NAVIGANT

Industrial Systems Study Program
EPY5 Evaluation Report

Final

Energy Efficiency / Demand Response Plan:
Plan Year 5
(6/1/2012-5/31/2013)

Presented to
Commonwealth Edison Company

March 21, 2014

Prepared by:

Vishy Tirumalashetty
Itron, Inc.

Sara Rosenbrock
Itron, Inc.

Itron

Opinion Dynamics

MichaelsEnergy

www.navigant.com

© 2014 Navigant Consulting, Inc.

Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606
Phone 312.583.5700
Fax 312.583.5701

Contact:

Randy Gunn, Managing Director
312.938.4242
Randy.Gunn@Navigant.com

Jeff Erickson, Director
608.497.2322
Jeff.Erickson@Navigant.com

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd based upon information provided by ComEd and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

NAVIGANT

Table of Contents

List of Figures and Tables

Figures

Tables

E. Executive Summary

This report presents a summary of the findings and results from the Impact and Process Evaluation of the Electric Program Year 5 (EPY5[1]) for the Industrial Systems Study program (Industrial Program). The Industrial Program included the study of compressed air systems starting in EPY4. In EPY5, the Industrial Program was expanded to include the study of process cooling systems and industrial refrigeration systems. The Industrial Program offers a combination of technical assistance and financial incentives. Technical assistance includes an industrial systems study which assesses the performance of the facility's industrial compressed air, process cooling, and refrigeration systems to ensure efficient, economical operation. The study examines the systems' operating characteristics to help identify energy saving measures, using a combination of capital investments and low or no cost measures.

E.1. Program Savings

Table E-1 summarizes the electricity savings from the EPY5 Industrial Program.

Table E-1. EPY5 Total Program Electric Savings

Savings Category †	Energy Savings (kWh)	Peak Demand Savings (kW)
Ex-ante Gross Savings	13,100,939	1,441
Verified Gross Savings	11,578,189	1,305
Verified Net Savings	7,757,387	939

Source: Utility tracking data and EM&V team analysis.
† See the Glossary in the Appendix for definitions.

E.2. Impact Estimate Parameters

In the course of estimating verified gross and net savings, the evaluation used a variety of parameters in its calculations. Some of those parameters were deemed for this program year and others were adjusted based on evaluation research. The key parameters used in the analysis are shown in the following table.

[1] The EPY5 program year began June 1, 2012 and ended May 31, 2013.

Table E-2. Impact Estimate Parameters

Parameter	Data Source	Deemed or Evaluated?
Net-to-Gross Ratio (NTGR)	SAG Spreadsheet †	Deemed
Gross Energy RR	*EM&V Analysis*	Evaluated
Gross Peak Demand RR	*EM&V Analysis*	Evaluated

† http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

Based on the gross impact sample of 13 Industrial Systems Study projects in EPY5, the evaluation results yielded energy gross realization rate of 0.88 and a demand gross realization rate of 0.91. The relative precision of the gross impact results at a one-tailed 90% confidence level for ± 4% for the kWh Realization Rate and the kW Realization Rate. These results are shown in Table E-3 below.

Table E-3. Verified Gross Savings Parameters

Input Parameters	Value	Deemed or Evaluated?
Energy Savings Realization Rate	0.88	Evaluated
Peak Demand Savings Realization Rate	0.91	Evaluated

Source: Evaluation Team analysis.

The energy NTGR used to calculate the verified EPY5 savings is a deemed SAG[2] value derived from EPY4 evaluation results. The EPY5 demand NTGR value is also derived from the EPY4 evaluation results and the evaluation team believes it is a reasonably representative value. The deemed values are 0.67 for energy savings and 0.72 for demand savings, as show in Table E-4 below.

Table E-4. Verified Savings Parameters

Input Parameters	Value	Deemed or Evaluated?
Energy Savings NTGR	0.67	Deemed
Peak Demand Savings NTGR	0.72	Evaluated (derived from EPY4 evaluation results)

Source: http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

E.3. Impact Estimate Parameters for Future Use

In the course of our EPY5 research, the evaluation team did research on the Net-to-Gross ratio (NTGR) parameter to be used in impact calculations. Some of those parameters are eligible for

[2] http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

deeming for future program years. The evaluation team's NTGR parameter recommended for future use is shown in the following table and in more detail in appendix section 7.2 on page 37. Directionally, this value is substantially the same as the Deemed value used to compute net savings in this year's evaluation.

Table E-5. Impact Estimate Parameters for Future Use

Parameter	kWh Value	kW Value	Data Source
Net-to-Gross Ratio (NTGR)	0.68	0.68	Evaluation Results

Source: Evaluation Team analysis

E.4. Participation Information

In total, 21 projects were completed in EPY5. Although the program offers studies for all 3 systems, only compressed air systems projects were completed in EPY5.This is most likely due to the program's strong momentum with this end-use; the other two end-uses were added in EPY5 and it appears have not gained sufficient momentum.

The table below presents the number of completed projects, along with ex-ante gross kWh claimed, ex-ante gross kW claimed, and the amount of incentives paid in EPY5. Note that one of the projects in EPY5 reported zero savings.

Table E-6. EPY5 Industrial Program Participation

Sampling Strata	Ex-ante kWh Impact Claimed	Ex-ante kW Impact Claimed	Completed Projects
TOTAL	13,100,939	1,441	21

Source: Evaluation Team analysis

E.5. Conclusions and Recommendations

The following provides insight into key program findings and recommendations:

Production Data Collection and Analysis

Finding 1. The program was not always successful in collecting production data from the facility prior to the new equipment installation, and this affects the certainty of the savings calculations. Without the production data for the pre-metering period, post-metering period and annual observed production, some related amount of uncertainty in the final savings estimates is expected.

Recommendation 1. The program should strongly consider making production data collection a program requirement. Production data is a critical parameter that impacts savings calculations for industrial systems, gathering production data for each completed project would significantly increase accuracy of savings estimates.

Data Collection Activities

Finding 2. The program collected amperage data through metering and estimated power factor through spot measurements to calculate kW usage for most of the completed projects. If amperage is measured for an array of part load conditions and is combined with spot measurement-derived power factors (PF), this can lead to inaccurate simulation/modeling results.

Recommendation 2. The program should use power (kW) meters to collect kW measurements using interval metering instrumentation and recording devices. The availability of kW data will reduce uncertainty in metering data-based kW estimation by reducing reliance on assumptions. This will also increase the value of metering resource expenditures, given the improved resulting accuracy and reliability.

Finding 3. The program typically collects metering data for two weeks for both pre- and post-periods. If the metering period is not representative due to any issues or some changes in system operating conditions, the program and evaluation team is left with inadequate data to calculate annual energy usage through extrapolation. Insufficient ex-ante measurement for pre retrofit conditions can greatly decrease the accuracy of ex-post savings calculations.

Recommendation 3. The program should consider increasing the metering period to four weeks. This will ensure that more varying conditions are captured and also minimize any loss of data due to compressor breakdown/shutdown and the resulting lack of representativeness of typical operations during the logged period. The extended metering period will also benefit evaluation activities mainly the desk reviews.

Improvements to Ex-ante Savings Calculations

Finding 4. The program verification calculations overestimated airflow (CFM) demand reduction savings compared to the actual airflow (CFM) demand reduction (e.g., #16114).

Recommendation 4. Check to make sure CFM reduction is consistent with the program estimates. The difference between pre- and post-period CFM should be adjusted to match the demand reduction observed.

Program Process

Finding 5. Customers, service providers, and program staff all mentioned program time requirements as major concerns, which include the following:

- A majority of customers reported various issues that caused their program participation to be time-consuming. Some of the issues mentioned by customers were the time it took to receive the paperwork, the time it took to receive the study, and delays in getting the equipment. Many of their recommendations were focused on actions to reduce the amount of time required to participate.
- Service providers mentioned concerns about the time they spent per project, time spent getting to incentive amounts, and the lack of consistency in program oversight. A few service providers mentioned that they aren't actively promoting the program (including one that had multiple projects in EPY5), stating that they preferred to steer customers to the Custom program due to the amount of time they have to spend per project.. Recommendations given by the service providers included streamlining the program, making the program available to smaller customers, and better communication and consistency in the project oversight.

- Program staff also report concerns about the amount of time each project takes which affects their ability to reach program participation goals, noting they are continuously analyzing what they can improve upon. To address this issue, in EPY5 ComEd added the option to combine the planning/investigation phases and the option to split savings between program years when some of the measures have been implemented. Also, another program redesign is set to be implemented in January 2014.

Recommendation 5. This finding indicates that the program may have room to improve to keep customers satisfied, service providers engaged, and the program meeting its participation goals. The changes set to roll out in January appear to be a step in the right direction and hopefully we will see the positive results in next year's evaluation. Another program consideration could be to include a prescriptive option for a select set of compressed air measures.

The EPY5 gross realization rate of 0.88 for energy and 0.91 for demand are a significant improvement compared to those for the EPY4 program. The EPY5 energy realization rate of 0.88 is higher than the EPY4 level of 0.75, while the EPY5 demand realization rate of 0.91 is significantly higher than the EPY4 level of 0.68. The substantial improvement in gross energy and demand realization rates is commendable, given the complexity of the savings calculations, challenging data collection activities and the varying operating conditions of the industrial systems. These results demonstrate that the program M&V methods have improved since EPY4.

1. Introduction

1.1 Program Description

The Commonwealth Edison (ComEd) Smart Ideas for Your Business program provides incentives for business customers who upgrade their facilities with energy efficient equipment. This incentive program is available to all eligible, nonpublic, commercial and industrial customers in ComEd's service territory.

The Industrial Systems Study portion of ComEd's Smart Ideas for Your Business program included only the compressed air system study in EPY4. In EPY5, the Industrial Systems Study program (Industrial Program) was expanded to include the study of process cooling systems and industrial refrigeration systems.

The Industrial Program offers a combination of technical assistance and financial incentives. Technical assistance includes an industrial systems study which assesses the performance of the facility's industrial compressed air system, process cooling system and refrigeration system to ensure efficient, economical operation. This service examines the system's operating characteristics to help identify energy saving measures, using a combination of capital investments and low or no cost measures. In addition to the study, ComEd provides a one-time incentive payment of $0.07 per annual kWh saved after proper implementation of recommendations identified through the Industrial Systems Program. Recommendations from the study are not eligible for any other ComEd incentive. Eligible annual kWh savings are determined through measurement and verification activities. The total incentive cannot exceed 50% of the total implementation costs and 100% of the total incremental costs for improvements recommended in the study.

The Evaluation Team identified the following key researchable objectives for EPY5:

1.1.1 Impact Objectives

1. Estimate the program gross impacts.
2. Identify opportunities for improvement to program impact calculations and estimates.
3. Estimate the program net impacts.
4. Assess the degree to which the program influenced customers' decisions to improve the efficiency of their industrial systems (as compared to the influence of other non-program factors).
5. Assess whether or not the program met its impact goals. If not, why not?

1.1.2 Process Objectives

1. Examine the program design and implementation.
2. Evaluate the effectiveness of the program design and processes.
3. Examine the effectiveness of program implementation.
4. Assess the effectiveness of program marketing and outreach.
5. Identify barriers to participation for both customers and Industrial Systems service providers.
6. Evaluate participant satisfaction for both customers and Industrial Systems service providers.

2. Evaluation Approach

Program Year 5 represents the first full year of implementation for the Industrial Program. For the EPY5 evaluation, gross impact results were developed based on detailed M&V analysis for five projects and thorough desk reviews for another eight projects. The net-to-gross ratio (NTGR) used to calculate EPY5 impacts was deemed by SAG[3] and resulted from the EPY4 Industrial Systems evaluation. The verified gross savings estimates were multiplied by the deemed NTGR to calculate the verified net energy and peak demand savings. Lastly, a process evaluation was conducted in PY5. Three research activities were undertaken to support the process evaluation: (1) interviews with program manager and implementation staff, (2) in-depth interviews with participating service providers and (3) quantitative telephone surveys with participating customers.

2.1 Overview of Data Collection Activities

The core data collection activities included on-site audits and desk reviews in support of gross impact analysis , and telephone surveys in support of NTG and Process analysis. The full set of data collection activities is shown in the following table.

Table 2-1. Core Data Collection Activities

N	What	Who	Target Completes	Completes Achieved	When	Comments
Impact Assessment						
1	Onsite M&V Audit	Participants	5	5	September – November 2013	Sampled projects from Stratum 1 and Stratum 2
2	Desk Reviews	Participants	8	8	September – November 2013	Sampled projects from Stratum 3
3	Telephone Survey	Participants	Census Attempt (21 participants)	18	September – November 2013	Data collection for Process in the same instrument.
Process Assessment						
4	Telephone Survey	Participants	Census Attempt (21 participants)	18	September – November 2013	Data collection for NTG in same instrument.
5	Telephone Survey	Participating Service Providers	Census Attempt (8 participants)	8	August – November 2013	
6	In Depth Interviews	Program Manager /Implementer Staff	2	2	September – October 2013	

Source: Evaluation Team

[3] http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

2.2 Verified Savings Parameters

The following table presents the parameters that were used in the verified gross and net savings calculations and indicates which were examined through evaluation activities and which were deemed.

Table 2-2. Verified Gross and Net Savings Parameter Data Sources

Input Parameters	Data Source	Deemed or Evaluated?
Gross Energy Savings Realization Rate	EPY5 Analysis	Evaluated
Gross Peak Demand Savings Realization Rate	EPY5 Analysis	Evaluated
Net-to-Gross Ratio (NTGR)	SAG Agreement	Deemed
Net Energy Savings	EPY5 Analysis	Evaluated
Net Peak Demand Savings	EPY5 Analysis	Evaluated

2.3 Verified Gross Program Savings Analysis Approach

The gross impact evaluation approach was a combination of desk reviews and on-site audits. Out of the 13 sampled projects, on-site audits were conducted for five projects and a thorough desk reviews for eight projects.

