PY2017 Conservation on the Coast Home Assistance Program Evaluation

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Prepared for:

Independent Electricity System Operator

120 Adelaide Street West

Toronto, ON M5H 1T1

CADMUS

Prepared by:
Robert McCormack
Gina Henderson
Cynthia Kan, PhD
Jane Colby

CADMUS

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Executive Summary

The Cadmus team evaluated the Five Nations Energy Inc. (FNEI) Conservation on the Coast Home Assistance Program (COTC HAP) for the 2017 program year (PY).

Program Description

FNEI offers the COTC HAP to help its customers improve their homes' energy efficiency and to manage their energy use more effectively. Participants can access the program free of charge. A program representative directly installs eligible efficiency measures as determined through an in-home energy assessment. During the in-home assessment, participants receive education on electricity conservation, time-of-use rates and new energy efficiency equipment that they receive.

Evaluation Objectives

The PY2017 COTC HAP evaluation included impact, process and cost-effectiveness components to achieve the following objectives:

- Determine net and gross verified energy and summer peak demand savings
- Compare evaluated performance against reported participation and energy savings
- Assess delivery channel and marketing methods
- Assess participant experiences, including satisfaction and motivation
- Identify and estimate the value of the COTC HAP's non-energy benefits
- Document areas of success, challenge and change to the program
- Determine program cost-effectiveness and greenhouse gas reduction

Methodology

To address the research objectives, the Cadmus team conducted impact and process evaluations.

The Cadmus team used engineering analysis and survey data to evaluate gross and net savings (impact evaluation). The team applied a net-to-gross ratio (NTGR) of 1.0, therefore net savings are equal to gross savings. This is a standard approach for programs that target low-income customers, and is consistent with the PY2015, PY2016, and PY2017 HAP evaluation.

The Cadmus team gathered insight on the program's effectiveness in employing delivery strategies tailored specifically to the Five Nations' Communities through a process evaluation, which included a review of background materials and interviews with the program manager and delivery contractor.

Initially the team sought to assess participant experiences through a participant survey, but due to the small number of participants for whom phone numbers were provided, combined with transiency and language barriers, the team was unable to complete any surveys.

Key Observations and Recommendations

As shown in Table 1, in PY2017, the program completed 26 projects, contributing 248 MWh and 0.002 MW net verified first-year savings. The overall realization rate for energy and summer peak demand savings are 79% and 14%, respectively. These realization rates were primarily affected by updated savings assumptions and in-service rates (ISR).

Table 1. PY2017 COTC HAP Performance

Metric	Units	Evaluated
Spending (Materials and Administrative)	$	$188,873
Participation	Homes	26
Gross Verified Savings	MWh	248
	MW	0.002
Gross Realization Rate[a]	MWh	79%
	MW	14%
Net Verified Annual Savings (First Year)	MWh	248
	MW	0.002
Net Verified Annual Savings (2020)	MWh	248
	MW	0.002
Net-to-Gross Ratio	--	1.0

[a]Evaluated/Reported gross savings

The following statements present the team's key observations and recommendations:

Key Observation 1. The small participant group and a lack of contact information didn't allow for direct feedback from COTC participants.

- ***Recommendation 1***. The next evaluation should attempt to verify installation of reported measures, perhaps through photo documentation provided by the staff conducting the energy audit or a leave behind mail in survey. The IESO should ensure the HAP-like programs all require direct installation by its contractors, photo evidence of measure installation, as well as inclusion of printed materials for households on measure operations (such as power bars and block heater timers).

Key Observation 2. The COTC HAP program faces unique challenges in serving remote communities.

- ***Recommendation 2a***. The program should continue to take advantage of opportunities to collaborate and cost-share with other programs/community services with similar goals of improving the local housing conditions if it aims to continue serving these remote communities.

Key Observation 3. Given the program had goals beyond energy savings and serves a low-income community, as is typical for these types of programs, it does not pass cost-effectiveness tests. However, in addition to lowering costs and increasing savings, cost-effectiveness could be improved by accounting for non-energy benefits.

- ***Recommendation 3***. Determine whether additional costs from collaborating partners should be included and consider valuing and adding non-energy benefits in cost-effectiveness modeling.

Introduction

The Cadmus team evaluated the Five Nations Energy Inc. (FNEI) Conservation on the Coast Home Assistance Program (COTC HAP) for the 2017 program year (PY).

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

- Determine net and gross verified energy and summer peak demand savings
- Compare evaluated performance against reported participation and energy savings
- Assess delivery channel and marketing methods
- Assess participant experiences, including satisfaction and motivation
- Identify and estimate the value of the COTC HAP's non-energy benefits
- Document areas of success, challenge and change to the program
- Determine program cost-effectiveness and greenhouse gas reduction

Program Description

FNEI offers the COTC HAP to help its Five Nations customers improve their homes' energy efficiency and to manage their energy use more effectively. Participants can access the program free of charge. The program directly installs eligible efficiency measures, determined through an in-home energy assessment, through a program representative. During the in-home assessment, participants also receive education on electricity conservation behaviours, time-of-use rates and new energy efficiency equipment that they receive.

