2017 Program Evaluation: Toronto Hydro PUMPsaver Local Program

Submitted to Independent Electricity System Operator

November 15, 2018
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Nexant

2017 Program Evaluation: Toronto Hydro PUMPsaver Local Program
Acronyms and Abbreviations

CDM  = Conservation demand management
Cv   = Coefficient of variance
FR   = Free ridership
HP   = Horsepower
HVAC = Heating, ventilation, and air conditioning
kW   = Kilowatt
kWh  = Kilowatt-hour
IESO = Independent Electricity System Operator
LDC  = Local distribution company
MW   = Megawatt
MWh  = Megawatt-hour
n    = Sample size (number of respondents)
NTG  = Net-to-gross
NTGR = Net-to-gross ratio
PAC  = Program administrator cost
SP   = Spillover
TRC  = Total resource cost
VFD  = Variable frequency drive
1 Executive Summary

1.1 Background, Goals and Objectives
The Independent Electricity System Operator (IESO) retained the Nexant team (Nexant, Inc. and NMR Group, Inc.) to conduct an evaluation of its Business Programs for the 2017 evaluation cycle. This report provides the results of the impact and process evaluation of the PUMPsaver local program for the 2017 program year.

The goals and objectives of the 2017 evaluation of the PUMPsaver local program are to:

- Verify energy and demand savings with a high degree of confidence, taking into account:
  - Measure-specific characteristics and data;
  - Spillover savings and program-enabled savings;
- Review and evaluate key program elements;
- Conduct annual cost-effectiveness analyses; and
- Report and attribute savings due to the program.

1.2 Key Observations and Recommendations
This section provides a summary of the impact and process evaluation results and observations for the PUMPsaver local program for 2017 program year.

1.2.1 Impact Evaluation
The PUMPsaver local program included 193 projects, 185 from Toronto Hydro and 8 from Oakville Hydro. Almost half (47%) of the motors included in the program were either 15 or 20 HP. The program’s stated intent was to focus on primarily the multifamily building segment and the 2017 results reflect that intent, with 78% of the projects being implemented at multifamily buildings. The program level savings are summarized in Table 1-1 below.
Table 1-1: Program Level Savings Results

<table>
<thead>
<tr>
<th>Savings Type</th>
<th>Gross Reported Savings</th>
<th>Gross Verified Savings</th>
<th>Net To Gross Ratio</th>
<th>Net Verified First Year Savings</th>
<th>Net Verified 2020 Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (GWh)</td>
<td>13.8</td>
<td>15.8</td>
<td>101%</td>
<td>15.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Summer Peak Demand (MW)</td>
<td>1.61</td>
<td>1.67</td>
<td>121%</td>
<td>2.02</td>
<td>2.02</td>
</tr>
</tbody>
</table>

*Due to 90/10 sampling target for confidence and precision, energy and demand savings realization rates were calculated and applied across the combined set of local program participants only.

Listed below are the findings and recommendations from the 2017 impact evaluation. While some of these findings were previously noted in the 2016 program year report, these findings are considered important enough to warrant inclusion once again.

- The program’s project qualification criteria and market targeting are key contributors to the program’s savings and cost effectiveness.

- Motor size minimum. Requiring motors of at least 7.5 horsepower ensures higher levels of savings per motor and when looking at fixed costs associated with implementing the program, the larger motor measures may contribute more savings per motor for the same fixed cost.

  **Recommendation:** If there is a sufficiently large enough market to continue focusing on larger motor upgrades while still meeting other program goals (e.g. kW or kWh savings), then it is recommended to stay focused on larger motors to help maintain a strong cost effectiveness.

- Targeted applications. The program specifically targeted pumps that were believed to be operating year-round serving heating, ventilation and air-conditioning (HVAC) systems, which typically run much or all of the year and will therefore produce higher levels of savings.

  **Recommendation:** It is recommended that the program continue to pursue pumps with high run hours but also consider pumps in non-HVAC applications such as those used in service of industrial processes.

- Some of the more sophisticated participants used the program-provided VFDs in a variable speed capacity, dialing back the run speeds during low use periods (e.g. overnight, seasonally, or based on meeting a setpoint), leading to savings above and beyond the program’s expected savings based on a fixed-speed installation.

  **Recommendation:** While the evaluation team understands and appreciates the streamlined nature of the program only offering fixed speed VFD upgrades, the LDCs may wish to
consider offering participants the option to control the new VFDs on a variable basis, as applicable, as an “add-on” to their existing fixed-speed VFD measure program offering.

- The primary building type focus of the program, multifamily, appears to have the smallest energy and peak demand savings per project.

**Recommendation:** Consider targeting certain building types with larger projects on average. The 2017 program year data indicated manufacturing and industrial building types had relatively high energy and peak demand savings per project.

### 1.2.2 Net-to-Gross (NTG)

The findings from the 2017 local program impact evaluation pertaining to NTG include the following:

- Participant feedback indicates relatively low free-ridership (16.8%), as responses show that the program helped customers complete projects they would have had to cancel, delay, or reduce in size or scope. Room for improvement exists in terms of identifying customers most in need of program support, as a few respondents (14%) said they would have done the exact same upgrade in the absence of the program.

**Recommendation:** Even though the free-ridership results were mostly positive, it will continue to be important for the program to target customers who would not make upgrades without the support of the program and for program vendors to more readily identify worthwhile projects.

### 1.2.3 Process Evaluation

The findings and recommendation from the 2017 local program process evaluation include:

- Program staff indicated that the program-selected vendors were very diligent and met the requirements as contracted. To help alleviate concerns of customers who were contacted by misinformed vendors, the program presented these customers with statistics about the VFD equipment.

**Recommendation:** Ensure that all marketing materials, program applications, program delivery partner and vendor talking points clearly address topics related to VFD savings opportunities, installation and system requirements, and failure/longevity rates.

- The program staff indicated that the program’s savings achieved are three times greater than what they initially estimated they would achieve. They also noted that installation times are typically quick and efficient with no down-time for any of the participating facilities, noting that they refined this process as they went along.
Recommendation: Consider expanding on the existing case studies or develop short videos that highlight the success of the program to date with a focus on savings opportunities and ease of installation.

