

**Commonwealth Edison Company  
Energy Efficiency/Demand Response Plan  
Plan Year 1 (6/1/2008-5/31/2009)  
Evaluation Report:  
Summary Report**

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**Submitted To:  
ComEd**



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engineering

**Final Report**

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# E EXECUTIVE SUMMARY

The goal of this report is to present a summary of the findings and results from the Impact and Process Evaluation of the energy efficiency and demand response programs offered by ComEd in Plan Year 1, which ran from June 1, 2008 to May 31, 2009.

## E.1 Impact Evaluation

On the whole, ComEd exceeded their statutory requirements for net program savings for the first program year for both demand and energy (Table 1). They exceeded their demand reduction requirements by 23% and their energy savings requirements by 10%. This was achieved even as net energy savings were slightly under their planned internal targets.

**Table 1. Portfolio Year 1 Results – Planned and Net Savings**

	Original Planned Results		PY 1 ExPost Net Results	
	kW	MWh	kW †	MWh
<b>Energy Efficiency</b>				
Residential Energy Star Lighting	NA	75,809	5,700	60,789
Appliance Recycling	NA	8,159	2,454	11,478
All-Electric Efficiency Upgrade	NA	2,369	160	1,852
Business Prescriptive	NA	43,255	13,166	80,932
Business Custom	NA	18,932	322	4,761
C&I Retro-Commissioning	NA	1,090	120	1,090
Small C&I CFL Intro kit	NA	16,816	700	2,815
Portfolio Totals		166,430	22,622	163,717
<b>Demand Response</b>				
Central Air Conditioning Cycling	11,700	NA	14,400	NA
<b>Statutory Requirements</b>	11,700	148,842	11,700	148,842
<b>Comparison to Statutory Requirements</b>			+2,700	+14,875

† kW reductions are reported peak values

Table 2 shows that the ComEd program tracking systems reported 268,844 MWh of gross savings at the portfolio level for PY1. Evaluation review of these ex-ante gross savings estimates on a program-by-program basis concluded that 89% of the estimated gross savings had been realized. Additional evaluation work to estimate free riders and spillover effects resulted in an overall net-to-gross ratio of 68%. The results of all the individual program reviews was an ex-post estimate of 163,717 MWh of verified net savings at the portfolio level.

**Table 2. Portfolio Year 1 Results – Ex Ante and Ex Post Savings**

	<b>Ex-Ante Gross (MWh)</b>	<b>Realization Rate</b>	<b>Ex-Post Gross (MWh)</b>	<b>Net-to- Gross Ratio</b>	<b>Ex-Post Net (MWh)</b>
Residential Energy Star Lighting	119,151	0.74	87,917	0.68	60,789
Appliance Recycling	21,570	0.73	15,698	0.73	11,478
All-Electric Efficiency Upgrade	2,568	0.90	2,315	0.80	1,852
Business Prescriptive	90,571	1.33	120,550	0.67	80,932
Business Custom	8,411	0.79	6,606	0.72	4,761
C&I Retro- Commissioning	1,509	0.90	1,363	0.80	1,090
Small C&I CFL Intro Kit	25,064	0.20	5,025	0.56	2,815
ComEd Total (MWh)	268,844	0.89	239,474	0.68	163,717

**Definitions**

- Ex-Ante Gross MWh are the expected total savings based on installed measures under the program. This information comes from ComEd's data tracking system.
- The realization rate represents the % of Gross MWh accepted after verification by evaluators.
- Ex-Post Gross MWh are the accepted savings from program after verification by evaluators.
- Net-to-Gross (NTG) is the ratio of accepted program savings due to program influence over accepted program savings.
- Ex-Post Net MWh are the accepted savings due to program influence.

**E.2 Process Evaluation**

The primary objective of the process evaluation effort is to gather market intelligence to help program designers and managers structure their programs to achieve cost-effective savings while maintaining high levels of customer satisfaction. Specific process evaluation methods and objectives vary based on each individual program's needs and stage of development, and detailed process findings are reported separately for each program in the individual evaluation reports. However, customer satisfaction is a key component of each process evaluation and a comparison of customer satisfaction scores across programs is presented in Table 3. While there are slight differences in how each score is assessed, it can be seen that all scores indicate high levels of customer satisfaction.