FNEI serves the Western James Bay Coast's remote Five Nations' communities of Attawapiskat, Fort Albany and Kashechewan, with the COTC HAP offered in all three communities. These three communities are remote and not connected to Ontario's road system. Attawapiskat Power Corporation, Fort Albany Power Corporation and Kashechewan Power Corporation own FNEI. Figure 1 (below) displays locations for the Five Nations' Communities.

Figure 1. Five Nations' Communities Map

Eligibility

To be considered eligible for the COTC HAP, Five Nations' customers must meet the following criteria:

- Homeowners and renters:
  - Must be an on-reserve First Nation individual, who owns, rents or leases the eligible residence and is the primary or secondary local distribution company (LDC) account holder listed on electrical utility bills served by Attawapiskat Power Corporation, Fort Albany Power Corporation or Kashechewan Power Corporation
  - If the participant does not own the property, they must have the building owner's or manager's consent for equipment replacements and installation of weatherization measures

- Building owners and managers:
  - Must be the building owner or the manager of band-owned housing[1]
  - Must be responsible for paying the hydro bill
  - Must agree not to increase rent due to receiving eligible measures

The PY2016 *Conservation on the Coast Home Assistance Program Rules* provide full details on COTC HAP's eligibility requirements. To receive weatherization or domestic hot water measures, homes must be heated or produce hot water by electricity).

PY2017 Measures

The COTC HAP measures and the program's delivery structure match the Independent Electricity System Operators (IESO) province-wide Save on Energy HAP. Table 2 lists eligible program measures by measure track (as provided in the *Program Rules*). The weatherization track includes air sealing and insulation measures (e.g., attic, basement, wall). In addition, the delivery contractor may repair the residence to install eligible measures and may make health and safety upgrades, when necessary. Spending caps for health and safety installations in homes receiving the weatherization track measures double the amount offered for the province-wide HAP, accounting for additional costs attributable to housing conditions and these communities' remote locations.

Table 2. PY2017 COTC HAP Measures

Basic Measure Track	
≤ 11-Watt ENERGY STAR LED A-Shape	Hot Water Tank Pipe Insulation: 1/2-inch or 3/4-inch inside diameter
≤ 14-Watt ENERGY STAR LED A-Shape	Block Heater Timer
≤ 23-Watt ENERGY STAR LED A-Shape	Efficient Showerheads (standard) < 4.8 litres per minute (L/min)
Power Bar	Hot Water Tank Insulation—fibreglass R10 (fits up to a 60-gallon tank)
Extended Measure Track	
Efficient Aerators (Bathroom) < 3.8 L/min	Efficient Aerators (Kitchen Aerator) < 5.7 L/min
Weatherization Measure Track	
Attic Insulation	Comprehensive Draft Proofing
Basement Insulation	Wall Insulation
Health and Safety Measures[a]	

[a]Note: Health and Safety Measures were not explicitly reported in PY2017 but the program may repair a residence if this would permit installations of additional eligible measures, in addition to health and safety upgrades to the residence if such upgrades promote energy efficiency and are required reasonably to mitigate immediate health and safety concerns in the residence, with repair and upgrade values limited to $1,500 total.

[1] Many First Nation families on reserves rent homes from the First Nation. Known as "band-owned housing," such structures make up an estimated two-thirds to three-quarters of all housing on Canadian reserves. Information via the Government of Canada: Indigenous and Northern Affairs Canada, found at https://www.canada.ca/en/indigenous-northern-affairs.html.

Program Implementation

The three-local distribution company's (LDCs)[2] general managers oversee the COTC HAP jointly, in addition to one board member from each community and the FNEI CEO. A program manager markets and manages the administration and delivery of COTC HAP. Local, approved delivery contractors determine and install appropriate efficiency measures during initial in-home energy audits: these delivery contractors are most often trained by the program manager.

During the audits, participants receive energy-saving behaviour tips and instructions regarding use of new energy-efficient equipment. Per the Program Rules, participants in electrically heated, single-family homes may receive a more extensive weatherization audit to determine eligibility for additional air sealing and insulation upgrades.

Service providers use an Excel workbook called the Field Audit Report Support Tool (FAST) to record installed measures and to verify projects meet minimum TRC requirements. Ultimately, FAST files are compiled into HAP project records and measure data, which are reported to the IESO.

PY2017 Participation

In PY2017, the program completed 26 projects, contributing 248 MWh and 0.002 MW in net verified first-year savings. The number of projects and total number of private dwellings in each community are shown in Table 3.