On-site audits were performed for the sampled stratum 1 and stratum 2 projects (total of five (5) projects). On-site data collection included verification of measure installation, verification of a functioning system, verification of planned system operation, and specific details of any variance of these verifications. On-site audits also collected or obtained customer-stored data to support downstream M&V calculations. Measurements included spot measurements, run-time hour data logging, and post-installation interval metering. Customer-supplied data from dedicated facility meters for the industrial systems or supervisory control and data acquisition (SCADA) systems were used when available.

For the smallest projects (stratum 3), engineering desk reviews were performed to complete ex-post analysis. Desk reviews do not incorporate on-site audits. Instead, desk reviews involve a review of project documentation provided by the program, an engineering review of the algorithms and an audit of ex-ante calculation models used by the program to estimate energy savings. The engineering audit of program calculations determined if the inputs that feed the program calculations are reasonable and acceptable or if they needed revision based on evaluation findings. Additionally, telephone interviews with the site contacts were conducted in support of these desk reviews and information obtained from the interviews was used to verify savings. Also, the site contacts were requested to provide post-installation production data electronically. The information collected was used to inform evaluation savings calculations.

Engineering calculations were performed to derive evaluated gross kWh and KW savings. These calculations started with an engineering audit of the algorithms used by the program to calculate energy savings and the inputs that feed into those algorithms. The engineering review also included a preliminary judgment to identify those assumptions with higher uncertainty or potential to influence

the program savings estimate. The data collected was to verify and/or update the assumptions that feed into engineering algorithms of measure level savings. Data obtained from the sampled sites served to verify measure installation, determine installed measure characteristics, assess operating hours and relevant modes of operation, identify the characteristics of the replaced equipment, support the selection of baseline conditions and perform ex-post savings calculations. The peak kW savings calculation methodology was consistent with PJM requirements for each project.

A verified gross realization rate (e.g., the ratio of the verified gross savings-to-reported tracking savings) was then estimated for the sample, by sampling stratum, and applied to the population of reported tracking savings, using sampling-based approaches that are described in greater detail in Section 3 below. The result is a verified gross savings estimate for the Industrial Program.

2.4 Verified Net Program Savings Analysis Approach

Verified net energy and demand (peak and overall) savings were calculated by multiplying the Verified Gross Savings estimates by a net-to-gross ratio (NTGR). In EPY5, the NTGR estimates used to calculate the Net Verified Savings were based on past evaluation research and defined through a consensus process through SAG as documented in a spreadsheet.[4]

2.5 Process Evaluation

Three research activities were conducted in support of the process evaluation: (1) interviews with program and implementation staff, (2) in-depth interviews with participating service providers and (3) telephone surveys with participating customers.

2.6 Sampling

2.6.1 Profile of Population

ComEd's Frontier tracking extract dated October 9th, 2013 contains data for all the completed projects in EPY5. A total of 21 projects were completed in EPY5 and although the program offers studies for industrial compressed air, process cooling, and refrigeration systems, all the projects completed in EPY5 are compressed air systems projects. Table 2-3 presents information for each of three strata developed for sampling within the Industrial Program. The number of projects is presented by strata, along with ex-ante gross kWh claimed and ex-ante gross kW claimed. One of the 21 completed projects in EPY5 reported zero savings. This project was not considered for gross sampling purposes.

[4] http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

Table 2-3. EPY5 Industrial Program Participation by Sampling Strata

Sampling Strata	Ex-ante kWh Impact Claimed	Ex-ante kW Impact Claimed	Completed Projects
1	5,084,654	580	2
2	3,697,636	349	4
3	4,318,649	512	15
TOTAL	13,100,939	1,441	21

Source: Evaluation Team analysis based on ComEd tracking database, October 9, 2013.

2.6.2 Gross Impact Sample

Consistent with the evaluation plan, a stratified random sampling approach was used to select the gross impact sample of 13 projects. Projects were sorted and placed in three strata using ex-ante savings kWh to create roughly equal contributions to total program savings. Table 2-4 provides a profile of the gross impact sample in comparison with the program population. Shown is the resulting sample that was drawn, consisting of 13 applications, responsible for 10 million kWh of ex-ante impact claim and representing 77% of the program population's ex-ante impact claim. Also shown are the ex-ante based kWh sample weights for the three strata.

Table 2-4. EPY5 Industrial Program Gross Impact Sample by Strata

Population Summary				Gross Impact Sample		
Sampling Strata	Number of Projects (N)	Ex-ante kWh Impact Claimed	kWh Weights	Number of Projects (n)	Ex-ante kWh	Sampled % of Population kWh
1	2	5,084,654	0.39	2	5,084,654	100%
2	4	3,697,636	0.28	3	2,967,537	80%
3	15	4,318,649	0.33	8	2,038,259	47%
TOTAL	**21**	**13,100,939**	**-**	**13**	**10,090,450**	**77%**

Source: Evaluation Team analysis

2.6.3 Net Impact Sample

Per the evaluation plan, the sampling approach for the participant survey conducted in support of the net-to-gross component of the impact evaluation (and the process evaluation) was a census attempt.

Out of the 21 participants in EPY5, telephone surveys were conducted with 18 participants. We were unable to reach anyone willing to complete a survey after multiple attempts at the remaining three businesses. The table below presents the count and kWh claimed for the sample included in the EPY5 net impact analysis.

Table 2-5. EPY5 Industrial Program Net Impact Sample by Strata

Population Summary				Net Impact Sample		
Sampling Strata	Number of Projects (N)	Ex-ante kWh Impact Claimed	kWh Weights	Number of Projects (n)	Ex-ante kWh	Sampled % of Population kWh
1	2	5,084,654	0.39	2	5,084,654	100%
2	4	3,697,636	0.28	4	3,697,636	100%
3	15	4,318,649	0.33	12	3,467,291	80%
TOTAL	**21**	**13,100,939**	**-**	**18**	**12,249,581**	**94%**

Source: Evaluation Team analysis

3. Gross Impact Evaluation

The evaluation team reviewed ComEd's tracking data extract dated October 9th, 2013 to determine reported ex-ante gross savings. The Verified gross program impacts for the evaluation for the Industrial System Study program were developed based on the on-site visits and detailed M&V analysis for five projects and thorough desk reviews for eight projects.

3.1 Tracking System Review

In EPY5, ComEd added Industrial Program participants within the overall *Smart Ideas* commercial program on-line tracking database. The evaluation team worked off of a copy of the tracking system data uploaded by ComEd to their secure SharePoint site on a periodic basis. Additionally, measure level information for the completed projects was provided in a standard spreadsheet format. While reviewing tracking systems, the evaluation team found the changes made to the tracking system in EPY5 are a major improvement from EPY4. The evaluation team found the tracking system data to be consistent and the upgraded tracking system enabled the evaluation team to analyze program statistics without issues.

To support the impact evaluation, the evaluation team was given direct access to ComEd's on-line tracking system and data. The on-line system was easy to work with and provided viewing access to the project tracking data plus downloading rights to project documentation in electronic format for each project. This documentation was complete and greatly facilitated the evaluation, while removing a step that commonly impedes evaluation progress: a data request for the very information that ComEd made available in the tracking database itself. This level of access and documentation is highly commendable and represents a best practice in this area.

Key findings include:

1. The measure field (Measure_Number) with in the tracking database identifies the program name. The projects were identified as Industrial Systems Study projects based on this field name. The program should ensure the Industrial System Study projects are clearly identified within the tracking database and the measure level field is populated consistently.
2. The evaluation team identified some inconsistencies with demand savings reported during the tracking system review. However, the program fixed all the issues identified and ensured the reported demand savings are consistent with the calculated savings.

3.2 Gross Program Impact Parameter Estimates

Gross program impacts for this evaluation of the Industrial Program were developed based on the on-site visits and detailed M&V analysis for five projects and thorough desk reviews for 8 projects.

The EM&V team conducted research to validate the parameters that were not specified in the TRM. The results are shown in the following table.

Table 3-1. Verified Gross Savings Parameters

Input Parameters	Value	Deemed or Evaluated?
Energy Savings Realization Rate	0.88	Evaluated
Peak Demand Savings Realization Rate	0.91	Evaluated

Source: Evaluation Team analysis

3.2.1 Development of the Verified Gross Realization Rate

There are two basic statistical methods for combining individual gross realization rates from the sample projects into an estimate of verified gross kWh savings for the population when stratified random sampling is used. These two methods are called "separate" and "combined" ratio estimation.[5] In the case of a separate ratio estimator, a separate gross kWh savings realization rate is calculated for each stratum and then combined. In the case of a combined ratio estimator, a single gross kWh savings realization rate is calculated directly without first calculating separate gross realization rates by stratum.

The separate ratio estimation technique was used to estimate verified gross kWh savings for the Industrial Program. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework[6] which identified best practices in program evaluation. These steps are matched to the stratified random sampling method that was used to create the sample for the program. The standard error was used to estimate the error bound around the estimate of verified gross kWh.

3.2.2 Verified Gross Program Impact Results

Based on the gross impact sample size of 13 Industrial Systems Study projects in EPY5, the evaluation results yielded an energy gross realization rate of 0.88 and a demand gross realization rate of 0.91. The results of each project are summarized in Table 3-2 below.

[5] A full discussion and comparison of separate vs. combined ratio estimation can be found in Sampling Techniques, Cochran, 1977, pp. 164-169.

[6] Tec Market Works, "The California Evaluation Framework," Prepared for the California Energy Commission, June 2004. Available at http://www.calmac.org

Table 3-2. Gross Impact Realization Rate Results for the Selected Industrial Systems Study Sample

Sampled Application ID	Sample-Based Ex-ante Impact Claimed		Sampling Strata	Ex Ante-Based Gross Impact Weights by Strata	Sample-Based Evaluation Verified Gross Impact		Application -Specific Evaluation Verified Gross Realization Rate		Sample-Based Evaluation Verified Gross Realization Rate	
	kWh	kW		kWh	kWh	kW	kWh	kW	kWh	kW
16114	3,143,892	359	1	0.62	2,347,295	285.07	0.75	0.79	0.84	0.87
17218	1,940,762	222	1	0.38	1,940,762	221.50	1.00	1.00		
16449	1,453,303	171	2	0.49	1,467,363	184.46	1.01	1.08	1.05	1.15
16450	807,753	96	2	0.27	821,061	128.59	1.02	1.34		
16458	706,481	81	2	0.24	818,986	84.96	1.16	1.05		
16441	619,047	71	3	0.30	321,603	36.46	0.52	0.52	0.79	0.78
17213	65,939	8	3	0.03	109,085	6.10	1.65	0.81		
17186	363,282	42	3	0.18	178,167	20.34	0.49	0.49		
17220	306,374	35	3	0.15	306,374	35.00	1.00	1.00		
17184	228,841	30	3	0.11	228,841	29.50	1.00	1.00		
16456	227,582	31	3	0.11	209,556	28.26	0.92	0.93		
17215	167,493	19	3	0.08	217,605	27.71	1.30	1.45		
17219	59,701	13	3	0.03	42,051	9.12	0.70	0.69		
TOTAL	10,090,450	1,175	-	NA	9,008,749	1,097	NA	NA	0.88	0.91

Source: Evaluation Team analysis

The EPY5 gross energy and demand realization rate of 0.88 and 0.91 is a significant improvement compared to the EPY4 program. The EPY5 energy realization rate of 0.88 is higher than the EPY4 level of 0.75, while the EPY5 demand realization rate of 0.91 is substantially higher than the EPY4 level of 0.68. This improvement in gross energy and demand realization rates for the EPY5 program compared to the EPY4 program is particularly commendable, given the complexity of the savings calculations, challenging data collection activities and the varying operating conditions of the industrial systems.

EPY5 gross energy realization rate results indicate that the smallest projects (stratum 3) (RR = 0.79) realized a lower proportion of the ex-ante claims than the largest (stratum 1) (RR = 0.84) and medium projects (stratum 2) (RR = 1.05). The evaluation team hypothesizes that this may be due to program M&V activities being less rigorous for stratum 3 projects and relying more heavily on the use of simplified calculation methods.

For projects evaluated through on-site M&V analysis (which account for 60% of total program savings), the energy savings realization rate is 0.93 and the energy savings realization rate for projects evaluated through desk reviews is 0.79. The lower realization rate for the desk review projects which were mainly smaller sized projects is due to the following: use of simplified calculation methods; the application of assumptions not conservative enough and/or not supported with reliable sources; and, inconsistent use of available site specific data. The program can further improve gross impact results by refining program calculations and data collection methods for smaller sized projects.

At the project level, the EPY5 energy savings realization rate results ranged from 0.49 to 1.65 which shows a large variation in realization rates across projects. The energy realization rate of eight of the 13 projects evaluated is 1.0 or greater.

The EPY5 demand realization rate of 0.91 is significantly higher than the EPY4 level of 0.68. The program did not always report peak demand savings for projects for the PJM peak period. The average demand savings were reported instead.

Overall the program team did an excellent job of ensuring all the implemented measures were installed and operating as planned. The program team collected site specific pre- and post-metered data for estimated savings; however, they were not able to collect production data for all projects. This meant that savings normalization was not feasible. For some projects, the program collected proxy parameters for production data such as labor-hours and machine hours for normalizing savings but this method did not yield reliable results. The reliability of the savings estimates could have been increased if the production data was available for all projects and normalization could have been performed. The program team continued doing an excellent job of using the pre- and post-M&V data for revising the savings estimates provided by the service providers, which were typically overestimated.