- The majority of participants heard about the program directly from Toronto Hydro (53%), though others heard about the program from their property or energy management company, the IESO, a colleague or competitor, or an in-house Energy Advisor. This second year of the local program delivery indicates participants heard about the program from multiple sources, which is in contrast to the first year where all the participants heard about the program via a representative from Toronto Hydro.

Recommendation: Continue to find new avenues in which to market and promote the program to key customer demographics, perhaps through more direct engagement with condominium associations.

- Saving energy and lowering energy was the primary reason that participants reported for participating in this program. Survey responses also indicate participating organizations have a strong sense that their corporate culture supports decisions on energy saving or sustainability-related activities, even without a formal written policy in place.

Recommendation: Ensure that all marketing materials and vendor and program delivery partner talking points highlight the fact that program-sponsored energy efficiency improvements can help businesses meet their energy or sustainability-related policies and goals.
2 Evaluation Goals and Objectives

The goals and objectives of the 2017 evaluation of the PUMPsaver local program are to:

- Verify energy and demand savings with a high degree of confidence, taking into account:
  - Measure-specific characteristics and data;
  - Spillover savings and program-enabled savings;
- Review and evaluate key program elements;
- Conduct annual cost-effectiveness analyses;
- Report and attribute savings due to the program.

To estimate gross verified energy and peak-demand savings, the evaluation team conducted desk reviews of project documentation, followed by telephone and on-site surveys for a representative sample of projects. To estimate the direct influence of the local program in generating energy savings, the evaluation team conducted attribution surveys to calculate the rates of free ridership and spillover. This information was used to calculate a net-to-gross ratio, which was then applied to the gross verified savings to calculate the net savings. These scaling factors, along with the gross savings, were developed using random sampling methods to select and survey projects that were representative of the population at large.
3 PUMPsaver Local Program Description

The PUMPsaver local program was created to save electricity consumption through improving the efficiency of cooling and heating distribution systems. Specifically, the program’s objective is to re-engineer and re-balance inefficient closed loop heating and cooling distribution systems, typically found in mid to high-rise buildings, with the application of variable frequency drives (VFDs). Typically, valves are used to restrict the flow of liquid which creates back-pressure on the motor and increases energy consumption. With a variable frequency drive valves can be opened and systems can be configured to move liquid at the desired rate of flow, reducing work required of the motor. The 2017 local program was similar to the 2016 local program in many key aspects, such as target market, measures offered, and delivery process, therefore the 2017 program was evaluated in a consistent manner as the 2016 local program.

The program provided participants a fully funded turn-key upgrade, which included an on-site assessment of existing conditions and measurement of associated electrical loads and consumption by qualified water auditing and balancing professionals. Retrofit of the hydronic distribution system was then implemented based upon recommendations from the on-site assessment. Measurement of associated electrical loads and consumption were subsequently carried out and compared to initial measurements to establish actual savings achieved from the system changes. The documentation for each project provided by Toronto Hydro and Oakville Hydro included all site contact information such as address, contact name, and phone number. For each measure, Toronto Hydro and Oakville Hydro provided data collected from the initial on-site assessment observation and measurements as well as post installation system performance measurements. In 2017, Toronto Hydro began delivering the program on behalf of Oakville Hydro. The program delivery by Toronto Hydro utilizes the same vendor for program delivery for both Toronto Hydro and Oakville Hydro.
4 Methodology

The sections below describe the methodologies used to complete the impact and process-related components of the evaluation.

4.1 Impact Evaluation Methodology

4.1.1 Sampling, Project Reviews, and Evaluation

The impact evaluation sample frame targeted 90% confidence level and 10% precision (90/10) for the program. Using just the 2017 program data, the evaluation achieved 14% and 12% precision for energy and demand savings results, respectively, at the 90% confidence level. Since the 2017 results alone did not achieve 90/10 confidence and precision, the 2017 results were aggregated with the 2016 results. Aggregating the two years’ data was only possible because the 2017 program design and delivery did not experience significant changes from the 2016 program year. The combined 2016 and 2017 evaluation sample’s achieved confidence and precision was 90/10 for both energy and demand savings estimates. The sample evaluated in this program year, broken out by evaluation activity, and achieved precision is summarized in Table 4-1.

Data collection included both desk reviews and on-site verification. Desk reviews consisted of reviewing project documentation available in the program’s database, such as program applications, verification reports, and any other documentation available to IESO. For each desk review, Nexant contacted the participant via phone to verify that the measure was installed and currently operating, as well as confirm measure characteristics such as equipment size, operating hours, and control strategies. The site visits expanded upon the work conducted from the desk reviews and also included an on-site review of the measures, which involved verifying pump nameplate information, verifying VFD operating speed(s), and conducting an in-person interview with the site contacts.

Table 4-1: Impact Evaluation Sample

<table>
<thead>
<tr>
<th>Program Year(s)</th>
<th>Participant Quantity</th>
<th>90/10 Target Sample (Cv** = 0.5)</th>
<th>Achieved Evaluation Sample</th>
<th>Confidence/ Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Desk Review</td>
<td>On Site Verification</td>
</tr>
<tr>
<td>2017</td>
<td>193*</td>
<td>50</td>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>2016 + 2017</td>
<td>208</td>
<td>52</td>
<td>45</td>
<td>18</td>
</tr>
</tbody>
</table>

* 193 is the final 2017 program year quantity. However, at the time the sample was drawn, only 180 participants were in the program tracking data. Therefore the target sample was based on a program population of 180.

** Cv: coefficient of variance
Once the data had been collected, Nexant created hourly savings load shapes based on observed measure parameters. These load shapes were then used to derive verified annual energy savings and peak demand savings.

