove
   4. Wood furnace
   5. Propane furnace
   6. Propane stove
   7. Propane space heater
   8. Other [SPECIFY: ____________]
   98. (Don’t know)
   99. (Refused)

C. Experience and Behaviour

C1. [ASK IF B4=1] What type of controls were on your electric baseboard?
   1. (Dial on equipment)
   2. (Central thermostat)
   3. (Other) [SPECIFY: ____________]
   98. (Don’t know)
   99. (Refused)
C2. Before getting your new heat pump, what percentage of your home was heated by your [RESPONSE FROM B4 – IF B4=DK/REFUSED, INSERT “PRIMARY HEAT SOURCE”]? Would you say it was...

1. 100%
2. 75%
3. 50%
4. 25%
5. Less than 25%
98. (Don’t know)
99. (Refused)

C3. After getting your new heat pump, what percentage of your home is heated by your new heat pump? Would you say it was...

1. 100% [SKIP TO C8]
2. 75%
3. 50%
4. 25%
5. Less than 25%
98. (Don’t know)
99. (Refused)

C4. How often do you use a heat source in addition to your heat pump? [READ LIST]

1. (Very often/all the time)
2. (Somewhat often)
3. (Not too often)
4. (Never)
98. (Don’t know)
99. (Refused)

C5. What other heating sources do you use? [DO NOT READ LIST]

1. (Electric baseboard)
2. (Electric furnace)
3. (Wood stove)
4. (Wood furnace)
5. (Propane furnace)
6. (Propane stove)
7. (Propane space heater)
8. (Other) [SPECIFY: ____________]
98. (Don’t know)
99. (Refused)
Appendix C. Hydro One Networks Inc. Heat Pump Advantage Pilot Participant Survey

**C6.** [ASK IF C5=1 AND C1=1-3] Are you still using [RESPONSE FROM C1] to control your electric baseboard heating?
   1. (Yes)
   2. (No)
   98. (Don’t know)
   99. (Refused)

**C7.** [SKIP IF C6=1] What type of controls are you using on your electric baseboard?
   1. [SPECIFY: _____________]
   98. (Don’t know)
   99. (Refused)

**C8.** Prior to getting your new heat pump, did you use room or central air conditioner?
   1. (Yes, room AC)
   2. (Yes, central AC)
   3. (No)
   98. (Don’t know)
   99. (Refused)

**C9.** [SKIP IF C8=1 or 2] Are you planning to use or have you already used your heat pump to provide air conditioning?
   1. (Yes)
   2. (No)
   98. (Don’t know)
   99. (Refused)

**C10.** Did you secure any private financing to help purchase your heat pump?
   1. (Yes)
   2. (No) [SKIP TO D1]
   98. (Don’t know) [SKIP TO D1]
   99. (Refused) [SKIP TO D1]

**C11.** Can you please describe the financing you obtained?
   1. [RECORD RESPONSE]
   98. (Don’t know)
   99. (Refused)

**D. Satisfaction**

Now, I’d like to ask you a series of questions regarding your satisfaction with various elements of the pilot. Each question will use the same rating scale, using very satisfied, somewhat satisfied, a little satisfied or not at all satisfied.
D1. How satisfied are you with your new heat pump? [READ LIST IF NEEDED]
   1. (Very satisfied) [SKIP TO D3]
   2. (Somewhat satisfied) [SKIP TO D3]
   3. (A little satisfied)
   4. (Not at all satisfied)
   98. (Don’t know)
   99. (Refused)

D2. [IF D1=3,4] Why are you [RESPONSE FROM D1] with your new heat pump?
   1. [RECORD RESPONSE]
   98. (Don’t know)
   99. (Refused)

D3. How satisfied are you with the contractor who installed your new heat pump?
   1. (Very satisfied)
   2. (Somewhat satisfied)
   3. (A little satisfied)
   4. (Not at all satisfied)
   98. (Don’t know)
   99. (Refused)

