PY2017 Block Heater Timer Pilot Impact and Process Evaluation

November 15, 2018

Prepared for:
Independent Electricity System Operator
120 Adelaide Street West
Toronto, ON M5H 1T1
Prepared by:
Allie Marshall
Cynthia Kan, PhD
Jane Colby
Cadmus

Normand Michaud
Jillian Mallory
Julie-Anne Belzile
Jean-François Bergeron
Econoler
# Table of Contents

**Executive Summary** ......................................................................................................................... 1
  - Pilot Description ........................................................................................................................... 1
  - Methodology ................................................................................................................................ 1
  - Key Observations and Recommendations ................................................................................... 2

**Introduction** ..................................................................................................................................... 4
  - Pilot Description ........................................................................................................................... 4
  - Pilot Participation Summary ......................................................................................................... 5

**Impact Evaluation** ............................................................................................................................. 7
  - Methodology .................................................................................................................................. 7
  - Gross Verified Savings Methodology ............................................................................................ 7
  - Net Savings Methodology .............................................................................................................. 10
  - Findings ......................................................................................................................................... 12
  - Gross Verified Savings ................................................................................................................... 12
  - Net Verified Savings ..................................................................................................................... 12

**Process Evaluation** ............................................................................................................................ 15
  - Methodology .................................................................................................................................. 15
  - Stakeholder In-Depth Interviews .................................................................................................. 15
  - Market Actor In-Depth Interview ................................................................................................. 15
  - Participant Surveys ....................................................................................................................... 15
  - Findings ......................................................................................................................................... 16
  - Pilot Design and Delivery ............................................................................................................... 16
  - Participant, LDC and Market Actor Experience ........................................................................... 17
  - Success, Challenges and Future Planning ..................................................................................... 22

**Cost-Effectiveness** ............................................................................................................................... 24
  - Methodology .................................................................................................................................. 24
  - Total Resource Cost Test ............................................................................................................... 24
  - Program Administrator Cost Test ................................................................................................. 25
  - Levelized Unit Electricity Costs .................................................................................................. 25
  - Inputs and Assumptions ................................................................................................................ 25
  - Findings ......................................................................................................................................... 26
Key Observations and Recommendations ........................................................................................................... 27
Appendix A. Participant Demographics ............................................................................................................. A-29
Appendix B. Impact and Process Evaluation Documents ..................................................................................... B-32
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHT</td>
<td>Block Heater Timer</td>
</tr>
<tr>
<td>HAP</td>
<td>Home Assistance Program</td>
</tr>
<tr>
<td>HOU</td>
<td>Hours of use</td>
</tr>
<tr>
<td>IESO</td>
<td>Independent Electricity System Operator</td>
</tr>
<tr>
<td>LDCs</td>
<td>Local distribution companies</td>
</tr>
<tr>
<td>LUEC</td>
<td>Levelized unit electricity costs</td>
</tr>
<tr>
<td>NTGR</td>
<td>Net-to-gross ratio</td>
</tr>
<tr>
<td>PAC</td>
<td>Program administrator cost test</td>
</tr>
<tr>
<td>PY</td>
<td>Program year</td>
</tr>
<tr>
<td>TRC</td>
<td>Total resource cost test</td>
</tr>
</tbody>
</table>
Executive Summary

As part of the program year (PY) 2017 Residential Portfolio evaluation, the Cadmus team (Cadmus and Econoler) evaluated the Block Heater Timer (BHT) pilot, which was offered by five local distribution companies (LDCs): Thunder Bay Hydro, Atikokan Hydro, Fort Frances Power, Kenora Hydro and Sioux Lookout Hydro.

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

- Determine gross and net verified energy savings
- Compare evaluated performance against reported participation and energy savings
- Assess delivery channel and marketing methods
- Assess participant and market actor experiences
- Assess program duplication and overlap with Home Assistance Program and Coupons and Instant Discount
- Assess market acceptance and interest in block heater timers
- Document areas of success, challenge and changes to the pilot
- Determine cost-effectiveness and greenhouse gas reductions

Pilot Description

The LDCs designed the BHT pilot to save energy by reducing the time that vehicle block heaters operate. Typically, vehicle owners use block heaters in winter temperatures below -15°C. The heaters are plugged into the vehicle and keep the engine warm throughout the night. However, the use of a timer allows the engine heater to come on only at a pre-programmed time, rather than staying on all night.

To participate, customers must meet several criteria:

- Be a residential customer of a participating LDC;
- Possess at least one car with no block heater timer that is not stored in a heated shelter; and
- Have an operating outdoor outlet.

To ensure the proper installation and use of the measure, the LDCs designed the pilot to take a direct install approach by having a delivery agent, install the block heater timers at the participants’ residences. The LDC covered the full cost of the block heater timer measure and installation.

Methodology

To address the evaluation research objectives (listed above), the Cadmus team conducted both impact and process evaluation. The team verified energy savings by applying results from the BHT pilot participant surveys to engineering algorithms appropriate for the measure. To produce net verified
energy savings, the team used self-report data from the participant surveys to assess pilot free ridership and spillover. Demand savings were not evaluated since they occur outside the IESO’s peak demand periods.¹

The Cadmus team gathered insights on the BHT pilot effectiveness and assessed the overall pilot operation and performance through a process evaluation, which included a comprehensive review of pilot documents, a phone interview with a staff member of the sponsoring lead LDC and a phone interview with a delivery agent staff member. Additionally, the Cadmus team conducted an online survey of participants to assess their experience with the pilot and with the block heater timer.

**Key Observations and Recommendations**

As shown in Table ES-1, the BHT pilot achieved gross verified savings of 458 MWh and installed 1,599 block heater timers over the 2017 to 2018 winter season. The Cadmus team estimated a gross realization rate of 37% for energy savings.

<table>
<thead>
<tr>
<th>Table ES-1. PY2017 Block Heater Timer Pilot Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Units</strong></td>
</tr>
<tr>
<td>Spending (Materials and Administrative)</td>
</tr>
<tr>
<td>Participation</td>
</tr>
<tr>
<td>Gross Savings</td>
</tr>
<tr>
<td>Gross Realization Rate</td>
</tr>
<tr>
<td>Net Annual Savings (First Year)</td>
</tr>
<tr>
<td>Net Annual Savings (2020)</td>
</tr>
<tr>
<td>Net-to-Gross Ratio</td>
</tr>
</tbody>
</table>

The following summarizes the key observations and recommendations:

**Key Observation 1. Although actual savings were lower than estimated, the pilot provided a cost-effective and satisfying customer experience and could be scaled.**

**Key Observation 2. The pilot’s direct install approach could be further leveraged.**

- **Recommendation 2:** Consider opportunities to leverage the direct install approach and using the delivery agent to cross-promote other programs.

¹ The IESO’s *Prescriptive Measure and Assumptions List* has a winter peak conversion factor of 0.00 for block heater timers as BHT usage occurs outside of IESO winter peak demand peak period.
**Key Observation 3.** The amount of lifetime savings depends on the proper use of the block heater timer over the life of the measure.