**Table 3. Summary of Customer Satisfaction Scores**

	Sector	Customer Satisfaction	
Energy Efficiency		Score	Details
Residential Energy Star Lighting	Residential	86% to 90%	<i>Satisfaction with bulbs purchased Score of 6 to 10 on a 10-point scale Higher score is for Coupon program</i>
Appliance Recycling	Residential	96%	<i>Score of 6 to 10 on a 10-point scale</i>
All-Electric Efficiency Upgrade	Residential	98%	<i>Score of 5 on a 5-point scale Self-selected response to leave-behind</i>
Business Prescriptive	C&I	94%	<i>Score of 7 to 10 on a 10-point scale</i>
Business Custom	C&I	87%	<i>Score of 7 to 10 on a 10-point scale Small sample size</i>
C&I Retro-Commissioning	C&I	NA	<i>Pilot program with several customers</i>
Small C&I CFL Intro kit	C&I	86%	<i>Score of 7 to 10 on a 10-point scale</i>
Demand Response			
Central Air Conditioning Cycling	Residential	NA	<i>No process evaluation in PY1</i>

## E.3 High Level Conclusions and Recommendations

### Program Tracking Systems

The program tracking systems are found to be generally well designed and populated with the information needed for program evaluation purposes. However, for several programs, including Appliance Recycling, Business Custom, and All Electric Efficiency Upgrade, demand savings values are not included in the program tracking data, or the demand savings values are often left blank.

In addition, for Appliance Recycling, the program implementation contractor collects amp readings on the appliances picked up at the time of pick-up. However, this information is not included in the program tracking database, and should be for PY2.

### Gross Savings Estimates

The gross savings realization rates were significantly less than 1.0 for four programs (Residential, Appliance Recycling, Residential Lighting, Business Custom, and Small C&I Intro Kit), were greater than 1.0 for one program (Business Prescriptive), and were within 10% of 1.0 for three programs (All Electric Efficiency Upgrade, Business Recommissioning, and Central Air Conditioning Cycling). ComEd should consider revising its tracking system estimates for some key parameters for the programs for which the realization rates were found to be significantly different than 1.0.

### Net-to-Gross Ratios

The estimated net-to-gross (NTG) ratios for most programs were below ComEd's program planning assumptions, which were generally 80% NTG. However, for PY1, the evaluations were generally only able to estimate free ridership rates, and not spillover rates. In PY2 spillover rates will be estimated for

most programs. So the evaluation team suggests that ComEd wait to revise its planning assumptions for NTG until the PY2 evaluations are completed.

### **Customer Satisfaction**

Customer satisfaction rates are quite high, usually 86% positive or higher, for all programs for which participant surveys were conducted. This indicates that the programs are being well run, and no major changes are needed to address program process issues.

### **Evaluation Funding**

Evaluation budgets are set at 3% of program spending for each year. In the first year program spending was relatively small compared to subsequent years as the programs were just beginning, however, many evaluation activities had to be fully funded to get the evaluation planned and set up data collection and analysis procedures. As a result, evaluation budgets in the first year were extremely tight, which limited the amount of primary data collection that could be afforded. Adding flexibility to move evaluation funds across program years would go a long way to ameliorating this problem.

# 1 INTRODUCTION TO THE PORTFOLIO AND PROGRAMS

ComEd's portfolio of programs includes four residential programs and four programs targeted at business customers (Table 4). Details about each of these programs follows.

**Table 4. Portfolio Year 1 Programs and Planned Savings**

	Sector	Original Planned Results	
		kW	MWh
<b>Energy Efficiency</b>			
Residential Energy Star Lighting	Residential	NA	75,809
Appliance Recycling	Residential	NA	8,159
All-Electric Efficiency Upgrade	Residential	NA	2,369
Business Prescriptive	C&I	NA	43,255
Business Custom	C&I	NA	18,932
C&I Retro-Commissioning	C&I	NA	1,090
Small C&I CFL Intro kit	C&I	NA	16,816
<b>Portfolio Totals</b>			<b>166,430</b>
<b>Demand Response</b>			
Central Air Conditioning Cycling	Residential	11,700	NA

## 1.1 Residential Energy Star Lighting

The Residential Energy Star Lighting program provides incentives to increase the market share of Energy Star (ES) qualified compact fluorescent lamp (CFL) bulbs sold through retail sales channels. It also seeks to distribute educational materials that will increase customer awareness and acceptance of energy-efficient lighting technology, as well as promote proper bulb disposal.

The majority of the Residential Lighting program is delivered upstream (at the retailer level) which minimizes the burden on consumers, thus lowering barriers to participation, but making program participant identification (and thus evaluation) more difficult. A small portion of the CFL rebates were delivered via in-store coupons<sup>1</sup> that allowed for the capture of participant name and contact information, however due to the small proportion of the overall sales these coupons represent, as well as the limited retail categories where these coupons were distributed (restricted to small hardware stores), customers

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<sup>1</sup> Coupon sales account for less than 1% of program sales (traditional spiral bulbs only) and were the sole means of program participation at two of the eleven program retailers.

who participated via the coupon channel cannot be deemed representative of the entire participant population.

