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Impact and Process Evaluation of the 2015 Illinois Power Agency Small Business Direct Install Program

Final

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Opinion Dynamics

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1. Executive Summary

This report presents results from the first year of the Small Business Direct Install (SBDI) Program implemented by Franklin Energy, which is one of seven stand-alone Illinois Power Agency (IPA) energy efficiency programs implemented from June 2015 to May 2016 (also referred to as Program Year 8 [PY8]). While previously offered by another implementer, Leidos, Ameren Illinois Company (AIC) small business customers have been able to take advantage of an SBDI program offering since June 2013.

The SBDI Program is designed specifically to overcome barriers unique to small business customers including the lack of access to capital, time required to investigate energy saving opportunities, and the split incentive challenge faced by leased properties. The program provides small businesses (DS-2 electrical accounts) with a free energy assessment, free directly installed energy-saving products,[1] a Customer Recommendation Report detailing additional energy-saving opportunities, and discounted pricing for qualified interior and exterior lighting, as well as exterior motor improvements. AIC customers involved in this program typically receive an assessment, as well as free direct install measures and/or additional incentivized measures. However, some AIC customers, referred to as assessment-only participants, receive an assessment but opt not to install any measures, free or incentivized.

The PY8 evaluation of the SBDI Program involved both impact and process assessments. To support the process evaluation, the evaluation team conducted a review of program materials and program-tracking data, interviews with program implementation staff, interviews with Small Business Program Allies (SBPAs), and application review and SBDI participant site visits to inform gross impacts. Our research efforts also included a telephone survey with SBDI participants to explore process-related issues and attribution.

Below we present the key findings from the PY8 evaluation.

Program Impacts

Overall, 649 eligible customers completed 671 projects through the SBDI Program in PY8. Table 1 summarizes the gross and net energy and demand savings from the PY8 SBDI Program. The program exceeded its goal of 9,933 MWh and also achieved high gross realization rates.

[1] Free direct install measures include: CFLs, faucet aerators, pre-rinse sprayers, and vending machine and cooler controls.

Table 1. PY8 Gross and Net SBDI Program Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	11,445	110%	12,586	0.89	11,202
Demand Savings (MW)					
Total MW	2.36	112%	2.65	0.89	2.36

Key Findings and Recommendations

Overall, the Franklin Energy SBDI Program had a strong first year of implementation. The implementer exceeded their energy savings goals for the program and participating customers and program allies generally report high levels of satisfaction. While there were some frustrations around the re-application process, the fact that returning SBPAs generally expressed positive feedback about the program also suggests that Franklin Energy handled the transition between implementers well.

As the program continues to mature and as AIC determines future program offerings for this customer segment, it is important to keep in mind potential challenges to implementation. Along these lines, all of the SBPAs with whom we spoke mentioned rising measure costs as the most significant barrier to customer participation beyond the direct installation of free measures. Further, some SBPAs have already seen customers hesitant to participate due to the associated costs. Additionally, many SBPAs commented on the challenges associated with the established measure caps[2] and noted that funding for high-demand measures often ran out too early. Both of these design elements warrant ongoing review and consideration by the implementer.

Based on the results of the PY8 SBDI evaluation, the evaluation team offers the following key findings and recommendations for the program moving forward:

- **Key Finding #1**: The need for multiple points of communication and contact between SBPAs and participating customers—from energy assessment through measure installation—appears to be burdensome for SBPAs and could lead to customer dissatisfaction. In particular, SBPAs are dissatisfied to varying degrees with the Excel-based workbook assessment method due to the fact that the they have to make multiple trips back to a customer in order to fill out paperwork and get documents signed.
  - **Recommendation:** Franklin Energy should explore whether changes can be made to the Excel-based assessment tool to reduce the amount of back and forth between SBPAs and participating customers. For example, Franklin Energy should consider modifying the Excel-based workbook to allow for the assessment report to be generated and delivered to the customer more rapidly, ideally allowing the SBPAs to deliver the report to customers immediately after an assessment.
- **Key Finding #2**: The program does not currently track the data necessary to calculate conversion rates (i.e., the percentage of customers who receive an energy assessment and go on to install equipment

[2] AIC set incentive budgets or caps that established the maximum amount of total incentives paid for a given measure during a given program year. Franklin Energy then managed the program to these measure caps.

whether free or incented). While not critical, this data can serve as a valuable metric for program delivery as low conversion rates may indicate customer dissatisfaction with program offerings, delivery of services, or a lack of demand.

  - **Recommendation**: Franklin Energy should work with SBPAs to develop a protocol for tracking assessment-only and assessment and installation projects so that the program can determine program conversion rates. This information can help program staff track the program's success in moving customers towards measure installation and energy savings. By looking at this information by region or by SBPA, the implementer can also determine where they may need to focus training or Energy Advisor involvement.

- **Key Finding #3**: The evaluation team determined that discrepancies between ex ante and ex post savings values were partially due to different assumptions such as hours of use, coincidence factors, lighting wattages, in-service rates, aerator flow rates, vending machine type, and misapplication of variables from the Illinois Statewide Technical Reference Manual Version 4.0 (IL-TRM V4.0).

  - **Recommendation:** In order to minimize discrepancies between ex ante gross and ex post gross savings estimates for future program measures, the team recommends the use of primary data collected by the implementer for such things as actual installed wattage, whether space cooling is present in the facility, heating fuel types, building type, vending machine type, etc., so that variables within the algorithms are more reflective of the installed measures instead of assumed averages based on general assumptions. If primary data is unavailable, we recommend applying the assumptions provided in the IL-TRM V4.0.

2. Evaluation Approach

The PY8 evaluation of the SBDI Program involved both process and impact assessments. To support the process evaluation, we conducted a review of program materials and program-tracking data, interviews with program implementation staff, interviews with SBPAs, and a participant survey. To evaluate gross impacts, the evaluation team utilized PY8 program tracking data, the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0 (IL-TRM V4.0) and SAG-approved NTGRs. In addition, based on the participant survey, we developed estimates of free-ridership and participant spillover for the SBDI Program for prospective application in PY10.

2.1 Research Objectives

The evaluation team sought to answer the following research questions as part of the PY8 SBDI evaluation:

Impact Questions

1. What were the estimated gross electric energy and demand impacts from this program?
2. What were the estimated net electric energy and demand impacts from this program?
3. What is the level of participant free-ridership and spillover for the program?

Process Questions

4. Program Design and Implementation
    a. What changes, if any, were made to the program's design and implementation between PY7 and PY8? What was the rationale for these changes?
    b. What effect did program changes made between PY7 and PY8 have on program performance?
        i. How did the shift from "packages" of measures offered during PY7 to the a la carte individual measure offerings during PY8 impact participation in the program?
        ii. How did the shift from utilizing seven Energy Advisors, each responsible for a different geographic territory in PY7, to utilizing two Energy Advisors, responsible for the entire AIC service territory in PY8, impact participation rates in the program across the various regions within the AIC service territory?
    c. Was the program implemented according to plan? If not, what changes were made and why?
    d. What implementation challenges occurred in PY8, and what was done to address them?
    e. What program marketing and outreach strategies did the program implement in PY8? What is the format of the outreach? How often does outreach occur? Are the messages clear and actionable?
    f. What is the role of SBPAs and are they fulfilling it? Has the role of SBPAs changed since PY7? If so, what effect did the change in the SBPA role since PY7 have on program implementation and participation?

5. Program Participation
   a. How many customers and SBPAs participated in the program in PY8? Did participation meet expectations? If not, why not?
   b. What percentage of customers who receive an assessment go on to install program measures? What are the characteristics of assessment-only customers and full participants?
   c. What barriers exist to installing measures recommended through the assessment process? What changes, if any, could the program make to overcome these barriers?
6. Program Processes
   a. Are customers and SBPAs satisfied with the program processes in which they were involved?
   b. What do SBPAs feel are the barriers and benefits to participation?
   c. What quality assurance and quality control processes does the program have in place? Are they sufficient to ensure high quality projects?
   d. What are the impacts to customers, trade allies, AIC, and energy efficiency measure implementation and savings of having multiple small business energy efficiency program vendors operating in the AIC service territory?

2.2 Evaluation Tasks

Table 2 summarizes the PY8 process and impact evaluation activities conducted for the SBDI Program. Each activity is summarized in detail below.

Table 2. SBDI PY8 Evaluation Activities

Activity	PY8 Process	PY8 Impact	Forward Looking	Details
Program Staff Interviews	✓			Provided insight into program design and processes
Review of Program Materials and Data	✓	✓		Reviewed all program materials and tracking data to document the design and implementation of the PY7 program
SBPA Interviews	✓			Provided insight into program implementation and processes
SBDI Participant Survey	✓		✓	Gathered data on the participation experience, as well as on participant decision making (NTGR)
Participation Analysis	✓			Analyzed overall participation trends
Application Review		✓		Ensured program-tracking database was accurately capturing information
Verification Onsite Visits		✓		Confirmed installation of measures installed through the program
Impact Analysis		✓		Calculated gross and net impacts for the program

2.2.1 Program Staff Interviews

We conducted interviews with AIC program staff and Franklin Energy implementation team staff to understand the SBDI Program's design and implementation and to discuss evaluation priorities. In total, we completed two interviews, one with the AIC program manager and one with the Franklin Energy program manager.

2.2.2 Review of Program Materials and Data

We conducted a comprehensive review of all program materials and tracking data to document the program's PY8 activities and describe any key changes in program implementation from PY7 to PY8. In particular, we reviewed program marketing and implementation plans, as well as extracts from the program-tracking database.

2.2.3 Small Business Program Ally Interviews

The evaluation team conducted SBPA interviews in PY8 to gain their perspective on the program ally application process, their role in providing turnkey services, how jobs are delegated, new program processes, satisfaction with the program, and any ongoing barriers to AIC customer participation in the program.

Using a census approach, we attempted to contact all 38 SBPAs with the goal of completing 20 interviews consisting of a mix of new and returning SBPAs, as well as different productivity levels (i.e., the number of completed projects). As shown in Table 2, we completed 12 interviews,

Table 3. Completed SBPA In-Depth Interviews

SBPA Productivity Tier by Projects	SBPA Population		Completed Interviews	
	Repeat SBPAs (N)	New SBPAs (N)	Repeat SBPAs (n)	New SBPAs (n)
Top Third	3	0	2	0
Middle Third	5	0	2	0
Bottom Third	24	6	7	1
Total	**32**	**6**	**11**	**1**

Survey Disposition and Response Rate

We interviewed SBPAs during the month of September 2016. Table 4 provides the survey dispositions.

Table 4. SBPA In-Depth Interview Dispositions

Category Key	Disposition	Total Allies
I	Complete Interview	12
N	Eligible Incomplete Interview	0
X1	Survey-Ineligible Business[a]	2
U1	Business with Undetermined Eligibility	21
X2	Not a Business	2
U2	Undetermined if Business	1
e1	Estimated proportion of cases of unknown survey eligibility that are eligible	86%

Category Key	Disposition	Total Allies
e2	Estimated proportion of cases of unknown household/business eligibility that are eligible	95%
	Total Participants in Sample	**38**

[a] Two SBPAs in our sample frame stated that they did not participate in the SBDI Program in PY8.

Table 5 provides the response and cooperation rates. Appendix D provides information on the methodology used to calculate response rates for telephone surveys.

Table 5. SBPA In-Depth Interview Response and Cooperation Rates

AAPOR Rate	Total Allies
Response Rate	39%
Cooperation Rate	92%

2.2.4 SBDI Participant Survey

We fielded a telephone survey with SBDI Program participants and a small number of assessment-only participants (those who received an assessment and no measures) to gather information on program processes and satisfaction, as well as to develop an updated NTGR for prospective application. Overall, we completed surveys with 77 full participants and nine assessment-only participants.

Sample Design

We developed the sample frame based on the final participant database provided on June 22, 2016. The data extract included 671 unique SBDI projects. We dropped projects without a valid phone number, removed duplicate contact names, and combined multiple projects at the same address, resulting in 577 unique contacts in our sample frame (522 contacts completing installation projects and 55 contacts completing assessment-only projects).

We completed a telephone survey with a random sample of 77 decision makers associated with the 552 SBDI projects and attempted a census with assessment-only participants. Where the database contained multiple completed SBDI projects for a contact, we selected one project at random for the purposes of asking the detailed free-ridership questions. However, we also asked if the decision-making process was the same for the other projects. This follow-up question provided information for an additional six projects, resulting in 83 responses for the purpose of free-ridership calculations. In our final free-ridership calculations, we dropped a single respondent who was unable to provide responses to key free-ridership questions, for a total of 82 responses used in our calculations.

Table 6 summarizes key information about sampling for the SBDI survey and completed interviews.

Table 6. Summary of SBDI Survey Sampling and Completes

Project Type	Population[a]		Contacts in Sample Frame[b]	Completed Interviews
	Projects	Contacts		
Completed Project	671	649	522	77
Assessment-Only	87	86	55	9
Total	**758**	**735**	**577**	**86**

[a] The total number of projects listed reflects the population of paid projects as of May 15, 2014.

[b] The sample frame contains unique contacts and therefore one project per contact.

Survey Disposition and Response Rate

We fielded the survey with SBDI participants from August 25 through September 7, 2016. Table 7 provides the final survey dispositions.

Table 7. SBDI Participant Survey Disposition

Category Key	Disposition	Total
I	Complete Interview	86
N	Eligible Incomplete Interview	11
X1	Survey-Ineligible Business	1
X2	Not a Business	46
U2	Undetermined if Business	160
U1	Business with Undetermined Eligibility	273
e1	Estimated proportion of cases of unknown survey eligibility that are eligible	99%
e2	Estimated proportion of cases of unknown business eligibility that are eligible	89%
	Total Participants in Sample	**577**

Table 8 provides the response and cooperation rates. Appendix D provides information on the methodology used to calculate response rates for telephone surveys.