Table 3. Number of Projects by LDC

LDC Name	PY2017 Projects	Private Dwelling Units (2016 Statistics Canada Census)
Attawapiskat Power Corporation	10	415
Fort Albany Power Corporation	8	239
Kashechewan Power Corporation	8	N/A[a]

[a] Number of dwellings are unknown however total population in this service territory is about 1800.

[2] Attawapiskat Power Corporation, Fort Albany Power Corporation and Kashechewan Power Corporation.

PY2017 Evaluation Tasks and Data Sources

For the PY2017 process and impact evaluation, the Cadmus team performed the tasks shown in Table 4. Descriptions of these tasks follow the table.

Table 4. PY2017 COTC HAP Evaluation Tasks

Tasks	Sample Size	Key Data Collected	Impact	Process
Participant Phone Survey	170	The evaluation was unable to reach any COTC participants by telephone. As a proxy, the evaluation used measure ISR data from the Hydro One First Nation Conservation Program (HONI FNCP) evaluation survey.	✓	
Stakeholder In-Depth Interviews	3	Program processes, delivery and marketing and challenges and opportunities		✓
Program Tracking Data Review	N/A	Ensure data consistency and completeness, and update reported per-unit values	✓	
Engineering Analysis and Simulation Modelling	N/A	Update per-unit gross verified savings	✓	
Cost-Effectiveness	N/A	Determine TRC, PAC and LUEC	✓	

Participant Phone Surveys

The Cadmus team attempted to contact COTC HAP participants by phone but could not establish any contacts.[3] The team, however, completed telephone surveys with 170 Hydro One First Nation Conservation Program (FNCP) participants to use as a proxy. Formerly the province-wide Aboriginal Conservation program, the FNCP has an identical program design to the COTC HAP and is offered in select Hydro One First Nation communities. Using the FNCP survey of PY2017 participants, the team collected data to support the measure-level ISR for the impact evaluation, assuming consistent installation rates between COTC HAP participants and the FNCP. The Cadmus team conducted the surveys in accordance with the *EM&V Protocols and Requirements*, Version 2.0.[4] The team designed the survey sample to achieve a ±10% precision level with 90% confidence at the province and measure-track levels, provided sufficient data allowed.

[3] Due to the extremely small number of participants with phone numbers provided, combined with transiency and language barriers, the survey subcontractor could not complete any surveys. For the few working telephone numbers provided, the subcontractor made up to five callback attempts.

[4] The Independent Electricity System Operator. *Conservation First (2015–2020) EM&V Protocols and Requirements*. Available online: http://www.ieso.ca/sector-participants/conservation-delivery-and-tools/evaluation-measurement-and-verification

Stakeholder In-Depth Interviews

The Cadmus team conducted a telephone interview with a Five Nations program staff member that led COTC HAP's deployment and implementation, and one of the LDC's general managers. The interviews provided insights into program's progress, design and delivery. Specifically, questions addressed the following topics:

- Roles and responsibilities
- Delivery and marketing methods, including the energy education delivery and curriculum
- Program savings and participation
- The program's perceived non-energy impacts
- Areas of success, challenges and lessons learned
- Coordination with agencies and community groups
- Non-energy impacts of the COTC HAP, including improvements in health, safety, comfort and job training

Program Tracking Data Review

The Cadmus team reviewed the program tracking database (LDC Project Lists) and worked with the IESO to resolve data discrepancies through the following actions:

- Comparing and resolving data with different unique application IDs between measure and project levels, resulting in different impact results at those levels
- Removing duplicate records
- Removing or correcting project savings for measures without reported quantities

Engineering Analysis and Energy Modeling

As part of the PY2017 province-wide HAP evaluation, the Cadmus team reviewed all prescriptive measures and recommended updates to certain gross per-unit savings values. The evaluation team applied these same updates to the COTC HAP measures. For weatherization measures, the Cadmus team collected and reviewed documentation in the form of HOT2000 files, an energy simulation and design tool for low-rise residential buildings. Widely used across Canada, the software supports program, policy and regulatory development and implementation; the Office of Energy Efficiency at Natural Resources Canada developed and manages the tool. The team reviewed the HOT2000 project models and project data used to estimate weatherization savings and verified HOT2000 inputs and fuel costs for consistency and reasonableness. Where possible, the team also tested the model by running simulations to check estimated savings between pre- and post-retrofit models. Additionally, the team reviewed a sample of 55 pre-installation files, project documentation and post-installation files with HOT2000 simulation files from COTC HAP projects completed in PY2016 and PY2017 to calculate gross savings for weatherization measures.

Impact Evaluation

The impact evaluation's goal was to determine gross and net verified energy savings and demand reduction at the program and measure levels. To achieve this, the Cadmus team conducted the following impact evaluation tasks:

- With 90% confidence and ±10% precision, determine annual gross and net verified energy and demand savings at the project track or measure category levels
- Conduct HOT2000 file reviews

This section presents the impact evaluation methodology and findings.