### 4.1.2 Net-to-Gross (NTG) Methodology

To calculate net savings, the team evaluated the portion of gross verified savings that was specifically attributable to the program. Net savings are determined by multiplying the gross verified savings by the NTG ratio, as shown in Equation 4-1.

\[
\text{Equation 4-1: Net Savings} \\
\text{Savings Net} = \text{Savings verified} \times \text{NTG}
\]

Where:

- Savings net = Net savings impact (kW or kWh)
- Savings verified = Gross verified energy savings (kW or kWh)
- NTG = Net-to-gross

To estimate the direct influence of the PUMPsafer local program in generating net energy savings, the evaluation team implemented a survey to calculate the free-ridership (FR) and spillover (SO) rates, assessed as percentages of total reported savings. Free-ridership is the program savings attributable to free riders (program participants who would have implemented a program measure or practice in the absence of the program). Spillover refers to additional reductions in energy consumption or demand that are due to program influences beyond those directly associated with program participation.\(^1\) The NTG ratio is defined by Equation 4-2, where FR is the free-ridership percentage and SO is the spillover percentage:

\[
\text{Equation 4-2: Net-to-Gross Ratio} \\
\text{NTG} = 100\% - \text{FR} + \text{SO}
\]

### 4.2 Process Evaluation Methodology

#### 4.2.1 Program Staff and Implementation Trade Partner

The evaluation team completed one phone interview with Toronto Hydro program staff in February of 2018, and one interview with an implementation trade partner on June 8, 2018. The purpose of the interview was to better understand how the program was administered in 2017, and to attain program staff and implementation trade partner’s perspectives regarding design

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and implementation. Topics covered include staff roles, any changes to the program, supply channel engagement, barriers to implementation, and perspectives on the success of the program. The evaluation team identified the appropriate staff to be interviewed in consultation with the IESO evaluation staff. The Toronto Hydro program staff interviewed oversees the planning and implementation strategy.

4.2.2 Participants
The evaluation completed 28 web-based surveys with PUMPsaver participants to better understand participant perspectives related to program delivery. The PUMPsaver survey asked a series of questions encompassing respondent characteristics, program outreach and marketing, participant motives and decision-making, participant satisfaction, free-ridership and spillover, and firm characteristics. A summary of the feedback gathered from these survey responses is presented below in Section 7.2.
5 Participation

The PUMPsaver local program included 193 projects, 185 from Toronto and 8 from Oakville Hydro. Figure 5-1 shows the distribution of motor sizes by quantity reported. Almost half (47%) of the motors included in the program were either 15 or 20 HP. For comparison, Figure 5-1 also shows the 2016 PUMPsaver local program results. As a note, roughly one third (101 of 295 measures) in the 2017 program year data reported to IESO were reported with a measure quantity of zero, so the motor quantities depicted in Figure 5-1 do not show the full program population’s motor size distribution. While the measure quantities submitted to IESO in the tracking data were incomplete, the LDCs provided a complete but separate program tracking dataset to the evaluation team, which showed input assumptions and calculations used to generate the reported savings estimates. These input assumptions and calculations were generally appropriate and consistently applied across all projects to ensure the verified savings align with the reported savings.

Figure 5-1: Profile of Pump Motor Sizes

![Profile of Pump Motor Sizes](image)

The program’s stated intent was to focus on primarily the multifamily building segment and the 2017 results reflect that intent, with 78% of the projects being implemented at multifamily buildings. Figure 5-2 shows the relative frequency of each building segment in the program.
**Figure 5-2: Relative Frequency of Building Segments in the 2017 PUMPsaver Local Program**

- Multifamily: 78%
- Office: 8%
- Commercial: 7%
- Institutional: 3%
- Retail Other (non food): 1%
- University Colleges: 1%
- Industrial: 1%
- Chemical Mfg: 1%
6 Impact Evaluation Results

The sections below provide the impact evaluation results.

6.1 Energy and Peak Demand Savings

6.1.1 Energy and Peak Demand Savings Overview

The program level savings are summarized in Table 6-1 below.

<table>
<thead>
<tr>
<th>Savings Type</th>
<th>Gross Reported Savings</th>
<th>Realization Rate*</th>
<th>Gross Verified Savings</th>
<th>Net To Gross Ratio</th>
<th>Net Verified First Year Savings</th>
<th>Net Verified 2020 Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (GWh)</td>
<td>13.8</td>
<td>114%</td>
<td>15.8</td>
<td>101%</td>
<td>15.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Summer Peak Demand (MW)</td>
<td>1.61</td>
<td>104%</td>
<td>1.67</td>
<td>121%</td>
<td>2.02</td>
<td>2.02</td>
</tr>
</tbody>
</table>

*Due to 90/10 sampling target for confidence and precision, energy and demand savings realization rates were calculated and applied across the combined set of local program participants only.

The realization rates of 114% and 104% indicates general agreement between the reported and verified savings estimates, with the verified savings estimates being slightly higher than their reported counterparts. The slightly higher verified savings was due to a variety of project specific reasons, but one of the most common observed differences was due to the reported savings basing their value on a single pump running with another pump on standby (back up) while the projects were verified to have 2 pumps running for either part of or during the full duration of the year.

Another operational parameter found to be different from the reported assumptions in a few projects was the ramping up and down of the VFD to match a load. While the PUMPsaver local program focuses on programming the new VFDs to operate at a constant speed, some relatively more sophisticated customers operated the VFDs on a variable speed basis to match the loading of the system. To help achieve additional program savings, the LDCs may wish to consider offering participants the option to control the new VFDs on a variable basis, as applicable, as an “add-on” to their existing fixed-speed VFD measure program offering.

Other reasons for the high realization rate include: different operating schedules, different verified VFD run speeds, and different pump configurations (e.g. lead/lag, duty/standby, both constantly on).
6.1.2 Comparison of 2016 and 2017 Program Year Savings
The program year 2016 was the inaugural year for the PUMPsaver local program, and therefore program savings were much smaller than 2017 program savings. Net verified savings per project were 82.6 MWh and 10.5 kW in 2017, which was lower than the 166.8 MWh and 15.0 kW net verified savings per project in 2016. There were only five projects in the 2016 PUMPsaver local program so this difference in average net verified savings per project between 2016 and 2017 program years is not considered indicative of any trend.

6.1.3 Savings Contribution by Motor Size
Figure 6-1 and Figure 6-2 show the net verified energy and demand savings by reported motor horsepower.

Similar to the motor quantity results shown in Section 5, 15 and 20 HP motors contributed the most towards the programs savings, with their combined savings making up 33% of the program energy savings and 30% of the program’s total summer peak demand savings.

While the larger motor horsepower sizes (i.e. larger than 25 HP) were upgraded less frequently than the 15 and 20 HP motors, their savings contributions were higher per motor.

As Table 6-2 shows, in every motor size category of 25 HP or greater, the percent of the program total energy and demand savings contributions was equal to or greater than the respective measure quantity percent of the program total. Table 6-2 also shows the average net verified savings per motor by motor size.