D4. [IF D3=3,4] Why are you [RESPONSE FROM D3] with the contractor who installed your new heat pump?
   1. [RECORD RESPONSE]
   98. (Don’t know)
   99. (Refused)

D5. How satisfied are you with the Hydro One Networks Heat Pump Advantage Pilot overall? [READ LIST IF NEEDED]
   1. (Very satisfied) [SKIP TO D7]
   2. (Somewhat satisfied) [SKIP TO D7]
   3. (A little satisfied)
   4. (Not at all satisfied)
   98. (Don’t know)
   99. (Refused)

D6. [SKIP IF D5=3 OR 4] Why are you [RESPONSE FROM D5] with the pilot overall?
   1. [RECORD RESPONSE]
   98. (Don’t know)
   99. (Refused)
D7. If you could offer one suggestion for Hydro One Networks to improve the Heat Pump Advantage Pilot next year, what would you recommend?

1. [RECORD RESPONSE]
2. DO NOT READ (Nothing)
98. DO NOT READ (Don’t know)
99. DO NOT READ (Refused)

E. Net-to-Gross Influence and Intention

[SKIP SECTION IF B2=2 (NO), ASK SECTION E IF B2=YES, DON’T KNOW OR REFUSED] Now, I’d like to ask you some more questions about your heat pump purchase.

E1. [IF B2=1,98,99] Did your [RESPONSE FROM B4.7] require immediate replacement, or could you have repaired your equipment or postponed the purchase for a year or more?

1. (Immediately replaced)
2. (Could have repaired or postponed the purchase)
3. (Existing equipment was not broken and functioned fine)
98. (Don’t know) [SKIP TO E4]
99. (Refused) [SKIP TO E4]

E2. [SKIP IF E1=1] Which of the following would you most likely have done if there were no Heat Pump Advantage pilot, meaning no rebate? Would you have...

[READ LIST]

1. Replaced my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with [RESPONSE FROM B4.7 – IF B4=DK/REF INSERT “the same type of”] equipment but with a higher efficiency
2. Replaced my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with [RESPONSE FROM B4.7 – IF B4=DK/REF INSERT “the same type of”] equipment with the same level of efficiency
3. Replaced my [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with a heat pump and paid full cost within one year
4. Kept or repaired my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment
5. Replaced my [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with other equipment within one year [SPECIFY: _____________; IF NEEDED, GIVE EXAMPLES: ELECTRIC BASEBOARD; ELECTRIC FURNACE; PROPANE FURNACE; PROPANE STOVE; PROPANE SPACE HEATER; WOOD STOVE; WOOD FURNACE]
98. (Don’t know) [SKIP TO E4]
99. (Refused) [SKIP TO E4]
E3.  [IF E1=2 or 3] Which of the following would you most likely have done if there were no Heat Pump Advantage pilot, meaning no rebate? Would you have...

1. Replaced my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with [RESPONSE FROM B4.7 – IF B4=DK/REF INSERT “the same type of”] equipment but with a higher efficiency
2. Replaced my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with [RESPONSE FROM B4.7 – IF B4=DK/REF INSERT “the same type of”] equipment with the same level of efficiency
3. Replaced my [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with a heat pump and paid full cost within one year
4. Kept or repaired my existing [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment
5. Replaced my [RESPONSE FROM B4.7 – IF B4=DK/REFUSED INSERT “primary heat source”] equipment with other equipment within one year [SPECIFY: _____________; IF NEEDED, GIVE EXAMPLES: ELECTRIC BASEBOARD; ELECTRIC FURNACE; PROPANE FURNACE; PROPANE STOVE; PROPANE SPACE HEATER; WOOD STOVE; WOOD FURNACE]

98. (Don’t know) [SKIP TO E4]
99. (Refused) [SKIP TO E4]

For the next portion, I’m going to read a list of factors that you may have considered when buying your energy-efficient air-source heat pump. For each factor, please indicate how important it was in your purchase decision. Please answer with a number from 1 to 4, where 1 means very important, 2 means somewhat important, 3 means a little important and 4 means not at all important.