The Residential Lighting program kicked-off in June 2008 with a Quick Start launch aimed at three of the ten retailers participating in this program and rebated specialty bulbs exclusively. The retailers selected for the Quick Start (Phase 1) program were Costco, Home Depot and Sam's Club. The seven remaining retailers were brought on-line starting in September.

ComEd selected APT and EFI to implement the ComEd Residential Lighting program. APT oversees the RFP process to recruit retailers and manufacturers to participate in the program, from reviewing the submitted proposals to suggesting SKU mixes for stores to negotiating the incentive levels to signing the Memorandum of Understanding (MOU). APT sends trained field representatives into the stores to educate retailer employees as well as customers about the program, makes sure the required POP materials are visible and does special events to help promote the program. EFI is a subcontractor to APT. Their primary role is processing incentive payments for the coupon and markdown program to industry partners.

APT and ComEd prefer markdown partnerships because incentives are paid upon product sale, not upon product shipment, as is done with a buy down program. With these partnerships, discounted bulbs are listed at lower retail price on the shelves or automatically marked down at the register. There are signs indicating the bulbs are discounted through ComEd, but customers may still be unaware that they are purchasing bulbs discounted through the program. Discounts for standard CFLs averaged less than \$0.75 per bulb, whereas discounts on specialty bulbs averaged around \$1.50 per bulb and those on fixtures were all \$10 per fixture. The average discount across all bulbs was around 35% off retail prices, while on fixtures it was nearly half off retail prices.

## **1.2 Appliance Recycling**

The Residential Appliance Recycling program was designed to achieve energy savings through the retirement and recycling of older, inefficient refrigerators, freezers, and room air conditioners. The primary objectives of the program are to:

- Decrease the retention of high energy-use refrigerators and freezers; and
- Deliver long-term energy savings.

A secondary objective is to dispose of these older refrigerators and freezers in an environmentally safe manner by offering comprehensive toxic material recycling and disposal that conforms with applicable environmental laws and regulations and permitting requirements.

The Residential Appliance Recycling program began operation in June 2008. The program offers free pickup and recycling services for older, working refrigerators and freezers, and room air conditioners that households no longer want. Program savings are based on the accelerated removal, dismantling and recycling of these older, inefficient units. In exchange for participating in the program, ComEd pays participants \$25 each for up to two recycled refrigerators or freezers. Operational room air conditioner (RAC) units are also eligible for pick up and recycling, but they can only be picked up from sites where the recycler, JACO, is already collecting a refrigerator and/or freezer (so the room AC unit can "ride for free"). Participants contributing these working room AC units also receive the \$25 program rebate.

ComEd hired JACO to be the program implementer for the Appliance Recycling program. JACO is responsible for the following functions:

- Appliance pickups and related scheduling
- Processing program enrollments
- Deconstructing and recycling program units
- Responding to customer questions and complaints
- Program tracking and reporting functions

The program is marketed through a combination of methods – bill stuffers, radio and TV spots, newspaper ads, and word-of-mouth.

## 1.3 All-Electric Efficiency Upgrade

ComEd's All-Electric Efficiency Upgrade Program targets multifamily buildings with both electric heat and hot water and provides site visits to improve the building's energy efficiency. These site visits consist of two major elements:

- Apartment walkthrough assessment – Energy specialists conduct a walkthrough assessment of each unit in the building and provide installation of high efficiency measures where possible. Replacement measures include compact fluorescent light (CFL) bulbs, low-flow showerheads, sink aerators and water heater wraps. The staff member also provides the tenant with a write-up of the measures installed and information regarding energy efficiency.
- Common area assessment – Program staff also conduct an energy audit of the building's common areas to identify potential energy savings. The building manager or property owner is then given a report of recommended improvements and information regarding rebates through ComEd's Business Custom or Prescriptive programs.

The program launched in June 2008 and has just completed Program Year 1. Honeywell Utility Solutions is the implementer of the program.

## 1.4 Business Prescriptive and Business Custom

The 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 Illinois Service territory. There were two specific program elements during program year 1:

- **Prescriptive** incentives are available for energy-efficiency equipment upgrades and improvements including lighting, cooling, refrigeration, and motors. Incentives are paid based on the quantity, size, and efficiency of the equipment. Incentives are provided for qualified equipment commonly installed in a retrofit or equipment replacement situation.
- **Custom** incentives are available to customers for less common or more complex energy-saving measures installed in qualified retrofit and equipment replacement projects. Custom measure incentives are paid based on the first year energy (kWh) savings. All projects must meet ComEd's cost-effectiveness and other program requirements.