Figure 6-1: Total Net Verified Energy Savings Contribution by Pump Motor Horsepower
Table 6-2: Percent Measure Quantity and Savings Contribution by Motor Horsepower

<table>
<thead>
<tr>
<th>Motor HP</th>
<th>% of Program Total</th>
<th>Average Net Savings / Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net Energy Savings</td>
<td>Net Peak Demand Savings</td>
</tr>
<tr>
<td>7.5</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>15</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>20</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>25</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>30</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>40</td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>50</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>60</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>75</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>100</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>125</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>150</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

* The measure quantity and average savings per motor columns in this table only present results for measures with specified measure horsepower in the program tracking database.

6.1.4 Savings Contribution by Building Type

While the program’s stated intent was to focus on multifamily buildings, 22% of the projects were implemented at other building types. Figure 6-3 compares the quantity of projects and program energy savings contribution by building type. Office, commercial, institutional, and chemical manufacturing building types all had higher percent energy savings contribution than their respective project quantities, indicating that these projects had higher per project savings than the average project in the program. Alternatively, Table 6-3 presents the average reported energy and peak demand savings per project by building type. The “Chemical Manufacturing”,...
“Commercial”, and “Institutional” building types each had average reported energy savings above 100,000 kWh per project, indicating there may be an opportunity to increase program savings with additional emphasis on these building types in the future. Program tracking data did not provide enough data to isolate particular reasons that the building types varied in savings. One possible reason is that, assuming relatively similar percent of base case savings across all projects, the magnitude of savings per project would therefore be dependent on the base case HVAC electric usage. A building’s HVAC electric usage is dependent upon the building’s HVAC loads, which are highly dependent upon building size and internally produced loads. Therefore, larger buildings with high internally-created loads (i.e. manufacturing, industrial) may serve as a source for large savings projects in the future.

Figure 6-3: Comparison of Project Quantity and Program Energy Savings by Building Type
### Table 6-3: Average Reported Savings Per Project by Building Type

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Average Reported Savings/Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kWh</td>
</tr>
<tr>
<td>Multifamily</td>
<td>59,495</td>
</tr>
<tr>
<td>Office</td>
<td>82,986</td>
</tr>
<tr>
<td>Commercial</td>
<td>135,961</td>
</tr>
<tr>
<td>Institutional</td>
<td>106,500</td>
</tr>
<tr>
<td>Retail Other (non-food)</td>
<td>60,168</td>
</tr>
<tr>
<td>Industrial</td>
<td>91,241</td>
</tr>
<tr>
<td>University/Colleges</td>
<td>93,499</td>
</tr>
<tr>
<td>Chemical Manufacturing</td>
<td>390,127</td>
</tr>
</tbody>
</table>

#### 6.2 Lifetime Savings

The same measure (VFD on pump serving building HVAC system) was implemented in each project of the program. Therefore, the same effective useful life was used for all program savings based on the Measures and Assumptions List value for VFDs - 15 years. This means that the savings first observed in 2017 will be expected to persist through 2031 on average. Therefore, the net 2020 annual savings is expected to be identical to the net savings listed in Table 6-1.

#### 6.3 Net-To-Gross (NTG)

NTG findings for the PUMPsaiver local program are presented in the following subsections with information collected as part of the participant survey.

##### 6.3.1 Net-to-Gross Results

There were 28 responses received for the net-to-gross survey. The results from these surveys are presented in Table 6-4.

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Table 6-4: Net-to-Gross Survey Results

<table>
<thead>
<tr>
<th>NTG Assignment</th>
<th>Sample size</th>
<th>Savings Weighted FR*</th>
<th>Energy SO*</th>
<th>Demand SO*</th>
<th>Energy Savings Weighted NTG **%</th>
<th>Demand Savings Weighted NTG* %</th>
<th>Energy Relative Precision at 90% Confidence Level</th>
<th>Demand Relative Precision at 90% Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Province-wide</td>
<td>28</td>
<td>16.8%</td>
<td>17.8%</td>
<td>37.5%</td>
<td>101.0%</td>
<td>120.7%</td>
<td>19.4%</td>
<td>32.4%</td>
</tr>
</tbody>
</table>

*Note: FR: Free-ridership; SO: Spillover; NTG: Net-to-Gross

6.3.2 Free Ridership

Respondents were asked when they learned about the incentives offered by Toronto Hydro’s PUMPsaver local program and what they would have done absent the program (Table 6-5). Most respondents (86%) stated they learned about the program before they started implementing their respective upgrades. Four percent (one respondent) said they became aware of the program incentives only after completing the project. Given the nature of the PUMPsaver local program, which involves an assessment of the customer’s site prior to the completion of the VFD installation, it does not seem possible that this customer would have only learned about the program after completing the project. It is possible that the respondent could have misunderstood the question or may not have had accurate recall. This question is not used to estimate free-ridership but is instead intended to provide additional context around participant decision-making.

Table 6-5: Awareness of Program Incentives (n=28)

<table>
<thead>
<tr>
<th>When did you first learn you could get energy efficiency incentives through Toronto Hydro’s PUMPsaver Local Program?</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before you started planning this upgrade</td>
<td>71%</td>
</tr>
<tr>
<td>After you started planning, but before you started implementing this upgrade</td>
<td>14%</td>
</tr>
<tr>
<td>After you completed this project</td>
<td>4%</td>
</tr>
<tr>
<td>Don’t know/ refused</td>
<td>11%</td>
</tr>
</tbody>
</table>

Respondents were also asked what they would have done had they not learned about the incentives (Table 6-6). Three-fifths of respondents (61%) noted that the program assisted them with upgrades that they would not have been able to implement on their own, or that they would have had to delay. About one-tenth of respondents (11%) said they would have had to scale back on the size of the upgrade by a small to moderate amount.