Table 8. SBDI Wave 2 Participant Survey Response and Cooperation Rates

AAPOR Rate	Percent
Response Rate	17%
Cooperation Rate	42%

2.2.5 Participation Analysis

The evaluation team analyzed the final PY8 SBDI Program database, focusing on overall participation levels. We analyzed the types of measures installed through the program, as well as the types of facilities that participated. The participation analysis also involved using ArcGIS to map the location of all program participants who completed a project to assess participation across the AIC service territory. However, the evaluation team was not able to develop a program conversion rate (i.e., the percentage of customers who receive an assessment that go on to install any recommended equipment) given the program's data tracking practices. In particular, although Franklin Energy had some data on assessment-only participants from their Energy Advisors, they do not require SBPAs to track assessment-only participants.

2.2.6 Impact Analysis

Gross Impact Analysis Approach

The Evaluation Team used the following process to determine ex post gross savings:

- **Application Review:** Performed a detailed application review of a random sample of 10 lighting projects including 549 measures. This included reviewing post-inspection records, application forms, and invoices while comparing the documentation with the reported values in the tracking database.
- **Onsite Visits:** Selected 10 additional (outside of the application review sample) lighting projects using a random sampling approach and performed site visits to assess measure installation. These projects included 716 measures.
- **Database Review:** Reviewed the SBDI database and applied algorithms and variable assumptions from the IL-TRM V4.0.[3] The team also used information obtained from the application review and onsite visits to adjust measure installation.

Application Review

The application review consisted of drawing a random sample of 10 lighting projects and comparing project documentation, such as applications, post-inspection records, and invoices with information contained within the program-tracking database. The evaluation team purposely chose to sample lighting projects, since savings from lighting measures account for 99% of the total program's savings. Results from the application review, in conjunction with results from onsite visits, are used to derive in-service rates for PY8.

Onsite Visits

The Evaluation Team randomly selected 10 additional lighting projects, aside from those randomly selected as part of the application review, in which to conduct onsite visits to verify installed measure quantities. Results from the onsite visits, in conjunction with results from application reviews, are used to derive in-service rates for PY8. The visits occurred in August 2016.

Net Impact Analysis Approach

The evaluation team applied the SAG-approved deemed net-to-gross ratios (NTGR) of 0.89 to ex post gross savings to obtain net savings for PY8.

Net-to-Gross Analysis

As part of the PY8 evaluation, the team also gathered data to support the development of an updated NTGR for prospective application for potential IPA programs approved by the Illinois Commerce Commission (ICC) in a docketed proceeding for implementation in PY10 (June 1, 2017 – May 31, 2018). The methodology and results are presented in Appendix B.

[3] State of Illinois Energy Efficiency Technical Reference Manual Version 4.0. Final. June 2015.

2.3 Sources and Mitigation of Error

Table 9 provides a summary of possible sources of error associated with research tasks conducted for the SBDI Program. We discuss each item in detail below.

Table 9. Possible Sources of Error

Research Task	Survey Errors		Non-Survey Errors
	Sampling Errors	Non-Sampling Errors	
Participant Survey	• Yes	• Non-Response • Measurement errors • Data processing errors • External validity	• N/A
Impact Analysis	• Yes (application review and site visits)	• Non-Response • Measurement errors • Data processing errors • External validity	• Analysis errors
NTG Analysis	• Yes (based on participant survey)	• Non-Response • Measurement errors • Data processing errors • External validity	• Analysis errors

The evaluation team took a number of steps to mitigate potential sources of error throughout the planning and implementation of the PY8 evaluation.

Survey Errors

- **Sampling Errors**
  - **Participant Survey**: The evaluation team designed the telephone survey sample of SBDI participants to achieve 90% confidence and ±10% relative precision for the NTGR. We surveyed 77 participating customers out of a population of 671. At the 90% confidence level, we achieved a precision of ±1.3% on the NTGR.[4] For those who only received an assessment and no measure installation, we performed a census of the 55 customers in the population and completed nine surveys. As a census, this effort does not require a confidence interval.
  - The evaluation team designed the application review and site visit samples to achieve 90% confidence and ±10% relative precision on the verification rate. Based on the execution of this approach, at the 90% confidence level, we achieved a precision of ±1.6% on the desk review and 9.2% on the site visits.

[4] Note that the actual precision of each survey question differed, depending on the variance and number of responses to each question.

- **Non-Sampling Errors**
  - **Measurement Errors**: We addressed both the validity and reliability of quantitative data through multiple strategies. First, we relied on the experience of the evaluation team to create questions that, at face value, appear to measure the idea or construct that they we intended to measure. We reviewed the questions to ensure that we did not ask double-barreled questions (i.e., questions that asked about two subjects but had only one response) or loaded questions (i.e., questions that were slanted one way or another). We also checked the overall logical flow of the questions so as not to confuse respondents, which would decrease reliability.

    Key members of the evaluation team, as well as AIC and ICC staff, had an opportunity to review all survey instruments. In addition, to determine if the wording of the questions was clear, we pretested each survey instrument and monitored the telephone interviews as they were being conducted, and we reviewed the pretest survey data. We also used the pretests to assess whether the length of the survey was reasonable.

  - **Non-Response:** Given that the response rates for the participant survey was 17%, there is the potential for non-response bias. However, we attempted to mitigate possible bias by contacting each contact in the sample at least five times, unless a hard refusal was received, and by calling at different times of the day as appropriate. In addition, the team used all available data at its disposal to assess whether evidence of non-response bias existed. In particular, we compared survey respondents to the population based on facility type and project savings. For both, we found that there was not a statistically significant difference between respondents and the population in terms of project savings.

    For the SBPA interviews, while the response rate is high at 39%, there is the potential for nonresponse bias. The team attempted to mitigate possible bias by calling on different days of the week, as well as at different times of the day. We also compared respondents based on their level of productivity in the program and saw slight differences between the population and respondents with SBPAs in the top third of productivity representing a larger percentage of respondents than the population (17% vs. 8% respectively).

  - **Data Processing Error:** The team addressed processing error through interviewer training, as well as quality checks of completed survey data. Opinion Dynamics interviewers went through rigorous training before they began interviewing. Interviewers received a general overview of the research goals and the intent of the survey instrument. Through survey monitoring, members of the evaluation team also provided guidance on proper coding of survey responses. In addition, we carried out continuous, random monitoring of all telephone interviews and validation of at least 10% of every interviewers' work.

  - **External Validity:** We addressed external validity (the ability to generalize any findings to the population of interest) through development of an appropriate research design. As noted above, for participating customers, we drew a random sample from the 671 projects and completed sufficient surveys to achieve 90% confidence and ±1.3% relative precision for the NTGR. We performed a census effort among the 55 assessment-only customers.

Non-Survey Errors

- **Analysis Errors**
  - **Database Review:** We applied the TRM calculations to the participant data in the tracking database to calculate ex post gross impacts. To minimize analysis error, the evaluation team had all calculations reviewed by a separate team member to verify that calculations were performed accurately.
  - **Application Review and Site Visits:** The team took a similar quality assurance approach to the database review when conducting the application review and site visits. To minimize analysis error, the evaluation team had all calculations reviewed by a separate team member to verify that calculations were performed accurately.
  - **NTGR Analysis:** To minimize analysis error, the evaluation team had all the algorithms and calculations reviewed by a separate team member to verify that calculations were performed accurately.

3. Detailed Evaluation Findings

Within this section of the report, we provide detailed findings related to program processes, the participant and SBPA experience, and program impacts.

3.1 Program Design and Implementation

The SBDI Program began as a pilot in PY5 and PY8 was its third full year of operation. The program was designed specifically to overcome barriers unique to small business customers including the lack of access to capital, time required to investigate energy saving opportunities, and the split incentive challenge faced by leased properties. The program provides small businesses (DS-2 electrical accounts) with a free energy assessment to identify direct install and additional electrical savings opportunities, free directly installed energy-saving products, a Customer Recommendation Report detailing additional energy-saving opportunities, and discounted pricing on these additional energy-saving measures (Table 10). Participants in the program receive an assessment, as well as free direct install measures, and/or additional incentivized measures whereas assessment-only participants do not receive any measures.

Table 10. PY8 SBDI Measure Offerings

Offering	Measures
Free Direct Install	High-efficiency faucet aerators
	High-efficiency pre-rinse spray valves
	CFLs
	Vending and cooling misers
Additional Electrical Savings Opportunities	T12 to T8 fluorescent retrofits
	LED screw-in or high-bay lighting retrofits
	Outdoor lighting retrofits
	Lighting controls
	EC motors

In PY8, Franklin Energy offered the additional, non-direct install measures individually at a set cost (i.e., a la carte), which differed from the PY7 program which offered set packages of measures at different price tiers. Program staff also noted that demand for the program was high and many customers largely pursued the incentivized measures as opposed to those offered for free (see a detailed review of installed measures in Section 3.3).

Franklin Energy assumed responsibility for implementing the SBDI program from Leidos in PY8. Franklin Energy relied on 38 registered Small Business Direct Install Program Allies (SBPAs) to act as the face of the program and guide participants through the participation process from start to finish. SBPA responsibilities included promoting the program to customers, checking program eligibility and submitting program paperwork on the participant's behalf, completing the energy assessment, providing the Customer Recommendation Report, installing free and incentivized recommended measures, and providing instant incentives. While in PY7 multiple SBPAs could work on the same project, with one performing the assessment and another completing work orders, in PY8 SBPAs were expected to perform both activities on a given project.

Most SBPAs who participated in PY8 had also participated in previous years and therefore had experience delivering the program. Despite this experience, SBPAs encountered a number of changes to the assessment tools and reporting formats they had used in PY7. In PY7, SBPAs performed assessments using an iPad with dedicated software that catalogued recommended measures, estimated savings, and submitted a rebate application. In PY8, SBPAs used a dedicated Excel template that performed the same functions except that SBPAs now fill out and submit the application form for processing separately rather than directly through a software platform. While the software platform used in PY7 automatically delivered Customer Recommendation Reports to participants via email, in PY8 SBPAs used the Excel template to generate a report that is delivered by email, mail, or fax, at the customer's request.

As in previous years, the implementer also utilized Small Business Energy Advisors (SBEAs) to manage and train SBPAs, ensure SBPA performance by inspecting select projects, and on some occasions, performing energy assessments in place of an SBPA. With regard to inspection, SBEAs inspect one of the first five projects completed by each SBPA and any project that received more than $10,000 in incentives. During an inspection, the SBEA ensures that the SBPA installed all the correct measures and that the customer is satisfied with the project. In some ways, SBEAs played a more limited role in PY8. For one, Franklin Energy reduced the number of SBEAs from seven in PY7 to two in PY8. In addition, while SBEAs played a key role in recruiting customers to the program in PY7, SBPAs held this responsibility in PY8.

Franklin Energy relied on outreach performed by SBPAs to spread the word about the SBDI program and provided SBPAs with promotional materials, including a sell sheet and catalogue to aid in their efforts. While Franklin had additional promotional activities planned, they did not implement them because program goals were reached sooner than expected. Franklin attributes this, in part, to pent up demand for the SBDI Program that has resulted from previous years of SBDI operation and outreach.

3.2 Program Participation and Processes

Within the PY8 evaluation effort, we sought the perspectives of participating customers and SBPAs on the participation process and aspects of program delivery. The following sections outline the key findings from these interviews and present an overall positive picture of the program.

3.2.1 Program Participation

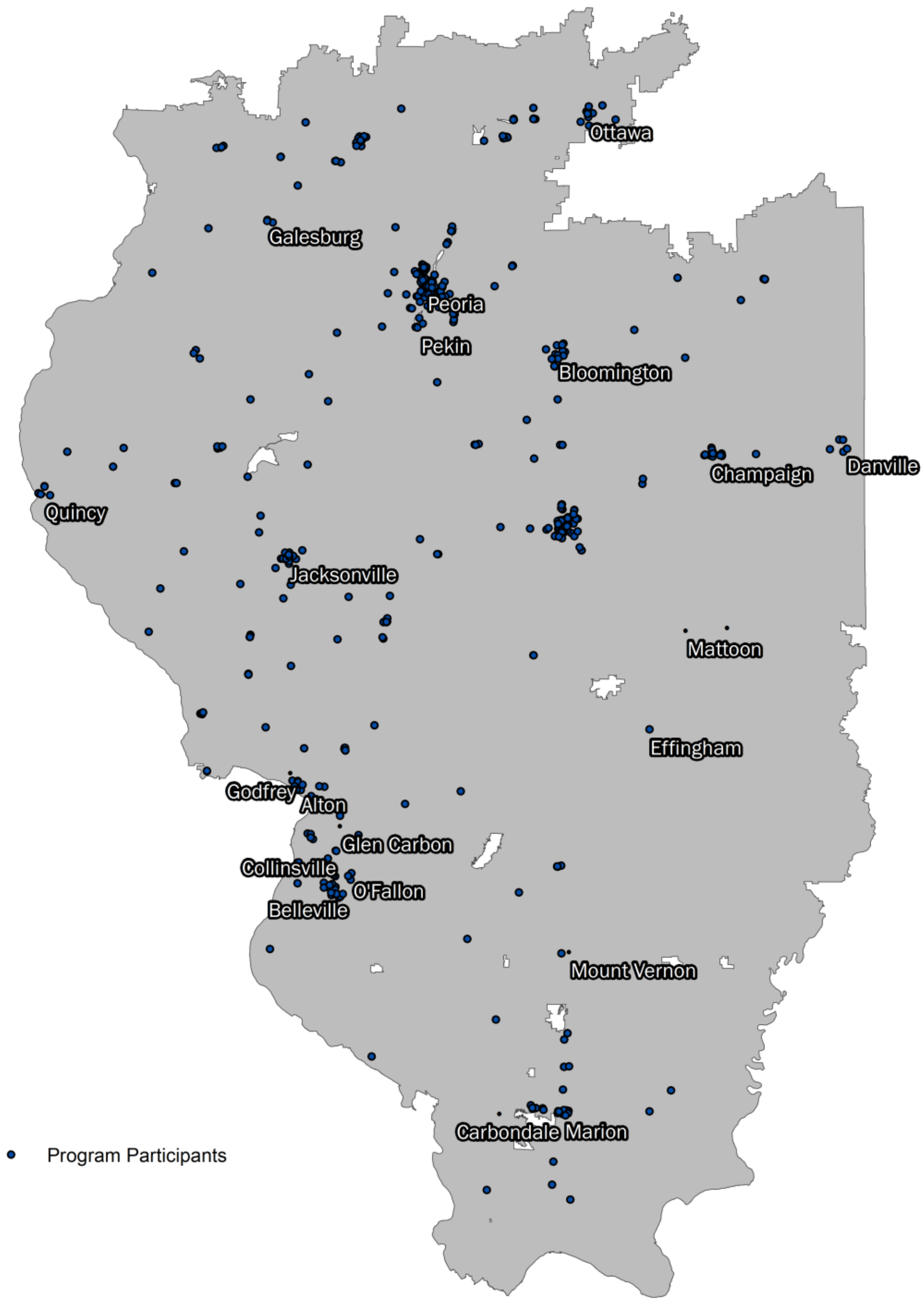
Overall, 649 eligible customers completed 671 projects through the SBDI Program in PY8 and achieved 11,202 MWh in ex post net savings (Table 11), which exceeded the implementer's goal of 9,933 MWh. The implementer recruited 38 SBPAs to help deliver this program. Thirty-two participated in the last IPA SBDI Program while six were new to the program.