- **Recommendation 3:** Maintain energy savings over the EUL of block heater timers by sending reminders to past participants at the beginning of the winter season with information on setting up their block heater timer.

**Key Observation 4.** Challenges with meeting pilot demand led to lower participation levels.

- **Recommendation 4a:** Consider launching the pilot earlier (in the late fall) to provide additional time for installations.
- **Recommendation 4b:** Ensure that the delivery agent has full capacity at beginning of launch, with trained staff ready to begin installations.

**Key Observation 5.** Pilot marketing strategies were effective but were put on hold due to challenges in meeting demand.

**Key Observation 6.** Although the LDC and the delivery agent considered the pilot successful overall, the large territory covered by the pilot and stronger than expected demand at launch of pilot were challenges.

- **Recommendation 6a:** To maximize installation rates and ensure proper installation, consider combination of delivery approaches for remote areas (such as community events or partnerships with auto-mechanics).
Introduction

As part of the PY2017 Residential Portfolio evaluation, the Cadmus team (Cadmus, Apex Analytics and Econoler) evaluated the BHT pilot, which was offered by five LDCs: Thunder Bay Hydro, Atikokan Hydro, Fort Frances Power, Kenora Hydro and Sioux Lookout Hydro.

Using results from the evaluation, the Cadmus team sought to address several evaluation research objectives:

- Determine gross and net verified energy savings
- Compare evaluated performance against reported participation and energy savings
- Assess delivery channel and marketing methods
- Assess participant and market actor experiences
- Assess program duplication and overlap with Home Assistance Program and Coupons and Instant Discount
- Assess market acceptance and interest in block heater timers
- Document areas of success, challenge and changes to the pilot
- Determine cost-effectiveness and greenhouse gas (GHG) reduction using the IESO’s custom Conservation and Demand Management Energy Efficiency Cost Effectiveness Tool (CDM Cost Effectiveness Tool)

Pilot Description

The LDCs designed the BHT pilot to save energy by reducing the amount of time that vehicle block heaters operate. Typically, vehicle owners use block heaters in winter temperatures below -15°C. The heaters are plugged into the vehicle and keep the engine warm throughout the night. However, the use of a timer allows the engine heater to come on only at a pre-programmed time, rather than staying on all night.

To participate, customers must meet several criteria:

- Be a residential customer of a participating LDC;
- Possess at least one car with no block heater timer that is not stored in a heated shelter; and
- Have an operating outdoor outlet.

The participating LDCs initially required two additional criteria: (1) customers must use their vehicles daily and (2) customers must not be eligible for the Home Assistance Program (HAP). However, to expand the pilots reach, the LDCs removed these criteria during pilot implementation, allowing customers who used their vehicles less frequently to participate. In addition, although pilot staff encouraged HAP eligible customers to go through the HAP to receive a block heater timer, customers who preferred the BHT pilot could participate.
Although the *Business Case*\(^2\) indicated that eligible customers must live in a single, semi-detached or townhouse, customers who lived in multi-residential buildings could participate in the pilot if they paid their electricity bills (versus renters who do not pay their utility bills) and if they had access to a working outdoor outlet.

To ensure the proper installation and use of the measure, the LDCs designed the pilot to take a direct install approach with a delivery agent installing block heater times at the participants’ residences. The LDC covered the full cost of the block heater timer measures and installation.

Figure 1 illustrates the locations of the five LDCs that took part in the pilot during the PY2017 to PY2018 winter season (with Thunder Bay Hydro as the lead LDC).

**Figure 1. Participating Local Distribution Company Mapping**

![Figure 1. Participating Local Distribution Company Mapping](image)

**Pilot Participation Summary**

The LDCs launched the BHT pilot on November 1, 2017 and offered it until March 1, 2018. The LDCs reported installing 1,599 block heater timers, which the team verified. The participation levels in the five LDCs corresponded to their relative population size.

---

Table 1. Reported and Verified Measures

<table>
<thead>
<tr>
<th>LDC</th>
<th>Reported</th>
<th>Verified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atikokan Hydro</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Fort Frances Power</td>
<td>79</td>
<td>79</td>
</tr>
<tr>
<td>Kenora Hydro</td>
<td>112</td>
<td>112</td>
</tr>
<tr>
<td>Sioux Lookout Hydro</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Thunder Bay Hydro</td>
<td>1,297</td>
<td>1,297</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,599</strong></td>
<td><strong>1,599</strong></td>
</tr>
</tbody>
</table>
Impact Evaluation

The Cadmus team used engineering analysis and participant survey responses to determine the gross and net verified energy savings from the BHT pilot. Peak demand savings were not calculated for this pilot since demand savings occur outside of the IESO’s summer and winter peak demand periods.

Methodology

This section presents the Cadmus team’s methodology and data sources to estimate gross and net verified energy savings for the PY2017 BHT pilot. The team used several data sources for the impact evaluation (file names and detailed information on each source are provided in Appendix B):

- LDC project reporting;
- Business Case;
- Participant surveys;
- Block heater timer per-unit calculations and default values; and
- IESO Prescriptive Measures and Assumptions from Ontario Power Authority.3

The following sections present the gross per-unit savings and net savings calculation methodologies.

Gross Verified Savings Methodology

The Cadmus team determined the gross verified energy savings associated with the BHT pilot through an engineering review of the LDCs’ savings assumptions and input parameters, as well as based on the participant survey results of typical block heater usage. The BHT Pilot Evaluation Plan stated that the Cadmus team would compare pilot assumptions to technical reference manuals from other jurisdictions comparable to the IESO. However, no technical reference manuals presented relevant information on this measure.

The team’s reported and gross verified energy savings methodologies are outlined below.

Reported Energy Savings

The participating LDCs calculated the energy and demand savings using a unitary savings value based on the 2011 Prescriptive Measures and Assumptions, which were also used in the past for HAP, but have since been updated for HAP.

As detailed in the 2011 Prescriptive Measures and Assumptions, the base case assumes that block heaters are in use for 7.9 hours per day prior to having a timer and then for 2.9 hours per day once the timer is installed. When planning for the BHT pilot, the LDCs staff assumed that there are 25% more days when the temperature drops below -10°C in their regions compared to the average climate of HAP participants. Therefore, the LDCs estimated the base case as 853 hours per year (up from 711 hours in

---

the *2011 Prescriptive Measures and Assumptions* and estimated use after the timer installation as 313 hours per year (up from 261 hours in the *2011 Prescriptive Measures and Assumptions*). As a result, the LDCs established that a block heater timer would reduce block heater usage by 540 hours annually.

By adjusting the hours of operation before the timer installation as described above and while maintaining the other parameters from the *2011 Prescriptive Measures and Assumptions* (such as the block heater wattage of 1.45 kW), the LDCs used unitary energy savings for the block heater timer of 784.80 kWh.

To summarize, the LDCs based their gross per-unit savings calculation on Equation 1.