E4. How important was the rebate?

1. (Very important)
2. (Somewhat important)
3. (A little important)
4. (Not at all important)
98. (Don’t know) [IF NOT A FACTOR, PROBE TO CODE AS ‘NOT AT ALL IMPORTANT’]
99. (Refused)

E5. How important was the contractor recommendation?

1. (Very important)
2. (Somewhat important)
3. (A little important)
4. (Not at all important)
98. (Don’t know) [IF NOT A FACTOR, PROBE TO CODE AS ‘NOT AT ALL IMPORTANT’]
99. (Refused)
E6. How important was the educational material about your new heat pump?
   1. (Very important)
   2. (Somewhat important)
   3. (A little important)
   4. (Not at all important)
   98. (Don’t know) [IF NOT A FACTOR, PROBE TO CODE AS ‘NOT AT ALL IMPORTANT’]
   99. (Refused)

E7. How important was the pilot marketing and/or advertising?
   1. (Very important)
   2. (Somewhat important)
   3. (A little important)
   4. (Not at all important)
   98. (Don’t know) [IF NOT A FACTOR, PROBE TO CODE AS ‘NOT AT ALL IMPORTANT’]
   99. (Refused)

F. **Spillover**

F1. Since installing your new heat pump, have you made any other energy-efficient upgrades in your home?
   1. Yes
   2. No [SKIP TO NEXT SECTION]
   98. Don’t know [SKIP TO NEXT SECTION]
   99. Refused [SKIP TO NEXT SECTION]

F2. [IF F1=YES] What energy-efficient upgrades have you added to your home?
   1. (Additional heating or cooling equipment)
   2. (New windows)
   3. (New energy-efficient appliances)
   4. (Weatherstripping, caulking, etc.)
   5. (Energy-efficient lighting products)
   6. (Insulation)
   7. (Water heater)
   8. (Hot water pipe wrap)
   9. (Electric water heater blanket)
  10. (Power strips)
  11. (Outdoor timers)
  12. (Clotheslines)
  13. (Programmable thermostats)
  14. (Ceiling fans)
  15. (Other) [SPECIFY: ___________]

Appendix C. Hydro One Networks Inc. Heat Pump Advantage Pilot Participant Survey
16. (None)
98. (Don’t know)
99. (Refused)

F3. [IF F2-1-15] Please tell me if you received an rebate or rebate from Save on Energy Coupon for:
[ONLY ASK EACH IF MENTIONED IN F2] [READ LIST]
F3a. Additional heating or cooling equipment
F3b. New windows
F3c. New energy-efficient appliances
F3d. Weatherstripping, caulking, etc.
F3e. Energy-efficient lighting products
F3f. Insulation
F3g. Water heater
F3h. Hot water pipe wrap
F3i. Electric water heater blanket
F3j. Power strips
F3k. Outdoor timers
F3l. Clotheslines
F3m. Programmable thermostats
F3n. Ceiling fans
F3o. Other

1. (Yes)
2. (No)
98. (Don’t know)
99. (Refused)

F4. [IF F1=YES] How important was your experience with the pilot in your decision to install other energy-efficient product(s) or appliance(s)? Would you say it was ...

1. Very important
2. Somewhat important
3. Not too important
4. Not at all important
98. (Don’t know)
99. (Refused)

F5. [IF F4=1-4] Why was your experience with the pilot important in your decision to install other product(s)?