Table 11. PY8 SBDI Participation and Savings

Key Program Metrics	PY8 Results
Participating Customers	649
Completed Projects	671
Ex Post Net MWh Savings	11,202

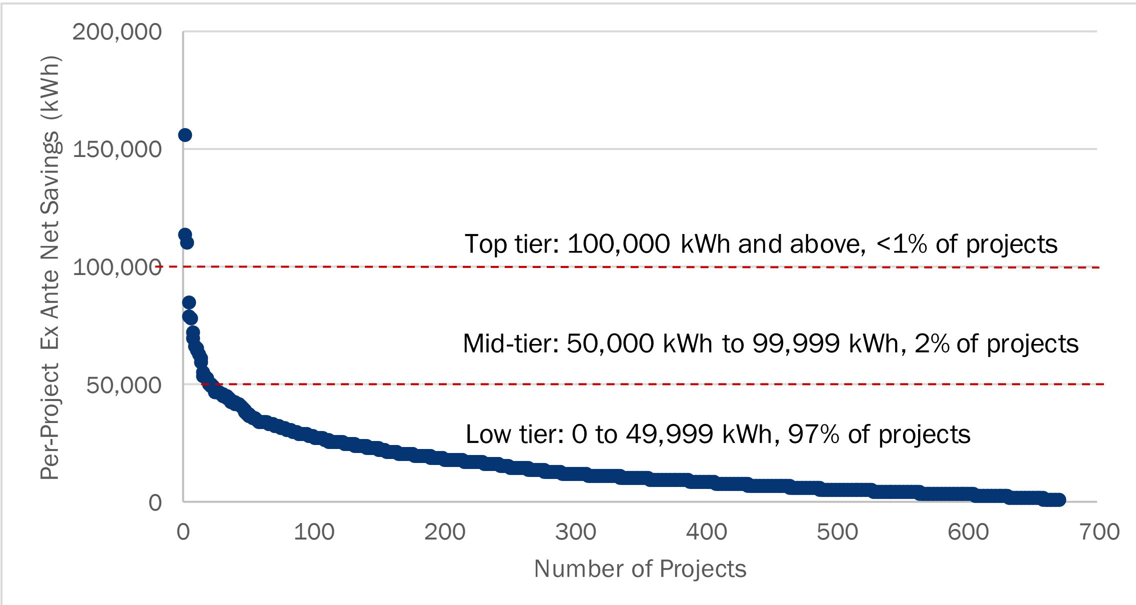
The SBDI Program continues to serve small business customers from throughout the AIC service territory as shown in Figure 1. In addition, the vast majority of SBDI projects continue to be small in size, achieving ex ante net kWh savings of less than 50,000 kWh.

Figure 1. PY8 SBDI Program Participation



In looking more closely at project savings, the evaluation team classified projects into three tiers (Figure 2). The top tier includes projects that achieved ex ante savings of 100,000 kWh and above. This tier accounts for approximately 4% of program savings and less than 1% of completed projects. The mid-tier includes projects achieving between 50,000 kWh and 99,999 kWh ex ante savings; mid-tier projects account for 11% of program savings and 2% of completed projects. Finally, the low tier projects achieved ex ante savings from 0 kWh to 49,999 kWh, and account for 86% of program savings and 97% of completed projects. These trends are similar to those seen within the PY7 program.

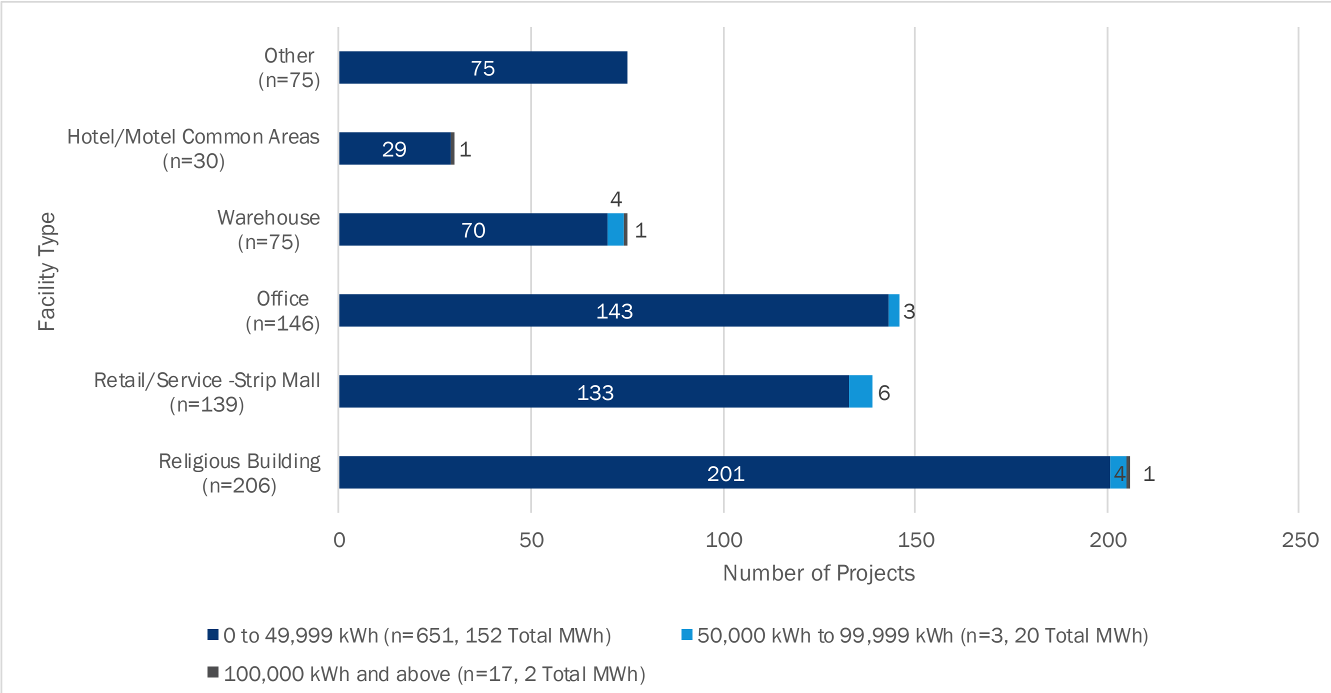
Figure 2. PY8 SBDI Per-Project Savings



Note: Percentages are rounded.

In terms of the business types served by the program, nearly three-fourths (73%) of projects were completed in religious buildings, retail/service – strip malls, and offices. Figure 3 shows that there is variation in facility types within the savings tiers. As noted above, low tier projects were the most common and represented a majority of projects across all building types. In contrast, top tier projects were only represented in three facilities including one religious building, one warehouse, and common areas of one hotel/motel.

Figure 3. Distribution of Facility Types by Savings Tier[a]



[a] The PY8 program-tracking database provides facility type information at the measure level. As a result, there were several cases where a unique project had several facility types. For such cases, the evaluation team determined the primary facility type by selecting the facility type with the highest ex ante savings.

While outlined in detail within the Impact Results section, the SBDI Program continues to focus largely on energy efficient lighting. In particular, approximately three-fourths (76%) of projects completed through the SBDI Program involved reduced wattage T8s replacing T12 measures, and almost half of the projects (44%) involved LED bulb measures. The least popular measures were LED fixtures and vending misers, which were collectively installed in less than 1% of projects. Table 12 presents the installed measures by participants.

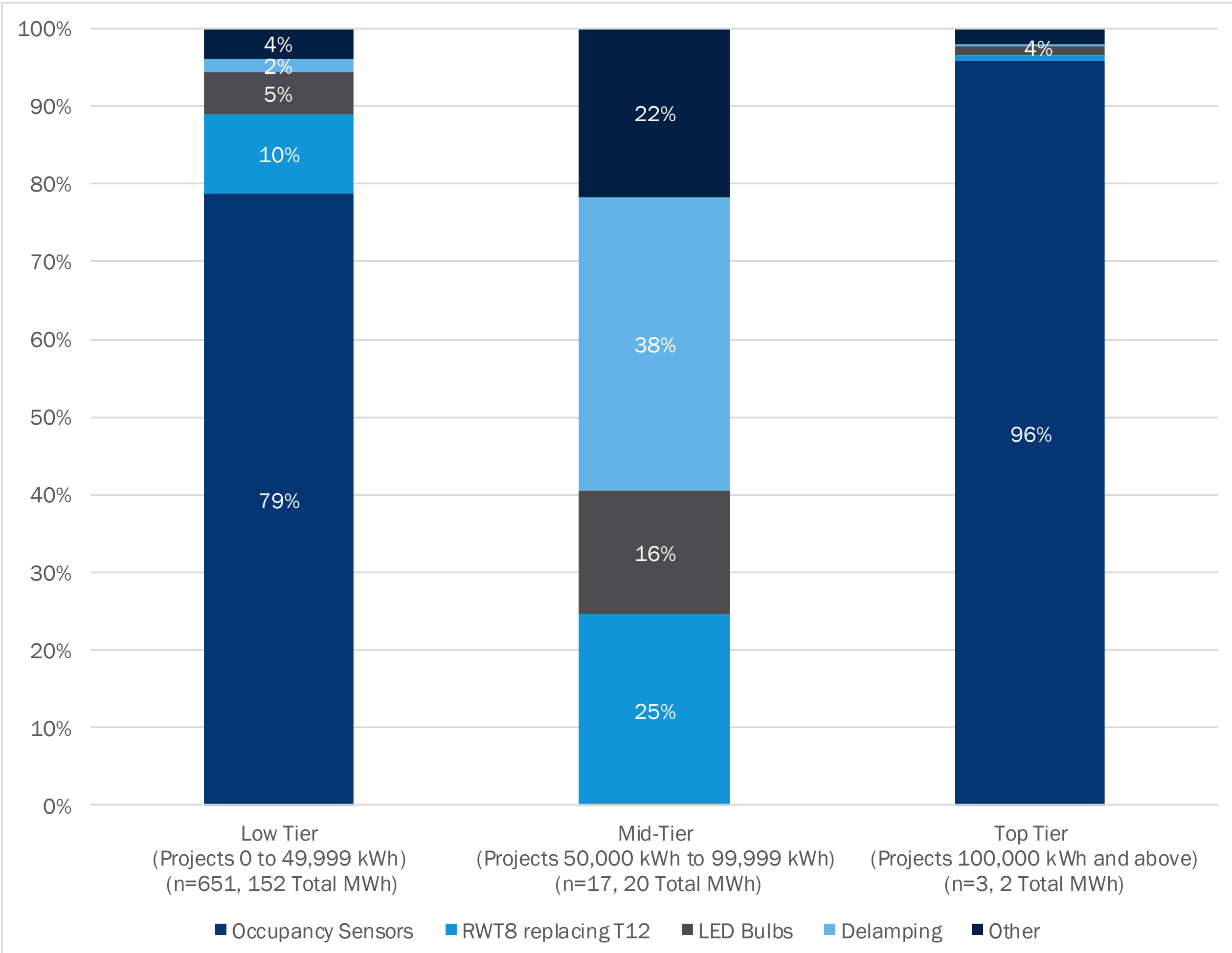
Table 12. Measures Installed by Participants

Measure	Number of Projects with Equipment (N=671)	Percent of Projects (N=671)
RWT8 replacing T12	509	76%
LED Bulbs	295	44%
HPT8 replacing T12	224	33%
LED Exit Sign	156	23%
Delamping	134	20%
HPT8 replacing HID	123	18%
CFL	54	8%
Occupancy Sensors	19	3%
Aerator	7	1%
LED Fixture	2	<1%
Vending Miser	1	<1%

Note: Most projects contained multiple measure types.

Further, different project savings tiers were comprised of different types of equipment. Figure 4 shows that while the vast majority of the measures installed in low and top tier projects were occupancy sensors, there were no occupancy sensors installed in the mid-tier projects.

Figure 4. Distribution of Equipment Type by Savings Tier



In sum, while the PY8 SBDI Program had lower savings and participation goals than previous IPA SBDI programs, the evaluation team saw a similar composition of projects in terms of project size and installed equipment.

3.2.2 Program Experience and Satisfaction

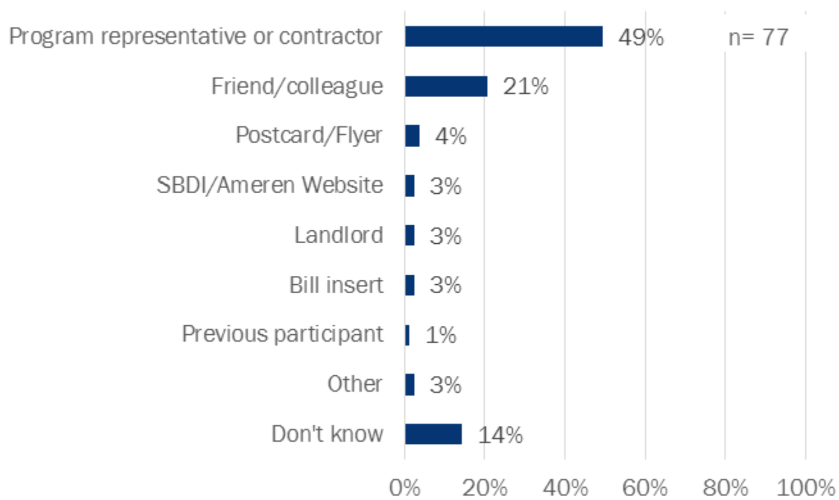
In this section, we discuss the findings from surveys with participating customers and in-depth interviews with SBPAs regarding their engagement with the SBDI Program.