**Equation 1. Gross Per-Unit Savings for Block Heater Timers**

\[ kWh_{GrossPerUnit} = \text{NumberHoursAvoided} \times kWh_{BlockHeater} \]

Where:

- \( \text{NumberHoursAvoided} \) = Number of hours of block heater use per year avoided by block heater timer
- \( kWh_{BlockHeater} \) = Per block heater wattage

**Gross Verified Energy Savings**

The Cadmus team estimated the gross verified energy savings using Equation 2.

**Equation 2. Gross Verified Per-Unit Savings for Block Heater Timers**

\[ kWh_{GrossVerified} = \text{QtyBH} \times \text{ISR} \times kWh_{GrossPerUnit} \]

\[ kWh_{GrossPerUnit} = \text{NumberHoursAvoided} \times kWh_{BlockHeater} \]

Where:

- \( \text{QtyBH} \) = Number of block heaters for which a timer was provided by the pilot (one timer can be used for up to two block heaters)
- \( \text{ISR} \) = In-service rate for block heater timers provided through the pilot

As described in the following sections, the team adjusted these parameters based on an engineering review and participant survey results.

**Block Heater Hours of Use**

To establish avoided hours of use (HOU), the Cadmus team asked participants about their block heater usage habits before and after installing the block heater timer. Table 2 shows the HOU results reported by survey respondents and the resulting annual HOU. The team subtracted the average annual HOU

---

4 These numbers are from the *Business Case* and equate to an adjustment of 20% versus the 25% described in the *Business Case*.  

---
after installation from annual HOU before installation to establish the avoided HOU of 468 hours, a 13% decrease from the planned 540 hours.

Table 2. Car Block Heater Hours of Use

<table>
<thead>
<tr>
<th></th>
<th>Before Installation</th>
<th>After Installation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average hours of use per day</td>
<td>10.1 hours</td>
<td>3.7 hours</td>
<td>Participant survey(^a)</td>
</tr>
<tr>
<td>Average days of use per year</td>
<td>73.1 days</td>
<td>72.1 days</td>
<td>Participant survey(^b)</td>
</tr>
<tr>
<td>Annual hours of use</td>
<td>735.3 hours</td>
<td>267.2 hours</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\) PY2017 Block Heater Timer Survey Question D8. “Since installing the block heater timer, what time is the timer programmed to turn on the block heater and at what time do you unplug your vehicle(s) from it?” (n=198) and Question D12. “Before installing the block heater timer, at what time did you plug your vehicle(s) into your block heater and at what time did you unplug your vehicle(s) from it?” (n=198)

\(^b\) PY2017 Block Heater Timer Survey Question D2. “In the winter, over what months do you plug your vehicle into a block heater?” (n=177), Question D7. “How many days a week do you use your block heater?” (n=70) and Question D11. “Before having a block heater timer, how many days a week did you use your block heater?” (n=58)

**Block Heater Wattage**

The team determined the block heater wattage for the five main vehicle types by consulting specification sheets as well as discussions with four car dealership part managers in dealerships in Ontario, Alberta and Quebec. The team then weighted the average block heater timer wattage with the ownership of each vehicle type, which was information the team collected in the participant surveys. As shown in Table 3, the team established the average car block heater wattage at 511 watts or 0.511 kW, as opposed to the assumed 1.45 kW.

Table 3. Average Block Heater Wattage

<table>
<thead>
<tr>
<th>Type of Vehicle</th>
<th>Average Block Heater Wattage</th>
<th>Ownership among BHT Pilot Survey Respondents(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small or compact car</td>
<td>400</td>
<td>16%</td>
</tr>
<tr>
<td>Mid-size car</td>
<td>408</td>
<td>17%</td>
</tr>
<tr>
<td>Mini-van</td>
<td>467</td>
<td>6%</td>
</tr>
<tr>
<td>Pick-up truck</td>
<td>750</td>
<td>29%</td>
</tr>
<tr>
<td>Sports utility vehicle</td>
<td>408</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Weighted average block heater wattage</strong></td>
<td><strong>511 watts</strong></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Source: PY2017 Block Heater Timer Survey Question D4. “Which of the following best describes your vehicle(s)?” (n=198)

**Vehicles Per Block Heater Timer**

Participants can plug one or two vehicles into the block heater timer distributed through the pilot. The Cadmus team asked survey respondents how many vehicles they plug into the block heater timer they
received. On average, respondents plugged 1.28 vehicles into each block heater timer. The assumed value was one vehicle per block heater timer.

**In-Service Rate**
Overall, 94% of survey respondents used their block heater timer during the PY2017 to PY2018 winter. Therefore, the Cadmus team established 94% as the in-service rate. Respondents who did not use their block heater timer (6%) cited that it did not work properly or that it was difficult to program. The LDCs assumed an in-service rate of 100%.

**Effective Useful Life**
The LDCs set the measure EUL as 10 years, as listed in the *2011 Prescriptive Measures and Assumptions*. As mentioned previously, no other jurisdictions present this measure in their technical reference manuals. The Cadmus team found this value to be reasonable based on its understanding of the technology and suggests continuing using this value. The EUL of block heater timers is 10 years, but the team notes that the amount of lifetime savings is dependent on participants properly using and reprogramming their block heater timer annually, particularly since programmed settings are erased when the block heater timer is unplugged (Key Finding 3a).

To summarize, the team used the inputs listed in Table 4 to calculate gross verified energy savings.

<table>
<thead>
<tr>
<th>Table 4. Gross Verified Per-Unit Savings Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
</tr>
<tr>
<td>Avoided Hours of Use</td>
</tr>
<tr>
<td>Block Heater Wattage</td>
</tr>
<tr>
<td>Block Heater Quantity (Cars per Timer)</td>
</tr>
<tr>
<td>In-Service Rate</td>
</tr>
</tbody>
</table>

**Net Savings Methodology**
To calculate net verified savings, shown in Equation 3, the Cadmus team applied an estimated NTGR, outlined in Equation 4 and determined from responses to the participant surveys to the gross verified savings.

**Equation 3. Net Verified Energy Savings for Block Heater Timers**

\[ kW_{\text{net}} = NTGR * kW_{\text{gross verified}} \]

**Equation 4. Net-to-Gross Ratio**

\[ NTGR = 1 - \text{Free Ridership} + \text{Spillover} \]

\[ ^5 \text{PY2017 Block Heater Timer Question D3. “How many vehicles are plugged into the block heater timer you received from the program?” (n=181)} \]

\[ ^6 \text{PY2017 Block Heater Timer Question D1. “Did you use your block heater timer this winter?” (n=197)} \]
The Cadmus team assessed free ridership and spillover for the pilot. Free ridership refers to participation by those who would have acquired the energy efficiency measure in absence of the pilot’s influence. The effect of free riders reduces the net savings attributable to the pilot. Spillover represents the additional energy savings that occur when customers—because of the pilot’s influence—install other energy efficiency measures without rebates or change their energy use behaviour.