1. [RECORD RESPONSE]
98. (Don’t know)
99. (Refused)
F6. **[ASK IF F2=1]** What additional heating and cooling equipment did you install? **[SELECT ALL THAT APPLY]**

1. (Central forced air furnace [uses ducts to deliver heat])
2. (Floor furnace [no ducts])
3. (Ductless heat pump or ductless mini-split [no ducts])
4. (Ducted heat pump or ducted mini-split)
5. (Baseboard heaters)
6. (Wall heaters or cadet heaters)
7. (Plug-in space heaters)
8. (Heating stove)
9. (Fireplace)
10. (Central air conditioner [uses ducts to deliver cool air])
11. (Evaporative cooler, swamp cooler, desert cooler or wet air cooler)
12. (Window AC unit[s])
13. (Portable air conditioning unit[s])
14. (Other) **[SPECIFY: _____________]**
98. (Don’t know)
99. (Refused)

F7. **[ASK IF F2=3]** What new energy-efficient appliances did you install? **[SELECT ALL THAT APPLY]**

1. (High-efficiency dishwasher)
2. (High-efficiency clothes washer)
3. (High-efficiency refrigerator)
4. (High-efficiency water heater)
5. (Other) **[SPECIFY: _____________]**
98. (Don’t know)
99. (Refused)

F8. **[ASK IF F2=5]** What types of energy-efficient lighting did you install? **[SELECT ALL THAT APPLY]**

1. (LEDs [light emitting diodes])
2. (Motion sensors)
3. (Dimmers)
4. (Other) **[SPECIFY: _____________]**
98. (Don’t know)
99. (Refused)

F9. How many of the following energy efficiency lighting products did you install? Your best estimate is fine. **[ONLY ASK EACH IF MENTIONED IN F8]** **[READ LIST]**

- **F9a. LEDs (light emitting diodes)**
- **F9b. Motion sensors**
- **F9c. Dimmers**
- **F9d. Other [SPECIFY: _____________]**
1. [RECORD NUMERIC RESPONSE]
   98. (Don’t know)
   99. (Refused)

G. Demographics

Finally, I have a few general questions about your household.

G1. What is the primary language spoken in your household?
   1. (English)
   2. (French)
   3. (Chinese)
   4. (Spanish)
   5. (German)
   6. (Italian)
   7. (Arabic)
   8. (Other) [SPECIFY: _____________]
   99. (Refused)

G2. What is the last level of education that you have completed?
   1. (Grade school or less)
   2. (Some high school)
   3. (High school grad)
   4. (Vocational/technical school)
   5. (College)
   6. (Some university)
   7. (University graduate)
   8. (Postgraduate degree)
   99. (Refused)

G3. How many people, including yourself, live in the household part time?
   1. (One)
   2. (Two)
   3. (Three)
   4. (Four)
   5. (Five)
   6. (Six)
   7. (Seven or more)
   99. (Refused)
G4. Do you own or rent your current place of residence?
   1. (Own)
   2. (Rent)
   3. (Occupy rent-free)
   99. (Refused)

G5. What type of home do you live in?
   1. (Single family detached house)
   2. (Single family semi-detached)
   3. (Townhouse or rowhouse)
   4. (Duplex, triplex or four-plex)
   5. (Condominium)
   6. (Apartment)
   7. (Mobile/manufactured home)
   8. (Other) [SPECIFY: ______________]
   99. (Refused)

G6. How many bedrooms are in your home?
   1. (One)
   2. (Two)
   3. (Three)
   4. (Four or more)
   99. (Refused)

G7. How many bathrooms are in your home?
   1. (One)
   2. (One and a half)
   3. (Two or more)
   99. (Refused)

G8. How many stories is your home?
   1. (One)
   2. (Two)
   3. (Three or more)
   99. (Refused)

G9. How old is your home? An estimate is fine.
   1. (Less than two years old [built in 2015 or after])
   2. (Two to less than seven years old [built between 2010 and 2015])
   3. (Seven to less than 12 years old [built between 2005 and 2009])
   4. (12 to less than 17 years old [built between 2000 and 2004])
   5. (17 to less than 22 years old [built between 1995 and 1999])
6. (22 to less than 27 years old [built between 1990 and 1994])
7. (27 to less than 32 years old [built between 1985 and 1989])
8. (32 to less than 42 years old [built between 1975 and 1984])
9. (42 to less than 52 years old [built between 1965 and 1974])
10. (52 to less than 67 years old [built between 1950 and 1964])
11. (67 to less than 92 years old [built between 1925 and 1949])
12. (92 years or more [built in 1924 or earlier])
98. (Don’t know)
99. (Refused)