Methodology

The Cadmus team used engineering analysis to evaluate gross and net savings. For prescriptive measures, the team started with the gross-per unit savings from the province-wide PY2017 HAP evaluation. For weatherization measures, the Cadmus team collected and reviewed documentation in the form of HOT2000 files, an energy simulation and design tool for low-rise residential buildings. At the program level, gross verified savings were determined from the per unit savings values multiplied by the COTC reported quantities and FNCP survey data for ISRs, as COTC HAP did not have sufficient sample for developing ISRs. Finally, the team applied a NTGR of 1.0, which is consistent with the HAP PY2015, PY2016 and PY2017 evaluations, as well as with low-income direct install programs in other jurisdictions. Therefore, net savings are equal to gross savings.

Gross Verified Energy and Summer Peak Demand Savings

For each measure, the Cadmus team applied the reported measure quantity and ISR to the per-unit energy and demand savings to determine total gross verified savings. The algorithm shown in Equation 1 is used to calculate gross verified energy savings; the team used a similar equation to calculate demand savings:

Equation 1. Gross Verified Energy Savings

$$Gross\ Verfied\ Energy\ Savings\ =\ Gross\ Per\ Unit\ Energy\ Savings\ *\ ISR\ *\ Quantity$$

The Cadmus team used the FNCP participant survey to determine the ISR (with details provided in the Participant Phone Surveys section) and to collect data on measure installation, retention and removal. The FNCP was used as a proxy because it, like COTC HAP, is a local program and the survey produced sufficient responses at the measure level. Respondents confirmed the measure quantities they received and quantities that remained installed. To determine the ISR, the team divided the number of measures still operating by the number received.

The team assessed per-unit demand reduction using Equation 2, consistent with the EM&V Protocols, which multiplies energy savings by the appropriate summer peak demand factor, developed from the IESO-provided load shapes.

Equation 2. Gross Verified Demand Savings

$$Summer\ Peak\ Demand\ Savings\ (kW) = kWh_{savings} * Summer\ Peak\ Demand\ Factor$$

The Cadmus team calculated realization rates at the measure and program levels as gross verified savings divided by reported savings. The team summed the reported savings by measure, as provided in the IESO's consolidated LDC project list.

Net Verified Energy and Demand Savings

The team deemed the NTGR for the COTC HAP as 1, consistent with the HAP PY2015, PY2016 and PY2017 evaluations as well as with low-income direct install programs in other jurisdictions. Low-income programs are targeted at customers who are thought to lack the means to make energy upgrades on their own, and thus would not have taken energy saving actions without the program's intervention.

Findings

This section describes the updates to the per-unit energy and summer peak demand savings as well as the gross and net verified savings results.

Gross Per-Unit Savings

The Cadmus team applied the gross verified per-unit energy savings and summer demand savings values determined through the province-wide HAP program to the COTC HAP. Table 5 and

Table 6 present the PY2017 gross verified per-unit energy savings and summer peak demand savings along with the verified savings percentage of reported COTC savings. First-year savings were identical to persistence in 2020 savings.

Table 5. Comparison of PY2017 and Reported Gross Per-Unit First Year Energy Savings

Measure	Per-Unit Energy Savings (kWh)[a]		Percentage of Reported
	PY2017 Reported	PY2017 Verified	
≤ 11-Watt ENERGY STAR-Qualified LED A Shape	74	48	64%
≤ 14-Watt ENERGY STAR-Qualified LED A Shape	93	47	51%
≤ 23-Watt ENERGY STAR-Qualified LED A Shape	117	61	52%
Power Bar	53	4	7%
Per 3-Feet of 1/2-inch Pipe Wrap	38	35	92%
Per 3-Feet of 3/4-inch Pipe Wrap	38	35	92%
Car Block Timer	653	576	88%
Low-Flow Showerhead	377	228	60%
Water Heater Blanket	270	35	13%
Bathroom Aerator < 3.8 L/min	80	54	68%
Kitchen Aerator < 5.7 L/min	140	137	98%
Attic Insulation	N/A	N/A	N/A
Basement Insulation	N/A	N/A	N/A
Comprehensive Draft-Proofing	N/A	N/A	N/A
Wall Insulation	N/A	N/A	N/A

[a] Values are rounded and not inclusive of ISRs

[b] Weatherization measure assumptions were not reported at the unit level. The realization rate for PY17 weatherization measures was 84.3%.

A comparison of verified and reported demand savings are shown in

Table 6.