**Free Ridership**

The Cadmus team used the results of participant surveys to calculate free ridership, based on data of each participant’s intention and factors that might have influenced the participant. The intention score is based on what the participant would most likely have done if not receiving pilot assistance. The Cadmus team assessed the pilot’s influence on respondents’ decisions to implement a timer by asking respondents to identify the extent to which three pilot elements influenced their decision regarding the energy-efficient measure implemented:

- Block heater timer was free
- Marketing or advertising about the pilot
- Installation by a professional

Influence and free ridership have an inverse relationship: the greater the pilot influence, the lower the free ridership. The team computed the total free-ridership score for each respondent by summing that respondent’s intention and influence scores, each of which represented 50% of the total free-ridership score. Total free ridership for each respondent ranged from 0% (no free ridership) to 100% (complete free ridership). The team calculated free ridership at the pilot level since no significant difference was observed between LDCs or LDC groups.

**Spillover**

The Cadmus team used Equation 5 to calculate the percentage of spillover, at the measure level, in which the spillover savings reported by respondents is divided by the total gross verified savings achieved by all survey respondents in the measure category.

\[
\text{Equation 5. Spillover} \\
\text{Spillover} \% = \frac{\sum (\text{Spillover Measure Energy Savings for All Survey Respondents} \times \text{Influence})}{\sum \text{Pilot Measure Energy Savings for All Survey Respondents}}
\]

The Cadmus team calculated spillover savings for survey respondents who indicated that they purchased additional energy-efficiency measures, after participating in the BHT pilot, but did not receive a rebate for those measures.

The team calculated measure savings values for each individual spillover measure using the best information available from the PY2016 Consumer Programs Evaluation and the *Prescriptive Measures and Assumptions.*
Findings
This section describes the gross and net verified savings results.

Gross Verified Savings
As shown in Table 5, the LDCs reported 1,255 MWh in gross energy savings while the team established gross verified annual energy savings of 458 MWh. This corresponds to a realization rate of 37% for energy savings due to lower verified block heater timer wattage and the lower hours of usage than assumed (Key Finding 1a).

Table 5. PY2017 Gross Verified Savings

<table>
<thead>
<tr>
<th>LDC</th>
<th>Annual Gross Verified Savings (MWh)*</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reported</td>
<td>Verified</td>
<td>Realization Rate</td>
</tr>
<tr>
<td>Atikokan Hydro</td>
<td>39</td>
<td>14</td>
<td>37%</td>
</tr>
<tr>
<td>Fort Frances Power</td>
<td>62</td>
<td>23</td>
<td>37%</td>
</tr>
<tr>
<td>Kenora Hydro</td>
<td>88</td>
<td>32</td>
<td>37%</td>
</tr>
<tr>
<td>Sioux Lookout Hydro</td>
<td>48</td>
<td>18</td>
<td>37%</td>
</tr>
<tr>
<td>Thunder Bay Hydro</td>
<td>1,018</td>
<td>372</td>
<td>37%</td>
</tr>
<tr>
<td>Total</td>
<td>1,255</td>
<td>458</td>
<td>37%</td>
</tr>
</tbody>
</table>

*a Values are rounded.

The low gross realization rate is attributable to the lower block heater wattage, which averaged 511 watts compared to 1,450 watts assumed by the pilot. Surveyed respondents reported fewer days of use than expected, at 73 days of use per year compared to 90 days assumed by the pilot. Furthermore, the installation rate was 94% compared to an assumed 100%. Table 6 shows the reported and gross verified savings per unit.

Table 6. PY2017 Gross Verified Savings Per Unit*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Reported (kWh)</th>
<th>Verified (kWh)</th>
<th>Percentage Change from Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block Heater Timer</td>
<td>785</td>
<td>287</td>
<td>37%</td>
</tr>
</tbody>
</table>

*a Values are rounded.

Net Verified Savings
As shown in Table 7, the BHT pilot resulted in 802 MWh of annual net verified first-year savings. This is based on an overall NTGR of 1.75, which is a combination of 0.15 free ridership and 0.90 spillover.

Table 7. PY2017 Net Verified Savings

<table>
<thead>
<tr>
<th>Measure</th>
<th>n</th>
<th>Free Ridership</th>
<th>Spillover</th>
<th>NTGR</th>
<th>Annual Net Verified Energy Savings (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>First Year</td>
</tr>
<tr>
<td>Block Heater Timer</td>
<td>1,599</td>
<td>0.15</td>
<td>0.90</td>
<td>1.75</td>
<td>802</td>
</tr>
</tbody>
</table>
Free Ridership
The participant survey revealed that 49% of respondents had never considered installing a block heater timer before hearing about the pilot and that 62% of respondents were highly influenced by the pilot on their decision to obtain a timer. These elements contributed to a free-ridership level of 0.15.

Spillover
The participant surveys revealed that 61% of respondents reported installing at least one additional energy efficiency measure influenced by their participation in the pilot. These respondents reported not receiving an incentive for these new measures and said that the pilot was important in their decision to install additional measures. The team calculated savings for spillover measures and divided the total survey sample spillover savings by the gross pilot savings to obtain a spillover estimate of 0.90.

Respondents reported installing or adopting the following measures:
- LED bulbs
- Window film
- Weather stripping
- Smart power bars
- Programmable thermostats
- Lighting controls
- High-efficiency heating or cooling systems
- ENERGY STAR clothes washers
- ENERGY STAR clothes dryers
- Low-flow showerheads
- Switched to washing laundry with cold water
- Reduced use of lights
- Turned down the thermostat setting in the winter
- Unplugged devices usually plugged into outlets

The net verified savings for each LDC are shown in Table 8. Overall, the BHT pilot generated net verified first-year savings of 802 MWh.
Table 8. PY2017 Gross Verified and Net Verified Energy Savings by Region\(^a\)

<table>
<thead>
<tr>
<th>LDC</th>
<th>Gross Verified Savings (MWh)</th>
<th>NTGR</th>
<th>Net Verified First Year Savings (MWh)</th>
<th>Net Verified 2020 Savings (MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atikokan Hydro</td>
<td>14</td>
<td>1.75</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Fort Frances Power</td>
<td>23</td>
<td>1.75</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Kenora Hydro</td>
<td>32</td>
<td>1.75</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>Sioux Lookout Hydro</td>
<td>18</td>
<td>1.75</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Thunder Bay Hydro</td>
<td>371</td>
<td>1.75</td>
<td>651</td>
<td>651</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>458</strong></td>
<td>1.75</td>
<td><strong>802</strong></td>
<td><strong>802</strong></td>
</tr>
</tbody>
</table>

\(^a\) Values are rounded.
Process Evaluation

In addition to addressing the evaluation research objectives listed in the Executive Summary, the Cadmus team used the process evaluation to examine several questions such as:

- Could this delivery model be successful with other LDCs?
- What are the advantages of this delivery model compared to the other programs offering the same measure (HAP, Coupons and Instant Discount)?
- What challenges did the LDCs and the delivery agent face during pilot implementation and delivery, and what improvements could be made?
- What was the customer experience with the pilot?