G10. How many square feet is your home?
1. (Less than 1,000)
2. (1,000 to 1,999)
3. (2,000 to 2,999)
4. (3,000 to 4,999)
5. (5,000 or more)
98. (Don’t know)
99. (Refused)

G11. Do you have wireless internet in your home?
1. (Yes)
2. (No)
99. (Refused)

G12. Please tell me which of the following categories applies to your total household income for the year 2016.
1. Less than $20,000
2. $20,000 to less than $30,000
3. $30,000 to less than $40,000
4. $40,000 to less than $50,000
5. $50,000 to less than $60,000
6. $60,000 to less than $80,000
7. $80,000 to less than $100,000
8. $100,000 to less than $120,000
9. $120,000 or more
98. (Don’t know)
99. (Refused)

This completes the survey. Your responses are very important to Hydro One. We appreciate your participation and thank you for your time. Have a good [DAY/EVENING].
Appendix D. Hydro One Networks Inc. Heat Pump Advantage Pilot Staff Interview Guide

<table>
<thead>
<tr>
<th>Research Objectives</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify roles and responsibilities</td>
<td>A1, C1</td>
</tr>
<tr>
<td>Document design process including goal setting and purpose</td>
<td>B1-B3</td>
</tr>
<tr>
<td>Assess delivery and marketing methods</td>
<td>C1-C7</td>
</tr>
<tr>
<td>Assess participant and market actor experience including satisfaction and rebate level effectiveness</td>
<td>D1-D3, E3-E6</td>
</tr>
<tr>
<td>Document areas of success, challenges and lessons learned</td>
<td>B4, C8, E1-E2, E7, F1-F2</td>
</tr>
<tr>
<td>Assess scalability including design and delivery modifications and target markets</td>
<td>F3-F4</td>
</tr>
<tr>
<td>Identify key evaluation topics</td>
<td>G1</td>
</tr>
</tbody>
</table>

**Audience:** Local distribution companies (LDCs) and Independent Electric System Operator (IESO) staff responsible for the pilot programs.

**Purpose:** Identify key roles and responsibilities; document pilot design processes and delivery; assess participant and market actor satisfaction; determine what works well and areas where challenges exist, scalability of pilot and ways to improve evaluability.

The Cadmus team scheduled and conducted these interviews. The interviews took between 45 and 60 minutes. We used the interviews to inform the evaluation plans.

**Target Audience:** The team conducted one interview per LDC (listed in table below) and one with the IESO staff, for a total of nine interviews.

<table>
<thead>
<tr>
<th>Pilot</th>
<th>LDCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truckload Event</td>
<td>Enersource</td>
</tr>
<tr>
<td>Home Appliance Market Lift</td>
<td>IESO</td>
</tr>
<tr>
<td>Residential Direct Mail</td>
<td>Canadian Niagara Power, Eastern Ontario Power and Algoma Power</td>
</tr>
<tr>
<td>Residential Direct Install</td>
<td>Westario</td>
</tr>
<tr>
<td>Electronics Take Back</td>
<td>Toronto Hydro*</td>
</tr>
<tr>
<td>Solar Powered Ventilation Fan</td>
<td>Hydro One Brampton</td>
</tr>
<tr>
<td>Heat Pump Advantage</td>
<td>Hydro One Networks, Inc.</td>
</tr>
<tr>
<td>Heat Pump Water Heater Advantage</td>
<td>Hydro One Networks, Inc.</td>
</tr>
<tr>
<td>Residential Air Source Ductless Heat Pump</td>
<td>EnWin</td>
</tr>
</tbody>
</table>

*In partnership with Green Living Enterprises and Samsung Electronics.
General Instructions

- We did not read the interview guide verbatim, but used it to guide the conservation.
- Interviewer instructions are in green [LIKE THIS].
- Skip pattern instructions are in red [LIKE THIS].