Participating Customers

Program Awareness

The PY8 evaluation assessed whether marketing messages were clear and actionable. To answer this question, the evaluation team first assessed sources of program awareness within the context of the SBDI Program marketing strategy. In PY8, Franklin Energy relied on outreach performed by SBPAs to spread the word about the SBDI Program. We found that nearly one-half of participants (49%) first heard about the program from a program representative or a contractor, which suggests Franklin Energy's focus on SBPA outreach was effective. In addition, participants indicate that word of mouth from friends and colleagues is a common source of information about the program (21%).

Figure 5. How Customers Learned about the SBDI Program



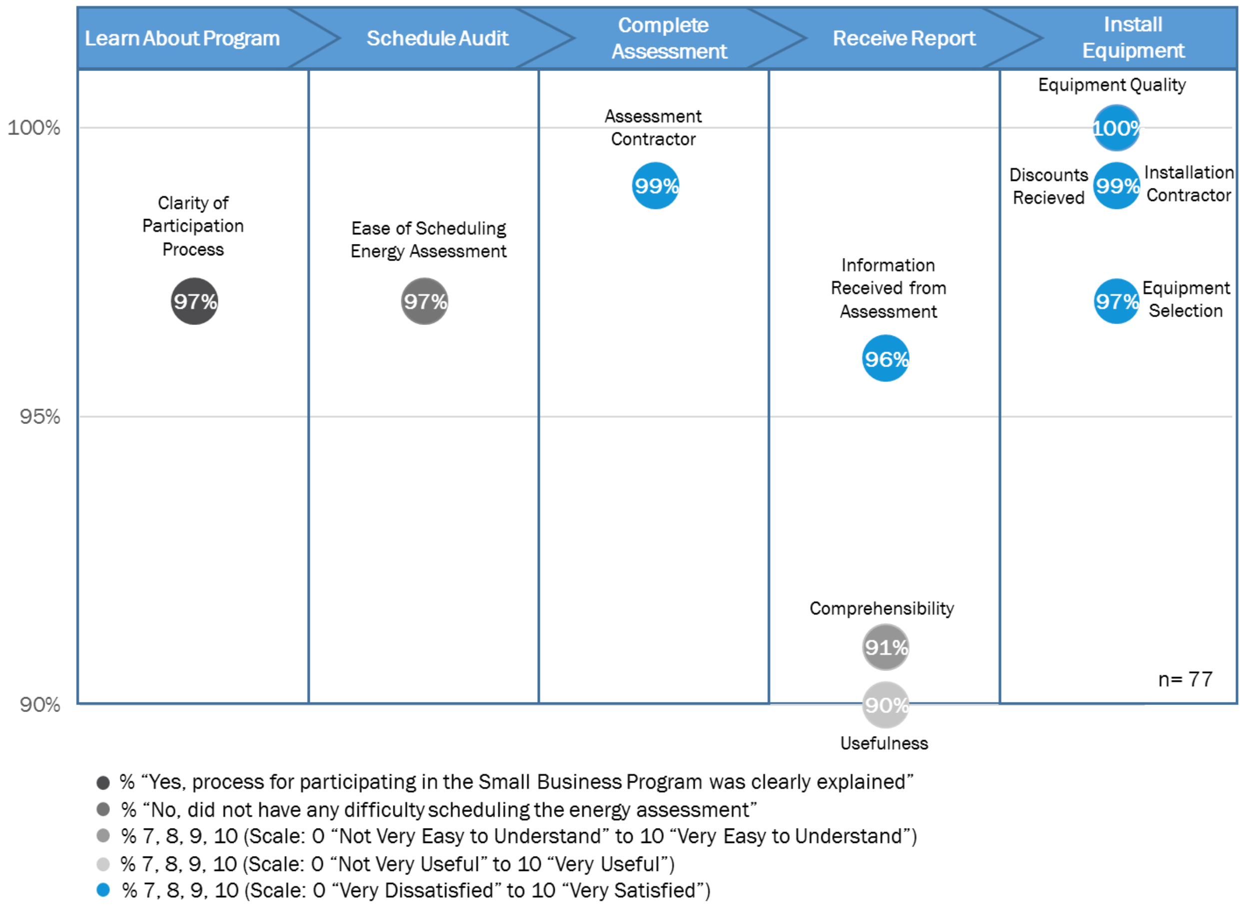
In terms of transitioning from awareness to participation, nearly all (97%) participants who first heard about the program through a contractor, program representative, or the AIC website felt that the process for participating in the SBDI Program was clearly explained to them. This finding suggests that PY8 materials effectively explain the participation process.

Program Satisfaction

In light of changes made to the program between PY7 and PY8, the PY8 evaluation examined customer satisfaction with their program experience to assess the potential effects of changes on program performance. For this assessment, we compared satisfaction with nine aspects of the PY8 participation process with the most recent comparable benchmark, established in PY6. Of the program aspects we looked at, we observed significant improvements in participant experience related to the discounts received and did not observe any significant declines in satisfaction with the program. In particular, the significant increase in satisfaction related to discounts (99% in 2016 compared to 91% in 2014), paired with increased satisfaction in both quality (100% in 2016 compared to 97% in 2014) and selection of equipment (97% in 2016 compared to 91% in 2014), suggests that the switch to a la carte measures was an improvement.

As indicated above, in PY8, the SBDI Program achieved very high customer satisfaction across all aspects of the participation process. Further, all participants (100%) indicate they are satisfied with the program overall and all are highly likely to recommend the program to other small businesses. Figure 6, below, summarizes participant satisfaction with various elements of the customer experience. The graphic moves through the participation process starting with the customer learning about the program on the left of the graphic and ending with equipment installation on the right of the graphic.

Figure 6. Participant Satisfaction with Participation Elements



Based on data related to program awareness and satisfaction, the program is performing smoothly. The program achieved high satisfaction scores from most participants in nearly all aspects of the participation process. However, the assessment report performed relatively lower than other program aspects on two fronts, comprehensibility (91%) and usefulness (90%). These relatively lower scores suggest that AIC could work on enhancing the assessment report to make it easier to understand and more useful to potential participants.

Small Business Program Allies

The PY8 evaluation assessed a number of questions surrounding the activities and opinions of SBPAs. This assessment is based on 12 in-depth interviews with SBPAs. The SBPAs that were interviewed represent a diverse group of companies. On average, the SBPAs have approximately 8 employees and serve multiple sectors, the most common sectors being small commercial and small industrial. Most of the SBPAs have participated in other Ameren business programs, with the Standard Program being the most common.

SBPA Recruitment and Training

With the start of a new Franklin Energy-implemented SBDI Program in PY8, program staff had to recruit SBPAs to help market and deliver the program. Most of the SBPAs learned about the SBDI Program through either AIC or a Franklin Energy representative.

The majority of allies selected to participate in PY8 had participated in past SBDI programs offered through the IPA. However, these allies were required to re-apply to the program in order to participate. Despite this change, returning SBPAs did not find the reapplication process to be difficult or overly time-consuming. However, three returning SBPAs voiced dissatisfaction with the fact that they had to reapply at all and felt the process should have been streamlined for returning SBPAs.

In terms of bringing allies into the program, Franklin Energy provided a training seminar at the start of the program year for all participating allies. Those SBPAs we spoke with felt the training was sufficient in preparing them to complete work through the program. However, the few critiques we heard regarding the seminar were that it was redundant for SBPAs returning to the program and that it was less useful than past introductory seminars (given where Franklin Energy was in their planning process). Beyond the introductory training seminar, most SBPAs do not feel they need additional training.

Interactions with Franklin Energy Advisors

While the amount of interaction between SBPAs and Franklin Energy Advisors is dependent on the SBPA's need for assistance and the individual Energy Advisor's proclivity for reaching out, the SBPAs report that their interactions with the Energy Advisors have been positive. Most of the SBPAs said that the Energy Advisors they worked with were easy to reach and helpful. On average, the SBPAs were satisfied with their interactions with Franklin Energy Advisors, giving the Energy Advisors an average rating of 5.9 on a scale of 1 to 7 (where 1 is "Not at all satisfied" and 7 is "Extremely satisfied").

When asked specifically about the provision of leads from Energy Advisors, most SBPAs reported that they did not receive many. In particular, those who had received leads mentioned receiving a total number in the single digits. Further, multiple SBPAs reported issues with the leads that the Energy Advisors provided, which included SBPAs receiving leads for projects that did not actually qualify for funding under the SBDI Program. These experiences led some SBPAs to become skeptical of Energy Advisor leads.

Program Promotion

All of the SBPAs said that they promote the SBDI Program in some way. SBPAs said that the most effective method of promotion is site-visits, although word-of-mouth is another common source of leads. The SBPAs mentioned a number of promotion methods, including: door-to-door sales, word of mouth advertising, cold calling, flyers, newspaper and radio ads, direct mailings (sometimes cobranded with Ameren), information on their businesses' website, Facebook advertisements, and promotion at trade shows. Only two SBPAs said that they do not proactively promote the SBDI program to new customers, but they do look for opportunities to use the program at existing customer project sites.

Most SBPAs believe that the level of marketing and promotion of the SBDI program is appropriate. In addition, all of the SBPAs stated that they refer some of their customers to other AIC programs. While most SBPAs complete projects for their customers through other AIC programs, they will occasionally refer customers to other contractors to have projects completed. The most common program used in conjunction with SBDI is the Standard Program.

Given the various programs currently available to AIC small business customers, the evaluation team also asked SBPAs about potential customer confusion. In general, SBPAs have not seen any confusion about various program offerings among their customers and they attribute this to the low levels of customer awareness of the energy efficiency programs available to them. While not directly related, SBPAs also commented on a trend the evaluation team has seen in prior program years, namely customer skepticism of the SBDI Program. Multiple SBPAs said that some of their customers are initially skeptical of the SBDI Program because it seems “too good to be true.” This feeling among customers is largely ascribed to third-party energy providers. One SBPA noted:

“They think I am out to scam them or I am a third-party trying to sell them third-party energy. A lot of people are confused. They don’t know what it is [the SBDI program] and don’t know who I am.”

Energy Assessment Process

Assessment Tools

Franklin Energy provides SBPAs with an Excel-based workbook for their use during the energy assessment process. In general, all SBPAs are dissatisfied, to some degree, with the Excel-based workbook assessment method due to the fact that the they have to make multiple trips back to their customer in order to fill out paperwork and get documents signed. As noted by one SBPA:

“The part that I don’t like about it is there is not electronic signatures or anything like that. So we end up making two or three trips back to the customer to propose the measures to them and then a trip back to get a signature. Then a trip back to perform the work and then a trip back to get another signature.”

Returning SBPAs frequently compared the Excel-based workbook to the iPad app used in previous program years and all preferred the iPad app to the Excel-based workbook because it was streamlined and self-contained. With that said, SBPAs are generally satisfied with the other characteristics of the Excel-based workbook and only one SBPA reported experiencing significant technical issues.

The Excel-based workbook also gives SBPAs the ability to provide their customers with an assessment report. SBPAs are highly satisfied with the assessment report and are using it as a sales tool with a perceived high level of success. SBPAs find the report to be easy and quick to generate. However, SBPAs said that the report would be a better sales tool if it could be given to the customer instantaneously on-site. As noted above, SBPAs report making multiple trips to the customer’s facility, which can delay delivery of the report and inconvenience the customer.

Additionally, two SBPAs believe the report may be too detailed. As one SBPA noted:

“People want to know the dollar amount…if you provide too much information, they freeze. Keep it as simple as possible, with cost, incentive, and savings payback.”

Customer Conversion

According to the SBPAs, on average, approximately 70% of customers who receive an assessment eventually install measures through the SBDI Program. However, SBPA reported conversion rates vary widely from between 30%-40% to close to 100%. In terms of data tracking, approximately half of the SBPAs report that they track the data necessary to calculate conversion rates from assessment to installation, while the other half do not regularly track this information but would be able to gather it from their records. All SBPAs who track this information are willing to share it with AIC.

Program Incentive and Measure Offerings

Most SBPAs believe program incentives are currently at an appropriate level. However, all SBPAs mentioned rising customer copayments as the most significant barrier to customer participation, and some have seen customers hesitate to participate. Additionally, many SBPAs have had significant issues with measure caps and stated that funding for high-demand measures often ran out too early. SBPAs report that measure caps add a high level of uncertainty to their business strategies and can cause issues with their customers when they have to explain why a certain measure is no longer incentivized through the program. Multiple SBPAs expressed confusion as to why measure caps are needed.

Satisfaction with the SBDI Program

SBPAs were satisfied with the SBDI Program overall, giving an average satisfaction rating of 5.7 on a scale of 1 to 7 (where 1 is "Not at all satisfied" and 7 is "Extremely satisfied"). Additionally, all of the SBPAs said that they plan to continue participating in the SBDI Program. The SBPAs were also satisfied with Franklin Energy overall, giving them an average rating of 5.6 on the same scale.

When exploring SBPA experiences with the program in PY8, the evaluation team also asked about the benefits and barriers to participation. As a result, SBPAs mentioned two primary benefits of participating in the program. The first benefit is expanded revenue streams, especially during times of the year when business would otherwise be slow. The second benefit is that the program gives the SBPAs an opportunity to attract more customers through repeat business and strengthened relationships with returning customers. As one SBPA stated:

"We used to call it filler work. But actually it is getting your foot in the door in some places you wouldn't get in otherwise."