ComEd retained KEMA Services Inc. as its program administrator responsible for day-to-day operations. Important aspects of program implementation are summarized below.

**Incentive Caps:** Incentives are subject to annual limits or caps that are set per facility per year. A facility is defined as contiguous property for which a single customer is responsible for paying the ComEd electricity bill. The incentive cap for PY1 ending May 31, 2009 is \$100,000 per facility.

**Incentive Limits:** Project incentives cannot exceed 50 percent of the total project cost (includes costs of equipment and contractor labor; excludes in-house labor) and 100 percent of the incremental measure cost.

**Preapproval and Final Applications:** Customers submit pre-applications and/or final applications depending on the scope of their project. Applications are required for prescriptive projects where the review team must verify the pre-existing conditions. While not mandatory, pre-applications are encouraged by ComEd for all other prescriptive projects in order to reserve funding. In PY1, pre-approval and pre-inspection was required for permanent lamp removal and new T8/T5 fixture retrofits.

**Reservation:** The program reserves the project funds once the pre-inspection report and/or initial project review is approved. Projects that come in after funds are fully reserved are placed on a waiting list. In the event that a project is not completed within 90 days of the reservation and an extension has not been requested and granted, then the project is cancelled.

**Final Submittal:** Final applications must be submitted within 60 days of project completion and include the appropriate back-up documentation to verify the project is complete and meets the program requirements. The program reviews final applications for eligibility and completeness.

**Final Inspection:** The program performs final inspections as defined by quality assurance/quality control procedures to verify the measures.

## 1.5 C&I Retro-Commissioning

The Retro-Commissioning Program focuses on using existing equipment more efficiently to save energy. Successful retro-commissioning requires experienced service providers and cooperation and buy-in of the facility staff. The program is delivered in four main phases: application, planning, implementation and verification.

**Application Phase.** The facility owner or representative completes the application material and submits paperwork to the Program Administrator (PA). Based on the application material and some follow-up with the site, the PA selects sites that have the highest likely savings opportunities. After accepting a project for the Program, the Administrator assigns a Retro-Commissioning Service Provider (RSP).<sup>2</sup> Projects that are screened out are given detailed reasons for non-acceptance. If other Smart Ideas programs are more appropriate, the customer is directed to applicable programs. For PY1 pilot projects the PA, Nexant, Inc., also performed the duties of the RSP.

**Planning Phase.** The project planning phase commences after assignment of the RSP. Activities include a kick-off meeting with the PA, ComEd representatives, and RSP with the customer team where expectations are described and roles and responsibilities are defined. A site assessment and data

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<sup>2</sup> Retro-Commissioning Service Providers are qualified through the Program by ComEd staff and the Program Administrator. RSP training conducted by the PA and ComEd must be completed prior to participation with the program.

acquisition plan is also completed by the RSP during this phase, where findings are used to generate the Retro-Commissioning Plan for the project and assess potential measures and project economics.

The Retro-Commissioning Plan establishes the framework and direction for the Implementation Phase. Upon completion of the retro-commissioning plan, another meeting is held with the owner representative and engineering staff to review the scope of the plan and the impacts and economics of the identified potential measures. At the completion of the Planning Phase, the facility owner enters into the formal Program Agreement.

The Program Agreement includes several components that define the roles and responsibilities of each party. The primary goal is to require the customer to commit to spending at least \$10,000 for agreed-upon retro-commissioning measures that result in a bundled estimated simple payback of 1.5 years or less. These measures must be installed within the program year the project is started. Additionally, the agreement acts as a decision point where the customer selects measures from the Planning report that they wish to pursue for further investigation in the next phase.

**Implementation Phase.** This work takes the consensus decisions from the Planning Phase and builds on them. Additional field data is gathered to better define, augment, add to, or discard measures presented in the Plan. The RSP and customer's team members work together to implement the measures in the Plan. This may involve coordination of multiple contractors to ensure that the Plan measures are executed to save energy.

**Verification Phase.** After measures are implemented, the RSP evaluates data from the facility to determine that measures are operating as intended to save energy. These data might be observations of installed and/or repaired equipment, trend data from an automation system or data from dataloggers installed after the measure was implemented. The RSP prepares a report describing the status of implementation and revised savings estimates based on observations and measurements.