Email Invitation

To: [EMAIL]  
From: [YOUR EMAIL]  
Subject: Evaluation Interview about the Hydro One Air Source Heat Pump Pilot

Hello [XXX],

As part of the 2016 consumer evaluation, which includes certain pilot programs, the Cadmus team (Cadmus, Apex and Econoler) is conducting in-depth interviews with key local distribution companies (LDCs) and Independent Electric System Operator (IESO) staff. As such, I would like to set up a time to speak with you regarding the Hydro One Air Source Heat Pump Pilot.

These interviews will make sure we have a thorough understanding of the pilot design and delivery and will inform development of the evaluation plan. We’ll also learn your perspective on elements working well or any challenging areas.

Please let me know if you are available during any of the following times: [LIST OPTIONS]. I expect this interview will take about 45 to 60 minutes, but we can always schedule a follow up if we need more time. If these times and dates do not work well, let me know what availability you have next week, and I’ll schedule a time for us to speak then.

I appreciate your time and help with this. I look forward to speaking with you.

Calendar Invite

To: [EMAIL]  
From: [YOUR EMAIL]  
Subject: Interview about the Hydro One Air Source Heat Pump Pilot

Hello [XXX],

Thank you for agreeing to speak with me about the Hydro One Air Source Heat Pump Pilot. Our call is scheduled for [INSERT TIME AND DATE OF CALL] and will take about 45 to 60 minutes.

Thank you. I look forward to speaking with you.
A. Introduction

Thank you for making the time to speak with me. As part of the IESO pilot evaluation and to inform the development of the Hydro One Air Source Heat Pump Pilot evaluation plan, the Cadmus team is conducting in-depth interviews with key LDCs and IESO staff.

Through these interviews, we seek to ensure we have a thorough understanding of the pilot, data sources and what you look forward to learning through the evaluation. We’ll also get your perspective on what is working well or any challenging areas. We will use the information you provide to inform our understanding of the pilot, so we can provide well rounded and balanced observations and recommendations.

A1. To start, please tell me about your role and main responsibilities working on the Hydro One Air Source Heat Pump Pilot.

B. Pilot Design

Now, I’d like to talk about how the pilot was initially designed.

B1. Thinking about the design and intent of the pilot, what would you say was the pilot’s primary purpose?

B2. How did you and your team...

   1. Assess market readiness for the pilot?
   2. Identify rural customers as the target market?
   3. Decide on the delivery approach?
   4. Set participation and savings goals?

B3. According to the business plan, projected participation for the pilot was 120 customers, with total energy savings of 711,484 kWh and peak demand reduction of 41 kW. Was the pilot able to achieve those goals?

   1. [IF NO] Why do you think that is?

B4. [SKIP IF B3 INDICATES PILOT IS ON TRACK] What, if anything, would you change about the pilot to help reach the [PARTICIPATION/SAVINGS] goals?

C. Pilot Delivery

Now, I’d like to talk with you about the pilot delivery.

C1. Please describe how the pilot was administered and delivered, beginning with how customers first learned about the pilot through when the rebates were processed.
C2. Thinking about outreach, what percentage of participants would you say were referred to the pilot by participating contractors?

C3. Was any other marketing or outreach done to promote the pilot?
   1. [IF APPROPRIATE] How effective was this effort?
   2. What makes you say that?

C4. How would you recommend enhancing the pilot marketing?

C5. How did Hydro One cross-promote its other efficiency programs to pilot participants?

C6. How did your team monitor and report on the pilot progress?

C7. Did you make any changes to pilot from the initial design as described in the business case?
   1. [IF YES] What were the changes?
   2. [IF YES] Why did you make them?

C8. What challenges did you encounter with the delivery of the pilot?
   1. How were these challenges addressed?

D. Customer Experience

Now, I’d like to talk about customer experience.