In general, the program team did a very good job of collecting site specific pre- and post-M&V data and calculating savings. Since the evaluators do not collect M&V data for desk reviews, the M&V data collected was very valuable for calculating evaluation-based savings for individual projects.

The relative precision at a one-tailed 90% confidence level for the gross impact results is ± 4% for the kWh Realization Rate and the kW Realization Rate. The results by stratum are summarized in Table 3-3 and Table 3-4 below.

Table 3-3. Gross kWh Realization Rates and Relative Precision at one-tailed 90% Confidence Level

Stratum	Relative Precision ± %	Low	Mean	High
Stratum 1	0%	0.84	0.84	0.84
Stratum 2	3%	1.02	1.05	1.07
Stratum 3	14%	0.68	0.79	0.90
Total kWh RR	4%	0.85	0.88	0.92

Source: Evaluation Team analysis

Table 3-4. Gross kW Realization Rates and Relative Precision at one-tailed 90% Confidence Level

Stratum	Relative Precision ± %	Low	Mean	High
Stratum 1	0%	0.87	0.87	0.87
Stratum 2	4%	1.09	1.15	1.20
Stratum 3	14%	0.67	0.78	0.88
Total kW RR	4%	0.87	0.91	0.95

Source: Evaluation Team analysis

The evaluation team has provided ComEd with site-specific M&V reports for each verified project. These site-specific impact evaluation reports summarize the ex-ante savings in the Final Application submitted, the ex-post M&V plan, the data collected at the site, and all of the calculations and parameters used to estimate savings.

Some general observations from the gross impact sample:

- For project #16114, the ex-ante analysis was not normalized for CFMs which reduced the realized savings. Similarly, for project #16458 ex-ante analysis was not normalized for CFMs which increased realized savings.
- For project #17186, the use of logged data and trended data in the ex-ante analysis was inconsistent in the estimation of total CFM and CFM/kW, respectively, which resulted in a significant reduction to realized savings.
- For projects #16441, #16456 and #17219, the ex-ante analysis estimated savings using simplified calculation methods which resulted in a reduction to realized savings. For project #17213, the simplified calculation method resulted in an increase to realized savings.
- For projects #16184 and #16186, the ex-ante metered data was not used for estimating savings or to perform check calculations for the estimated savings.
- For projects #16441, #16456 and #17219, the program did not conduct post verification M&V activities which resulted in overestimation of savings.
- For projects #16458 and #17186, the ex-ante analysis used to estimate demand savings were not consistent with the PJM peak period.

4. Net Impact Evaluation

Table 4-1 below presents the NTGR values used to calculate EPY5 verified net savings. As discussed previously, the EPY5 energy NTGR value used to calculate evaluation verified savings is a deemed value, derived from the EPY4 evaluation as defined through a consensus process through SAG as documented in a spreadsheet.[7] The EPY5 demand NTGR value is also derived from the EPY4 evaluation results and the evaluation team believes it is a reasonably representative value. The EPY4 energy saving NTGR is 0.67 and demand savings NTGR is 0.72.

Table 4-1. Verified Net Savings Parameters

Input Parameters	Value	Deemed or Evaluated?
Energy Savings NTGR	0.67	Deemed
Peak Demand Savings NTGR	0.72	Evaluated (derived from EPY4 evaluation results)

Source: Evaluation Team analysis.

4.1 Evaluation Verified Net Program Impact Results

Net program impacts were derived by multiplying EPY5 Evaluation Verified Gross program savings by the deemed EPY4 Net-to-Gross Ratio (NTGR). Table 4-2 and Table 4-3 provide the program-level Evaluation Verified Net impact results for the EPY5 Industrial Program. The Evaluation Verified gross realization rate for energy savings is 0.88, while the realization rate for demand savings is 0.91, based on the M&V analysis conducted for the projects in the sample. The NTGR for energy savings is 0.67 and demand savings is 0.72. These NTGRs are based on SAG deemed values, derived from the EPY4 evaluation.

Table 4-2. Program Level Evaluation Net kWh Impacts for EPY5

Sampling Strata	Ex-ante Gross kWh	Evaluation Verified Gross kWh	kWh RR	Evaluation Verified Net kWh	SAG Deemed NTGR
1	5,084,654	4,288,057	0.84	2,872,998	0.67
2	3,697,636	3,871,923	1.05	2,594,189	0.67
3	4,318,649	3,418,209	0.79	2,290,200	0.67
Total	**13,100,939**	**11,578,189**	**0.88**	**7,757,387**	**0.67**

Source: Evaluation Team analysis

[7] http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site at http://ilsag.info.

Table 4-3. Program Level Evaluation Net kW Impacts for EPY5

Sampling Strata	Ex-ante Gross kW	Evaluation Verified Gross kW	kW RR	Evaluation Verified Net kW	NTGR
1	580	507	0.87	365	0.72
2	349	399	1.15	288	0.72
3	512	399	0.78	287	0.72
Total	**1,441**	**1,305**	**0.91**	**939**	**0.72**

Source: Evaluation Team analysis

5. Process Evaluation

The process component of the Industrial Systems Study Program (Industrial Program) evaluation focuses on program participation, program design and implementation, marketing and outreach, barriers to participation, and participant satisfaction. The primary data sources for the process evaluation includes telephone surveys with 18 program participants and in-depth interviews with 8 service providers.

5.1 Participant Profile

The Industrial Program targets industrial customers, and self-reported business type from the 18 participants who were surveyed confirms this emphasis. Other demographics for the participants were also obtained:

- Industry: 94% manufacturing, 6% printing
- Size: 44% large, 33% medium, 22% small
- Own/Rent: 89% owners, 6% renters, 6% owns and rents
- Other locations: 94% have facilities at other locations

Two of the 18 participants surveyed were also participants from EPY4, and EPY5 participation consists of incremental measure installation supported by the EPY4 study. The remainder of this process section includes findings from the 16 participants that completed an industrial systems study in EPY5.

5.2 Program Design and Implementation

ComEd's Industrial Program design and implementation process was still being refined in EPY5. In general, the program is designed to provide customers with a fully funded industrial systems study that recommends both no/low cost and capital measures to lower participant energy use through improvements made to industrial systems. Compressed air customers that participate in the study are required to repair 50% of their compressed air leaks at their own expense and are also eligible for cash incentives towards the cost of implementing recommendations. In addition to compressed air measures included in EPY4, the EPY5 program was expanded to include process cooling and refrigeration measures. However, only compressed air projects were completed in EPY5.

One-fourth of ex-ante savings is attributed to compressed air leak repairs. All participants reported completing compressed air leak repairs at some point prior to participation in the Industrial Systems program. However, participants noted that prior to participation, leaks were most often found by either active or passive listening (80%). These leaks were reported to be found one of two ways; either the person working with the equipment reports hearing a leak or loss of pressure, or the compressed air system is powered up on a weekend and someone actively searches for leaks. The other 20% of participants reported using an ultrasonic leak detector to locate leaks in the system, however only one reported testing for leaks on a regular basis.

Twenty-five percent of participants reported having a regular leak testing schedule after participation, where one didn't exist before. Moreover, one company purchased an ultrasonic leak detector after participating in the program and now tests their system with the leak detector once a year. On the other hand, 44% of participants reported not having a regular leak testing schedule before or after participation.

5.3 Program Marketing and Outreach

All of the service providers that were interviewed indicate that they received some sort of promotional material from the program. They reported receiving the following marketing materials from ComEd: fact sheets, case studies, cobranding flyers, templates for brochures, *The Wire* newsletter, and a "toolkit" from training sessions they had attended. Moreover, almost all of the service providers reported that the marketing materials they received from ComEd are very useful. The following are a few examples of the praise service providers gave regarding the marketing materials:

> *"Their marketing people do a phenomenal job!"*
>
> *"The marketing materials "add credibility to program."*
>
> *"Co-branding helps."*

Moreover, a majority of the service providers report the program is creating more business for them. Four of the service providers that were interviewed reported that they had to increase staff as a result of the program. However, there were two service providers that were unhappy with the case study.

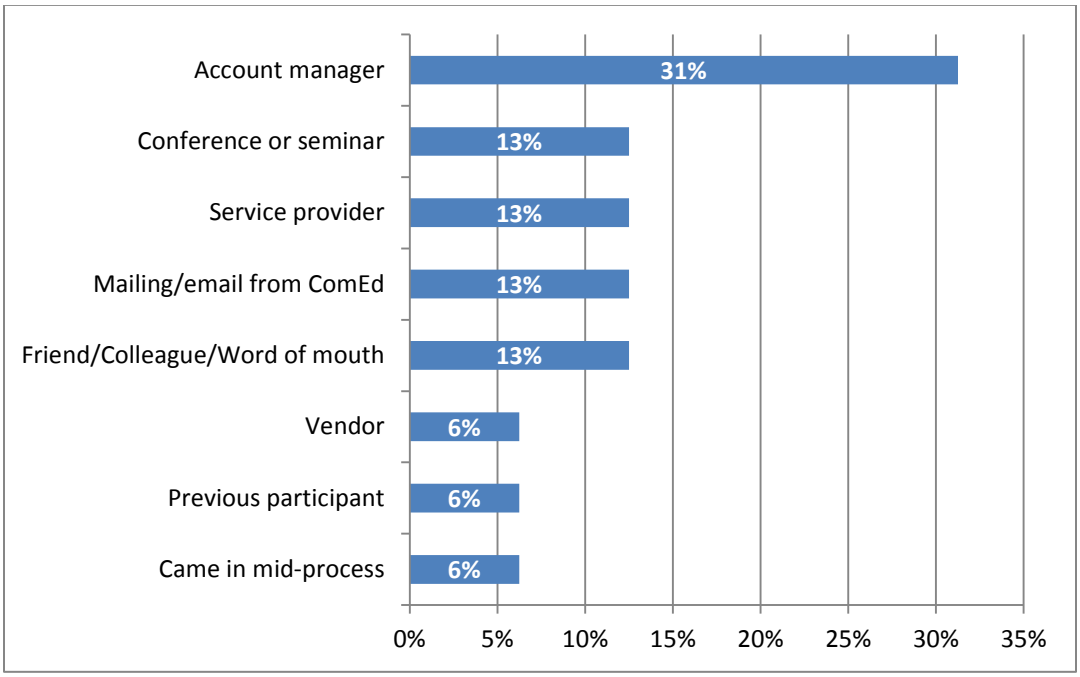
> *"They gave us a case study singing praises of a firm that was a direct competitor of us! Obviously we're not going to use that."*

Service providers were asked to gauge their customer's awareness of the Industrial Systems portion of the Smart Ideas for Your Business Program. Four of the eight participating service providers reported that their customers were somewhat aware of the program and another four assessed that their customers were not very or not at all aware of the program. They all reported that customers are generally interested once they become aware of the program. Moreover, all of the service providers report that program awareness is increasing. A few went into detail:

> *"Yes, now that we're in PY6, there's more knowledge, in ComEd service territory, industry publications, and more energy efficiency articles in trade press."*
>
> *"Yes, we see improvement over time – companies have energy efficiency managers, they're pushing from the top down, and awareness is improving."*

In EPY4, a majority of participants first heard about the program from their service provider. As shown in Figure 5-1, below, in EPY5 participants indicated a wider variety of methods of first hearing about the program, including; their account manager, Friend/Colleague/Word of mouth, mailing/email from ComEd, service provider, conference or seminar, previous participant, and vendor.

Figure 5-1. How Participants First Heard About the Program



Source: Participant survey

Sixty-three percent of the participants that were interviewed indicate that they received some sort of promotional material from the program. They reported seeing or receiving the following marketing materials about the Industrial Systems program: email (60%), brochure (20%), newsletter (20%), presentation/workshop (20%), and website (20%). Forty percent of participants that saw or received marketing materials reported that the marketing materials they received are very useful and the other 60% reported the materials being somewhat useful.

5.4 Barriers to Participation

Service providers were asked to give feedback on customer barriers to improving the energy efficiency of their compressed air systems. Similar to last year, they noted costs/payback, knowledge about energy efficiency, time-frame, and lack of understanding as barriers to customer participation.

> *"Money – they need a very short ROI; 1 year or shorter."*
>
> *"Principle concern is meeting production and financial goals. Energy efficiency just isn't a target. They don't have the training that would help them improve their energy efficiency."*
>
> *"Lack of funds, lengthy payback, complexity/process of program."*
>
> *"It's about payback, pretty simple, and the other factor is timeliness. People lose interest if the process takes too long."*

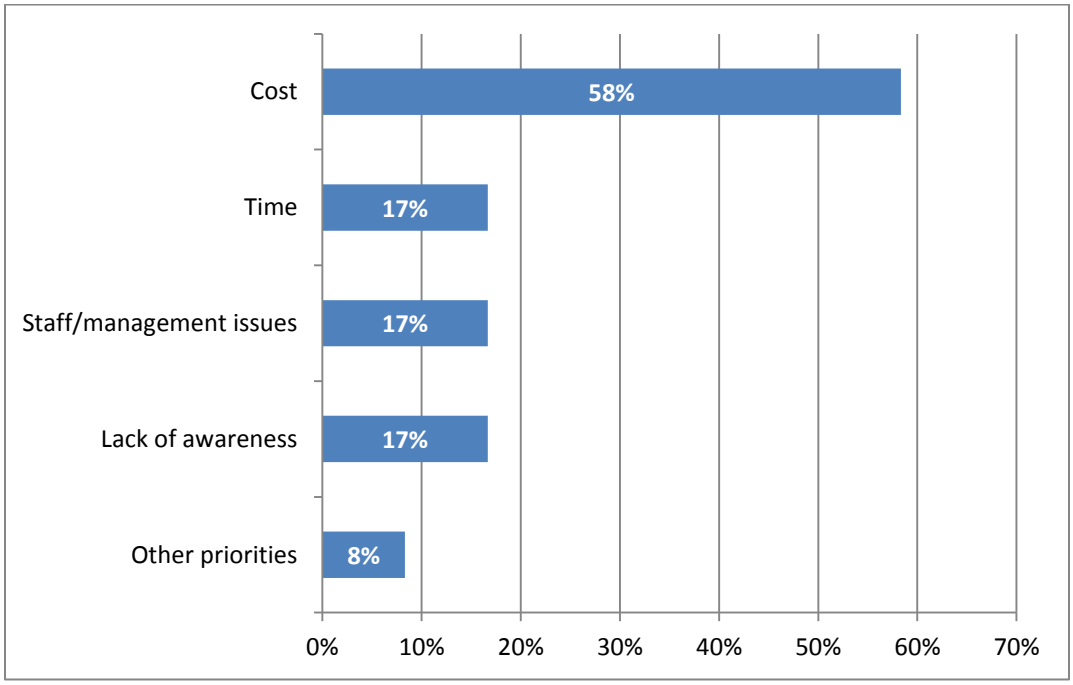
Program staff also provided feedback on customer barriers. They noted that some customers may lack awareness of the program, have uncertainty about the economic environment, and lack knowledge about the program commitment.