Table 6. Comparison of PY2017 and Reported Gross Per-Unit First-Year Demand Reduction

Measure	Per Unit Demand Savings (kW) [a]		Percentage of Reported
	PY2017 Reported	PY2017 Verified	
≤ 11-Watt ENERGY STAR-Qualified LED A Shape	0.051	0.003	6%
≤ 14-Watt ENERGY STAR-Qualified LED A Shape	0.064	0.003	5%
≤ 23-Watt ENERGY STAR-Qualified LED A Shape	0.080	0.004	5%
Power Bar	0.002	0	0%
Per 3-Feet of 1/2-inch Pipe Wrap	0.005	0.005	109%
Per 3-Feet of 3/4-inch Pipe Wrap	0.005	0.005	109%
Car Block Timer	—	—	—
Low-Flow Showerhead	0.046	0.034	74%
Water Heater Blanket	0.033	0.010	31%
Bathroom Aerator < 3.8 L/min	0.010	0.007	70%
Kitchen Aerator < 5.7 L/min	0.017	0.020	119%
Attic Insulation[b]	N/A	N/A	N/A
Basement Insulation[b]	N/A	N/A	N/A
Comprehensive Draft-Proofing[b]	N/A	N/A	N/A
Wall Insulation[b]	N/A	N/A	N/A

[a] Values are rounded and not inclusive of ISRs.
[b] Weatherization measure assumptions were not reported at the unit level.

Gross and Net Verified Energy and Summer Peak Demand Savings

The Cadmus team applied evaluated per-unit energy savings, ISRs and realization rate values to reported measure quantities to determine gross verified savings. Since the team was unable to directly survey COTC HAP participants to obtain ISRs, the team applied the ISR by measure obtained from the FNCP participant survey as a proxy for all measures other than weatherization, clothes drying racks and thermostats. Weatherization ISR is deemed at 100% as participants often are unaware of the installed square footage for weatherization, and they tend not to uninstall these measures. The FNCP participant survey did not produce data for clothes drying racks so the Cadmus team used the ISR from the province-wide HAP participant survey. Thermostats also were not represented in the FNCP participant survey, and the team assumed an ISR of 100%. Table 78 shows the ISR by measure group.

Table 7. PY2017 COTC HAP ISRs

Measure Group	ISR	Reasoning
LEDs	90%	Some bulbs were not installed by a technician on the site and remained uninstalled
Showerhead	74%	Some showerheads were not installed by technician on the site and remained uninstalled
Faucet Aerators	66%	Some aerators were not installed by technician on the site and remained uninstalled
Power Bar	73%	Many customers had not used the power bar and some power bars not installed by technicians on site remained uninstalled
Block Heater	41%	Customers were unsure how to use the block heater timer (ISR adjusted for participants who had not used block heater and for seasonality)
Hot Water Tank or Pipe Wrap	99%	Not all measures were installed by technicians on site and some remained uninstalled
Insulation/Air Sealing	100%	None detected through the survey, but assumed to be 100%

Direct measurement of ISR was not possible for COTC. Proxy ISRs for some measures were low because equipment was not directly installed by technicians on site and remained uninstalled, sometimes because customers did not know how to install or operate the equipment (Key Finding 1a).

The Cadmus team determined realization rates by comparing reported values to evaluated values, based on engineering analysis and simulation modelling conducted for the province-wide HAP program and applying ISRs.

The Cadmus team adjusted overall realization rates for all program measures, gross verified first-year savings as a percentage of reported savings. In PY2017, overall program realization rates were 78.7% for energy savings and 14.8% for demand reduction (as shown in Table 89, by measure).

Table 8. PY2017 COTC HAP Realization Rates by Measure

Measure	Realization Rate kWh	Realization Rate kW
≤ 11-Watt ENERGY STAR-Qualified LED A Shape	58%	6%
≤ 14-Watt ENERGY STAR-Qualified LED A Shape	45%	4%
≤ 23-Watt ENERGY STAR-Qualified LED A Shape	47%	5%
Power Bar	5%	3%
Per 3-Feet of 1/2-inch Pipe Wrap	91%	110%
Per 3-Feet of 3/4-inch Pipe Wrap	91%	110%
Car Block Timer	36%	N/A
Low-Flow Showerhead	45%	54%
Water Heater Blanket	36%	30%
Bathroom Aerator < 3.8 L/min	45%	45%
Kitchen Aerator < 5.7 L/min	65%	78%
Attic Insulation	84%	N/A
Basement Insulation	84%	N/A
Comprehensive Draft-Proofing	84%	N/A
Wall Insulation	84%	N/A

Savings Summary

Table 910 summarizes first-year reported gross and Verified energy and demand savings by LDC for the 2017 COTC HAP.

Table 9. 2017 COTC HAP First-Year (and 2020) Reported Gross and Verified Savings Summary[a]

LDC	Reported MWh	Reported MW	Verified MWh	Verified MW
Attawapiskat Power Corporation	106	0.007	82	0.001
Fort Albany Power Corporation	113	0.005	90	0.001
Kashechewan Power Corporation	96	0.004	76	0.001
Total	**315**	**0.015**	**248**	**0.002**

[a] Values are rounded.