D1. What, if any, customer data did you collect during the pilot? [PROBE: FOR EXAMPLE, SURVEY OR FOCUS GROUP RESULTS, SUB-METERING DATA] Would you mind sharing these with the IESO, so we can view them?

D2. [SKIP IF DISCUSSED IN D1] How, if at all, did you measure participant satisfaction with the pilot?
   1. [IF APPROPRIATE] Would you mind sharing these findings with the IESO so we can view them?

D3. The pilot rebate levels were set at 30% for ductless air-source heat pumps and 35% for central air-source heat pumps. How effective do you think these rebates level were are encouraging customers to participate?
   1. What makes you say that?

E. Market Actor Experience

The next few questions are about the supporting contractors.

E1. What do you think were the participating contractor’s main challenges in contributing to the pilot?

E2. [SKIP IF NO CHALLENGES ARE IDENTIFIED IN E1] How would you change the pilot to address these challenges?
E3. How satisfied do you think the contractors were with their pilot experience
   1. Why do you say that?

E4. The pilot offered contractors $200 for every customer referral. How, if at all, did you track these leads?

E5. How, if at all, did you ensure the contractor passed the rebate ($200) along to the participants?

E6. How effective do you think the rebate levels were at encouraging contractors to participate in the pilot?

E7. [SKIP IF EFFECTIVE] How, if at all, would you change the contractor rebate to increase their participation?

F. Successes, Challenges and Future Planning

Please think about the pilot overall for the next set of questions.

F1. What would you say is working particularly well?

F2. What were the key lessons Hydro One learned from running the Air Source Heat Pump Pilot?

F3. Is the pilot being converted or has it already been converted into a local program?
   1. If yes, how was this decided?

F4. If the pilot were expanded, what changes do you think Hydro One should make? [PROBE: DESIGN AND DELIVERY MODIFICATIONS, TARGET MARKET]

G. Closing

We are almost finished.

G1. Now thinking about the evaluation, what are you interested in learning from this evaluation?

G2. Is there anything else you would like to cover that we did not discuss?

G3. We would like to talk with supporting contractors. Can you provide us with a list of contact information?
   1. [IF YES, REQUEST CONTACT INFORMATION]
   2. [SKIP IF YES] Who should I request this contact list from? [DOCUMENT NAME AND CONTACT INFORMATION]

Thank you for your input. We appreciate your time. Have a nice day.
Appendix E. Hydro One Networks Inc. Heat Pump Advantage Pilot
Incremental Cost Inputs

Table 13 lists the actual equipment costs used to inform the updated incremental cost.

<table>
<thead>
<tr>
<th>Generic Participant ID</th>
<th>Heat Pump Type</th>
<th>Contractor Quote (before tax and incentive)</th>
<th>Incentive Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant_102</td>
<td>Central</td>
<td>$15,100</td>
<td>$5,750</td>
</tr>
<tr>
<td>Participant_105</td>
<td>Central</td>
<td>$14,700</td>
<td>$5,750</td>
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<td>Participant_72</td>
<td>Central</td>
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<td>$5,750</td>
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<tr>
<td>Participant_68</td>
<td>Ductless - 2 heads</td>
<td>$9,662</td>
<td>$4,000</td>
</tr>
<tr>
<td>Participant_107</td>
<td>Ductless - 2 units with 2 heads each</td>
<td>$14,300</td>
<td>$4,000</td>
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<td>Participant_82</td>
<td>Central</td>
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<td>$5,750</td>
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<td>Participant_98</td>
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<td>$4,000</td>
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<td>Participant_52</td>
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<td>Participant_3</td>
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<tr>
<td>Participant_84</td>
<td>Central</td>
<td>$15,708</td>
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<td>Incentive Received</td>
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<td>----------------------</td>
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<td>-------------------</td>
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<td>Participant_103</td>
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<td>Participant_83</td>
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<td>$4,000</td>
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<td>Participant_30</td>
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<td>Participant_20</td>
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<tr>
<td>Participant_18</td>
<td>Central</td>
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