"Customers are concerned that they are signing up for something and that they don't fully know what to expect. We need to do a better job of explaining the program."

Program staff mentioned that the marketing and outreach team has been working hard to address the barrier of lack of awareness, but there may be some room for improvement on educating the customer about the program process.

Participants were asked about prior awareness of the measures recommended through the program. Participants reported already being aware of nearly half of the recommendations given by service providers. When participants were asked about the barriers that kept them from making the energy saving changes they were previously aware of, cost was the most often cited reason. Other reasons mentioned were lack of awareness, staff/management issues and lack of time. This is shown in Figure 5-2, below.

Figure 5-2. Participant Barriers to Participation



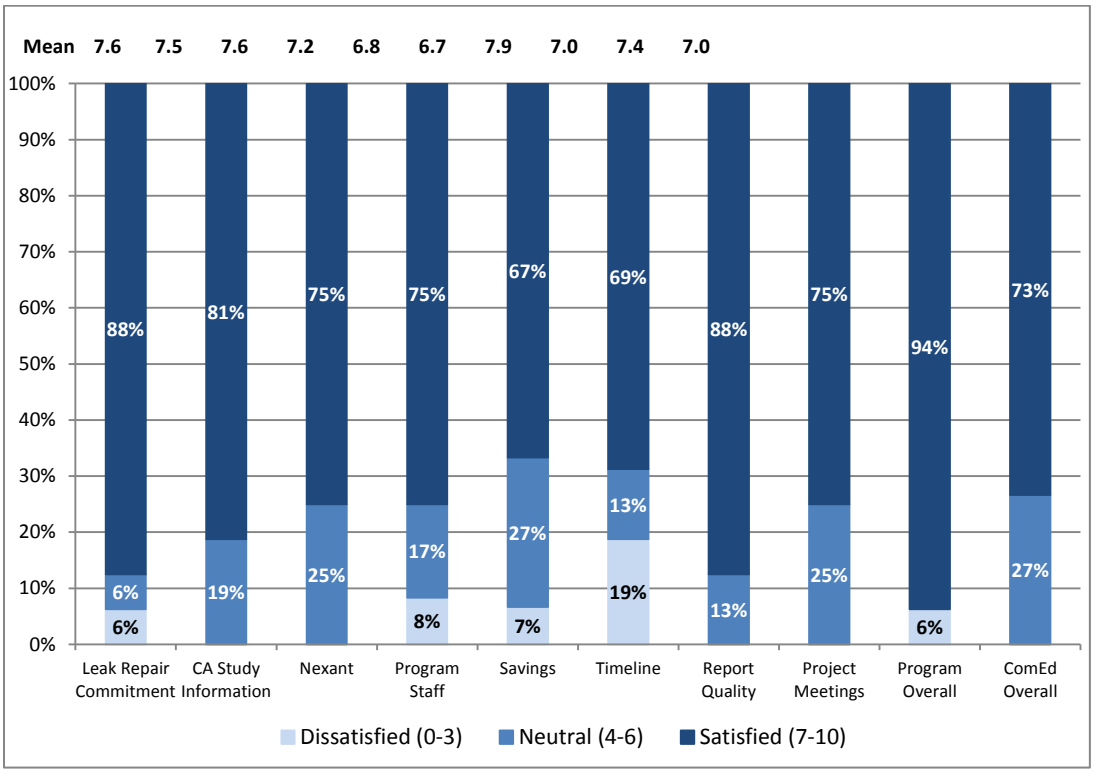
Source: Participant survey

5.5 Participant Satisfaction

Participants are satisfied with most aspects of the program. Customers were asked to rate – on a scale of 0 to 10, where 0 means "very dissatisfied" and 10 means "very satisfied" – several aspects of the program. As shown in Figure 5-3 below, satisfaction across all program categories was moderately high for EPY5, with an average greater than 6.7 for all program categories discussed. The highest average satisfaction was with the report quality followed by satisfaction with Nexant, and the leak repair commitment, with average satisfaction ratings of 7.9, 7.6 and 7.6 respectively.

Participants were asked to rate the following aspects of the program: the leak repair commitment, the compressed air study information, Nexant, program staff, savings achieved, the project timeline, the report quality, project meetings, the program overall, and ComEd. Thirty-one percent of the participants interviewed rated all of these program categories highly (a rating of 7 to 10). Another 50% were highly satisfied (a rating of 7 to 10) with most aspects of the program. Most importantly, 94% of the program participants said that they were satisfied with the program overall (a rating of 7 to 10). This is shown in Figure 5-3, below.

Figure 5-3. Participant Program Satisfaction



Note: This graph presents valid percentages, i.e., don't know, refused, and not applicable responses are excluded.
Source: Participant survey

One participant did not rate any of the program aspects highly. This participant also was the only one to report that he would not recommend the program to others.

The one aspect that participants were least satisfied with was the timeline requirement. Those that were dissatisfied (a rating of 0 to 3) with the timeline reported:

> *"Took forever, the paperwork turn around and data was convoluted and time consuming."*
>
> *"We had some equipment issues, that was the main thing, getting equipment here, time of study started a little slow, was February or March until it really got going."*
>
> *"Went on a lot longer than it should have."*

A few said they were moderately dissatisfied to moderately satisfied (a rating of 4 to 6) with the timeline. Those participants reported:

> *"It was pretty normal, of course would have liked to be faster, at times when I would have liked slower, overall about the right time frame."*

> *"Took quite a while to get data back, before we could actually start project."*

Even some of those that rated the timeline highly (a rating of 7 to 10) still raised concerns about the length:

> *"It was a pretty big lag between the leak audit and getting the report."*

> *"It took a long time, but I understand, there are a lot of people involved."*

> *"It took longer to get things, first step done slower than we wanted, then we wound up being slow to get our equipment installed, we pushed them hard, they did come through, admittedly we were slow pokes getting [the equipment] installed."*

> *"Overall it was a little bit long and then towards the end, there was a little pressure to get info to the administrator."*

> *"We had some delays in getting equipment and the project moving."*

The remaining 38% of participants had no complaints about the timeline.

Given the high satisfaction scores, it is not surprising that almost all (94%) of the participants surveyed would recommend this program to others. When asked what could be done to improve the program, many participants offered no recommendations (50%). While others thought that the program could improve with streamlining or speeding up the program (31%), fewer surveys (6%), better explanation of the program up front (6%), and simplifying the process for reimbursement (6%).

> *"Maybe a way to streamline the program, make it little bit easier for me, the person using it to go through it, as I said earlier, there's lots of repetition, do this, do that structure, like to see that streamlined a bit."*

> *"Speed up the process. Improve the forms, forms are difficult, or have someone that understands the forms available. Have a way to add a project to the process along the way."*

> *"The time it took to get data left only a few months to complete before June, get [the study results to the customer] quicker."*

> *"Do what you say you're going to do in the time frame you say you're going to do it, show real savings and do it in a timely manner."*

> *"Somehow streamline the custom programs for paperwork."*

"Lot less surveys after that, this is the 4th survey I've done from the whole project so far, I thought I was done with the last one. I did 1 for Air Power, 1 for Nexant, and 2 for ComEd... As long as you hit all the people actually eligible for it, that would great, help everybody save a lot of money."

"Have a better explanation of program up front. It was kind of confusing, who did what part and how to move forward."

"Simplify the process for reimbursement."

5.6 Service Provider Satisfaction

Participating service providers were asked about their satisfaction with four program components -- measures offered, incentive amounts, communication, and the program overall. In general, most were satisfied with the program overall: 38% were very satisfied, 50% were somewhat satisfied, and 13% were not satisfied at all. The one unsatisfied service provider noted a few reasons for his dissatisfaction:

One of "the problem[s] is the process of getting to the incentive amounts." Another problem is the "insane amount of oversight. I think it's heading to having the ComEd folks do the audits themselves, which would be a terrible outcome, because it would probably kill the service providers, particularly the smaller ones."

The service providers that were somewhat satisfied with the program overall reported various reasons for not being completely satisfied with the program, most comments revolved around the time spent on each project.

"It is sometimes frustrating, working with the bureaucratic procedures."

"The program is too cumbersome and time consuming."

Incentive amounts "need to be a fixed number, not an estimate of 'up to'; we get called on the carpet by our customers if it's too high. ComEd has hard data, they should use it."

"There's too much time spent validating, in a growing economy, there's a lot of missed opportunities that just increase as the economy picks up. These people don't have the time to sit around and wait for their incentive calculations to be finally agreed to - they're trying to run their business. They don't need a snapshot of what the savings would have been a year ago, that are totally irrelevant to what the savings would be today, because their production has picked up."

"Our biggest issue is when we submit a report to Nexant, sometimes the requirements of how we should do an analysis report have changed, which can be frustrating. Better communication between Nexant and the service providers about changes in the requirements would help speed the process."

When service providers were asked how frequently they promote the ComEd Industrial Program to their customers, 50% reported "Always" and 25% reported "Most of the time". However, it is interesting to note that one of these service providers reported:

"If I see that we can take a shortcut to the Custom Program, I'll do that."

The remaining 25% of service providers were not as enthusiastic about promoting the program. One service provider reported that it depends on their prior relationship with the customer; the other reported that they never promote the program to customers:

> *"It's based largely on our existing relationship. If it's a new customer, we would probably not promote it, but with a longer-term customer, we will promote it. We're transitioning more to the Custom Program. With the energy invested in administering the Industrial program, we're at significant risk if we don't have a prior relationship with the customer, it's not worth the risk. We could go through the study and have them choose another vendor at the end. We tend to think, strategically, it's better to come in at the tail end, let others do the study."*

> *"We don't go into a place to promote ComEd's program. It's a time-consuming program and not for everyone. We don't go in looking for Compressed Air projects only. We work all over the country and state. And if it's in the Northern Part of IL, depending on what the activities would involve, we won't promote the program. It's just not cost-effective for us, we're a small company, and we're not selling equipment, all we've got is our time."*

All but one of the participant service providers had suggestions on ways they would like to see the Industrial Program improved. Suggestions included: making the program available to smaller customers, streamlining the program, cutting back on the amount of project oversight, and giving incentives for a monitoring system so the savings from additional measures could be more accurately calculated.

> *"Sometimes it seems there are unnecessary audit procedures and delays. We do an audit, then give them a laundry list of like 10 items, then do a pre-audit, a post audit, have all these measures, then long debates about which items contributed what percent of energy efficiency. It is very frustrating because our patented system does the monitoring so if we could get incentives to install that system, first, we could then get the baseline for each of the measures recommended, and then an accurate measure of what the improvements saved. And cut out all the debate. With systems that cost over $100,000, you could then go step by step with what amount of savings, like for a VSD, you would get [an estimate] for each, and show exactly the energy savings. Now, the allocation of savings is always an issue. That's what really is frustrating, it's so unnecessary, and it slows the process considerably."*

> *"Streamline it and make smaller systems eligible for study through the program."*

> *"Design a program for small Compressed Air systems like they have in Wisconsin and Minnesota, could do 50 projects a year vs. 1,2,3. Smaller systems should be eligible for rebates; they need more energy efficient equipment too."*

> *"Reduce the amount of meetings, scope, requirements – but once you do, you're into the Custom Program. Our customers wouldn't pick up the phone and call us to come in and look at what's wrong with their Compressed Air equipment if they didn't think we could get in quickly and make a diagnosis. It's great that ComEd pays for the study, but it really has too excessive a level of oversight for the customers to put up with."*

"On the marketing side, ComEd has some very competent people, they could help us a lot, by sharing the burden, trying to get the Account Reps to be more actively engaged, to push the Program, marketing the program, and giving the customers a list of service providers to choose from. It works that way in Wisconsin and in California, but here, most of the outreach burden is on the service providers, and it takes a lot of effort. And since we're not selling equipment, we can't recover that time spent up-front, on a subsequent equipment sale. There needs to be a better compensation incentive for those like us that are consulting EE engineering firms. If it takes nine months of effort to go through a process, it's way too long. And, it's very important for us that the recommendations we've made are borne out, by the performance of the equipment, it needs to work to what we've predicted, but it's the equipment vendors through the customer's incentive that get the sale. But it's our reputation on the line. There should be some incentive for us to hang in there for that long a period, if that time is really necessary, or alternatively, to get projects completed in a shorter time frame."

"Make it easier for us and the customer, to deliver the energy efficiency. Combining Planning and Investigation phases has helped – before they were separate – and it is much better now. We gave them a lot of feedback about that already. Anything to streamline the program and improve communications, like clearly communicating what requirements have changed, before we submit, would help."