In 2017, the COTC HAP completed 26 projects, at an average cost of $10,714.17 for each project, with an average verified project savings of 9,544 kWh and 0.08 kW. Most of the 2017 COTC HAP savings (over 84% or 265,455 kWh) were provided by weatherization track measures.

Table 1011 summarizes first-year reported gross and verified energy and demand savings by LDC for the 2016 COTC HAP true ups.

Table 10. 2016 True-Up COTC HAP First-Year Reported Gross and Verified Savings Summary[a]

LDC	Reported MWh	Reported MW	Verified MWh	Verified MW
Attawapiskat Power Corporation	161	0.02	152	0.00
Fort Albany Power Corporation	129	0.01	121	0.00
Kashechewan Power Corporation	173	0.02	159	0.00
Total	**463**	**0.05**	**432**	**0.01**

[a] Values are rounded.

COTC HAP 2016 true-ups completed 112 projects, at an average cost of $3,398.32 for each project, with an average verified project savings of 3,858 kWh and 0.09 kW. Over 60% (278,861 kWh) of 2016 true-up COTC HAP gross savings were weatherization track measures.

Table 1112 provides summed 2017 and 2016 COTC HAP true-up, first-year gross and verified energy and demand savings by LDC.

Table 11. 2017 and 2016 True-Up COTC HAP First-Year Gross and Adjusted Verified Summary[a]

LDC	Reported MWh	Reported MW	Verified MWh	Verified MW
Attawapiskat Power Corporation	267	0.02	233	0.00
Fort Albany Power Corporation	242	0.02	211	0.00
Kashechewan Power Corporation	269	0.02	236	0.01
Total	**778**	**0.07**	**680**	**0.01**

[a] Values are rounded.

Process Evaluation

The Cadmus team designed the process evaluation to assess the program's effectiveness in employing delivery strategies tailored specifically to the Five Nations' Communities. The specific objectives of the PY2017 evaluation included the following:

- Assess program delivery's effectiveness, including outreach and marketing methods
- Characterize participant and market actor experiences, including satisfaction and ancillary program benefits
- Develop recommendations for program improvements

Process Evaluation Activities

The Cadmus team conducted the following activities for the process evaluation:

- Stakeholder interviews
- Review of background and marketing materials
- Participant surveys (attempted)

Methodology

The Cadmus team conducted primary and secondary research to address the process evaluation objectives. The team began with a comprehensive document review including the PY2016–PY2020 *Business Case* and *Program Rules*, current marketing materials and media covering Five Nations housing and energy burden issues to understand the program and to identify specific areas to explore during primary research activities. The team then gathered primary data for the process evaluation through interviews with the program manager and delivery contractor, as shown in Table 1213.

Table 12. PY2017 COTC HAP Process Evaluation Primary Research

Task	Audience	Completes
Stakeholder Interviews	COTC HAP program staff	2 interviews, each with 1 individual
Participant Surveys	Program participants	0[a]

[a] The Cadmus team attempted to conduct participant surveys, but, due to the extremely small number of participants for whom phone numbers were provided, the survey subcontractor could not complete any surveys.

Findings

This section discusses the promotional and delivery strategy, impact on bill arrearages, health and safety measures installed and non-energy benefits from the program staff perspective.

Promotional and Delivery Strategy

This local version of the province-wide HAP employs delivery strategies specifically tailored to the First Nations communities served by COTC. These objectives extend beyond meeting energy-savings targets in the overall residential sector, moving into creating healthier and safer housing and easing the energy burden for households in these remote communities, where average home consumption was over 30,000 kWh per year. Specifically, the IESO program strives to reduce consumption by 25% in each home. In addition, the program administrator designed the program to stimulate local economies by training and using workers from the communities where the program was delivered.

Local partners going door-to-door to inform residents of the opportunity to participate recruited the most participants, but the delivery contractor also sent out flyers and arranged community events. The program manager collaborated extensively with Western James Bay Coast community leaders and local representatives for the Band Housing administrator to identify homes in need of treatment.

Delivering this program to remote and relatively isolated communities involved many unique challenges beyond those experienced in delivering the province-wide version of the program including a limited building season, staff turnover, access to materials, and the need to address health and safety issues beyond the scope the program was prepared to handle (Key Finding 2a).

- These included a short building season (May to October) due to weather, regular flooding and subsequent evacuations.
- In addition, the delivery contractor reported recently experiencing labor issues and delays due to turnover and newly hired staff. Delays also occurred related to acquiring necessary materials in PY2017; these materials, delivered via an ice road, combined with other shipments along this route and could not be sorted until well after the building season started. Typically, homes required eight days of work each to adequately install COTC HAP measures. Some homes, however, took up to 16 days to complete due to new staff, material sorting and—especially—bereavement leave for deaths in the community. Finally, the delivery contractor found home conditions were worse than expected, requiring health and safety remediation beyond the COTC HAP's scope before retrofits could be conducted. Thus, treatment of this home subset was postponed until Five Nations addressed the health and safety issues.