SBPAs generally did not feel there were any significant barriers to their participation in the SBDI Program. However, some SBPAs mentioned having to wait for payment from Franklin Energy for longer than they were comfortable.

3.3 Impact Results

The following sections outline the results of the gross and net impact analysis for the PY8 SBDI Program. Overall, the program exceeded its goal and exhibited high gross and net realization rates.

3.3.1 Gross Impacts

Overall, total gross energy and demand ex post impacts for the SBDI Program were 12,586 MWh and 2.65 MW. The evaluation team applied savings algorithms from the IL-TRM V4.0[5] using program-tracking database inputs to estimate PY8 ex post gross savings for the SBDI Program. The evaluation team also applied in-service rates based on PY8 participant research, as well as the IL-TRM V4.0. We provide detailed results in the following sub-sections.

Measure Verification and In-Service Rates

As outlined in Section 2.2.6, the evaluation team used a combination of application review and onsite visits to develop updated in-service rates for the PY8 SBDI Program. For the non-lighting measures not explored through customer research, the evaluation team applied the IL-TRM V4.0.

[5] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0. Effective June 1, 2015.

Application Review Results

One aspect of verifying measure installation involved an application review, which consisted of choosing a random sample of 10 lighting projects and comparing project documentation, such as applications and post-inspection records, with information contained within the program tracking database. The evaluation team specifically chose to sample lighting projects, since savings from lighting measures account for 99% of the total program savings. Table 13 presents the verification rates from the application review by measure type.

Table 13. Verification Rate from Application Reviews

Measure Type	Quantity in Database	Quantity in Project Documentation	Application Review Verification Rate
CFLs	9	9	100.0%
Delamping	131	131	100.0%
HPT8 replacing HID	12	12	100.0%
HPT8 replacing T12	66	66	100.0%
LED Bulbs	162	162	100.0%
LED Exit Signs	5	5	100.0%
RWT8 replacing T12	164	164	100.0%
Total	**549**	**549**	**100.0%**

The Evaluation Team found that the information from the application review is consistent with what is provided within the program tracking database, resulting in verification rates of 100%.

Site Visit Results

Table 14 summarizes the in-service rates obtained from site visit verification (n=10) by measure type. Overall, the evaluation team did not encounter any significant issues verifying the measures within the sample.[6] In general, there were a few quantity discrepancies due to measures not being installed or installed measures breaking or becoming inoperable. Further, any discrepancies are small in scale and only slightly impact verification rates.

Table 14. Verification Rate from Site Visits

Equipment Description	Quantity in Database	Quantity from Site Visit	Site Visit Verification Rate
Delamping	5	5	100.0%
HPT8 replacing HID	13	13	100.0%
HPT8 replacing T12	50	50	100.0%
LED Bulbs	114	108	94.7%
LED Exit Signs	5	5	100.0%
RWT8 replacing T12	529	513	97.0%

[6] The evaluation team found it very helpful that documentation included measure specification sheets and post-install photos to easily identify the measures to verify.

Equipment Description	Quantity in Database	Quantity from Site Visit	Site Visit Verification Rate
Total	716	694	96.9%

Combined Results

The evaluation team developed a combined in-service rate by multiplying the results from the application reviews and site visits for all lighting measures incented through PY8. The resulting combined lighting in-service rate for PY8 is 96.9%, which the evaluation team applied to all lighting measures. Other measures such as occupancy sensors, vending misers, and low-flow faucet aerators relied on the in-service rates provided in the IL-TRM V4.0. Table 15 summarizes the in-service rates used to calculate PY8 ex post savings for each program measure.

Table 15. PY8 SBDI Measure Quantities and In-Service Rates

Measure Category	Ex Ante Measure Quantity[a] (a)	In-Service Rate[b] (b)		Verified Measure Quantity (a*b)
		Ex Ante	Ex Post	
Aerator	17	100.00%	95.00%	16
CFL	517	100.00%	96.93%	501
Delamping	3,443	100.00%	96.93%	3,337
HPT8 replacing HID	2,002	100.00%	96.93%	1,940
HPT8 replacing T12	3,711	100.00%	96.93%	3,597
LED Bulbs	8,854	100.00%	96.93%	8,582
LED Exit Sign	540	100.00%	96.93%	523
LED Fixture	19	100.00%	96.93%	18
RWT8 replacing T12	16,244	100.00%	96.93%	15,745
Vending Miser	1	100.00%	100.00%	1
Occupancy Sensors	139,158	100.00%	100.00%	139,158
Total	**174,506**	N/A	N/A	**173,420**

[a] Source: Franklin Energy – Ameren Illinois SBDI PY8 Paid Project Data – 6.22.16 (Final Program Tracking Database)
[b] In-service rates for lighting measures are from application reviews (n=10) and on-site visits (n=10) conducted as part of the PY8 evaluation. In-service rates for occupancy sensors, aerators, and vending misers are from the IL-TRM V4.0.

Ex Post Gross Impact Results

The overall ex post gross impact savings for the PY8 SBDI Program are 12,586 MWh and 2.65 MW. The gross realization rates are 110% for energy savings and 112% for demand savings. We calculated ex post savings using inputs and algorithms from the IL-TRM V4.0 and applied the in-service rates summarized above in Table 15. Table 17 summarizes the PY8 ex post gross impacts associated with the SBDI Program.

Table 16. PY8 SBDI Program Gross Impacts

Program	Ex Ante Gross Impacts[a]		Ex Post Gross Impacts	
	MW	MWh	MW	MWh
SBDI	2.36	11,445	2.65	12,586
		Gross Realization Rate[b]	112%	110%

[a] Source: Franklin Energy – Ameren Illinois SBDI PY8 Paid Project Data – 6.22.16 (Final Program Tracking Database)
[b] Gross realization rate = ex post gross value ÷ ex ante gross value

Table 17 summarizes the gross impact results by measure. Measure categories are sorted from largest to smallest based on ex post energy savings. We explain potential reasons for differences between ex ante and ex post gross impacts following the table and provide specific inputs for all ex post savings estimates in Appendix A.

Table 17. SBDI PY8 Ex Post Gross Impacts

Measure Category	Verified Measure Quantity	Ex Ante Gross			Ex Post Gross			Realization Rate	
		MW	MWh	Percent of Ex Ante MWh	MW	MWh	Percent of Ex Post MWh	MW	MWh
RWT8 replacing T12	15,745	0.84	4,095	35.78%	0.83	4,066	32.31%	99%	99%
HPT8 replacing HID	1,940	0.51	2,607	22.78%	0.49	2,516	19.99%	97%	97%
Delamping	3,337	0.33	1,605	14.03%	0.41	2,016	16.02%	126%	126%
LED Bulbs	8,582	0.36	1,495	13.07%	0.48	1,926	15.30%	134%	129%
HPT8 replacing T12	3,597	0.26	1,333	11.65%	0.33	1,675	13.31%	126%	126%
Occupancy Sensors	139,158	0.03	155	1.36%	0.07	167	1.33%	230%	108%
LED Exit Sign	523	0.01	58	0.51%	0.02	127	1.01%	136%	218%
CFL	501	0.02	77	0.67%	0.02	74	0.59%	95%	96%
LED Fixture	18	0.00	16	0.14%	0.00	15	0.12%	97%	97%
Aerator	16	0.00	2	0.02%	0.00	2	0.02%	6428%	91%
Vending Miser	1	-	2	0.01%	-	1	0.01%	N/A	87%
Grand Total	**173,420**	**2.36**	**11,445**	**100%**	**2.65**	**12,586**	**100%**	**112%**	**110%**

Differences in ex post and ex ante gross savings stem from differences in input values for the savings algorithms for each measure. The evaluation team reviewed all ex ante assumptions and identified the sources of these differences. Table 18 summarizes these findings with additional descriptions provided below.

Table 18. Reasons for Differences in Realization Rates per Measure

Measure	Realization Rate		Source of Discrepancies			
	MW	MWh	Baseline and Efficient Wattages	Hours of Use	ISR	Other (Specified)
RWT8 replacing T12	99%	99%	✓		✓	

Measure	Realization Rate		Source of Discrepancies			
	MW	MWh	Baseline and Efficient Wattages	Hours of Use	ISR	Other (Specified)
HPT8 replacing HID	97%	97%			✓	
Delamping	126%	126%	✓		✓	
LED Bulbs	134%	129%	✓		✓	
HPT8 replacing T12	126%	126%	✓		✓	
Occupancy Sensors	230%	108%				• Energy Savings Factor (ESF) • Coincidence Factor
LED Exit Sign	136%	218%		✓	✓	• Coincidence Factor
CFL	95%	96%			✓	
LED Fixture	97%	97%	✓		✓	
Aerator	6428%	91%				• Baseline flowrate (gpm) • Energy per Gallon (EPG) • Misapplied deemed kW values
Vending Miser	N/A	87%				• Vending machine type

The inputs for reduced wattage T8s, high-performance T8s replacing HIDs, and delamping measures have the largest impact on program level realization rates. Because reduced wattage T8 measures account for 36%, high-performance T8s replacing HIDs account for 23%, and delamping measures account for 14% of the total ex ante program savings, any differences within these measures affect the program savings significantly. We describe the differences in the ex ante and ex post savings calculations in detail below. Note that changes to inputs may increase or decrease savings. The combination of all changes to inputs results in the overall realization rates for a specific measure.

- **Lighting Measure Discrepancies:**
  - **Baseline and Efficient Wattages:** On average, ex post baseline wattage assumptions for the five lighting measures identified in Table 18 are 18% greater than the ex ante baseline wattage assumptions resulting in an increase in ex post savings. Additionally, the ex post efficient wattage assumptions are 21% greater than ex ante efficient wattage assumptions resulting in a reduction in ex post savings. The majority of ex post wattage assumptions are from the IL-TRM V4.0, but in some rare instances where the IL-TRM does not provide wattages (such as 8 ft. T12s) the evaluation team looked to other resources such as the New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs (V3.0)(See Appendix A for more details).
  - **Hours of Use (HOU):** The IL-TRM V4.0 specifies 8,766 annual HOU for LED Exit Signs regardless of the building type. However, ex ante savings applied the HOU that is specific by building type from the table presented in the IL-TRM V4.0 Section 4.5. These changes increase ex post savings.
  - **In-Service Rates (ISR):** All ex post lighting measure in-service rates (ISR) are based on research conducted as part of the PY8 evaluation. As noted above, the ex post ISR is 96.9% for all lighting measures (excluding occupancy sensors) whereas ex ante savings assume ISRs of 100%, resulting in a slight decrease to ex post savings.

- **Coincidence Factors (CF):**
  - **LED Exit Signs:** The IL-TRM V4.0 specifies a CF of 1.0 for all LED Exit Signs regardless of the building type. Ex post demand savings applied a CF of 1.0. Since LED Exit Signs operate 8,766 hours per year, 100% of summer peak hours, it makes sense that the CF should be 1.0. However, ex ante demand savings applied the CF that is specific to building type from the table presented in the IL-TRM V4.0 Section 4.5. These changes increase ex post savings.
  - **Occupancy Sensors:** The demand savings algorithm in the IL-TRM V4.0 requires subtracting the CF of the lighting system (with occupancy sensors) from the CF prior to installing occupancy sensors. Ex ante demand savings only accounted for the CF prior to installing occupancy sensors which results in a decrease in ex post demand savings.
- **Energy Savings Factor (ESF) for Occupancy Sensors:** The evaluation team calculated a weighted ESF using the ESFs from the IL-TRM V4.0 for wall mounted and fixture mounted occupancy sensors and data from the implementer that indicated the percentage of occupancy sensors that were either wall or fixture mounted. The weighted ESF used for ex post calculations is 3% greater than the ESF used in ex ante calculations resulting in a slight increase in ex post savings.

- **Low-Flow Faucet Aerator Discrepancies:**
  - **Baseline Flowrate in Gallons per Minute (gpm_{Base}):** Ex ante calculations underestimated savings by applying a baseline flow rate (1.20) that is 16% less than the baseline flow rate (1.39) provided in the IL-TRM V4.0.
  - **Energy per Gallon (EPG) of Water:** The IL-TRM V4.0 provides EPG values that vary by the location of installed low-flow aerators. Ex post applied an EPG of 0.0795 for aerators installed in bathrooms and an EPG of 0.0969 for aerators installed in kitchens. Ex ante savings used an average EPG (0.0894) that was applied to all aerators regardless of installed location resulting in decreased ex post savings.
  - **Misapplied Deemed Demand (kW) Savings:** The ex ante deemed demand savings for low-flow faucet aerators summarized in secondary documentation provided by the implementer are aligned with the ex post demand savings values. However, the program-tracking database includes a different value that is an order of magnitude greater than the expected demand savings value. Had the original ex ante value been used, demand realization rates would be close to 1.0.

- **Vending Miser Discrepancies:**
  - **Vending Machine Type:** Ex ante savings were calculated using the IL-TRM V4.0 variable assumptions for a refrigerator beverage machine. Since the program-tracking database does not specify the vending machine type, the evaluation team calculated ex post savings as an average for refrigerated beverage vending machines and glass front refrigerated coolers using variable assumptions from the IL-TRM V4.0. This resulted in a decrease in ex post savings.

3.3.2 Ex Post Net Impact Results

In determining the overall net savings associated with the SBDI Program, the team applied the SAG approved NTGR of 0.89, which is based on research conducted in PY6. As a result, the program achieved net realization rates of 110% for energy and 112% for demand savings.

Table 19. SBDI Program Net Impacts

Program	Ex Ante Net Impacts		Ex Ante NTGR	Ex Post NTGR	Ex Post Net Impacts	
	MW	MWh			MW	MWh
SBDI	2.10	10,186	0.89	0.89	2.36	11,202
Net Realization Rate[a]					**112%**	**110%**

[a] Net realization rate = ex post net value ÷ ex ante net value.

4. Conclusions and Recommendations

Overall, the Franklin Energy SBDI Program had a strong first year of implementation. The implementer exceeded their energy savings goals for the program, and participating customers and program allies generally report high levels of satisfaction. While there were some frustrations around the re-application process, the fact that returning SBPAs generally expressed positive feedback about the program also suggests that Franklin Energy handled the transition between implementers well.