6. Conclusions and Recommendations

Based on the gross impact sample size of 13 Industrial Systems Study projects in EPY5, the evaluation results yielded an energy gross realization rate of 0.88 and a demand gross realization rate of 0.91. The EPY5 gross energy and demand realization rates are a significant improvement compared to the EPY4 program. The EPY5 energy realization rate of 0.88 is higher than the EPY4 level of 0.75, while the EPY5 demand realization rate of 0.91 is significantly higher than the EPY4 rate of 0.68. The significant improvement in gross energy and demand realization rates for the EPY5 program compared to the EPY4 program is commendable, given the complexity of the savings calculations, challenging data collection activities and varying operating conditions of the industrial systems. These results demonstrate that the program M&V methods have improved since EPY4. However, the evaluation team believes the program should improve data collection methods to better facilitate evaluation desk reviews and should also use enhanced calculation models for estimating savings to ensure good results are achieved consistently.

For projects evaluated through on-site M&V analysis (which account for 60% of total program savings), the energy savings realization rate is 0.93 and the energy savings realization rate for projects evaluated through desk reviews is 0.79. The lower realization rate for the desk reviews projects, which were mainly smaller sized projects, is due to the program using simplified calculation methods, less conservative assumptions in the calculations, data unsupported by reliable sources, and inconsistent use of available site specific data. The program can further improve gross impact results by improving program calculations and data collection methods for the smaller sized projects.

Key evaluation findings and recommendations include the following:

Production Data Collection and Analysis

Finding 1. The program was not always successful in collecting production data from the facility which affects the certainty of the savings calculations. Typically, industrial systems operation is heavily dependent on production levels and any changes in production levels can significantly increase or decrease savings. Without the production data for the pre-metering period, post-metering period and annual observed production, some related amount of uncertainty in the final savings estimates is expected.

Recommendation 1. The program should strongly consider making production data collection a program requirement. Given that production data is a critical parameter that impacts savings calculations for industrial systems, gathering production data for each completed project would significantly increase accuracy of savings estimates. Any changes in annual production levels compared to the metering periods can be accounted for using production data and thereby contribute to appropriate estimation of annual savings.

Finding 2. When production data was not available for normalizing savings, the program developed regression models using proxy variables (e.g., machine hours and labor hours) for production units to normalize savings. The proxy variable was assumed to be representative of production units but no correlation between production units and the proxy variable was established (e.g., #16114, 16449 and #16458).

Recommendation 2.a. The program should establish a correlation between production units and proxy variables before using proxy variables in regression models. If the relationship is established the proxy variable can be used to normalize annual savings calculations. If variables such as labor hours and equipment hours are directly assumed as proxies, the regression analysis is likely to yield unreliable savings.

Recommendation 2.b. When regression models are being developed then the correlation between independent variables and the dependent variable should have an R^2 value better than 0.75. This is consistent with IPMVP guidelines, the industry standard. If no correlation exists between production and power (kW) usage then annual savings should be normalized using airflow (CFMs).

Data Collection Activities

Finding 3. The program collected amperage data through metering and estimated power factor through spot measurements to calculate kW usage for most of the completed projects. If amperage is measured for an array of part load conditions, then attempts to combine that with spot measurement-derived power factor (PF) can lead to inaccurate simulation/modeling results. Power factor varies with amperage and estimating power factor is very challenging for varying amperage/loads.

Recommendation 3.a. The program should use power (kW) meters to collect kW measurements using interval metering instrumentation and recording devices. The availability of kW data will reduce uncertainty in metering data-based kW estimation by reducing reliance on assumptions. This will also increase the value of metering resource expenditures, given the improved resulting accuracy and reliability.

Recommendation 3.b. Amperage metering can be used sparingly, such as when the panel size is too small to install kW meters or when only amperage data is collected from the SCADA system. Amperage metering should only be used for base loaded systems since the load remains constant. The proposed method of amperage measurement will not provide accurate results for any compressor that is not base loaded. For example, amperage measurement will not work for VSD type compressors since these typically operate at part loads and power factor varies with amperage/load. AirMaster+ estimates power factor and kW based on amperage measurements and can be used for calculating or calibrating the estimated power factors.

Finding 4. The program typically collects metering data for two weeks for both pre- and post-periods. If the metering period is not representative due to any issues or some changes in system operating conditions, the program and evaluation team is left with inadequate data to calculate annual energy usage through extrapolation. Since evaluators do not have access to pre retrofit conditions, insufficient ex-ante measurement for pre retrofit conditions can greatly decrease the accuracy of ex-post savings calculations.

Recommendation 4. The program should consider increasing the metering period to four weeks. This will ensure that more varying conditions are captured and also minimize any loss of data due to compressor breakdown/shutdown and the resulting lack of representativeness of typical operations during the logged period. The extended metering period will also benefit evaluation activities mainly the desk reviews. Since evaluation team does not collect any metered data for desk reviews, lack of data can limit the desk review process and affect the accuracy of the estimated savings. Also, when the

evaluators were not able to collect measured data for post conditions; the availability of ex-ante M&V data benefitted the evaluation savings calculations.

Finding 5. For projects #16441, #16456 and #17219, the program did not conduct post verification M&V activities which resulted in overestimation of savings.

Recommendation 5. The program should clearly explain the reasons for not conducting post metering activities. For large projects such as #16441, the program should conduct post metering activities to estimate the savings accurately. When post metering activities are not conducted for smaller projects, the program should use conservative methods to estimate savings.

Improvements to Ex-ante Savings Calculations

Finding 6. For projects #16184 and #16186, the program metering data was not used for estimating ex-ante savings or to perform check calculations for the estimated savings.

Recommendation 6. The program should ensure that metering data is used as a principal data source for estimating savings in the absence of customer trend data. When customer trend data is available, the program metering data should be used for calibrating customer trend data. If a simulated system model is used for estimating savings, metering data should be used to error check and verify savings estimates. Also the program should clearly explain the reasons for not using metering data as a principal data source for savings calculations.

Finding 7. The program verification calculations overestimated airflow (CFM) demand reduction savings compared to the actual airflow (CFM) demand reduction (e.g., #16114).

Recommendation 7. Check to make sure CFM reduction is consistent with the program estimates. The difference between pre- and post-period CFM should be adjusted to match the demand reduction observed.

Demand Savings Estimates

Finding 8. The program estimated peak demand savings were not consistent with the PJM peak period (e.g., #16458, 16449 and #17184).

Recommendation 8. The program should estimate peak demand savings consistent with PJM peak demand estimation and use this approach consistently across all projects. If there is any deviation then the reasons for not estimating PJM peak, the program should be clearly report the reasons for deviation.

Project Documentation

Finding 9. Project documentation provided by the program included all the information required to understand all the details about the measures implemented. Project documentation included verification reports, calculation spreadsheets, final application and pre implementation documentation. This documentation was generally in good shape and facilitated the evaluation. However, it was not always clear from the documentation the sources for the assumptions and data used for savings calculations which affected some of the evaluation desk reviews. For example, it was not clear if the program metering was performed using a power (kW) meter or amperage meters.

Recommendation 9. The program should provide high level project summary sheets for each project. The project summary sheet should typically include sources used for estimating pre and post energy usage, production data availability and analysis, inputs and

modeling assumptions for calculating savings, normalization parameters, source for compressor curves and notes about any unique issues encountered during the project implementation. This will help evaluation team to gain a better understanding of the projects and improve the desk review process for future program years.

Finding 10. The program did not always report the leak measurements taken using the leak detector for evaluation verification (e.g., #17220).

Recommendation 10.a. The program should ensure the measurements for all sizes of leaks are taken using the ultrasonic leak detector and are reported for evaluation review. The evaluation will have to consider making adjustments based on assumptions if leak measurements are not available for verifying through desk reviews.

Recommendation 10.b. For leaks savings, if the energy savings are primarily due to the centrifugal air compressor trimming or operating part loaded, the program should account for the blow off condition since it may not result in savings during blow off operating conditions/hours.

Program Process

Finding 11. Customers, service providers, and program staff all mentioned program time requirements as major concerns, which include the following:

- A majority of customers reported various issues that caused their program participation to be time-consuming. Some of the issues mentioned by customers were the time it took to receive the paperwork, the time it took to receive the study, and delays in getting the equipment. Many of their recommendations were focused on actions to reduce the amount of time required to participate. Several mentioned streamlining and speeding up the program processes as suggestions for program improvement.
- Service providers mentioned concerns about the time they spent per project, time spent getting to incentive amounts, and the lack of consistency in program oversight. A few service providers mentioned that they aren't actively promoting the program (including one that had multiple projects in EPY5), stating that they preferred to steer customers to the Custom program instead. These service providers mentioned the amount of time they have to spend per project as the main reason for transitioning to Custom. One provider also cited compressed air programs in Minnesota and Wisconsin as being better delivery models. Recommendations given by the service providers included streamlining the program, making the program available to smaller customers, and better communication and consistency in the project oversight.
- Program staff also report concerns about the amount of time each project takes which affects their ability to reach program participation goals, noting they are continuously analyzing what they can improve upon. To address this issue, in EPY5 ComEd added the option to combine the planning/investigation phases and the option to split savings between program years when some of the measures have been implemented. Also, another program redesign is set to be implemented in January 2014. For the compressed air projects, ComEd will pay to implement 5 pre-determined measures (i.e. air leaks, air nozzles, no-loss drains, optimize pressures, and optimize controls) and other measures identified in the study will go through the Custom program.

Recommendation 11. This finding indicates that the program may have room to improve to keep customers satisfied, service providers engaged, and the program meeting its participation goals. The changes set to roll out in January appear to be a step in the right direction and hopefully we will see the positive results in next year's evaluation. Another program consideration could be to include a prescriptive option for a select set of compressed air measures. Examples of measures to consider can be found in the Wisconsin and Minnesota compressed air programs.

Finding 12. As in PY4, participants and service providers are still noting some confusion with respect to the program process, and also mentioned how complex it is. Participants and service providers reported confusion with incentive amounts, lack of communication on changes in requirements, convoluted study data, difficult forms, and incorrect savings estimates.

Recommendation 12. Make the program rules and requirements as clear as possible. Facilitate improvements in communication to service providers and customers. Strong communication and clear expectations are crucial to the success of the program.

Finding 13. The marketing and outreach team has been doing a good job of promoting the program. Participation has increased from 9 projects in EPY4 to 21 projects in EPY5. However, this was still short of the programs goal of 65 projects in EPY5. All of the service providers that were interviewed indicate that they received some sort of promotional material from the program and almost all reported that the marketing materials they received from ComEd are very useful. Moreover, a majority of the service providers report the program is creating more business for them. Four of the service providers that were interviewed reported that they had to increase staff as a result of the program. Also in EPY5, participants indicated a wide variety of methods of first hearing about the program, including; their account manager, Friend/Colleague/Word of mouth, mailing/email from ComEd, service provider, conference or seminar, previous participant, and vendor.

Recommendation 13. Continue to increase the efforts to publicize the program by engaging account reps and service providers and continue the distribution of various marketing materials. Also, direct outreach to industrial customers should be considered using phone calls from ComEd and/or Nexant program staff.

7. Appendix

7.1 Glossary

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 through May 31, 2009, EPY2 is June 1, 2009 through May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 through May 31, 2012, GPY2 is June 1, 2012 through May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY5/GPY2 the Illinois TRM was in effect and was the source of most deemed parameters. Some of ComEd's deemed parameters were defined in its filing with the ICC but the TRM takes precedence when parameters were in both documents.

Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times research NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ "Energy" and "Demand" may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the "Terms to be Used in Reports" column).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a deemed measure shall use the superscript "D" (e.g., delta watts^{D}, HOU-Residential^{D}).

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd's approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript "E" for "evaluated" (e.g., delta watts^{E}, HOU-Residential^{E}).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript "DV" as in X^{DV} (meaning "Default Value").

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript "AV" as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012[8].

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

> **Measure Level Research**: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.
>
> **Program Level Research**: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be

[8] IL-TRM_Policy_Document_10-31-12_Final.docx

specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

Customized basis: Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

7.2 Detailed Net Impact Results

7.2.1 Free-Ridership

The calculation of the program's Net-to-Gross Ratio (NTGR) is a multi-step process. The NTGR was assessed using a customer self-report approach using data collected during participant phone surveys. The survey covers a battery of questions used to assess the net-to-gross ratio for a specific project. Responses from the survey are used to calculate a Program Components score, a Program Influence score and a No-Program score for each project covered through the survey. These three scores can take values of 0 to 10 where a lower score indicates a higher level of free-ridership. The calculation then averages those three scores to come up with a project-level net-to-gross ratio. In EPY5, telephone surveys were completed for a total of 18 projects in support of the net-to-gross ratio calculations. The EPY5 project-specific NTGRs are shown in Table 7-1.

Table 7-1. EPY5 NTGR Results for the Industrial Systems Sample

Project ID*	Sampling stratum	kWh		kW	
		Project Specific NTGR	Sample-Based Research Findings NTGR	Project Specific NTGR	Sample-Based Research Findings NTGR
EPY5 - 01**	1	0.64	0.67	0.64	0.67
EPY5 - 02**	1	0.73		0.73	
EPY5 - 03**	2	0.65	0.73	0.65	0.77
EPY5 - 04**	2	0.74		0.74	
EPY5 - 05**	2	0.88		1.00	
EPY5 - 06	2	0.64		0.64	
EPY5 - 07**	3	0.57	0.64	0.57	0.64
EPY5 - 08	3	0.80		0.80	
EPY5 - 09	3	0.91		0.91	
EPY5 - 10	3	0.48		0.48	
EPY5 - 11**	3	0.56		0.56	
EPY5 - 12**	3	0.46		0.46	
EPY5 - 13**	3	0.56		0.56	
EPY5 - 14**	3	0.59		0.59	
EPY5 - 15**	3	0.60		0.60	
EPY5 - 16	3	0.55		0.55	
EPY5 - 17**	3	0.77		0.77	
EPY5 - 18**	3	0.69		0.69	

Source: EM&V analysis
** Actual Project IDs are not provided to protect customer confidentiality.*
***Overlaps with gross impact sample.*

The separate ratio estimation technique was used to estimate NTGR for the program. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework. The standard error was used to estimate the error bound around the estimate of verified evaluation NTGR. The program level NTGR, along with precision estimates, is shown in Table 7-2 (kWh impacts) and in Table 7-3 (kW impacts).