A few respondents (14%, or four respondents) said they would have done the exact same upgrade in the absence of the program. It is possible and may not be surprising that a few of the

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3 Does not sum up to the values in the table due to rounding.
respondents were knowledgeable about and may have had plans to install VFDs prior to participating in the program. From the impact evaluation, the team learned that most participants did not have a very good understanding of what the VFDs were or how VFDs save energy - they just knew the VFDs would save them energy. This suggests that most participants would not have been aware of the VFD measure prior to their experience with the program. However, there were some participants that had a working understanding of the technology. Further, there were even a few participants that were sophisticated enough to change the settings on the new VFDs from constant speed (as the program intended) to variable speed (not included in the program), to generate more savings than the program anticipated. This experience suggests that a few customers may have been knowledgeable enough about VFDs prior to their experience with the program to have potentially been considering or even planning an upgrade like this on their own; this, however, is unlikely for most of the participants.

Table 6-6: Actions in Absence of Program Incentives (n=28)

<table>
<thead>
<tr>
<th>Action Description</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put off doing the upgrade for a least one year</td>
<td>32%</td>
</tr>
<tr>
<td>Cancelled the upgrade altogether</td>
<td>29%</td>
</tr>
<tr>
<td>Done the upgrade, but scaled back the size or extent of the upgrade.</td>
<td>11%</td>
</tr>
<tr>
<td>Done the exact same upgrade anyway</td>
<td>14%</td>
</tr>
<tr>
<td>Don’t know/refused</td>
<td>14%</td>
</tr>
</tbody>
</table>

The evaluation team asked respondents how much of a role program-related factors played in their decision to do the upgrades. They rated these factors using a scale of 1 to 5, where 1 means “played no role” and 5 means “played a great role.” Over four-fifths of respondents (86%) indicated that the availability of the program incentive played an important role (4 or 5 rating) in their decision to do the energy efficient upgrades. In addition, respondents indicated previous program experience (79%); information or recommendations from a Toronto Hydro representative (75%); and information or recommendations from auditors, contractors, vendors, or suppliers (71%) also played important roles (4 or 5 rating). Audits, technical studies, and marketing materials from Toronto Hydro played less of a role in decision-making (Figure 6-4).
6.3.3 Spillover

The evaluation team determined that there are participant spillover savings that can be attributed to the PUMPsafer local program. To identify spillover savings, respondents where first asked whether they installed additional equipment without an incentive after participating in the program. Five respondents made these types of additional upgrades, and with some respondents installing more than one equipment type. Four respondents made additional lighting upgrades without program assistance, one respondent made a motor/pump upgrade, and another respondent made a motor/pump drive improvement.

To identify which of these upgrades could be counted towards spillover savings, the survey asked respondents to rate how much influence their participation in the PUMPsafer local program had on their decision to make the additional upgrades. They responded using a scale of 1 to 5, where 1 means “no influence at all” and 5 means “great influence.” Spillover measures are those with program influence ratings of 3 or higher. Three respondents who installed a total of three lighting improvements and one motor/pump drive improvement said their experience with the program was influential on their installation decisions (Table 6-7). In summary, the program influenced three respondents to install two different types of spillover upgrades (lighting and a motor/pump drive improvement).
### Table 6-7: Actions in Absence of Program Incentives (n=5)

<table>
<thead>
<tr>
<th>What type of energy efficient improvements, products, or equipment did you install?</th>
<th>Upgrades Installed without Program</th>
<th>Program participation influence on upgrade decision (Rating of 3, 4, or 5 on a scale of 1 to 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Motor/Pump Upgrade</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Motor/Pump Drive Improvement (VSD and Sync Belt)</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

## 6.4 Cost Effectiveness

The evaluation team conducted a cost effectiveness analysis for PUMPsafer local program. This analysis was completed in accordance with the IESO requirements as set forth in the IESO *CDM Cost Effectiveness Test Guide* and using IESO’s *CDM Energy Efficiency Cost Effectiveness Tool*. The energy and demand savings results from the impact evaluation were inputs into the IESO *Cost Effectiveness Tool* as well as budget information supplied from IESO.

Cost effectiveness results are presented in Table 6-8. The program passed the Total Resource Cost (TRC) and Program Administrator Cost (PAC) test with both benefits exceeding their respective costs. The 2016 PUMPsafer Local program’s TRC and PAC ratios were found to be 3.02 and 2.63, respectively, which were lower than those found for the 2017 program year. A primary driver of a higher cost effectiveness in 2017 was a higher average net verified savings per motor. In 2016, average savings per upgraded motor were 39,297 kWh and 3.68 kW while in 2017, average savings per upgraded motor were 52,634 kWh and 5.58 kW, representing a 35% and 52% increase in savings per motor for kWh and kW, respectively. Achieving greater savings per motor allows for fixed program costs to have less of an impact on the costs side of the cost effectiveness ratios.

Similarly, the program’s administrative costs per upgraded motor dropped significantly between 2016 and 2017. In 2016, the program’s administration costs were $5,267 per upgraded motor while in 2017, the program’s administration costs were $1,364, indicating the program is realizing economies of scale as it grew between program years.
Table 6-8: Cost Effectiveness Results

<table>
<thead>
<tr>
<th>Cost Effectiveness Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Resource Cost (TRC)</td>
<td></td>
</tr>
<tr>
<td>TRC Costs ($)</td>
<td>1,008,998</td>
</tr>
<tr>
<td>TRC Benefits ($)</td>
<td>13,769,856</td>
</tr>
<tr>
<td>TRC Net Benefits ($)</td>
<td>12,760,858</td>
</tr>
<tr>
<td>TRC Net Benefit (Ratio)</td>
<td>13.65</td>
</tr>
<tr>
<td>Program Administrator Cost (PAC)</td>
<td></td>
</tr>
<tr>
<td>PAC Costs ($)</td>
<td>2,237,656</td>
</tr>
<tr>
<td>PAC Benefits ($)</td>
<td>11,973,788</td>
</tr>
<tr>
<td>PAC Net Benefits ($)</td>
<td>9,736,132</td>
</tr>
<tr>
<td>PAC Net Benefit (Ratio)</td>
<td>5.35</td>
</tr>
<tr>
<td>Levelized Unit Energy Cost (LUEC)</td>
<td></td>
</tr>
<tr>
<td>$/kWh</td>
<td>0.01</td>
</tr>
<tr>
<td>$/kW</td>
<td>109.05</td>
</tr>
</tbody>
</table>

A key contributor to the high cost effectiveness ratios was the program’s focus on only larger measures of 7.5 HP or greater. With certain costs being fixed, regardless of project size, larger projects with expected year round savings (i.e. pumps that serve both heating and cooling systems) provide relatively more savings and thus improve cost effectiveness. If there is a sufficiently large enough market to continue focusing on larger motor upgrades while still meeting other program goals (e.g. kW or kWh savings), then it is recommended to stay focused on larger motors to help maintain a strong cost effectiveness. Similarly, it is recommended that the program continue to pursue pumps with high run hours, with additional consideration for pumps in non-HVAC applications such as those used in service of industrial processes.