Impacts on Billing Arrearages

Similar to the Cadmus team's findings for both the province-wide HAP and for Hydro One's First Nations program, no documented, quantitative data were available on reductions in billing arrearages, but anecdotal observations indicated customers could better pay their hydro bills in full and were less likely to skip payments when their energy use reduced significantly.

Health and Safety Measures

The COTC HAP allowed for $1,500 of the $15,000 per-home budget to be allocated to health and safety measures, regardless of weatherization measures installed. For the most part, these funds were used to pay for heat-recovery ventilators to prevent mold from becoming an issue in homes after installations of

insulation and draft-proofing measures. The program conducted some mold remediation, but the delivery contractor reported, for the most part, that delivery staff did not encounter mold except in homes where mold was too extensive to proceed until after Five Nations coordinated remediation.

This held consistent with the Cadmus team's PY2016 evaluation findings for the HAP: when mold was present, it proved sufficiently extensive to create issues beyond the program's scope, thus remediation was not a common program measure. The COTC HAP program did conduct education regarding mold prevention.

The delivery contractor also reported encountering some issues with unsafe electrical wiring, which also fell outside of the program's scope, sometimes posing as a barrier to retrofits. **Program staff, however, confirmed interest in collaborating with other programs that address electrical work and health and safety measures and job-training services for cost-sharing purposes (Key Finding 2b).** Specifically, program staff has been in contact with officials connected to another government program that hard-wires smoke and carbon monoxide detectors and includes some electrical work, hoping to collaboratively offer these options for the COTC HAP and to share delivery costs.

Non-Energy Benefits

The Cadmus team assessed the non-energy impacts of the COTC HAP and dedicated specific program staff interview questions to this objective. The Interviewee highlighted job training and creation as the leading non-energy benefits. Because the evaluation team was unable to directly interview COTC HAP participants, additional information about participants non-energy benefits was unavailable. The province-wide HAP program found significant evidence of participant non-energy benefits which are likely to also be present in this program. The COTC HAP hired different staff from the local communities each year. In doing so, the program provided jobs and trained a new workforce to have the installation skills and energy efficiency knowledge required. **The IESO provided funding for the workforce training**. **The program, however, also relied on other regional organization and community organization funding. Safety and local training organizations provided further funding and support (Key Finding 3a)**.

Each home was allotted $15,500 to cover the audit and install COTC HAP measures—the values reported for cost-effectiveness and in the project list. However, full program measure treatment homes cost more than the $15,500 cap. Additional costs were often training related and billed to organizations separate from COTC HAP.

Cost-Effectiveness and Greenhouse Gas Impacts

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

Methodology

The Cadmus team used the IESO's CDM Cost Effectiveness Tool to perform the TRC, PAC and LUEC cost-effectiveness tests and obtain greenhouse gas (GHG) reductions. The cost-effectiveness tests assess several critical performance metrics: benefits, costs, net benefits and benefit/cost ratios. Programs are cost-effective when the benefits exceed the costs, meaning the program must have a benefit/cost ratio greater than 1.0.

Table 1314 shows the various components included in each test and whether they are treated as a benefit or cost.

Table 13. Cost-Effectiveness Test Components

Component	TRC	PAC	LUEC
Avoided Energy Costs	Benefit	Benefit	—
Non-Energy Benefits	Benefit	—	—
Secondary Fuel Savings (Gas)	Benefit	—	—
Incremental Participant Costs	Cost	—	—
Administration Costs	Cost	Cost	Cost
Incentive Payments	—	Cost	Cost
Participant Bill Savings	—	—	—
Discounted Lifetime Energy Savings	—	—	Benefit

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 program 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 LDC and the IESO. In addition, the TRC includes an non-energy benefits adder of 15%. The TRC uses the following benefit/cost ratio equation:

Equation 3. Total Resource Cost Test

$$TRC\frac{B}{C} = \frac{PV\ [(Value\ of\ Gross\ Saved\ Energy + Value\ of\ Gross\ Non\ Energy\ Benefits) * NTGR]}{PV\ [Program\ Adminstrative\ Costs\ + (Incremental\ Participant\ Cost\ * NTGR)]}$$

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

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

NTGR = Net-to-gross ratio

Program Administrator Cost Test

The PAC examines program benefits and costs solely from the administrators' perspective using the following benefit/cost ratio equation:

Equation 4. Program Administrator Cost Test

$$PAC\frac{B}{C} = \frac{PV\ [Value\ of\ Gross\ Saved\ Energy * NTGR]}{PV\ [Adminstrative\ Costs\ +\ Incentive\ Payments]}$$

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 the following equation (costs divided by kilowatt-hours):

Equation 5. Levelized Unit Electricity Costs

$$LUEC = \frac{PV\ [Adminstrative\ Costs\ +\ Incentive\ Payments]}{PV\ [Gross\ Lifetime\ kWh * NTGR]}$$

Inputs and Assumptions

The cost-effectiveness analysis relied upon the following evaluation impact results:

- Net verifiedenergy savings
- Peak demand savings
- Measure's effective useful life (EUL)
- Measure's incremental lifecycle costs
- Program incentive payments
- Secondary fuel savings

The Cadmus team combined the evaluation data with the following program financial data (provided by the IESO) to calculate cost-effectiveness:

- IESO administrative costs
- LDC administrative costs

The team used the load profiles in the LDC provided CDM Cost Effectiveness Tool from the IESO's library of load shapes.