A quantification of spillover was included in the calculation of NTGR for EPY5. Spillover effects are discussed in section 7.2.2 on page 39.

Table 7-2. kWh NTGR and Relative Precision 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low NTGR	Mean NTGR	High NTGR
1	0%	0.67	0.67	0.67
2	0%	0.73	0.73	0.73
3	6%	0.60	0.64	0.68
1, 2, 3 (All)	**2%**	**0.67**	**0.68**	**0.69**

Source: EM&V analysis

Table 7-3. kW NTGR and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low NTGR	Mean NTGR	High NTGR
1	0%	0.67	0.67	0.67
2	0%	0.77	0.77	0.77
3	6%	0.60	0.64	0.67
1, 2, 3 (All)	**2%**	**0.67**	**0.68**	**0.70**

Source: EM&V analysis

The Evaluation Research Findings EPY5 kWh NTGR of 0.68 is similar to that of EPY4 (0.67), meaning free-ridership is only slightly lower than last year. The NTGR scores for the three sampling strata were 0.67 for stratum 1 (large sized projects), 0.73 for stratum 2 (medium sized projects) and 0.64 for stratum 3 (small sized projects) which indicates the free-ridership levels for the three different sizes of projects were relatively similar.

Significant free-ridership (defined by projects with an NTGR below 0.60) was found in 7 out of 18 evaluated projects. No projects had an NTGR below 0.40. All seven projects with significant free-ridership were found in strata 3 (small sized projects).

The Program Components scores[9] are generally high across the board (with an average score of 9.0), indicating that almost all participants credit at least one program component as important in their decision to make energy improvements. The Program Influence scores[10] range from three to nine, but on average are moderate (with an average score of 4.9) indicating that participants give the program half of the credit for influencing them to participate and half the credit to other factors. The No-

[9] A Program Components score reflects the importance of various program and program-related elements in the customer's decision and timing of the decision in selecting specific program measures.

[10] A Program Influence score reflects a customer's rating of program influence versus the influence of other factors in their decision to make energy efficiency improvements. This score is reduced by half if the customer learned about the program after they decided to make the energy efficiency improvements.

Program scores[11] have the widest range of scores, (between 0.7 and 9.6) but average 5.5. If a participant indicates that they would have been very likely to install the same measure at the same time, they would get a low score. On the other hand, if a participant indicates they would not have been likely to install the same measure or they would have installed it at a much later date, they would get a higher score. There are many variations that participants report to these questions as is seen in the diversity among the scores reported.

7.2.2 Spillover

Spillover effects were quantified in the EPY5 evaluation, based on responses to a battery of spillover questions in the telephone survey. The evidence of participant spillover for the Industrial Program is presented in Table 7-4 below.

Table 7-4. Evidence of Participant Spillover in EPY5

Spillover Question	Evidence of Spillover
Since your participation in the ComEd's Industrial Systems program, did you implement any additional energy efficiency measures at this facility that did NOT receive incentives through any utility or government program?	Of the 16 surveyed customers that responded to this question, 3 said "Yes" (19%). These 3 respondents implemented a total of 5 energy efficiency measures.
What type of energy efficiency measure was installed without an incentive?	(1) Refrigerated chillers systems (1) Roof with insulation - rigid foam (1) Variable speed drives (1) Building control improvements (1) Mechanical equipment improvements
On a scale of 0 to 10, where 0 means "no influence" and 10 means "greatly influenced," how much influence did your participation in ComEd's Industrial Systems program have on your decision to install additional energy efficiency measures?	For the 5 implemented measures: (1) Rating between 0 and 3 (1) Rating between 4 and 6 (3) Rating between 7 and 10
How did ComEd's Industrial Systems program influence your decision to install additional energy efficiency measures?	For the 3 implemented measures that were greatly influenced by the program: (3) proactive implementation of energy efficient measures

Source: EM&V analysis

One customer reported being highly influenced by the program to install 3 measures outside of an incentive program. Two of the measures are on-going activities where the customer couldn't provide

[11] A No-Program score reflects the likelihood of making the same energy efficiency improvement and the timeframe in which it would have been completed had the program not been available.

specific details about the equipment or timing; building and mechanical equipment improvements and building controls improvements. The third measure the customer installed was VFDs. Detailed information on the VFDs installed was collected from the customer through a telephone interview. The customer reported installing a 40 HP VFD on Make Up Air unit and the three 15 HP VFDs on exhaust fans. The baseline energy usage was estimated for the fans operating at full speed and post energy usage was estimated for reduced fan speeds using the affinity law. The savings calculated for installing these measures was estimated to be 113,324 kWh and 23 kW and was included in the calculation of NTGR for EPY5. The EPY5 program NTGR score without spillover is 0.67 and the EPY5 NTGR score with spillover is 0.68 which indicates a participant spillover of 0.01 for EPY5.

Evaluation team also verified service provider spillover in EPY5 and found there was no spillover based on responses to a battery of service provider spillover questions.

The evaluation team will collect spillover data in this same manner for the EPY6 evaluation. The decision to conduct additional evaluation activities to quantify spillover in EPY6 will be examined as part of the evaluation planning effort.

7.3 Data Collection Instruments

7.3.1 Participating Service Provider Telephone Survey

Industrial Systems Service Provider Survey for the ComEd Industrial Systems Program

Firmographics

F1 What is your business category?

F2 What type(s) of equipment, does your company specialize in?

F3 Approximately, how many employees does your company have?

F4 What are the key business sectors your company serves?

FR Module

FR1 According to our records your firm was involved in the implementation of <**PROJECT DESC**>. Is this correct? Are you the person that is most knowledgeable about your firm's involvement in this project?

FR2 Can you please describe your firm's role in the decision to make improvements to the Compressed Air equipment at <**CUSTOMER**>'s facility?

FR3b And using a 0 to 10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, if the Industrial Systems Program, including the free study, cash incentives and other program services and information, had not been available, what is the likelihood that you would have recommended <**CUSTOMER**> make improvements to their Compressed Air equipment?

FR4 Do you know of any other vendors that worked with <**CUSTOMER**> while they were making improvements to their Compressed Air equipment, for example engineers or designers? If so, do you have their name and phone number?

Market Trends & Effect of Program on Business

M0. Of the [XX] customers for whom you have performed Industrial Systems program services in Program Year 5 (June 2012 to May 2013), how many did you have a prior working relationship with?

M1 Over the last 12 months, approximately what percentage of your Compressed Air equipment business in ComEd's service territory involved upgrades to improve the energy efficiency of your customers' Compressed Air equipment?

a. Of these energy efficiency improvements, approximately what percentage would qualify for incentives from the program?

b. And of the installations that would qualify for incentives, approximately what percentage did NOT receive an incentive? Why do you think they did not receive an incentive?

M2 Has the percentage of your business that involves upgrades to improve the energy efficiency of your customers' Compressed Air equipment *changed* in the past three years? How? In other words, does more of your business involve energy efficiency improvements to Compressed Air equipment?

If increase:

a. On a scale of 0 to 10, where 0 means not at all important and 10 means very important, how important was ComEd's Industrial Systems Program in bringing about this change? *(Probe for specific program components: incentives, training, program website, other program components.)*

b. How important were other factors not related to the program? What are these other factors? *(Probe for tax credits/gov't rebates, general EE awareness, change in codes or standards.*

c. Has your participation in ComEd's program resulted in any other changes to your business? If so, please describe what changes have resulted in your business from your participation in ComEd's program?

M3 When a Compressed Air equipment is present, in what percent of sales situations do you recommend energy efficiency improvements to Compressed Air equipment?

a. [If not 100%] When you don't recommend energy efficiency improvements to Compressed Air equipment, what are the reasons?

M4 Has the frequency with which you recommend energy efficiency improvements for Compressed Air equipment changed in the past three years? How?

- If change noted:

a. On a scale of 0 to 10, where 0 means not at all important and 10 means very important, how important was ComEd's Industrial Systems Program in this change? *(Examples of program components: incentives, training, program website, other program components.)*

b. How important are other factors not related to the program? What other factors are important? *(Examples of non-program components: tax credits/gov't rebates, general EE awareness, change in codes or standards.)*

M5 As a result of the Industrial Systems Program…

a. have you changed the types of Compressed Air equipment and related services you provide? How so?

b. have you changed any other business practices as a result of the program?

c. Has the program caused an increase in business? How so?

M6 How aware, would you say, are your customers of energy efficiency and options available to make their Compressed Air equipment more energy efficient? How interested would you say are they in adopting them?

M6a Has this (awareness/interest) changed over time?

M7 What do you view as the main barriers to the installation of energy efficient Compressed Air equipment for your customers? Does this vary by customer type or size? Anything else? What could be done to overcome these barriers?

Participant Outside SO

SO1. Did your experience with the Industrial Systems Program in any way influence you to perform similar studies at other facilities in Illinois that did NOT participate in other Utility funded programs beyond what you would have done otherwise? I'm asking here strictly about facilities that did not receive any technical assistance or funding from any of these programs.

SO2. [If SO1 = "yes"] Approximately how many of these additional energy efficiency equipment studies and related projects have been completed in the past year?

SO3. What types of efficiency measures have you recommended as part of these projects?

SO4. Were all of the measures you recommended installed in these projects, or were only some of the recommended measures installed??

SO5. Please briefly describe how the Industrial Systems Program has influenced you to perform these energy efficiency equipment studies and implement energy efficiency measures at these other facilities in Illinois that did NOT participate in any Utility rebate programs.

SO6. Why did these projects NOT participate in the Illinois Utility rebate programs? Was it something about the program processes or program offerings?

SO7. On average, would you estimate the energy savings from these other non-program facilities to be less than, similar to, or more than the energy savings from the Compressed Air equipment incorporated through the ComEd Program Industrial Systems Program projects you conducted?

Customer Specific SO for Follow Up

SO8. Are you currently aware of or working with any specific firms or types of customers that have elected to install energy efficiency measures on their own, without the help of incentives and technical assistance from ComEd's programs, or any other utility incentive programs?

SO8a. Which specific customers (or types of customers) are you aware of?

SO8b. What specific energy saving actions have they taken without the help of ComEd's programs, or any other utility incentive programs?

SO8c. May I record their name for later follow-up?

Process Module

P1 How aware, would you say, are your customers of the ComEd Smart Ideas for Your Business program? How aware are they about the Industrial Systems portion of the program? How interested are they in the Industrial Systems Program *(Ask very, somewhat, not very, not at all aware)*? Does this vary by customer type or size?

P2 How frequently do you promote the ComEd Industrial Systems Program to your customers? If sometimes/rarely/never: Why? Does this vary by customer type or size?

P3 Have you received any marketing materials from the ComEd Industrial Systems program? If so, what did you receive? Do you provide these materials to your customers?

a. If yes: How useful do you think are these materials in providing information about the program and encouraging customers to participate? If not useful, what would make them more useful?
b. If no: why not?
c. Are there any specific promotional materials that you would like ComEd to provide? If yes, what are they?

P7 What do you view as the main barriers to customer participation in the Industrial Systems Program? What could be done to overcome these barriers?

P8 How satisfied are you with your participation in the Industrial Systems Program? If not very satisfied or not at all satisfied: why?

a. Are you satisfied with the measures offered
b. Are you satisfied with the incentive amounts
c. Are you satisfied with the communication with Industrial Systems Program staff
d. Are you satisfied with the program overall

P10 Do you have any recommendations of how the Industrial Systems Program could be improved?

This concludes our survey. On behalf of ComEd, thank you very much for your time today!

7.3.2 Participant Telephone Survey

COMED SMART IDEAS FOR YOUR BUSINESS PROGRAM
PARTICIPANT SURVEY – INDUSTRIAL SYSTEMS PROJECTS
PY5 08/06/13

Contact Name:
Business Name:
Address:
Phone:
Email:

Introduction

Hello, this is _____ from Itron calling on behalf of ComEd regarding your company's participation in the Industrial Systems program. May I please speak with [**CONTACTNAME**]?

Our records show that [**COMPANY**] completed a < **PROJECT_TYPE**> project in ComEd's Smart Ideas for Your Business Industrial Systems Program, and we are calling to conduct a follow-up study about your firm's participation in this program. I was told you're the person most knowledgeable and the most involved with the decision to participate in the program. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO THE DECISION MAKER OR SOMEONE FAMILIAR WITH THE BASIS FOR THE DECISION TO PARTICIPATE OR RECORD NAME & NUMBER.]

[IF NEITHER DECISION MAKER OR SOMEONE FAMILIAR WITH THE BASIS FOR THE DECISION TO PARTICIPATE, IS AVAILABLE TERMINATE AND CALL REFERRAL]

This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back]

(IF NEEDED: Is it possible that someone else dealt with the < **PROJECT_TYPE**> project?)

Participation Verification

A1 First, according to our records, you participated in ComEd's Smart Ideas for Your Business Industrial Systems Program between <**MONTH/YEAR**>. [*IF NEEDED: the ComEd Smart Ideas for Your Business Industrial Systems Program promotes energy efficiency improvements to industrial facilities with a primary focus on Compressed Air, Industrial Refrigeration, and Process Cooling system improvements. The program offers technical assessments to help identify applicable measures and analyze the energy and cost savings of the recommended measures. The program also offers cash incentives to help cover a portion of the cost of making the recommended energy efficiency improvements to the energy using equipment.]*
Do you recall participating in the ComEd Smart Ideas for Your Business Industrial Systems Program between <**MONTH/YEAR** >?