As the program continues to mature and as AIC determines future program offerings for this customer segment, it is important to keep in mind potential challenges to implementation. Along these lines, all of the SBPAs with whom we spoke mentioned rising measure costs as the most significant barrier to customer participation beyond the direct installation of free measures. Further, some SBPAs have already seen customers hesitant to participate due to the associated costs. Additionally, many SBPAs commented on the challenges associated with the established measure caps[7] and noted that funding for high-demand measures often ran out too early. Both of these design elements warrant ongoing review and consideration by the implementer.

Based on the results of the PY8 SBDI evaluation, the evaluation team offers the following key findings and recommendations for the program moving forward:

- **Key Finding #1**: The need for multiple points of communication and contact between SBPAs and participating customers—from energy assessment through measure installation—appears to be burdensome for SBPAs and could lead to customer dissatisfaction. In particular, SBPAs are dissatisfied to varying degrees with the Excel-based workbook assessment method due to the fact that the they have to make multiple trips back to a customer in order to fill out paperwork and get documents signed.
  - **Recommendation:** Franklin Energy should explore whether changes can be made to the Excel-based assessment tool to reduce the amount of back and forth between SBPAs and participating customers. For example, Franklin Energy should consider modifying the Excel-based workbook to allow for the assessment report to be generated and delivered to the customer more rapidly, ideally allowing the SBPAs to deliver the report to customers immediately after an assessment.
- **Key Finding #2**: The program does not currently track the data necessary to calculate conversion rates (i.e., the percentage of customers who receive an energy assessment and go on to install equipment whether free or incented). While not critical, this data can serve as a valuable metric for program delivery as low conversion rates may indicate customer dissatisfaction with program offerings, delivery of services, or a lack of demand.
  - **Recommendation**: Franklin Energy should work with SBPAs to develop a protocol for tracking assessment-only and assessment and installation projects so that the program can determine program conversion rates. This information can help program staff track the program's success in moving customers towards measure installation and energy savings. By looking at this information

[7] AIC set incentive budgets or caps that established the maximum amount of total incentives paid for a given measure during a given program year. Franklin Energy then managed the program to these measure caps.

by region or by SBPA, the implementer can also determine where they may need to focus training or Energy Advisor involvement.

- **Key Finding #3**: The evaluation team determined that discrepancies between ex ante and ex post savings values were partially due to different assumptions such as hours of use, coincidence factors, lighting wattages, in-service rates, aerator flow rates, vending machine type, and misapplication of variables from the IL-TRM.
  - **Recommendation:** In order to minimize discrepancies between ex ante gross and ex post gross savings estimates for future program measures, the team recommends the use of primary data collected by the implementer for such things as actual installed wattage, whether space cooling is present in the facility, heating fuel types, building type, vending machine type, etc., so that variables within the algorithms are more reflective of the installed measures instead of assumed averages based on general assumptions. If primary data is unavailable, we recommend applying the assumptions provided in the IL-TRM.

A. Appendix – SBDI Program Assumptions and Algorithms

In PY8, the impact evaluation efforts estimated gross impact savings for the SBDI Program by applying savings algorithms from the Illinois Statewide Technical Reference Manual (TRM) V4.0 (2015)[8] to the information provided in the program-tracking database.

We present the algorithms used to calculate all evaluation program savings below, along with all input variables.

A.1 Compact Fluorescent Lighting (CFLs)

The evaluation team determined ex post lighting savings for CFLs using the algorithms below.

Equation 1. CFL Algorithms

$$Energy\ Savings\ (\Delta kWh) = \left(\frac{Watts_{Base} - Watts_{CFL}}{1000}\right) * ISR * Hours * WHFe$$

$$Demand\ Savings\ (\Delta kW) = \left(\frac{Watts_{Base} - Watts_{CFL}}{1000}\right) * ISR * CF * WHFd$$

Where:

$Watts_{Base}$ = Wattage of existing incandescent lamp (or halogen equivalent wattage for those that are not EISA exempt)

Table 20. Baseline Wattages for CFLs

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
General Purpose CFL (14W replacing 60W incandescent)	Yes	43	Halogen equivalent from IL-TRM V4.0 Section 4.5.1
General Purpose CFL (19W replacing 75W incandescent)	Yes	53	
General Purpose CFL (23W replacing 100W incandescent)	Yes	72	
23W PAR (Directional) CFL replacing 100W Incandescent	No	100	Assumed wattage from measure description in database
15W PAR (Directional) CFL replacing 75W Incandescent	No	75	

[a] The EISA schedule requires baseline adjustments to standard screw-based lighting with incandescent baseline wattages of 100W (as of June 2012), 75W (as of June 2013), and 60W (as of June 2014).

[8] Illinois Statewide Technical Reference Manual for Energy Efficiency V4.0. Effective June 1, 2015.

$Watts_{CFL}$ = Wattage of installed CFL (actual wattage from measure label used)

ISR = In-service rate or the percentage of lamps rebated that get installed = 96.9%[9]

Hours = Annual operating hours (varies by building type per IL-TRM V4.0 Section 4.5)

WHFe = Waste heat factor for energy that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

WHFd = Waste heat factor for demand that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

CF = Summer Peak Coincidence Factor (varies by building type per IL-TRM V4.0 Section 4.5)

A.2 Lighting Emitting Diodes (LEDs)

The evaluation team determined ex post lighting savings for LEDs using the algorithms below.

Equation 2. LED Algorithms

$$Energy\ Savings\ (\Delta kWh) = \left(\frac{Watts_{Base} - Watts_{LED}}{1000}\right) * ISR * Hours * WHFe$$

$$Demand\ Savings\ (\Delta kW) = \left(\frac{Watts_{Base} - Watts_{LED}}{1000}\right) * ISR * CF * WHFd$$

Where:

$Watts_{Base}$ = Wattage of existing incandescent lamp (or halogen equivalent wattage for those that are not EISA exempt)

Table 21. Baseline Wattages for LEDs

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
LED screw-in lamps replacing <65W Incandescent	Yes	38	Average EISA adjusted baseline wattage (25W - 53W) for omnidirectional lamps with incandescent equivalent of 65W or less from IL-TRM v.4.0 Section 4.5.4
LED screw-in lamps replacing ≥65W Incandescent	Yes (100W equivalent) No (>100W equivalent)	181	Average baseline wattage (72W - 300W) for omnidirectional lamps with incandescent equivalent greater than 65W from IL-TRM v.4.0 Section 4.5.4

[9] In-service rate calculated using results from an application review or on-site verification for a sample of PY8 participants (n=20).

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
LED PAR38 replacing ≥65W Incandescent PAR38	No	122	Average baseline wattage (65W - 200W) for all screw-in lamps with diameter >2.25" and wattage >65W from IL-TRM v.4.0 Section 4.5.4
DLC-listed High Bay LED replacing 250W HID	No	295	Metal Halide 250W CWA Pulse Start wattage from IL-TRM V4.0 Section 4.5.4 – pg. 372
Outdoor LED replacing existing HID ≤175W	No	160	Average wattage for 100W and 175W HID multiplied by a fixture to lamp wattage factor (1.16) using the lamp and fixture wattage for a 200W HID from IL-TRM v4.0 Section 4.5.3 Table A-2; Set minimum wattage to 100W based on secondary research.
Outdoor LED replacing existing HID 176-250W	No	247	Average wattage for 176W - 250W HID multiplied by a fixture to lamp wattage factor (1.16) using the lamp and fixture wattage for a 200W HID from IL-TRM v4.0 Section 4.5.3 Table A-2
Outdoor LED replacing existing HID 251-400W	No	356	Average wattage for 251W - 400W HID multiplied by a fixture to lamp wattage factor (1.09) using the lamp and fixture wattage for a 320W HID from IL-TRM v4.0 Section 4.5.3 Table A-2
Outdoor LED replacing Fluorescent T12HO 176-250W	No	211	Average wattage across 9 different T12HO fixtures with fixture wattages between 176W to 250W from NYS Ngrid Fixture Wattage Table

[a] The EISA schedule requires baseline adjustments to standard screw-based lighting with incandescent baseline wattages of 100W (as of June 2012), 75W (as of June 2013), and 60W (as of June 2014).

$Watts_{LED}$ = Wattage of installed LED

Table 22. Wattages for Installed LEDs

Measure Description	$Watts_{LED}$	Notes/Reference
LED screw-in lamps replacing <65W Incandescent	14	Average LED wattage (5.6W -23.1W) for omnidirectional lamps with incandescent equivalent of 65W or less from IL-TRM v.4.0 Section 4.5.4
LED screw-in lamps replacing ≥65W Incandescent	67	Average LED wattage (37.2W - 104.4W) for omnidirectional lamps with incandescent equivalent greater than 65W from IL-TRM v.4.0 Section 4.5.4

Measure Description	$Watts_{LED}$	Notes/Reference
LED PAR38 replacing ≥65W Incandescent PAR38	40	Average LED wattage (21W - 75W) for all screw-in lamps with diameter >2.25" with incandescent equivalent 65W or greater from IL-TRM v.4.0 Section 4.5.4
DLC-listed High Bay LED replacing 250W HID	160	LED High and Low Bay Fixture wattage from IL-TRM V4.0 Section 4.5.4 – pg. 372
Outdoor LED replacing existing HID ≤175W	50	Linear regression using data from IL-TRM v4.0 Section 4.5.4 (see below). Used baseline wattage (average 100W – 175W HID) without ballast factor to calculate the LED equivalent wattage.
Outdoor LED replacing existing HID 176-250W	75	Linear regression using data from IL-TRM v4.0 Section 4.5.4 (see below). Used baseline wattage (average 176W – 250 HID) without ballast factor to calculate the LED equivalent wattage.
Outdoor LED replacing existing HID 251-400W	150	Linear regression using data from IL-TRM v4.0 Section 4.5.4 (see below). Used baseline wattage (average 251W – 400W HID) without ballast factor to calculate the LED equivalent wattage.
Outdoor LED replacing Fluorescent T12HO 176-250W	54	LED 2x4 Recessed Light Fixture from IL-TRM v4.0 Section 4.5.4 – pg. 372

ISR = In-service rate or the percentage of lamps rebated that get installed = 96.9%[10]

Hours = Annual operating hours (varies by building type per IL-TRM V4.0 Section 4.5)

WHFe = Waste heat factor for energy that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

WHFd = Waste heat factor for demand that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

CF = Summer Peak Coincidence Factor (varies by building type per IL-TRM V4.0 Section 4.5)

A.3 Linear Regression for Outdoor LEDs replacing HIDs

The program-tracking database does not indicate the actual wattage of installed LED fixtures, but includes a wattage range of the baseline fixture. The baseline wattage ranges from a minimum of 100 watts to greater than 400 watts. The IL-TRM V4.0 does not provide an equivalent LED wattage for baseline fixtures that exceed 200 watts. Therefore, the evaluation team determined the equivalent LED wattage using the average baseline wattage for existing outdoor High Intensity Discharge (HID) fixtures indicated in the program-tracking database using a linear regression model (Equation 3). The linear regression model includes inputs from the IL-TRM

[10] In-service rate calculated using results from an application review or on-site verification for a sample of PY8 participants (n=20).

V4.0 (Section 4.5.4) for LED wattages ranging from 11 to 75 watts with equivalent baseline wattages ranging from 40 to 200 watts.

Equation 3. Linear Regression to Determine Equivalent LED Wattage for Outdoor HID Baseline Fixtures

$$LED\ Watt = \left(0.0007 * HID^2_{Baseline\ Watt}\right) + \left(0.2055 * HID_{Baseline\ Watt}\right) + 2.6451$$

Applying Equation 3 yields the following results:

Table 23. Wattages for Installed LEDs Replacing Outdoor HIDs

Baseline Measure Description[a]	Baseline Wattage[b]	Equivalent LED Wattage using Linear Regression
HID ≤175W[c]	138	50
HID 176-250W	213	75
HID 251-400W	326	150

[a] The program-tracking database measure label included these baseline wattage descriptions.
[b] Average baseline wattage excluding ballast factors.
[c] The program-tracking database indicates a baseline wattage that is less than or equal to 175 watts. The minimum wattage is set to 100W based on secondary research.

A.4 LED Exit Signs

The evaluation team determined ex post savings for LED Exit signs using the algorithms below.

Equation 4. LED Exit Sign Algorithms

$$Energy\ Savings\ (\Delta kWh) = \left(\frac{Watts_{Base} - Watts_{LED}}{1000}\right) * ISR * Hours * WHFe$$

$$Demand\ Savings\ (\Delta kW) = \left(\frac{Watts_{Base} - Watts_{LED}}{1000}\right) * ISR * CF * WHFd$$

Where:

$Watts_{Base}$ = Wattage of existing exit sign (applied $Watts_{Base}$ from IL-TRM V4.0 for unknown baseline type) = 23 Watts

$Watts_{LED}$ = Wattage of installed LED Exit sign from IL-TRM V4.0 = 2 Watts

ISR = In-service rate or the percentage of lamps rebated that get installed = 96.9%[11]

Hours = Annual operating hours per IL-TRM V4.0 = 8,766 hours/yr

[11] In-service rate calculated using results from an application review or on-site verification for a sample of PY8 participants (n=20).

WHFe = Waste heat factor for energy that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

WHFd = Waste heat factor for demand that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

CF = Summer Peak Coincidence Factor per IL-TRM V4.0 = 1.0

A.5 Linear Fluorescent Fixtures

The evaluation team determined ex post lighting savings for linear fluorescent fixtures using the algorithms below.