Another contributor to the high cost effectiveness is the program’s single VFD measure, which has an estimated effective useful life of 15 years. The longevity of this measure’s expected life contributes significantly to the benefits side of cost effectiveness ratios (i.e. more years of measure life yields more savings over time) while still incurring the same cost of implementation. For example, if the estimated VFD effective useful life were reduced to 10 years, the program’s TRC ratio becomes 9.85, or a 28% decrease in the TRC ratio.
7 Process Evaluation Results

The sections below provide the process evaluation results.

7.1 Program Staff and Installation Trade Partner Perspective

The evaluation team interviewed the Toronto Hydro program staff responsible for the local program and one installation trade partner to better understand how the program was administered in 2017 and to attain program staff and the trade partner’s perspectives regarding design and implementation. Feedback from the interviews is summarized below.

7.1.1 Program Delivery Changes

The evaluation team asked program staff whether there had been any changes made to the way the program was delivered in 2017 compared to 2016. The program staff indicated that when the transition was made to a local program from a pilot, they closely evaluated whether the local program was cost-effective and whether it met the program rules.

As indicated in Section 3 - PUMPsaver Local Program Description, in 2017, Toronto Hydro began to deliver the program on behalf of Oakville Hydro as well. The evaluation team asked whether there were any program delivery changes that were a result of the program being expanded to include Oakville Hydro customers as well. Program staff indicated that there was no significant delivery differences and noted that the same program delivery partner provided services for both LDCs.

Program staff indicated they expanded to some additional motor types with horse powers that range both above and below the initial motors that were covered by the 2016 program. They made this change because they found they were cost-effective as well.

Finally, they indicated they continue to market the program typically through direct outreach to customers, and indicated that they have developed materials, such as sell sheets, to more easily market the program.

7.1.2 Barriers to Implementation

The program staff discussed some of the barriers to implementation of the local program. The main barriers are identified below:

- Program staff reported that the program delivery for Oakville Hydro was smooth overall but noted the building sector in the Oakville Hydro territory presents some limitations since there are not many condominiums, which are an important building sector for this particular program.
Program staff indicated they invited approximately 12 vendors to participate in the program through a competitive bid process. They said that some vendors who were not selected to participate were disappointed, and in some instances, these vendors passed on misinformation to potential program participants about the VFD technology used in the program. Program staff worked to address this issue by meeting with customers and presenting them with statistics on negligible VFD failures. They believe this addressed the customers’ concerns. During the procurement stage, they also extended the warranty from 18 to 24 months for both material and labor.

Program staff noted that some property managers would not allow their contractors onsite because they had their own preferred contractors. In these instances, program staff said they would speak with the customers and point out that the program’s vendors would likely be a less expensive and provide a more seamless option.

Another issue, though less common, was that some participants preferred to have the work performed on weekends. However, this conflicted with the original agreement between the program and the vendors regarding work being performed during business hours. If a customer insisted on a weekend installation, the customer was responsible for the difference in installation cost.

One customer insisted that a bypass switch be installed in case of VFD failure. Given that there is typically a back-up VFD installed, the program did not consider bypass switches a necessity. If a customer insisted on the bypass installation, it was an extra cost to the customer. Similarly, the program had a requirement that disconnect switches be installed, a requirement to do the electrical work, however if a customer preferred disconnect switches be installed in the same room, it was at their cost.

Program staff indicated that the participation agreement was a challenge for some customers. Their strategy to overcome this issue was to follow up with customers regularly about what support, if any, they could provide them in completing the agreement. They noted that condominium boards were particularly challenging to work with because they typically only meet during certain times per year.

The installation trade partner feels the main barrier to implementation is sourced from some mechanical service providers that service the buildings. A very small portion of these may have the sentiment that their client relationship is in jeopardy due to the program service provider coming in and “taking over” their role. The service provider feels that when this fear is adequately addressed and negated the program has every opportunity for success.
7.1.3 Success of the Program to Date and Improvements

The evaluation team asked program staff for their perspectives on the success of the local program to date. The program staff reported that they thought both the pilot and the local program have been very successful.

Program staff indicated that the installers were very diligent and met the requirements as contracted, noting that “They were very keen on delivering the program as agreed, and have done a tremendous job, even with the adversity they have faced from some of the customers.”

The program staff also indicated that the program’s savings were higher than originally anticipated and the savings target achieved was three times greater than what they initially estimated they would achieve. They also noted that installation times are typically quick and efficient with no down-time for any of the participating facilities, noting that they refined this process as they went along.

There were no open-ended constructive comments offered from the trade partner on how the program could be improved. The trade partner mentioned that VFDs and associated auxiliary equipment have a reputation for being expensive to install, and when customers realize the cost benefit of this program they understand the cost/benefit is good and choose to participate.

The trade partner was asked if there are additional pump systems they would recommend to be included in the PUMPsaver local program. The trade partner feels many of these variable flow applications are already incentivized under existing Save on Energy programs, and the specific constant speed constant flow pumps covered by the PUMPsaver local program are effectively addressing the specific need the program was setup to serve.

7.2 Participant Perspectives

The evaluation completed 28 web-based surveys with PUMPsaver participants to better understand participant perspectives related to program delivery. A summary of the feedback gathered from these survey responses is presented below.

7.2.1 Firmographics

Respondents were asked about their position in the company. Given titles are summarized below in Figure 7-1.
7.2.2 Program Outreach and Marketing
To assess how awareness of the PUMPsaver local program occurs, respondents were asked how they first heard about the program. The majority of participants heard about the program directly from Toronto Hydro (53%), and 25% of respondents heard about the program from their property or energy management company. Additional sources of awareness include: the IESO, a colleague or competitor, or an in-house Energy Advisor. This second year of the local program delivery indicates participants heard about the program from multiple sources, which is in contrast to the first year where all the participants heard about the program via a representative from Toronto Hydro. As programs mature it is typical to see awareness occurring from an increasing variety of sources. This change in the sources of awareness shows that word is getting out about the program via the mechanisms summarized in Figure 7-2.