1. Yes
2. No Thank & terminate
88. Refused Thank & terminate
99. Don't know Thank & terminate

A2 Next, I'd like to confirm the following information regarding your participation in the Industrial Systems Program. I understand that you participated at <**ADDRESS**>. The Industrial Systems study was completed in <**MONTH/YEAR**> by <**SERVICEPROVIDER**> and you implemented <**NO OF MEASURES**> measure(s), including <**MEASURE1**>, <**MEASURE2**>, <**MEASURE3**>.) Does that sound right?

1. Yes

2. No Thank & terminate
88. Refused Thank & terminate
99. Don't know Thank & terminate

Project Background

B1. Before I ask you specific questions about your decision, please tell me in your own words why you decided to make changes to improve the energy efficiency of the <**PROJECT_TYPE**> equipment at this facility? Were there any other reasons? **[DO NOT READ]**

1 To replace old or outdated equipment
2 As part of a planned remodeling, build-out, or expansion
3 The maintenance downtime and expenses for the old equipment were too high
4 Had process problems and were seeking a solution
5 To improve equipment performance
6 To comply with company policies regarding regular maintenance/replacement policy
7 To get a cash incentive from the program
8 To protect the environment
9 To reduce energy costs
10 To reduce energy use
77. Other (RECORD VERBATIM)
88. Refused
99. Don't know

[IF <**PROJECT_TYPE**>="COMPRESSED AIR", THEN ASK, ELSE B2a.]

B1a. Before you participated in the Industrial Systems Program, did your company test the compressed air system for leaks on a regular basis?

1. Yes
2. No [skip the next question, go to B1bb – top of page 3]
88. Refused [skip the next question, go to B1bb – top of page 3]
99. Don't know [skip the next question, go to B1bb – top of page 3]

[ASK IF B1a=1]

B1b. How often would you test your compressed air system for leaks?

77. RECORD VERBATIM
88. Refused
99. Don't know

B1bb. Before you participated in the Industrial Systems Program, had your company ever repaired any compressed air system leaks?

1. Yes
2. No
88. Refused
99. Don't know

B1c. Could you tell me a little bit about your procedure for finding and repairing leaks before your participation in the program? (What tools, procedures, or services are used to identify leaks? How are leaks tagged or tracked? Are standards used to repair leaks? Who repairs the leaks? What percentage of leaks are repaired? Is a history of leak repair available to support your leak repair practices?)

77. RECORD VERBATIM
88. Refused
99. Don't know

B1d. Since your participation in the Industrial Systems Program, does your company test the compressed air system for leaks on a regular basis?

1. Yes
2. No [skip the next question, go to B1f]
88. Refused [skip the next question, go to B1f]
99. Don't know [skip the next question, go to B1f]

[ASK IF B1d=1]

B1e. How often do you test your compressed air system for leaks now?

77. RECORD VERBATIM
88. Refused
99. Don't know

B1f. Could you tell me a little bit about your procedure for testing for leaks since you participated in the program? (What tools, procedures, or services are used to identify leaks? How are leaks tagged or tracked? Are standards used to repair leaks? Who repairs the leaks? What percentage of leaks are repaired? Is a history of leak repair available to support your leak repair practices?)

77. RECORD VERBATIM
88. Refused
99. Don't know

B2a. Before learning about the ComEd Industrial Systems Program, had you ever made any other changes to improve the energy efficiency of your <**PROJECT_TYPE**> equipment at this facility or any of your other facilities?

1. Yes, at this facility
2. Yes, at another facility [skip the next two questions, go to B5 – mid page 4]
3. No [skip the next two questions, go to B5 – mid page 4]
88. Refused [skip the next two questions, go to B5 – mid page 4]
99. Don't know [skip the next two questions, go to B5 – mid page 4]

[ASK IF B2a=1]

B2aa. Specifically, what did you have done at this facility?

77. RECORD VERBATIM
88. Refused
99. Don't know

[ASK IF B2a=1]

B2b. Did you receive an incentive or another form of financial support for this previous <**PROJECT_TYPE**>project?

1. Yes
2. No
88. Refused
99. Don't know

B5. My next questions are about your awareness of the energy saving opportunities identified through your Industrial Systems study PRIOR to conducting it. Would you say you were aware of all, some, or none of the opportunities before the study? [if needed read: <**MEASURE1** through **MEASUREx**>]

1. All [skip the next question, go to B2bb – top of page 5]
2. Some
3. None [skip the next three questions, go to B6b – bottom of page 5]
88. Refused [skip the next three questions – bottom of page 5]
99. Don't know [skip the next three questions – bottom of page 5]

[ASK IF B5=2]
B6. Which of the following energy saving opportunities were you previously aware of? Were you aware of the opportunities with your… (1=Yes, 2=No, 88=Refused, 99=Don't know)

a. **MEASURE1**
b. **MEASURE2** [ASK IF MEASURE2=1]
c. **MEASURE3** [ASK IF MEASURE3=1]
d. **MEASURE4** [ASK IF MEASURE4=1]
e. **MEASURE5** [ASK IF MEASURE5=1]
f. **MEASURE6** [ASK IF MEASURE6=1]
g. **MEASURE7** [ASK IF MEASURE7=1]
h. Leaks in the compressed air system

[ASK IF B5=1,2]
B2bb. What were the main factors that kept you from making the specific changes identified through the Industrial Systems Program Study PRIOR to your participation in the program?

77. Other (RECORD VERBATIM)
88. Refused
99. Don't know

[ASK IF B5=1,2]
B6a. Before participating in ComEd's Industrial Systems program, did you undertake specific activities or studies in order to identify the energy saving opportunities you just mentioned you were aware of prior to participation?

1. Yes
2. No [skip the next question, go to B6b – bottom of page 5]
88. Refused [skip the next question, go to B6b – bottom of page 5]
99. Don't know [skip the next question, go to B6b – bottom of page 5]

[ASK IF B6a=1]
B6aa. What specific activities or studies did you do?

1. Hired a third party to perform an energy audit/data trending [skip the next question]
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

[IF **PROJECT_TYPE**=COMPRESSED AIR, THEN ASK, ELSE B2a.]
B6b. In the past, have you hired any third parties to conduct a comprehensive energy assessment of the compressed air system in your facility?

1. Yes
2. No [skip the next three questions, go to B8c – mid page 6]
88. Refused [skip the next three questions, go to B8c – mid page 6]
99. Don't know [skip the next three questions, go to B8c – mid page 6]

[ASK IF B6b=1 OR B6aa=1]
B6bb. Please describe the scope of this compressed air assessment conducted by the third party and the approximate timing of the study.

77. RECORD VERBATIM
88. Refused
99. Don't know

[ASK IF B6b=1 OR B6aa=1]

B6c. Were any changes made to the facility as a result of this assessment?

1. Yes
2. No [skip the next question, go to B8c – mid page 6]
88. Refused [skip the next question, go to B8c – mid page 6]
99. Don't know [skip the next question, go to B8c – mid page 6]

[ASK IF B6c=1]

B6cc. What changes were made?

77. RECORD VERBATIM
88. Refused
99. Don't know

[ASK IF **MEASURES_NOT_INSTALLED** not blank]

B8c. Our records show that your company did not install all of the measures recommended in the Industrial Systems study. What were the reasons why your company didn't implement [<**MEASURES_NOT_INSTALLED**>]?

77. RECORD VERBATIM
88. Refused
99. Don't know

[ASK IF **#PROJECTS**>1]

B7. Our records indicate that your company completed <**#PROJECTS**> projects through the program. Was your decision to participate in the program the same for each project?

1. Yes
2. No
77. Some decisions were the same (RECORD VERBATIM)
88. Refused
99. Don't know

Decision Influences

N0 When were you first contacted by a service provider regarding ComEd's Program? (if needed: regarding the availability of technical assistance and incentives for energy efficiency improvements?)

77. RECORD VERBATIM
88. Refused
99. Don't know

N1 When did you first learn about ComEd's Industrial Systems Program, was it BEFORE or AFTER you first began to THINK about making energy efficiency improvements to the <**PROJECT_TYPE**> equipment at your facility?

1. Before [skip the next question, go to N3 – mid page 7]
2. After
88. Refused
99. Don't know

[ASK IF N1=2, 88, 99]

N2 Did you learn about ComEd's Program and the availability of technical assistance and incentives for energy efficiency improvements BEFORE or AFTER you DECIDED to make energy efficiency improvements to the <**PROJECT_TYPE**> equipment at your facility?

1. Before
2. After
88. Refused

99. Don't know

N3. Now I'm going to ask you to rate the importance of several factors that might have influenced your decision to conduct the study and commit the funding to make energy efficiency improvements to the <**PROJECT_TYPE**> equipment at your facility. On a scale from 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how important were the following in your decision to conduct the study and commit the funding to make energy efficiency improvements to the <**PROJECT_TYPE**> equipment.
[FOR N3a-m, RECORD 0 to 10; 96=Not Applicable; 88=Refused; 99=Don't know][If needed: How important in your DECISION to conduct the study and commit the funding to make energy efficiency improvements to the <**PROJECT_TYPE**> equipment was…]

[ROTATE N3a-N3m]

N3a. The age or condition of all or part of the <**PROJECT_TYPE**> equipment
N3b. The availability of cash incentives for energy efficiency improvements
N3c. The free comprehensive study
N3d. The recommendation from the service provider
N3e. Previous experience with this type of project
N3f. The recommendation from your ComEd Account Manager
N3h. The information from the Industrial Systems Program Representative (Service Provider)
N3i. Recommendation from an expert not affiliated with the program
N3j. Standard practice in your business/industry
N3l. Corporate policy or guidelines
N3m. Payback on the investment with the incentives

N3n. Were there any other factors that we haven't discussed that were influential in your decision to make changes to improve the energy efficiency of the <**PROJECT_TYPE**> equipment? If so, what were they?
77. Yes [RECORD VERBATIM]
96. Nothing else influential [skip the next question, go to N3p – top of page 8]
88. Refused [skip the next question, go to N3p – top of page 8]
99. Don't know [skip the next question, go to N3p – top of page 8]

[ASK IF N3n=77]

N3nn. Using the same 0 to 10 scale, how would you rate the influence of this factor?
#. RECORD 0 to 10
96. Not Applicable
88. Refused
99. Don't Know

[READ IF (N3a, N3b, N3c, N3d, N3e, N3f, N3h, N3i, N3j, N3l, N3m, OR N3n)=8,9,10]

You just told me that the following other factors were important:
[READ IN ONLY ITEMS WHERE THEY GAVE A RATING OF 8 or higher]

N3a. The age or condition of all or part of the <**PROJECT_TYPE**> equipment
N3b. The availability of cash incentives for energy efficiency improvements
N3c. The free comprehensive study
N3d. The recommendation from the service provider
N3e. Previous experience with this type of project
N3f. The recommendation from your ComEd Account Manager
N3h. The information from the Industrial Systems Program Representative
N3i. Recommendation from an expert not affiliated with the program
N3j. Standard practice in your business/industry
N3l. Corporate policy or guidelines
N3m. Payback on the investment with the incentives

N3n. Other factor

N3p If you were given a TOTAL of 100 points that reflect the importance in your decision to make changes to improve the energy efficiency of the <**PROJECT_TYPE**> equipment, and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM? Points given to program:

#. RECORD 0 to 100
888. Refused
999. Don't Know

[CALCULATE VARIABLE "OTHERPTS" AS: 100 MINUS N3p RESPONSE; IF N3p=888, 999, SET OTHERPTS=BLANK]

N3o And how many points would you give to other factors? [The response should be <OTHERPTS> because both numbers should equal 100.]

#. RECORD 0 to 100
888. Refused
999. Don't Know

CONSISTENCY CHECK ON PROGRAM IMPORTANCE SCORE

[ASK IF (N3p>69 AND ALL OF (N3b, N3c, N3f, AND N3h)=0,1,2,3), ELSE SKIP TO N4a]

N4 You just gave <N3p RESPONSE> points to the importance of the program, I would interpret that to mean that the program was quite important to your decision to install this equipment. Earlier, when I asked about the importance of individual elements of the program I recorded some answers that would imply that they were not that important to you. Just to make sure I have recorded this properly, I have a couple questions to ask you.

[ASK IF N3b=0,1,2,3]

N4a When asked about THE AVAILABILITY OF THE CASH INCENTIVE, you gave a rating of ...<N3B RESPONSE> ... out of ten, indicating that the cash incentive was not that important to you. Can you tell me why the cash incentive was not that important?

77. Record VERBATIM
88. Refused
99. Don't know

[ASK IF N3c=0,1,2,3]

N4b When I asked you about THE COMPREHENSIVE STUDY, you gave a rating of ...<N3C RESPONSE> ... out of ten, indicating that the study was not that important to you. Can you tell me why the study was not that important?

77. Record VERBATIM
88. Refused
99. Don't know

[ASK IF N3f=0,1,2,3]

N4c When I asked you about THE RECOMMENDATION FROM YOUR COMED ACCOUNT MANAGER, you gave a rating of ...<N3F RESPONSE> ... out of ten, indicating that the recommendation was not that important to you. Can you tell me why the recommendation was not that important?