Equation 5. Linear Fluorescent Fixture Algorithms

$$Energy\ Savings\ (\Delta kWh) = \left(\frac{Watts_{Base} - Watts_{LFT8}}{1000}\right) * ISR * Hours * WHFe$$

$$Demand\ Savings\ (\Delta kW) = \left(\frac{Watts_{Base} - Watts_{LFT8}}{1000}\right) * ISR * CF * WHFd$$

Where:

$Watts_{Base}$ = Wattage of existing fixture

Table 24. Baseline Wattages for Linear Fluorescent Fixtures

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
De-Lamping 2 Lamp 4ft T12 to 1 Lamp 4ft HPT8	No	81	Average wattage for 2-lamp F34T12 w/ EEMag Ballast (68W), 2-lamp F40T12 w/ EEMag Ballast (82W), 2-lamp F40T12 w/ Mag Ballast (94W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 2 Lamp 4ft T12 to 1 Lamp 4ft HPT8	No	81	Average wattage for 2-lamp F34T12 w/ EEMag Ballast (68W), 2-lamp F40T12 w/ EEMag Ballast (82W), 2-lamp F40T12 w/ Mag Ballast (94W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 2 Lamp 8ft T12 to 2 Lamp 4ft HPT8	No	173	Fluorescent 2 lamp 96" STD w/ Mag-STD ballast (F96T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 296
De-Lamping w/Refl 3 Lamp 4ft T12 to 2 Lamp 4ft HPT8	No	126	Average wattage for 3-lamp F34T12 w/ EEMag Ballast (110W), 3-lamp F40T12 w/ EEMag Ballast (122W), 3-lamp F40T12 w/ Mag Ballast (147W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping 4 Lamp 4ft T12 to 2 Lamp 4ft HPT8	No	162	Average wattage for 4-lamp F34T12 w/ EEMag Ballast (139W), 4-lamp F40T12 w/ EEMag Ballast (164W), 4-lamp F40T12 w/ Mag Ballast (182W) from IL-TRM v4.0 Section 4.5.3 Table A-2

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
De-Lamping 4 Lamp 4ft T12 to 3 Lamp 4ft HPT8	No	162	Average wattage for 4-lamp F34T12 w/ EEMag Ballast (139W), 4-lamp F40T12 w/ EEMag Ballast (164W), 4-lamp F40T12 w/ Mag Ballast (182W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping 4 Lamp 8ft T12 to 4 Lamp 4ft HPT8	No	346	Fluorescent 4 lamp 96" STD w/ Mag-STD ballast (F96T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 297
De-Lamping w/Refl 4 Lamp 4ft T12 to 2 Lamp 4ft HPT8	No	162	Average wattage for 4-lamp F34T12 w/ EEMag Ballast (139W), 4-lamp F40T12 w/ EEMag Ballast (164W), 4-lamp F40T12 w/ Mag Ballast (182W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 4 Lamp 4ft T12 to 3 Lamp 4ft HPT8	No	162	Average wattage for 4-lamp F34T12 w/ EEMag Ballast (139W), 4-lamp F40T12 w/ EEMag Ballast (164W), 4-lamp F40T12 w/ Mag Ballast (182W) from IL-TRM v4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 4 Lamp 8ft T12 to 4 Lamp 4ft HPT8	No	346	Fluorescent 4 lamp 96" STD w/ Mag-STD ballast (F96T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 297
De-Lamping w/Refl 2 Lamp U tube T12 to 2 Lamp 2ft T8	No	96	Fluorescent 2 lamp U-tube STD w/ Mag-STD ballast (FU40T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 298
1 Lamp 4ft HPT8/LWT8 L&B Retro	No	48	Average wattage for 1-lamp F34T12 w/ EEMag Ballast (40W), 1-lamp F40T12 w/ EEMag Ballast (48W), 1-lamp F40T12 w/ Mag Ballast (57W) from IL-TRM v4.0 Section 4.5.3 Table A-2
2 Lamp 4ft HPT8/LWT8 L&B Retro	No	81	Assumed baseline is a T12 fixture. Average wattage for 2-lamp F34T12 w/ EEMag Ballast (68W), 2-lamp F40T12 w/ EEMag Ballast (82W), 2-lamp F40T12 w/ Mag Ballast (94W) from IL-TRM v4.0 Section 4.5.3 Table A-2
2 Lamp tandem 4ft HPT8 replacing 1L 8ft T12 (Slimline, HO, or VHO)	No	94	Fluorescent 2-lamp 4 foot F40T12 w/ Mag Ballast. The IL-TRM does not provide 8ft T12 wattages, therefore we used a 2 lamp 4ft T12 instead. IL-TRM V4.0 Section 4.5.3 Table A-2
2 Lamp 8ft RWT8 L&B Retro replacing 2L 8ft T12 Slimline	No	173	Fluorescent 2 lamp 96" STD w/ Mag-STD ballast (F96T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 296

Measure Description	EISA Adjusted[a]	$Watts_{Base}$	Notes/Reference
2 Lamp T8 U HPT8/LWT8 Replacing 2-T12 U Lamp	No	96	Fluorescent 2 lamp U-tube STD w/ Mag-STD ballast (FU40T12) from New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs V3.0 – Appendix C – Standard Fixture Watts Table pg. 298
3 Lamp 4ft HPT8/LWT8 L&B Retro	No	126	Assumed baseline is a T12 fixture. Average wattage for 3-lamp F34T12 w/ EEMag Ballast (110W), 3-lamp F40T12 w/ EEMag Ballast (122W), 3-lamp F40T12 w/ Mag Ballast (147W) from IL-TRM v4.0 Section 4.5.3 Table A-2
4 Lamp 4ft HPT8/LWT8 L&B Retro	No	162	Assumed baseline is a T12 fixture. Average wattage for 4-lamp F34T12 w/ EEMag Ballast (139W), 4-lamp F40T12 w/ EEMag Ballast (164W), 4-lamp F40T12 w/ Mag Ballast (182W) from IL-TRM v4.0 Section 4.5.3 Table A-2
4 Lamp tandem 4ft HPT8 replacing 2L 8ft T12 (Slimline, HO, or VHO)	No	182	Fluorescent 4-lamp 4 foot F40T12 w/ Mag Ballast. The IL-TRM does not provide 8ft T12 wattages, therefore we used a 4 lamp 4ft T12 instead. IL-TRM V4.0 Section 4.5.3 Table A-2
4 Lamp 4ft HPT8 High bay Fluor replacing 250W HID	No	295	Metal Halide 250W CWA Pulse Start wattage from IL-TRM V4.0 Section 4.5.4 – pg. 372
6 Lamp 4ft HPT8 High bay Fluor replacing 400W HID	No	455	Metal Halide 400W from IL-TRM V4.0 Section 4.5.3 Table A-2 – pg. 357

[a] The EISA schedule requires baseline adjustments to standard screw-based lighting with incandescent baseline wattages of 100W (as of June 2012), 75W (as of June 2013), and 60W (as of June 2014).

$Watts_{LFT8}$ = Wattage of installed linear fluorescent T8

Table 25. Wattages for Installed Linear Fluorescent T8s

Measure Description	$Watts_{LFT8}$	Notes/Reference
De-Lamping 2 Lamp 4ft T12 to 1 Lamp 4ft HPT8	25	1-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 2 Lamp 4ft T12 to 1 Lamp 4ft HPT8	25	1-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 2 Lamp 8ft T12 to 2 Lamp 4ft HPT8[b]	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 3 Lamp 4ft T12 to 2 Lamp 4ft HPT8	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping 4 Lamp 4ft T12 to 2 Lamp 4ft HPT8	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping 4 Lamp 4ft T12 to 3 Lamp 4ft HPT8	72	3-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping 4 Lamp 8ft T12 to 4 Lamp 4ft HPT8[b]	94	4-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2

Measure Description	$Watts_{LFT8}$	Notes/Reference
De-Lamping w/Refl 4 Lamp 4ft T12 to 2 Lamp 4ft HPT8	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 4 Lamp 4ft T12 to 3 Lamp 4ft HPT8	72	3-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 4 Lamp 8ft T12 to 4 Lamp 4ft HPT8[b]	94	4-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
De-Lamping w/Refl 2 Lamp U tube T12 to 2 Lamp 2ft T8	32	F17T8 Standard Lamp - 2 foot from IL-TRM v4.0 Section 4.5.3 Table A-3
1 Lamp 4ft HPT8/LWT8 L&B Retro	25	1-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
2 Lamp 4ft HPT8/LWT8 L&B Retro	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
2 Lamp tandem 4ft HPT8 replacing 1L 8ft T12 (Slimline, HO, or VHO)	49	2-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
2 Lamp 8ft RWT8 L&B Retro replacing 2L 8ft T12 Slimline	114	RWT8 - F96T8 Lamp - 8 foot from IL-TRM v4.0 Section 4.5.3 Table A-3.
2 Lamp T8 U HPT8/LWT8 Replacing 2-T12 U Lamp	56	F32T8 Standard u-tube Lamp from IL-TRM v4.0 Section 4.5.3. Table A-3
3 Lamp 4ft HPT8/LWT8 L&B Retro	72	3-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
4 Lamp 4ft HPT8/LWT8 L&B Retro	94	4-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
4 Lamp tandem 4ft HPT8 replacing 2L 8ft T12 (Slimline, HO, or VHO)[b]	94	4-Lamp Relamp/Reballast HPT8 from IL-TRM V4.0 Section 4.5.3 Table A-2
4 Lamp 4ft HPT8 High bay Fluor replacing 250W HID	146	4-Lamp HPT8 w/ High-BF Ballast High-Bay from IL-TRM V4.0 Section 4.5.3 Table A-2
6 Lamp 4ft HPT8 High bay Fluor replacing 400W HID	206	6-Lamp HPT8 w/ High-BF Ballast High-Bay from IL-TRM V4.0 Section 4.5.3 Table A-2

ISR = In-service rate or the percentage of lamps rebated that get installed = 96.9%[12]

Hours = Annual operating hours (varies by building type per IL-TRM V4.0 Section 4.5)

WHFe = Waste heat factor for energy that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

[12] In-service rate calculated using results from an application review or on-site verification for a sample of PY8 participants (n=20).

WHFd = Waste heat factor for demand that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)

CF = Summer Peak Coincidence Factor (varies by building type per IL-TRM V4.0 Section 4.5)

A.6 Occupancy Sensor

The evaluation team determined ex post savings for occupancy sensors using the algorithms below.

Equation 6. Occupancy Sensor Algorithms

$$Energy\ Savings\ (\Delta kWh) = kWControlled * ISR * Hours * ESF_{weighted} * WHFe$$

$$Demand\ Savings\ (\Delta kW) = kWControlled * ISR * WHFd * (CFbaseline - CFos)$$

Where:

kWcontrolled = Total wattage connected to the sensor control in units of per 1,000 watts (kilowatts) (actual wattage controlled from program-tracking database)

ISR = In-service rate or the percentage of occupancy sensors rebated that get installed = 100%[13]

Hours = Annual operating hours (varies by building type per IL-TRM V4.0 Section 4.5)

$ESF_{weighted}$ = Weighted Energy Savings Factor (ESF) that represents the percentage of reduced operating hours from installing either wall mounted or fixture mounted occupancy sensors = 33% (See Equation 7)

Equation 7. Weighted Energy Savings Factor

$$ESF_{weighted} = (ESF_{Wall\ mounted} * \%sensors_{wall\ mounted}) + (ESF_{Fixt\ mounted} * \%sensors_{Fixt\ mounted})$$

$ESF_{Wall\ mounted}$ = Energy Savings Factor for wall mounted occupancy sensors per IL-TRM V4.0 = 41%

$ESF_{Fixt\ mounted}$ = Energy Savings Factor for fixture mounted occupancy sensors per IL-TRM V4.0 = 30%

$\%Sensors_{Wall\ mounted}$ = Approximate percentage of installed occupancy sensors that were wall mounted per implementer = 25%

$\%Sensors_{Fixt\ mounted}$ = Approximate percentage of installed occupancy sensors that were wall mounted per implementer = 75%

[13] The IL-TRM V4.0 does not provide an in-service rate, nor does it include it as part of the algorithm. The in-service rate is assumed to be 100%.

WHFe	= Waste heat factor for energy that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)
WHFd	= Waste heat factor for demand that accounts for cooling savings from efficient lighting (varies by building type per IL-TRM V4.0 Section 4.5)
CFbaseline	= Summer Peak Coincidence Factor for the lighting system without the installation of occupancy sensors (varies by building type per IL-TRM V4.0 Section 4.5)
CFos	= Summer Peak Coincidence Factor for the lighting system with the installation of occupancy sensors per IL-TRM V4.0 = 0.15

A.7 Low-Flow Faucet Aerators

The evaluation team determined ex post for low-flow faucet aerators using the algorithms below.

Equation 8. Low-flow Faucet Aerator Algorithms

$$Energy\ Savings\ (\Delta kWh) = \%ElectricDHW * \frac{GPM_{Base} - GPM_{LFA}}{GPM_{Base}} * Usage * EPG_{Electric} *\ ISR$$

$$Demand\ Savings\ (\Delta kW) = \frac{\Delta kWh}{Hours} * CF$$

Where:

%ElectricDHW	= 100% if electric water heater, 0% if gas water heater
GPM_{Base}	= Flow rate of the baseline faucet aerator per IL-TRM V4.0 = 1.39
GPM_{LFA}	= Flow rate of the low-flow faucet aerator per IL-TRM V4.0 = 0.94
Usage	= Estimated usage (gallons per year) of mixed water (varies by building type per IL-TRM V4.0 Section 4.3.2)
EPG_electric	= Energy per gallon of hot water supplied by electric water heater for bathroom faucets per IL-TRM V4.0 = 0.0795 (bathroom aerator); 0.0969 (kitchen aerator)
ISR	= In-Service Rate per IL-TRM V4.0 = 95%
Hours	= Annual electric DHW recovery hours for bathroom faucet use (varies by building type per IL-TRM V4.0 Section 4.3.2)
CF	= Coincidence Factor for electric load reduction (varies by building type per IL-TRM V4.0 Section 4.3.2)

A.8 Vending Misers

The evaluation team determined ex post savings for vending misers using the algorithms below.