Findings

Table 1415 shows TRC and PAC results for the PY2017 COTC HAP. **The TRC has a benefit cost ratio of 0.32 resulting from benefits of $181,450 and costs of $566,648. The PAC has a benefit cost ratio of 0.28 resulting from benefits of $157,783 and costs of $566,648 (Key Finding 3b)**. The low cost-effectiveness is primarily due to the high costs of improvements per home relative to savings achieved. **To improve cost-effectiveness, the LDC would need to reduce costs per home or save additional energy in addition to lowering administrative costs. Valuing and including non-energy benefits such as improvements to safety, comfort, health and economic security could also improve cost-effectiveness (Key Finding 3c).**

Table 14. PY2017 TRC and PAC Ratio and Net Benefits

Test	PY2017 Ratio	Benefits ($)	Costs ($)	Net Benefits ($)
TRC	0.32	$181,450	$566,648	-$385,198
PAC	0.28	$157,783	$566,648	-$408,866

Table 1516 shows LUEC results for the COTC HAP program with a dollars/kWh ratio of $0.1819/kWh resulting from costs of $5,66,648 and levelized savings of 3,115,693 kWh.

Table 15. LUEC Ratio Results for Energy Savings

Ratio ($/kWh)	Costs ($)	Benefits (Present Value kWh)
0.1819	$566,648	3,115,693

Table 1617 shows the pilot level first year and lifetime GHG reduction in tonnes from the CE calculator.

Table 16. GHG Reduction

	First Year	Lifetime
Tonnes CO_2 equivalent	53	1,653

Key Observations and Recommendations

The following statements present an overview of the Cadmus team's key observations and recommendations, based on the research and analysis conducted for the COTC HAP program:

***Key Observation 1. The small participant group and a lack of contact information didn't allow for direct feedback from COTC participants*.** Direct measurement of ISR was not possible for COTC. Proxy ISRs for some measures were low because equipment was not directly installed by technicians on site and remained uninstalled, sometimes because customers did not know how to install or operate the equipment (Finding 1a).

- ***Recommendation 1***. The next evaluation should attempt to verify installation of reported measures, perhaps through photo documentation provided by the staff conducting the energy audit or a leave behind mail in survey. The IESO should ensure the HAP-like programs all require direct installation by its contractors, photo evidence of measure installation, as well as inclusion of printed materials for households on measure operations (such as power bars and block heater timers).

***Key Observation 2. The COTC HAP program faces unique challenges in serving remote communities*.** COTC serves hard-to-reach and relatively isolated communities involved many unique challenges beyond those experienced in delivering the province-wide version of the program including a limited building season, staff turnover, access to materials, and the need to address health and safety issues beyond the scope the program was prepared to handle (Finding 2a). Program staff confirmed interest in collaborating with other programs that address electrical work and health and safety measures and job-training services for cost-sharing purposes (Finding 2b).

- ***Recommendation 2a***. The program should continue to take advantage of opportunities to collaborate and cost-share with other programs/community services with similar goals of improving the local housing conditions if it aims to continue serving these remote communities.

Key Observation 3. Given the program had goals beyond energy savings and serves a low-income community, as is typical for these types of programs, it does not pass cost-effectiveness tests. However, in addition to lowering costs and increasing savings, cost-effectiveness could be improved by accounting for non-energy benefits. Not only did the program receive funding from the IESO for workforce training, it also received support and funding from local organizations (Finding 3a). For cost-effectiveness, only costs for the IESO were included and do not reflect the additional funding billed to the other partner organizations or non-energy benefits. The TRC has a benefit cost ratio of 0.32 resulting from benefits of $181,450 and costs of $566,648. The PAC has a benefit cost ratio of 0.28 resulting from benefits of $157,783 and costs of $566,648 (Finding 3b). To improve cost-effectiveness, the LDC would need to reduce costs per home or save additional energy in addition to lowering administrative costs. Valuing and including non-energy benefits such as improvements to safety, comfort, health and economic security could also improve cost-effectiveness (Key Finding 3c).

- ***Recommendation 3***. Determine whether additional costs from collaborating partners should be included and consider valuing and adding non-energy benefits in cost-effectiveness modeling.