77. Record VERBATIM
88. Refused
99. Don't know

[ASK IF N3h=0,1,2,3]

N4d When asked about THE INFORMATION from the INDUSTRIAL SYSTEMS PROGRAM REP, you gave a rating of ...<N3H RESPONSE> ... out of ten, indicating that this information from the program rep was not that important to you. Can you tell me why this information was not that important?
77. Record VERBATIM
88. Refused
99. Don't know

[ASK IF N3p<31 AND ANY ONE OF (N3b, N3c, N3f, OR N3h =8,9,10) ELSE SKIP TO N5]

N4e You just gave <N3p RESPONSE> points to the importance of the program. I would interpret that to mean that the program was not very important to your decision to make energy efficiency improvements to the compressed air system. Earlier, when I asked about the importance of individual elements of the program I recorded some answers that would imply that they were very important to you. Just to make sure I understand, would you explain why the program was not very important in your decision to make energy efficiency improvements to the compressed air system?

N5 Now I would like you to think about the action you would have taken if the Industrial Systems Program had not been available. Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the Industrial Systems Program had not been available, what is the likelihood that you would have made exactly the same energy efficiency improvements?
#. RECORD 0 to 10
88. Refused
99. Don't know

Actions Without the Program

N9a. Now we would like you to think about the action you would have taken if the Program had not been available. If you had not received the ComEd comprehensive study, would you have undertaken a study on your own?
1. Yes
2. No
88. Refused
99. Don't know

PAYBACK BATTERY

N10a. Did the cash incentive move your project within the acceptable payback cutoff point?
- 1. Yes
- 2. No

88. Refused
99. Don't know

MEASURE1

N12_1. Now thinking about <**MEASURE1**> and using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the ComEd Industrial Systems program had NOT been available, what is the likelihood that you would have performed <**MEASURE1**>?
#. RECORD 0 to 10
88. Refused
99. Don't know

N13_1. Without the program, when do you think you would have implemented <**MEASURE1**>? Would you say…
1. At the same time [skip the next two questions, go to next measure – N12_2]

2. Earlier [skip the next two questions, go to next measure – N12_2]
3. Later
4. Never [skip the next two questions, go to next measure – N12_2]
88. Refused [skip the next two questions, go to next measure – N12_2]
99. Don't know [skip the next two questions, go to next measure – N12_2]

[ASK IF N13_1=3]

N13a_1. How much later would you have implemented <**MEASURE1**>? Would you say…

1. 1 to 3 months later [skip the next question, go to next measure – N12_2]
2. 4 to 6 months later [skip the next question, go to next measure – N12_2]
3. 7 to 12 months later [skip the next question, go to next measure – N12_2]
4. 13 to 24 months later [skip the next question, go to next measure – N12_2]
5. More than 2 years later
88. Refused [skip the next question, go to next measure – N12_2]
99. Don't know [skip the next question, go to next measure – N12_2]

[ASK IF N13a_1=5]

N13b_1. Why do you think it would have been 2 or more years later?

77. RECORD VERBATIM
88. Refused
99. Don't know

MEASURE2

N12_2. Now thinking about <**MEASURE2**> and using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the ComEd Industrial Systems program had NOT been available, what is the likelihood that you would have performed <**MEASURE2**>?

#. RECORD 0 to 10
88. Refused
99. Don't know

N13_2. Without the program, when do you think you would have implemented <**MEASURE2**>? Would you say…

1. At the same time [skip the next two questions, go to next measure – N12_3]
2. Earlier [skip the next two questions, go to next measure – N12_3]
3. Later
4. Never [skip the next two questions, go to next measure – N12_3]
88. Refused [skip the next two questions, go to next measure – N12_3]
99. Don't know [skip the next two questions, go to next measure – N12_3]

[ASK IF N13_2=3]

N13a_2. How much later would you have implemented <**MEASURE2**>? Would you say…

1. 1 to 3 months later [skip the next question, go to next measure – N12_3]
2. 4 to 6 months later [skip the next question, go to next measure – N12_3]
3. 7 to 12 months later [skip the next question, go to next measure – N12_3]
4. 13 to 24 months later [skip the next question, go to next measure – N12_3]
5. More than 2 years later
88. Refused [skip the next question, go to next measure – N12_3]
99. Don't know [skip the next question, go to next measure – N12_3]

[ASK IF N13a_2=5]

N13b_2. Why do you think it would have been 2 or more years later?

77. RECORD VERBATIM

88. Refused
99. Don't know

MEASURE3

N12_3. Now thinking about <**MEASURE3**> and using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the ComEd Industrial Systems program had NOT been available, what is the likelihood that you would have performed <**MEASURE3**>?

#. RECORD 0 to 10
88. Refused
99. Don't know

N13_3. Without the program, when do you think you would have implemented <**MEASURE3**>? Would you say…

1. At the same time [skip the next two questions, go to N10a – bottom page 13]
2. Earlier [skip the next two questions, go to N10a – bottom page 13]
3. Later
4. Never [skip the next two questions, go to N10a – bottom page 13]
88. Refused [skip the next two questions, go to N10a – bottom page 13]
99. Don't know [skip the next two questions, go to N10a – bottom page 13]

[ASK IF N13_3=3]

N13a_3. How much later would you have implemented <**MEASURE3**>? Would you say…

1. 1 to 3 months later [skip the next question, go to N10a – bottom page 13]
2. 4 to 6 months later [skip the next question, go to N10a – bottom page 13]
3. 7 to 12 months later [skip the next question, go to N10a – bottom page 13]
4. 13 to 24 months later [skip the next question, go to N10a – bottom page 13]
5. More than 2 years later
88. Refused [skip the next question, go to N10a – bottom page 13]
99. Don't know [skip the next question, go to N10a – bottom page 13]

[ASK IF N13a_3=5]

N13b_3. Why do you think it would have been 2 or more years later?

77. RECORD VERBATIM
88. Refused
99. Don't know

Spillover and Channeling

CH1. Since your participation in the Industrial Systems program, have you done any of the following? [1=Yes, 2=No, 88=Refused, 99=Don't know]

CH1a. Installed any additional energy efficient equipment at this facility that received incentives from ComEd?
CH1c. Implemented any additional <**PROJECT_TYPE**> equipment at this facility that did not receive incentives through any utility or government program?
CH1b. Installed any OTHER energy efficient equipment at this facility that did NOT receive incentives through any utility or government program?

#1 (A) [ASK IF CH1a=1(yes), ELSE SKIP TO CH8 – mid page 14]

CH2. What type of energy efficient equipment did you install that received incentives from ComEd?

77. RECORD VERBATIM

88. Refused [skip the next two questions, go to CH8 – mid page 14]
99. Don't know [skip the next two questions, go to CH8 – mid page 14]

CH3. On a scale of 0 to 10, where 0 means "no influence" and 10 means "greatly influenced," how much influence did your participation in the Industrial Systems Program have on your decision to install additional energy efficiency measures?
#. SCALE 0-10
88. Refused
99. Don't know

[ASK IF CH3=8,9 or 10; ELSE SKIP TO CH8]
CH4. How did the Industrial Systems Program influence your decision to install additional energy efficiency measures?
77. RECORD VERBATIM
88. Refused
99. Don't Know

#2 (C) [ASK IF CH1c=1(yes), ELSE SKIP TO CH5 – top of page 15]
CH8. What additional <**PROJECT_TYPE**> equipment did you implement?
77. RECORD VERBATIM
88. Refused [skip the next two questions, go to CH5 – top of page 15]
99. Don't know [skip the next two questions, go to CH5 – top of page 15]

[SKIP TO CH5 IF CH8=88, 99]
CH9. On a scale of 0 to 10, where 0 means "no influence" and 10 means "greatly influenced," how much influence did your participation in the Industrial Systems Program have on your decision to implement the additional <**PROJECT_TYPE**> equipment without an incentive?
77. RECORD VERBATIM
88. Refused
99. Don't know

[ASK IF CH9=8,9 or 10; ELSE SKIP TO CH5]
CH10. How did the Industrial Systems Program influence your decision to implement the additional <**PROJECT_TYPE**> equipment without an incentive?
77. RECORD VERBATIM
88. Refused
99. Don't Know

#3 (B) [ASK IF CH1b=1(yes), ELSE SKIP TO S1 – mid page 15]
CH5. What type of energy efficient equipment did you install that did NOT receive any incentives from utilities or government programs?
77. RECORD VERBATIM
88. Refused [skip the next two questions, go to S1 – mid page 15]
99. Don't know [skip the next two questions, go to S1 – mid page 15]

[SKIP TO S1 IF CH5=88, 99]
CH6. On a scale of 0 to 10, where 0 means "no influence" and 10 means "greatly influenced," how much influence did your participation in the Industrial Systems Program have on your decision to install additional energy efficiency measures without an incentive?
#. SCALE 0-10
88. Refused
99. Don't know

[ASK IF CH6=8,9 or 10; ELSE SKIP TO S1]

CH7. How did the Industrial Systems Program influence your decision to install additional energy efficiency measures without an incentive?

77. RECORD VERBATIM
88. Refused
99. Don't Know

Process Module

S1. How did you first hear about the Industrial Systems Program? **[DO NOT READ]**

- 1. Service provider
- 2. ComEd program representative
- 3. ComEd Account manager
- 4. ComEd Website
- 5. Friend/colleague/word of mouth
- 6. Contractor

77. Other [RECORD VERBATIM]

- 88. Refused
- 99. Don't know

Marketing and Outreach

MK1. Do you recall seeing or receiving any marketing materials or other information for the Industrial Systems Program?

1. Yes
2. No [skip the next three questions, go to MK4 – bottom of page 16]
88. Refused [skip the next three questions, go to MK4 – bottom of page 16]
99. Don't know [skip the next three questions, go to MK4 – bottom of page 16]

[ASK IF MK1=1, ELSE SKIP TO MK4]

MK1A. What types of materials do you remember? **[DO NOT READ]**

1. Presentation/workshop
2. Brochure
3. Case Study
4. ComEd website
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

MK2. How useful were these materials in providing information about the program? Would you say they were…?

1. Very useful [skip the next question, go to MK4 – bottom of page 16]
2. Somewhat useful [skip the next question, go to MK4 – bottom of page 16]
3. Not very useful
4. Not at all useful
88. Refused [skip the next question, go to MK4 – bottom of page 16]
99. Don't know [skip the next question, go to MK4 – bottom of page 16]

[ASK IF MK2=3, 4]

MK3. What would have made the materials more useful to you? **[DO NOT READ]**

1. More detailed information
2. Where to get additional information
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

MK4. What are the best ways of reaching companies like yours to provide information about energy efficiency opportunities? **[DO NOT READ]**
1. Flyers/ads/mailings
2. E-mail
3. Telephone
4. Account Manager/Key Account Executive
5. Service Providers/Trade Allies
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

Program Satisfaction (Process)

PS3. On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with…? [SCALE 0-10; 96=N/A; 88=Refused; 99=Don't know]
a. the level of commitment required by you to receive the free study
b. the information provided in the study
c. Nexant (the program administrator)
d. the Smart Ideas for Your Business Program (ComEd) staff
e. the amount of savings that was achieved compared to the savings estimated in the study
f. the timeline for the project
g. the quality of the reports
h. the project meetings you were involved in
i. the Industrial Systems program overall
j. ComEd overall

[ASK IF PS3a, b, c, d, e, f, g, h, i, j = 1 through 10]
PS4. Why did you rate [PS3a-j] this way? [77=OPEN END; 88=REFUSED; 99=Don't Know]
a. the level of commitment required by you to receive the free study
b. the information provided in the study
c. Nexant (the program administrator)
d. the Smart Ideas for Your Business Program (ComEd) staff
e. the amount of savings that was achieved compared to the savings estimated in the study
f. the timeline for the project
g. the quality of the reports
h. the project meetings you were involved in
i. the Industrial Systems program overall
j. ComEd overall

Benefits and Barriers (Process)

B1. What do you see as the main benefits of the Industrial Systems Program? **[DO NOT READ]**
1. Helps reduce the company's energy bills/save energy
2. Free study
3. Improves the performance of equipment
4. Helps reduce implementation costs

5. Improved awareness of system performance
6. Educates staff about our <**PROJECT_TYPE**> equipment
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

B2. What concerns do you have about the program? **[DO NOT READ]**
1. Paperwork too burdensome
2. Cash incentives/study not worth the effort or required commitment to implement
3. Program is too complicated
77. Other [RECORD VERBATIM]
96. No drawbacks
88. Refused
99. Don't know

Feedback and Recommendations (Process)

R1. Based on your experience, would you recommend the Industrial Systems program to your peers inside or outside of your organization? **[DO NOT READ]**
1. Yes
2. No
3. Maybe
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

R2. Do you have any suggestions for ways to improve the program, and if so, what are they? **[DO NOT READ]**
1. Higher incentives
2. More measures
3. Greater publicity
4. Advance payment
5. Longer engagement with Service Provider to implement more measures
6. Key Account Executives provide more information
96. No recommendations
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

Firmographics

F1 I only have a few general questions left. What is the business type of this facility?
77. RECORD VERBATIM
88. Refused
99. Don't know

F2 Does your company own or rent this facility?
1. Own
2. Rent
77. Other [RECORD VERBATIM]
88. Refused
99. Don't know

F3. How old is this facility? (INTERVIEWER: IN YEARS)
- #. NUMERIC OPEN END, 0 TO 150
- 888. Refused
- 999. Don't know

F4. How many employees, full plus part-time, are employed at this facility?
- #. NUMERIC OPEN END, 0 TO 2000
- 888. Refused
- 999. Don't know

F5. Which of the following best describes your facility? This facility is…
- 1. my company's only location
- 2. one of several locations owned by my company
- 3. the headquarters location of a company with several locations
- 88. Refused
- 99. Don't know

F6. In comparison to other companies in your industry, would you describe your company as…
- 1. A small company
- 2. A medium-sized company
- 3. A large company
- 96. Not applicable
- 88. Refused
- 99. Don't know

Those are all of the questions I have. Thank you very much for your participation!