Equation 9. Vending Miser Algorithms

$$Energy\ Savings\ (\Delta kWh) = kWh\ savings_{Ref\ Bev} + kWh\ savings_{Ref\ Glass\ Front}$$

$$kWh\ savings_{Ref\ Bev} = WattsBase_{Ref\ Bev} * ISR * Hours * ESF_{Ref\ Bev}$$

$$kWh\ savings_{Ref\ Glass\ Front} = WattsBase_{Ref\ Glass\ Front} * ISR * Hours * ESF_{Ref\ Glass\ Front}$$

$$Demand\ Savings\ (\Delta kW) = No\ demand\ savings\ for\ vending\ misers$$

Where:

$kWh\ savings_{Ref\ Bev}$ = Energy savings for installing controls on refrigerated beverage machines

$kWh\ savings_{Ref\ Glass\ Front}$ = Energy savings for installing controls on refrigerator glass front snack machines

$WattsBase_{Ref\ Bev}$ = Total refrigerated beverage machine wattage connected to the sensor control

$WattsBase_{Ref\ Glass\ Front}$ = Total refrigerated glass front snack machine wattage connected to the sensor control

ISR = In-service rate or the percentage of vending misers rebated that get installed = 100%[14]

Hours = Annual operating hours per IL-TRM V4.0 = 8,766 hours/yr

$ESF_{weighted}$ = Weighted Energy Savings Factor (ESF) that represents the percentage of reduced operating hours from installing either wall mounted or fixture mounted occupancy sensors = 33% (See Equation 7)

$ESF_{Ref\ Bev}$ = Energy Savings Factor for refrigerated beverage machine sensors per IL-TRM V4.0 = 46%

$ESF_{Ref\ Glass\ Front}$ = Energy Savings Factor for refrigerator glass front snack machine sensors per IL-TRM V4.0 = 30%

[14] The IL-TRM V4.0 does not provide an in-service rate, nor does it include it as part of the algorithm. The in-service rate is assumed to be 100%.

B. Appendix – NTGR Results

In PY8, the evaluation team conducted research with SBDI program participants to update the program's net-to-gross-ratios (NTGRs) for application in PY10. Consistent with prior program years, the NTGRs developed in PY8 are based on self-reported information from the participant CATI survey. The participant survey was used to develop estimates of free-ridership (FR) and participant spillover (PSO).

Key Findings

Our PY8 research found a free-ridership rate of 3.8% for electric savings. Our spillover analysis found a participant spillover rate of 0% for electric savings. To compute our NTGR, we incorporated our non-participant spillover rate from PY7 research of 0%, yielding a NTGR of 96.2%.

NTGR Background

Net impact evaluation is generally described in terms of determining program attribution. Program attribution accounts for the portion of gross energy savings associated with a program-supported measure or behavior change that would not have been realized in the absence of the program. The program-induced savings, indicated as a net-to-gross ratio (NTGR), is made up of free-ridership (FR) and spillover (SO) and is calculated as (1 – FR + SO). Free-ridership is the portion of the program-achieved verified gross savings that would have been realized absent the program and its interventions. Spillover is generally classified into participant and non-participant spillover. Participant spillover occurs when participants take additional energy-saving actions that are influenced by the program interventions but did not receive program support. Non-participant spillover is the reduction in energy consumption and/or demand by customers who did not participate in the program, but were influenced by it.

The formula to calculate the NTGR is:

$$NTGR = 1 - FR + PSO + NPSO$$

The Illinois Evaluation Teams have worked with the Illinois Commerce Commission (ICC) and the Illinois Stakeholder Advisory Group (SAG) to create a standard Illinois Statewide Net-to-Gross approach for use in Illinois energy efficiency evaluation, measurement, and verification work. Per the NTG Methods attachment to the Illinois TRM,[15] all NTG data collection and analysis activities for program types covered by the attachment that began after June 1, 2016 must conform to the statewide NTG methods. This evaluation conforms with these requirements.

Free-Ridership

Methodology

Free-riders are program participants who would have implemented the incented energy-efficient measure(s) even without the program. Free-ridership estimates are based on a series of questions that explore the

[15] Illinois Statewide Technical Reference Manual for Energy Efficiency: Attachment A – Illinois Statewide Net-to-Gross Methodologies. February 8, 2016.

influence of the program in making the energy-efficient installations as well as likely actions had the program not been available.

As prescribed by the Small Business Protocol in the NTG Methods attachment, we implemented two specifications of the free-ridership algorithm for all SBDI Program projects included in the participant survey. Each specification of the algorithm consists of two scores: 1) influence of program components score and 2) no-program score (counterfactual), which has a timing adjustment applied to it. Each sub-score serves as a separate estimator of free-ridership and can take on a value of 0 to 1, where a higher score means a higher level of free-ridership. The overall free-ridership score for a project is the average of the two scores. The free-ridership score for each project thus ranges from 0 (no free ridership) to 1 (100% free ridership).

The two scores included in the algorithm, their variations, and the timing adjustment are described below.

1. **Influence of Program Components (PC).** This score is based on a series of eight questions that ask respondents to rate the importance of program and non-program components in their decision to install the energy efficient equipment, using a scale of 0 to 10 (where 0 is "Not at all important" and 10 is "Very important"). Program components considered (if applicable) include the incentive amount, ease of participation, information provided during the assessment, the program representative who conducted the assessment, information from past participants, previous experience with equipment, and payback on investment. Non-program components considered (if applicable) include industry standard practice, previous experience with equipment, and payback on investment.[16]

   We estimate the Program Components score in two different ways, referred to as "Program Components FR Score A" and "Program Components FR Score B." Program Components FR score A is based on ratings for program factors only. The free-ridership score is calculated as:

   Equation 10. Program Components FR Score A

   $$PCS_{\propto} = 1 - \left(\frac{PF_{max}}{10}\right)$$

   Greater importance of the program components means a lower level of free ridership. In this approach, if a respondent rated the program rebate 10 out of 10, the recommendation of program staff 8 out of 10, and the information from program materials 8 out of 10, the final Program Components FR score A would be 0.

   Program Components FR score B is based on ratings for both program and non-program factors. The free-ridership score is calculated as:

   Equation 11. Program Components FR Score B

   $$PCS_{\beta} = 1 - \left(\frac{PF_{max}}{PF_{max} + NPF_{max}}\right)$$

[16] Note that previous experience with equipment and payback on investment can be treated as a program or non-program factor based on other responses given by the participant.

Greater importance of the program components relative to the importance of non-program components means lower level of free ridership. In this approach, if a respondent rated both the program rebate and corporate policy as a 10 out of 10, the final Program Components free-ridership score would be a 0.5.

2. **No-Program Score (NP).** This score is based on the likelihood that the exact same energy efficient equipment would have been installed without the program, using scale of 0 to 10 (where 0 is "Not at all likely" and 10 is "Very likely") and is calculated as follows:

$$\text{No-Program Score} = \text{Likelihood to Install Same Equipment} / 10$$

A greater likelihood of participating without the program means higher level of free ridership. For example, if the participant provides a likelihood rating of 7 to install the same equipment in the absence of the program, their No-Program free-ridership score would be a 0.70.

This score also incorporates a timing adjustment (discussed next) as follows:

$$\text{No-Program Score}_{\text{Adjusted}} = (\text{Likelihood to Install Same Equipment} / 10) * \text{Timing Adjustment}$$

3. **Program Timing Adjustment.** The program timing adjustment is based on two questions: (1) if the installation would have been done at the same time without the program, and (2) if the installation would have been done later, how much later. Later implementation without the program means lower level of free ridership. This adjustment is calculated on a 0 to 1 scale. A timing adjustment of 1 means that there is no evidence the program changed the timeframe in which the project would have been implemented, while a lower value of the timing adjustment means that the program caused the project to be implemented sooner. The timing adjustment provides the program with some credit for accelerating the project by reducing the level of free-ridership. Table 26 provides detail on how participant responses correspond to various timing adjustments.

Table 26. Timing Adjustments

Participant Survey Response	Timing Adjustment
In absence of program, would you have completed the project…	
At the same time/within 6 months	1.0
seven months to one year later	0.90
more than one year up to two years	0.71
more than two years up to three years	0.43
more than three years up to four years	0.14
more than four years later	0.00

The timing adjustment is multiplied by the No-Program free-ridership score (as shown above).

This evaluation implemented and analyzed the following two specifications of the free-ridership algorithm.

- **Approach 1A:** (Program FR Score A + Program Influence Score + Adjusted No-Program Score) / 3
- **Approach 1B:** (Program FR Score B + Program Influence Score + Adjusted No-Program Score) / 3

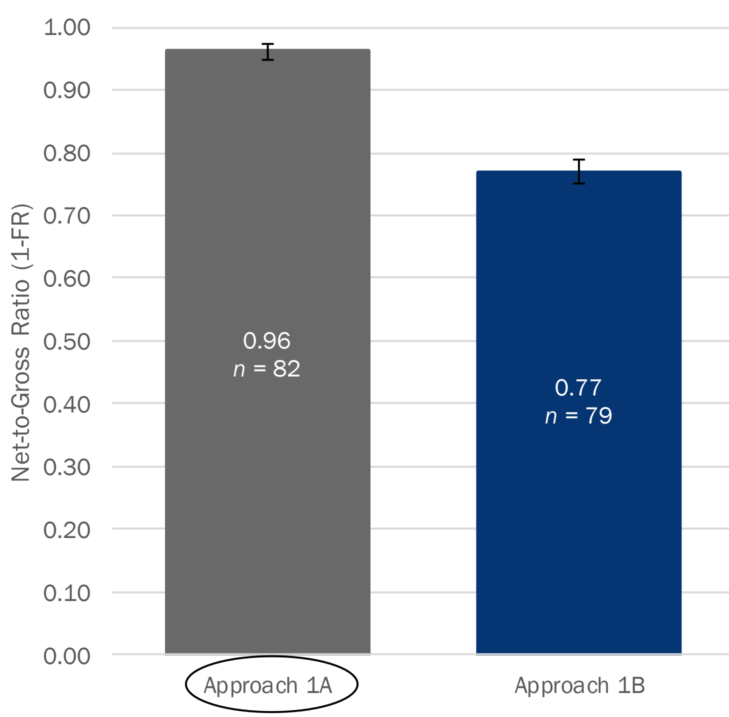
In each specification, one of the two variants of the Program Components Score, the Program Influence Score, and the adjusted No-Program score are averaged.

To produce final weighted free-ridership estimates, we weighted the responses from each completed interview by the ex post gross savings of the associated project.

Results

Figure 7 presents our estimates of NTGR for both of the two specifications of the FR algorithm discussed above. The figure also shows the associated error bounds and sample sizes. As discussed below, we choose Approach 1A as our specification of choice for this evaluation.

Figure 7. SBDI NTGR (1-FR) and Error Bounds by Approach



The figures show that the free-ridership estimates from the two algorithm specifications fall well outside other's confidence bounds.

The evaluation team examined these results and chose Approach 1A (circled in the above figures) as the preferred free-ridership approach for this evaluation. When we examine the scores inside each algorithm specification, we find that the Program Components FR Score B is generally close to 0.5, regardless of other responses provided (such as responses to questions used to calculate the No-Program Score, as well as the timing adjustment). As such, we feel that an algorithm incorporating this score is not a reasonable choice for use.since it reduces the correlation among the two components.in the NTGR algorithm, thus reducing the reliability of the resulting NTGR.

Participant Spillover

Methodology

Participant spillover refers to the installation of energy efficient measures by program participants that were influenced by the program but did not receive an incentive. An example of participant spillover is a customer who installed incented equipment in one facility and, as a result of the positive experience, installs additional equipment at another facility but does not request an incentive (outside spillover). In addition, the participant may install additional equipment, without an incentive, at the same facility because of the program (inside spillover).

We examined both inside and outside spillover in SBDI projects using participant responses to the phone survey.

Results

We examined both inside and outside participant spillover in PY8 SBDI projects using participant responses to the phone survey. We found no cases of participant spillover.

C. Appendix – Data Collection Instruments

The following files contain the SBPA participant survey and the SBPA interview guide.

PY8 IPA SBDI
Participant Survey FI

AIC SBDI SBPA
Interview Guide FIN.

D. Appendix – Survey Response Rate Methodology

The survey response rate is the number of completed interviews divided by the total number of potentially eligible respondents. We calculated the response rate (Response Rate 3 (RR3)) using the standards and formulas set forth by the American Association for Public Opinion Research (AAPOR).[17] The formulas used to calculate RR3 are presented below. The definitions of the letters used in the formulas are displayed in the Survey Disposition tables (Table 4 and Table 7). The response rate for this survey was 38%.

Equation 12: Response Rate Calculation

$$RR3 = \frac{I}{\left(I + N + e1(U1 + e2 * U2)\right)}$$

Where:

$$e1 = \frac{(I + N)}{(I + N + X1)}$$

$$e2 = \frac{(I + N + X1 + U1)}{(I + N + X1 + U1 + X2)}$$

[17] *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*, AAPOR, 2011. http://www.aapor.org/AM/Template.cfm?Section=Standard_Definitions2&Template=/CM/ContentDisplay.cfm&ContentID=3156

E. Appendix – Cost-Effectiveness Inputs

Table 27 presents total gross impacts for AIC cost-effectiveness calculations. These values differ from those included in the main report due to the inclusion of heating penalties for lighting measures. This approach was taken based on discussions with AIC and past agreements between AIC and ICC staff that heating penalties would not be included in savings calculations for goal attainment.

Table 27. PY8 SBDI Gross Impacts (Including Heating Penalties)

	kWh	kW	Therms
Gross Savings	12,586,249	2,653	0
Lighting Heating Penalty	0	0	- 103,952
Total Gross Savings with Heating Penalty	**12,586,249**	**2,653**	**- 103,952**

Lighting Heating Penalty

The inclusion of waste heat factors for lighting is based on the concept that heating loads are increased to supplement the reduction in heat that was once provided by the existing lamp type. We applied heating penalties to 34,019 fixtures and 139,158 controlled watts from occupancy sensors based on heating fuel and installed measure type. The program-tracking database does not provide the heating fuel type, therefore the Evaluation Team applied gas heat waste heat factors as specified in the IL-TRM V4.0 (when heating fuel is unknown). The total heating penalty for lighting measures is 103,952 therms.

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