Methodology

The Cadmus team began with a comprehensive review of pilot documentation (listed in Appendix B), then conducted phone interviews with one staff member from the lead LDC, one IESO staff member and one delivery agent staff to learn more about stakeholder and market actor experiences, motivations and overall satisfaction. For insight into the customer experience, the Cadmus team conducted participant surveys in the spring of PY2018.

Stakeholder In-Depth Interviews

The Cadmus team conducted telephone interviews with staff from the lead LDC and from the IESO. These interviews provided insight into how the pilot was delivered, marketing methods, participant and market actor experiences and information on successes and challenges.

Market Actor In-Depth Interview

The Cadmus team conducted one telephone interview with a delivery agent staff member. This interview provided an understanding of the pilot delivery, customer experiences and areas of success, challenges and lessons learned.

Participant Surveys

The team defined a participant as any LDC residential customer who received a block heater timer through this pilot. A total of 198 participating customers completed online surveys about their motivations, awareness of the pilot and pilot experience, including experience with the installation process. Participants also answered questions to inform the team’s NTGR calculation.

The Cadmus team also reviewed the results of 1,245 completed surveys fielded by the lead LDC during the pilot application process and presented in the participant database. The survey, collected by the delivery agent, primarily asked participants about pilot awareness, vehicle usage and awareness of other IESO energy conservation programs.
Findings
This section outlines the pilot design and delivery and experiences, successes, challenges and lessons learned from the perspectives of LDC staff, the delivery agent and, where relevant, participants.

Pilot Design and Delivery
As reported in the Business Case, the primary goal of the pilot was to be specifically designed for Northwestern Ontario, where opportunities for energy savings differ from the remainder of the province due to winter-peaking energy consumption. In addition, the lead LDC reported a desire to increase their offerings for residential customers.

Although block heater timers are included in other residential programs in the province, namely HAP, Coupons and the Instant Discount program, the lead LDC staff reported that block heater timer penetration from those programs to date is low. LDC staff hypothesized that reasons for low participation are the lack of HAP participants owning a car and the Instant Discount campaign occurring in the fall, far before potential participants are thinking about winter driving. Staff reported that the pilot encouraged HAP-eligible customers to access that program for their block heater timer. However, if HAP-eligible customers preferred the BHT pilot, they could participate.

The lead LDC staff designed the pilot with a direct install approach to ensure that the block heater timers would be installed and programmed properly. The pilot relied on a delivery agent for customer-facing implementation. The delivery agent was responsible for screening customer calls and online forms to ensure eligibility, scheduling customer visits, installing the block heater timer, educating the customer on operating the timer and ensuring that customers sign a form to confirm they received the timer. Overall, LDC staff agreed, the direct-install approach could be leveraged to increase awareness of other programs or to offer other measures to participants, such as by leaving education material behind to inform participants about other energy efficiency programs or measures (Key Finding 2a).

The LDC staff partnered with a public relations company, to deploy the marketing strategy. This included a range of activities, notably a media release, advertisements in print, radio and billboards, a partnership with a local mechanic shop, social media contests and video demonstrations posted online. According to the lead LDC, the marketing campaign was successful, producing greater-than-expected interest in the pilot (Key Finding 5a). The lead LDC attributed its success to coverage received from the local media, partnerships with local car mechanics and a successful media event, which included press release and print, billboard and radio ads as well as social media. The lead LDC staff reported that 500 participants applied for the pilot the day after their media event. Furthermore, they reported that while the marketing activities were successful overall, activities were put on hold due to challenges in meeting program demand and that efforts could have begun earlier in the fall to allow for installations over a longer timeline.

The lead LDC reported changes in eligibility criteria from the original Business Case. The BHT pilot was initially aimed solely at homeowners, but eligibility criteria were later expanded to include tenants who paid their own electricity bills. Furthermore, initial criteria asked that participants drive daily, but the LDC reported that no potential participants were disqualified for not meeting this requirement.
However, in the survey conducted by the delivery agent, over 95% of participants reported using their vehicle at least five days a week, indicating that this criteria change had only a small effect on pilot participation.

There were 69 potential participants who signed up for the pilot and were approved but did not receive a block heater timer. The lead LDC reported that this was because these individuals were unavailable for installation visits or did not answer the phone when the delivery agent called to schedule an appointment. The delivery agent reported that some participants grew frustrated with the waiting time and purchased a block heater timer themselves.

Participant, LDC and Market Actor Experience
This section discusses participant, LDC and market actor pilot experiences.

Participant Experience
The Cadmus team conducted an online survey with 198 participants. The following describes survey findings of awareness, motivations to participate, education and satisfaction.

In terms of demographics, the survey respondents were similar to the Ontario population, but with higher education levels, being more likely to own and live in a single-family home built in 1990 or before and having higher rates of wireless internet (see Appendix A for demographic details).

Awareness
As illustrated in Figure 2, participants reported becoming aware of the pilot primarily through radio (23%), print media (16%), word of mouth (11%) and brochures in their hydro bill (11%). A total of 34 different methods were mentioned and 12% of participants were unable to name a source.
While the lead LDC perceived advertisements in print, radio, billboards and social media as being the least effective means to reach participants, these methods were among the most popular answers given by participants. Fifty-one percent of respondents reported being informed about the pilot through these channels.

**Motivation**

As shown in Figure 3, respondents to the BHT pilot survey cited wanting to save energy (81%) and money (70%) as primary motives for participating in the pilot. In addition, 37% reported wanting to protect the environment as a primary motivation. This is consistent with LDC staff’s impression that participants were able to easily grasp how the measure would generate savings. Respondents who answered “Other” were prompted to provide additional details: seven said they were motivated by the block heater timer being free and three highlighted the convenience of owning a block heater timer.
**Figure 3. Motivations for Participation in Block Heater Timer Pilot**

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save energy</td>
<td>81%</td>
</tr>
<tr>
<td>Save money</td>
<td>70%</td>
</tr>
<tr>
<td>Protect the environment</td>
<td>37%</td>
</tr>
<tr>
<td>Influenced by family, friend, neighbour or co-worker</td>
<td>7%</td>
</tr>
<tr>
<td>Recommended by my car mechanic</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>7%</td>
</tr>
</tbody>
</table>

*Source: PY2017 Block Heater Timer Survey Question C2. “What motivated you to sign up to receive a free block heater timer?” (multiple response)*

**Education**

As illustrated in Figure 4, 75% received both verbal and written information about the block heater timer from the installing delivery agent.

**Figure 4. Information Received at Time of Installation**

<table>
<thead>
<tr>
<th>Information</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Information and a Handout</td>
<td>75%</td>
</tr>
<tr>
<td>Verbal Information</td>
<td>21%</td>
</tr>
<tr>
<td>Handout</td>
<td>2%</td>
</tr>
<tr>
<td>No Information</td>
<td>2%</td>
</tr>
</tbody>
</table>

*Source: PY2017 Block Heater Timer Survey Question C3. “Did the block heater timer installer provide you with information about the block heater timer?”*

Furthermore, 77% of participants said there was no other information that they would have liked to receive at the time of installation. Among the ten participants (23%) who said they would have liked to
receive more information, five said that they wished the installer had provided written instructions on how to program and use the block heater timer, namely on how to install one for the following winter.⁷

**Satisfaction**
As shown in Figure 5, respondents were highly satisfied with their experience in the BHT pilot. Specifically, 91% of respondents reported being very satisfied with how the block heater timer worked. In addition, most respondents were very satisfied with the other key pilot aspects: timer settings (79%), scheduling (82%) and professionalism of installers (85%).