When becoming aware of the program via a utility representative, contact was initiated both by the utility and by the participant. The fifteen respondents that had heard of the program from a representative from their utility were asked if the utility initiated the conversation or if the participant did, with the majority (73%) of PUMPsaver local program participants being contacted directly by the utility. Specific answers are summarized in Table 7-1 below.
These participant awareness results in general align with the trade partner perspective. The trade partner stated on average Toronto Hydro likely sourced about 70-75% of the installed projects via their contact with customers, with the remainder coming from existing relationships and outreach on the part of the trade partner.

We also asked participants their awareness of other Business Save on Energy programs offered through Toronto Hydro. Awareness of the Retrofit Program is strongest at 20% followed by the Small Business Lighting program (19%), Audit funding (13%), and the Existing Building Commissioning Program (12%). Complete responses are summarized below in Figure 7-3.
7.2.3 Participant Motives and Decision Making

The survey assessed motivational factors for participating in the program. Five respondents (18%) stated they had a corporate policy related to energy efficiency or sustainability. None of these five reported having specific targets or time periods in which to meet the sustainability or energy efficiency requirements (Table 7-2).

Table 7-2: Sustainability or energy Efficiency Policy

<table>
<thead>
<tr>
<th>Response Category</th>
<th>Count</th>
<th>Percent of Valid Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official Policy requiring demonstrated energy savings</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Official Policy encouraging energy savings</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>An unofficial commitment to energy efficient or sustainable practices</td>
<td>1</td>
<td>4%</td>
</tr>
</tbody>
</table>

The survey asked participants to rate their agreement with listed motivational factors to participate in the program that may not be directly related to the program. For each factor participants indicated how much of a role it played in their decision to implement the upgrade on a five-point scale where 1 indicates “no role at all” and 5 indicates a “great role”. Similar to 2016 evaluation, the main factor that participants note a “great role” is: “to save energy or lower energy bills”. Adherence to a sustainability or energy efficiency policy was the second highest ranked motivational factor in 2017, while in 2016 this was the third most ranked reason. Ease of participation was 2nd in 2016 yet is ranked 4th in 2017. All rankings are summarized in below Figure 7-4.
Saving energy and lowering energy is the primary reason participants participate in this program. Survey responses also indicate participating organizations have a strong sense that their corporate culture supports decisions on energy saving or sustainability-related activities, even without a formal written policy in place.

Participants were also asked how they made their selection of the equipment that was installed or upgraded through the program. The installer is a clear influencer on the selection of equipment installed with 68% mentioning them as being a prime influencer. An additional 21% of respondents stated that they did some research on the equipment and made their own choice, and the remaining 7% were not aware of how the specific equipment was selected.

### 7.2.4 Participant Barriers
The evaluation team also sought to assess common barriers and participant perspectives related to the relevancy of these barriers. In general, participants reported low relevancy with listed barriers, as shown below in Figure 7-5. However, some respondents were concerned that the benefits of energy efficient equipment upgrades were not cost effective, while others reported that they could not afford further upgrades at their facility.

**Figure 7-4 Motives for Participating in the Program**

<table>
<thead>
<tr>
<th>Motive</th>
<th>1 - Played no role</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - Played a great role</th>
</tr>
</thead>
<tbody>
<tr>
<td>To save energy or lower energy bills (n=28)</td>
<td>18%</td>
<td>4%</td>
<td>79%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To adhere to a sustainability or energy efficiency policy at your organization (n=3)</td>
<td>33%</td>
<td>67%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To be associated with “green” or “sustainable” actions (n=26)</td>
<td>31%</td>
<td>56%</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Because it seemed easy to participate (n=27)</td>
<td>7%</td>
<td>41%</td>
<td>52%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To increase comfort and/or productivity (n=25)</td>
<td>12%</td>
<td>4%</td>
<td>16%</td>
<td>28%</td>
<td>40%</td>
</tr>
<tr>
<td>Because you knew that any equipment or service Toronto Hydro would incentivize must be reliable (n=27)</td>
<td>11%</td>
<td>15%</td>
<td>37%</td>
<td>37%</td>
<td></td>
</tr>
</tbody>
</table>
7.2.5 Participant Satisfaction

Participants were asked a variety of questions to assess their satisfaction with the program and perspectives on applicable program factors.

When asked their agreement with statements of the program, the majority of participants agreed that program materials were sufficient, clear, and the feasibility assessment went smoothly (as shown below in Figure 7-6).

Figure 7-5: Barriers to Future Participation

The benefits from the energy savings do not outweigh the cost of the upgrades (n=24)
- 29%: 1, 21%: 2, 25%: 3, 13%: 4, 13%: 5

I can’t afford to make any further upgrades at my facility (n=24)
- 42%: 1, 21%: 2, 29%: 3, 8%: 5

The electric bill is not a concern to my business (n=25)
- 60%: 1, 12%: 2, 4%: 3, 20%: 4

I don’t know where I can get the help I need (n=24)
- 42%: 1, 25%: 2, 21%: 3, 13%: 4

I don’t have time to research equipment upgrades for my company (n=23)
- 48%: 1, 26%: 2, 13%: 3, 4%: 4, 9%: 5

My equipment is leased (n=25)
- 96%: 1, 4%: 5

Figure 7-6: Participant Satisfaction

The program feasibility assessment went smoothly.
- 44%: 1, 56%: 5

Program materials provided to you by Toronto Hydro were sufficient.
- 4%: 1, 44%: 2, 48%: 5

Program materials provided to you by Toronto Hydro were clear.
- 11%: 1, 44%: 2, 44%: 5
Satisfaction with program related factors was assessed by asking participants to rank given factors on a 5-point scale, where 1 indicates “not at all satisfied” and 5 indicates “completely satisfied”. As shown below in Figure 7-7, responses indicate high satisfaction (4 or 5 rating) with given program aspects. Notably, all 27 respondents were satisfied (30%) or very satisfied (70%) with the program overall.