> “I really appreciated the opportunity to take part in this program. As a senior on a fixed budget, it was very helpful. Thank you!”
> — BHT pilot participant

![Figure 5. Participant Satisfaction with Block Heater Timer Pilot](image)

Source: PY2017 Block Heater Timer Survey Question F1. “In terms of the BHT pilot, how satisfied were you with...”

---

⁷ Source: PY2017 Block Heater Timer Survey Question C4. “Is there any other information you would have liked to receive from the block heater timer installer?” and Question C5. “Is there any information you would have liked to receive from the block heater timer installer?” (n=43 for both questions due to survey programming glitch)
A few respondents reported they were not at all satisfied or only a little satisfied with the programmed settings, their interactions with the installer and the scheduling process. Specifically, 8% (14 of 182) of respondents wanted the following programmed setting changes:

- **More flexibility.** Four respondents would have preferred a block heater timer that allowed for more flexibility, such as multiple periods of use during a day.
- **Increased ease to change settings.** Eight respondents indicated that changing the block heater timer’s programmed settings was challenging.
- **Lower temperature equipment.** Two respondents said the block heater timer could not withstand extremely cold temperatures.

In addition, 3% (six of 187) of respondents said the installer did not explain how the timer worked and seemed to be pressed for time. Another 3% (six of 185) said that the amount of time between registration and installation was too long and that scheduling availability was limited.

**Local Distribution Company Experience**

The lead LDC said successful marketing activities led to strong participant interest in the pilot. However, staff reflected that this success exceeded their expectations, leading to initial difficulties in meeting customer demand, with the lead LDC pausing marketing activities and halting new applications to catch up with demand. Despite these initial challenges the LDC was satisfied with pilot.

The lead LDC managed the pilot and its delivery for all five participating LDCs and reported hosting monthly conference call to ensure regular and smooth communication. Staff acknowledged that the delivery agent had some difficulty with meeting timing expectations of participants of some of the smaller LDCs since installations occurred only once a month, due to coordination in these areas for efficiency. In addition, if participants missed their appointment or were not available at that date, they had to reschedule with the delivery agent.

**Market Actor Experience**

The delivery agent was satisfied with the pilot, citing the simplicity of the measure and the pilot design, although it did struggle with meeting the demand for installations (Key Finding 6a).

The delivery agent reported benefiting from its experience with HAP, which also offers block heater timer with a direct install approach. In addition, the main HAP installer trained the other pilot block heater timer installers. The pilot was launched in November, leading to a compressed timeline for delivering the pilot to interested customers for the winter season (Key Finding 4d).

Following the pilot’s launch and subsequent media coverage, demand exceeded expectations and, due to this large volume the delivery agent was unable to respond to all of the applications received in November. Eventually, a second contractor was hired to increase the daily number of installations.

Overall, the delivery agent reported that the level of communication was adequate, noting that they held biweekly phone calls with the lead LDC to discuss pilot planning and then increased their frequency to weekly and eventually to every other day once the pilot was launched. The LDC and delivery agent
also reported communicating via email and collaborating simultaneously on documents, such as the Mid-Point Report, using Google Docs.

**Success, Challenges and Future Planning**

This section outlines areas of pilot success, challenges and future planning considerations, based on results of the process evaluation activities.

**Success**

The lead LDC staff and delivery agent identified the following pilot successes.

- **High customer awareness generated through marketing activities.** By all accounts, the pilot was successful in generating interest in block heater timers among residential customers of Northwestern Ontario (Key Finding 1c and 4a). The LDC reported that while pilot participation did not meet the LDCs’ goal, this was not due to lack of interest, but to the LDCs needing to temper their marketing to allow the delivery agent to adjust to higher-than-expected demand after initial pilot launch. Marketing activities were so successful that they eventually needed to be curtailed to slow participant uptake to allow the delivery agent to meet the demand. The LDC staff noted that marketing efforts contributed to the pilot’s success. Participants reported hearing about the pilot through 34 different channels, indicating that the LDC and delivery agent marketing efforts were comprehensive.

- **High participant satisfaction with the pilot.** Overall, 84% of participants were very satisfied with the pilot (Key Finding 1c and 4b). The lead LDC said another source of pilot success was how easy it was to participate because of the direct install approach, the online sign-up, the 24-hour toll-free helpline and the block heater timer being distributed for free.

**Challenges**

The lead LDC staff and delivery agent identified the following pilot challenges.

- **Ability to meet demand.** The lead LDC and delivery agent agreed that the primary challenge for the BHT pilot was meeting demand, particularly after pilot launch, when the delivery agent could not keep up with the higher than expected volume of applications (Key Finding 4c). To respond to this issue, market efforts were put on hold after the launch to allow delivery agent to respond to interest already generated (Key Finding 5b).

- **Rural installation coordination and delivery.** In addition, due to coordinating the installations, some areas had only one installation day per month. Therefore, due to the large and often rural nature of the pilot territory, installers struggled to efficiently coordinate installations, resulting in some areas only having one installation day per month. (Key Finding 6b). The delivery was further affected by lack of internet connection in remote areas, where the delivery agent could not have participants sign waivers on a mobile application (Key Finding 6c).
One further challenge noted by the LDCs was the need to improve outreach outside of the Thunder Bay area. However, the Cadmus team found that participation levels in the five LDCs corresponded to their relative population size.

**Future Planning**

The successes and challenges outlined above led to two primary lessons learned from the pilot:

- **Improve scheduling and set customer expectations.** The LDCs noted that to improve the efficiency of the delivery, participants will be asked to select preferred installation times during pilot registration. To increase efficiency, the LDC will determine pre-allocated appointment times to allow the delivery agent to install several block heater timers in the same neighborhood. By scheduling the appointment at the time of registration, participants will be aware of the delay between registration and installation. Furthermore, the delivery agent is now aware of the need for more trained installers at the onset of program.

- **Improve outreach to LDC customers outside of the Thunder Bay area.** The LDCs plan to tailor their marketing efforts to each participating LDCs territory in the future. While some marketing methods proved to be successful in the Thunder Bay area, a focus on more traditional marketing methods, such as print and radio, will be favoured to reach and increase participant uptake among customers of LDCs in other areas.

The lead LDC staff member reported that while the LDC is not yet certain of the pilot’s future, it may be effective to continue for two more winter seasons because the number of potential new participants will eventually limit the pilot’s reach as the BHT market reaches saturation.
Cost-Effectiveness

This section provides the cost-effectiveness methodology and findings for the BHT pilot.