**Figure 7-7: PUMPsaver Participant Satisfaction**

<table>
<thead>
<tr>
<th>Factor</th>
<th>1 - not at all satisfied</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 - completely satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>The interactions you had with representatives from Toronto Hydro (n=24)</td>
<td>4%</td>
<td>25%</td>
<td></td>
<td>71%</td>
<td></td>
</tr>
<tr>
<td>The program overall (n=27)</td>
<td>30%</td>
<td>70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The interactions you had with the professional that conducted the water auditing and balancing (n=20)</td>
<td>30%</td>
<td>70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The quality of work done by the contractor who conducted the water balancing and auditing (n=24)</td>
<td>33%</td>
<td>67%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The energy savings achieved from the efficiency improvements made (n=24)</td>
<td>17%</td>
<td>21%</td>
<td>63%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The content and presentation of the on-site assessment or any other technical study related to the program (n=25)</td>
<td>16%</td>
<td>24%</td>
<td>60%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As an additional confirmation of high program satisfaction rates, 71% of participants reported being “extremely likely” to recommend the program to others, with a remaining 25% being “very likely” to recommend the program to others.

**7.2.6 Suggestions for Program Improvement**

Participants were asked if there are additional pump systems they would recommend to be included in the PUMPsaver local program. The following systems were mentioned:

- Booster Pumps (5 mentions)
- Domestic Water Pumps (5 mentions)
- Circulating Pumps (1 mention)
- Cooling Tower Motors (1 mention)
There were several comments verifying the high satisfaction results achieved, with one open-ended participant response stating that the only barrier to involvement among those that have not participated must be a lack of awareness. There were no open-ended constructive comments offered from participants.
8 Key Observations and Recommendations

8.1 Impact Evaluation

Listed below are the key observations and recommendations from the 2017 impact evaluation. While some of these findings were previously noted in the 2016 program year report, these findings are considered important enough to warrant inclusion once again:

- The program’s project qualification criteria and market targeting are key contributors to the program’s savings and cost effectiveness.

- Motor size minimum. Requiring motors of at least 7.5 horsepower ensures higher levels of savings per motor and when looking at fixed costs associated with implementing the program, the larger motor measures may contribute more savings per motor for the same fixed cost.

  **Recommendation:** If there is a sufficiently large enough market to continue focusing on larger motor upgrades while still meeting other program goals (e.g. kW or kWh savings), then it is recommended to stay focused on larger motors to help maintain a strong cost effectiveness.

- Targeted applications. The program specifically targeted pumps that were believed to be operating year-round serving HVAC systems, which typically run much or all of the year and will therefore produce higher levels of savings.

  **Recommendation:** It is recommended that the program continue to pursue pumps with high run hours but also consider pumps in non-HVAC applications such as those used in service of industrial processes.

- Some of the more sophisticated participants used the program-provided VFDs in a variable speed capacity, dialing back the run speeds during low use periods (e.g. overnight, seasonally, or based on meeting a setpoint), leading to savings above and beyond the program’s expected savings based on a fixed-speed installation.

  **Recommendation:** While the evaluation team understands and appreciates the streamlined nature of the program only offering fixed speed VFD upgrades, the LDCs may wish to consider offering participants the option to control the new VFDs on a variable basis, as applicable, as an “add-on” to their existing fixed-speed VFD measure program offering.
The primary building type focus of the program, multifamily, appears to have the smallest energy and peak demand savings per project.

**Recommendation:** Consider targeting certain building types with larger projects on average. The 2017 program year data indicated manufacturing and industrial building types had relatively high energy and peak demand savings per project.

The net-to-gross findings from the 2017 program impact evaluation are as follows:

- Participant feedback indicates relatively low free-ridership (16.8%), as responses show that the program helped customers complete projects they would have had to cancel, delay, or reduce in size or scope. Room for improvement may exists in terms of identifying customers most in need of program support, as a few respondents (14%) said they would have done the exact same upgrade in the absence of the program.

  **Recommendation:** Even though the free-ridership results were mostly positive, it will continue to be important for the program to target customers who would not make upgrades without the support of the program and for program vendors to more readily identify worthwhile projects.

### 8.2 Process Evaluation

The findings and recommendation from the 2017 local program process evaluation include:

- Program staff indicated that the program-selected vendors were very diligent and met the requirements as contracted. To help alleviate concerns of customers who were contacted by misinformed vendors, the program presented these customers with statistics about the VFD equipment. Additionally, some participating customers insisted on bypass switch installations despite the fact that the program considers them redundant and others preferred their disconnect switches to be installed in locations other than those suggested by the program. The program found ways to meet the needs of these customers, though at their own cost.

  **Recommendation:** Ensure that all marketing materials, program applications, program delivery partner and vendor talking points clearly address topics related to VFD savings opportunities, installation and system requirements, and failure/longevity rates.

- The program staff indicated that the program’s savings achieved are higher than originally anticipated and the savings target achieved was three times greater than what they initially estimated they would achieve. They also noted that installation times are typically quick and efficient with no down-time for any of the participating facilities, noting that they refined this process as they went along.
**Recommendation:** Consider expanding on the existing case studies or develop short videos that highlight the success of the program to date with a focus on savings opportunities and ease of installation.

- The majority of participants heard about the program directly from Toronto Hydro (53%), though others heard about the program from their property or energy management company, the IESO, a colleague or competitor, or an in-house Energy Advisor. This second year of the local program delivery indicates participants heard about the program from multiple sources, which is in contrast to the first year where all the participants heard about the program via a representative from Toronto Hydro. As programs mature it is typical to see awareness occurring from an increasing variety of sources. This change in the sources of awareness shows that word is getting out about the program. Program staff indicated that condominium associations can be particularly challenging to sign on as program participants given that they do not meet frequently throughout the year.

**Recommendation:** Continue to find new avenues in which to market and promote the program to key customer demographics, perhaps through more direct engagement with condominium associations.

- Saving energy and lowering energy was the primary reason that participants reported for participating in this program. Survey responses also indicate participating organizations have a strong sense that their corporate culture supports decisions on energy saving or sustainability-related activities, even without a formal written policy in place.

**Recommendation:** Ensure that all marketing materials and vendor and program delivery partner talking points highlight the fact that program-sponsored energy efficiency improvements can help businesses meet their energy or sustainability-related policies and goals.
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