Methodology

The Cadmus team reviewed the initial pilot planning cost-effectiveness inputs prepared by LDCs, then used the IESO’s CDM Cost Effectiveness Tool\(^8\) to calculate TRC, PAC and levelized unit electricity costs (LUEC) values. These tests assess several critical performance metrics: benefits, costs, net benefits and benefit/cost ratios. Pilots are cost-effective when the benefits exceed the costs, meaning the pilot must have a benefit/cost ratio greater than 1.0.

Table 9 shows the various components included in each of these calculations and whether they are treated as a benefit or cost.

<table>
<thead>
<tr>
<th>Table 9. Cost-Effectiveness Test Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component</td>
</tr>
<tr>
<td>Avoided Energy Costs</td>
</tr>
<tr>
<td>Non-Energy Benefits</td>
</tr>
<tr>
<td>Secondary Fuel Savings (Natural Gas)</td>
</tr>
<tr>
<td>Incremental Participant Costs</td>
</tr>
<tr>
<td>Administration Costs</td>
</tr>
<tr>
<td>Incentive Payments</td>
</tr>
<tr>
<td>Participant Bill Savings</td>
</tr>
<tr>
<td>Discounted Lifetime Energy Savings</td>
</tr>
</tbody>
</table>

The remainder of this section presents the three cost-effectiveness tests in detail, as well as CDM Cost Effectiveness Tool inputs.

Total Resource Cost Test

The TRC measures the overall impacts of pilot benefits and costs. The test compares the total resource benefits to total resource costs to society to determine if the benefits received by the populace outweigh the total costs incurred by the customers, the LDCs and the IESO. In addition, the TRC includes a non-energy benefits adder of 15%. The TRC uses the benefit/cost ratio shown in Equation 6.

\[
TRC = \frac{B}{C} = \frac{PV \left( Value \ of \ Gross \ Saved \ Energy + Value \ of \ Gross \ Non \ Energy \ Benefits \right) \times NTGR}{PV \left( Pilot \ Administrative \ Costs + (Incremental \ Participant \ Cost \times NTGR) \right)}
\]

---

Where:

- **B** = Benefits
- **C** = Costs
- **PV** = Present value (discount rate (real) + societal discount rate (real) = 4.00%)

Value of Gross Saved Energy = Gross savings multiplied by utility avoided energy and capacity costs

- **NTGR** = Net-to-gross ratio

Incremental Participant Cost = Additional costs incurred by participants to install the energy-efficient technology over baseline or standard equipment typically installed in the absence of efficient technology

### Program Administrator Cost Test

The PAC examines pilot benefits and costs solely from the administrators’ perspective using the benefit/cost ratio shown in Equation 7.

**Equation 7. Program Administrator Cost Test**

\[
PAC = \frac{PV \ [\text{Value of Gross Saved Energy} \times NTGR]}{PV \ [\text{Pilot Administrative Costs} + \text{Incentive Payments}]}\]

### Levelized Unit Electricity Costs

The LUEC measures the overall competitiveness of different electricity sources, which allows for comparing demand-side management programs, programs over different timeframes or supply-side options. The LUEC represents the annualized costs (discounted costs and lifetime savings) per lifetime kilowatt-hours from the PAC test perspective (administrative, delivery and incentive costs) using Equation 8 (costs divided by kilowatt-hours):

**Equation 8. Levelized Unit Electricity Costs**

\[
LUEC = \frac{PV \ [\text{Pilot Administrative Costs} + \text{Incentive Payments}]}{PV \ [\text{Gross Lifetime kWh} \times NTGR]}\]

### Inputs and Assumptions

For the cost-effectiveness analysis, the Cadmus team relied on several PY2017 evaluation impact results:

- Net verified energy savings
- Incremental product cost for block heater timers
- Block heater timer EUL
The team combined the evaluation data with pilot financial data provided in the *CDM Cost Effectiveness Tool*:

- Administrative costs (LDC)
- Third-party costs
- Incentive payments

The IESO and LDCs variable pilot costs were not provided and assumed to be zero. The team used the Residential Car Block Heater load profiles in the LDC-provided *CDM Cost Effectiveness Tool*. The per-unit installation cost was not available and therefore the cost of block heater timer installation was included as a pilot administration cost and not as an incentive. In the future, as this pilot uses a direct install approach, the Cadmus team recommends estimating a per-unit installation cost and including it as an incentive payment instead of as a pilot administration cost in the cost-effectiveness analysis.

**Findings**

Pilots typically have benefit/cost ratios less than 1.0 because overhead costs frequently outweigh the benefits from a limited number of participants. **However, as shown in Table 10, the BHT pilot was cost-effective with a 1.85 TRC test and a 1.77 PAC test (Key Finding 1b).**

<table>
<thead>
<tr>
<th>Test</th>
<th>Ratio</th>
<th>Benefits</th>
<th>Costs</th>
<th>Net Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRC</td>
<td>1.85</td>
<td>$313,235</td>
<td>$169,422</td>
<td>$143,813</td>
</tr>
<tr>
<td>PAC</td>
<td>1.77</td>
<td>$272,378</td>
<td>$153,515</td>
<td>$118,863</td>
</tr>
</tbody>
</table>

Table 11 shows the LUEC for the pilot with a ratio of $0.02 per kilowatt-hour resulting from the present value costs of $153,515 and of benefits of 6,177,724 kWh.

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Benefits</th>
<th>Costs</th>
<th>Benefits (PV kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.02/kWh</td>
<td>$6,177,724</td>
<td>$153,515</td>
<td>6,177,724</td>
</tr>
</tbody>
</table>

Table 12. GHG Reduction shows the pilot first year and lifetime GHG reduction in tonnes from the CE calculator.

<table>
<thead>
<tr>
<th></th>
<th>First Year</th>
<th>Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonnes CO₂ equivalent</td>
<td>166.15</td>
<td>2,173.61</td>
</tr>
</tbody>
</table>
Key Observations and Recommendations

The following statements present an overview of the key observations and recommendations, based on the research and analysis conducted for the BHT pilot:

**Key Observation 1. Although actual savings were lower than estimated, the pilot provided a cost-effective and satisfying customer experience and could be scaled.** The LDCs realized 37% of the reported energy savings due to lower verified block heater timer wattage and the lower hours of usage than assumed (Finding 1a). The BHT pilot was cost-effective with a 1.85 TRC test and a 1.77 PAC test (Finding 1b). The pilot was successful in generating interest in block heater timers among residential customers of Northwestern Ontario, achieved high satisfaction levels from participants and therefore has the potential to be scaled in other cold-weather regions (Finding 1c).

**Key Observation 2. The pilot’s direct install approach could be further leveraged.** This pilot uses a direct-install approach that could be leveraged to increase awareness of other programs or to offer other measures to participants, such as by leaving education material behind to inform participants about other energy efficiency programs or measures (Finding 2a).

- **Recommendation 2:** Consider opportunities to leverage the direct install approach and using the delivery agent to cross-promote other programs.

**Key Observation 3. The amount of lifetime savings depends on the proper use of the block heater timer over the life of the measure.** The EUL of block heater timers was found to be 10 years. However, the amount of lifetime savings is dependent on participants properly using and reprogramming their block heater timer annually, particularly since programmed settings are erased when the block heater timer is unplugged (Finding 3a).

- **Recommendation 3:** Maintain energy savings over the EUL of block heater timers by sending reminders to past participants at the beginning of the winter season with information on setting up their block heater timer.

**Key Observation 4. Challenges with meeting pilot demand led to lower than expected participation levels.** The pilot design and delivery approach successfully encouraged participation (Finding 4a) and achieved high satisfaction among participants (Finding 4b); however, the delivery agent’s challenges in meeting the larger than expected initial demand capped the total possible number of participating customers (Finding 4c). The pilot was launched in November, leading to a compressed timeline for delivering the pilot to interested customers for the winter season (Finding 4d).

- **Recommendation 4a:** Consider launching the pilot earlier in the fall to provide additional time for installations.
- **Recommendation 4b:** Ensure that the delivery agent has full capacity at beginning of launch, with trained staff ready to begin installations.
Key Observation 5. *Pilot marketing strategies were effective but were put on hold due to challenges in meeting demand.* The LDC staff partnered with a public relations company, to deploy the marketing strategy. This included a range of activities, notably a media release, advertisements in print, radio and billboards. According to the lead LDC, the marketing campaign was successful, producing greater-than-expected interest in the pilot at the time of its launch (Finding 5a). Due to delivery challenges, marketing efforts were put on hold after the launch to allow the delivery agent to respond to the interest already generated (Finding 5b).

Key Observation 6. *Although the LDC and the delivery agent considered the pilot successful overall, the large territory covered by the pilot and stronger than expected demand at launch of pilot were challenges.* Both the LDC and the delivery agent were satisfied with the pilot, although the delivery agent did struggle with meeting the demand for installations (Finding 6a). Due to the large and often rural nature of the pilot territory, installers struggled to efficiently coordinate installations, resulting in some areas only having one installation day per month (Finding 6b). In addition, the delivery agent was challenged by the lack of internet connection in remote areas which prevented installers from using their mobile application to collect the participant waiver during installation (Finding 6c).

- **Recommendation 6a:** To maximize installation rates and ensure proper installation, consider combination of delivery approaches for remote areas (such as community events or partnerships with auto-mechanics).
Appendix A. Participant Demographics

This appendix outlines details of BHT pilot participants’ education, household size and income, home type and age and internet access, as reported through participant surveys.

Education Level

As shown in Table 13, participants tended to have a higher level of education than those among the general Ontario population. Approximately 74% of pilot respondents have a post-secondary education degree, compared to 52% of the Ontario General population.

![Table 13. Highest Education Level Completed](image)

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Participants&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Ontario General Population&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>No degree, certificate or diploma</td>
<td>2%</td>
<td>22%</td>
</tr>
<tr>
<td>High school graduate</td>
<td>9%</td>
<td>27%</td>
</tr>
<tr>
<td>High school graduate, some college or post-secondary</td>
<td>15%</td>
<td>0%</td>
</tr>
<tr>
<td>College or trade certificate below a bachelor’s degree</td>
<td>37%</td>
<td>31%</td>
</tr>
<tr>
<td>University degree (bachelor’s degree level)</td>
<td>25%</td>
<td>13%</td>
</tr>
<tr>
<td>Master’s degree or higher</td>
<td>12%</td>
<td>8%</td>
</tr>
</tbody>
</table>

<sup>a</sup> PY2017 Block Heater Timer Survey Question G1. “What is the highest level of education that you have completed?” (n=170)

<sup>b</sup> Statistics Canada 2006 Census Profile for Ontario

Household Size

As illustrated in Figure 6, pilot respondents tend to live in homes with two or three people, similar to the general Ontario population.

![Figure 6. Household Size](image)

Sources: Participants: PY2017 Block Heater Timer Survey Question G2. “How many people, including yourself, live in the household full time?”

Statistics Canada 2006 Census Profile for Ontario
**Dwelling Type**

As shown in Figure 7, 73% of Ontario residents and 99% of pilot respondents live in a single-family dwelling. Furthermore, most Ontario residents (69%) and almost all respondents (97%) own their home.

![Figure 7. Dwelling Type](image)

Ontario General Population: Statistics Canada 2016 Census Profile for Ontario

**Dwelling Age**

As illustrated in Figure 8, 86% of pilot respondents live in homes built in 1990 or before, which is higher than the general Ontario population (67%).

![Figure 8. Dwelling Age](image)

Sources: Participants: PY2017 Block Heater Timer Survey Question G5. "What year was your home built?"
Ontario General Population: Statistics Canada 2016 Census Profile for Ontario
**Internet Access**

Figure 9 shows that 97% of pilot respondents have access to wireless internet in their homes, compared to only 23% of the Ontario general population.

![Figure 9. Households with Wireless Internet Access](image)

Sources: Participants: PY2017 Block Heater Timer Survey Question G7. “Do you have wireless internet at home?”
Ontario General Population: Statistics Canada 2016 Census Profile for Ontario

**Household Income**

BHT pilot respondents are most likely to be from middle-income households, with 43% reporting income in the $50,000 to $99,999 range. This is consistent with the Ontario general population (33%) reporting income in this range. Figure 10 shows a full income distribution.

![Figure 10. Household Income](image)

Sources: Participants: PY2017 Block Heater Timer Survey Question G8. “Please tell me which of the following categories applies to your total household income for the year 2017.”
Ontario General Population: Statistics Canada 2016 Census Profile for Ontario
Appendix B. Impact and Process Evaluation Documents

The Cadmus team used the documents listed in Table 14 to inform the impact evaluation.

**Table 14. Block Heater Timer Pilot Impact Evaluation Sources**

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Information and Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project List</td>
<td>Independent Electricity System Operator. Thunder Bay_BHT Pilot Completed files June 2018 (1)</td>
</tr>
<tr>
<td>Pilot Business Case</td>
<td>Thunder Bay Hydro Electricity Distribution Inc. <em>Business Case – BHT Pilot</em>. April 7, 2017</td>
</tr>
</tbody>
</table>

The team reviewed the documents shown in Table 15 to inform development of the data collection instruments. The IESO provided these documents on behalf of the LDCs.

**Table 15. Block Heater Timer Pilot Process Evaluation Sources**

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Document Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Business Case</td>
<td>Thunder Bay Hydro Electricity Distribution Inc. <em>Business Case – BHT Pilot</em>. April 7, 2017</td>
</tr>
<tr>
<td>Project List</td>
<td>Independent Electricity System Operator. Thunder Bay_BHT Pilot Completed files June 2018 (1)</td>
</tr>
<tr>
<td>Handout with Instructions on Block Heater Timer Usage</td>
<td><em>Woods 50016 digital timer for use with engine block heaters</em></td>
</tr>
<tr>
<td>Online Marketing Materials</td>
<td>Thunder Bay Hydro Electricity Distribution Inc. <em>BHT Program</em>.</td>
</tr>
</tbody>
</table>