The program is marketed primarily through one-on-one marketing to candidate facilities by ComEd Account Managers, ComEd Energy Efficiency Services staff, the Program's qualified Retro-Commissioning Service Providers (RSPs), and Program Administrator staff. Marketing training is conducted by the PA for ComEd personnel and marketing materials were produced.

## 1.6 Small C&I CFL Intro Kit

The Small C&I Intro Kit lighting program provides a point-of-entry to ComEd's Smart Ideas for Your Business program and increases the market penetration of energy-efficient lighting by offering free CFL bulbs to hard-to-reach (HTR) small business customers. It also seeks to distribute educational and discounted lighting product materials that will increase customer awareness and acceptance of energy-efficient lighting technologies.

The Small C&I Intro Kit lighting program kicked off in February 2009 with a mailing of brochures containing information on the benefits of energy-efficient lighting to small HTR nonresidential customers.<sup>3</sup> These brochures included a tear-off coupon offering a choice of three free CFL bulbs that

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<sup>3</sup> These customers were selected from the ComEd Customer database (CIMS) by rate code and in some instances, due to incorrect rate codes, these offers ended up in residential locations.

could be redeemed by selecting the bulbs desired and placing the postage-paid coupon in the mail. Customers also had the option of ordering the CFLs by phone or via a website.

The free CFLs were then mailed directly to customers along with a mini-catalog offering a wide array of discounted lighting technologies as well as water, load reduction, and ventilation products. The goal of this direct mail approach was to help small HTR businesses overcome the barriers they face to energy efficiency program participation in hopes of engaging them in future energy efficiency program offerings.

ComEd hired Energy Federation Incorporated (EFI) to be the program implementer for the Small C&I Intro Kit program.

## **1.7 Central Air Conditioning Cycling**

Central Air Conditioning Cycling is a residential direct load control program that ComEd has been running since 1996. The program allows ComEd to cycle off and on a participant's home central air conditioner condenser so it uses less electricity on the hottest days of the year. The air conditioner's fan remains powered to circulate air to help the participant's home stay comfortable.

Customers can select either a 50% cycling option or a 100% load shed option. They receive an annual incentive of \$20 for cycling or \$40 for load shed. Approximately 60% of participants are on the 100% load shed option.

At the end of 2007, there were approximately 50,000 participants in the program. The evaluation covered only the participants who joined the program since 6/1/2008 and not those who were already in the program. Impact evaluation of this program is regularly performed by GoodCents Solutions, the installation contractor, based on a sample of approximately 250 customers that have whole house interval meters installed. Estimated program impacts are reported annually to PJM ISO as demand response resources.

Control events were called fifteen times between 1996 and 2006. New guidelines from PJM now require that an annual system test be run at least once each year.

## 2 EVALUATION METHODS

The ComEd EM&V team developed an evaluation work plan for each program in the portfolio. Methods employed consisted of a combination of surveys, secondary research, on-site data collection, modeling, engineering review, program database and other information reviews, and staff interviews. Table 5 summarizes the main evaluation tasks for each program.

Evaluation budgets are set at 3% of program spending for each year. In the first year program spending was relatively small compared to subsequent years as the programs were just beginning, however, many evaluation activities had to be fully funded to get the evaluation planned and set up data collection and analysis procedures. As a result, evaluation budgets in the first year were extremely tight, which limited the amount of primary data collection that could be afforded.

**Table 5. Summary of Evaluation Tasks**

Program	Action	Impact	Process	Details
All Programs	Manager interview	✓	✓	Program procedures, impact assumptions
	Review Tracking Database	✓	✓	Quality control, meet the needs of the program
	QAQC	✓	✓	Quality control, meet the needs of the program
	In-depth Interviews with Program Implementers		✓	Process-related strengths and weaknesses
Residential Energy Star Lighting	Phone Survey of Coupon Participants	✓	✓	Installation rate, free rider, spillover and process issues
	Phone Survey of Upstream Markdown Participants and NonParticipants	✓	✓	Installation rate, free rider, spillover and process issues
Appliance Recycling	Regression modeling of Unit Energy Consumption for Refrigerators and Freezers	✓		Based on secondary data for 1600 metered units applied to characteristics of collected units
	Phone Survey of Participants	✓	✓	Part-use factor, free rider, and process evaluation
All-Electric Efficiency Upgrade	Engineering review of energy savings	✓		Impact estimates
Business Prescriptive	Phone Survey of Participants	✓	✓	Installation rate, free rider, spillover and process issues
	Project File Engineering Review	✓		Impact realization rate
	On-Site Visits	✓		Impact realization rate
Business Custom	Same as Business Prescriptive			
C&I Retro-Commissioning	Engineering Review of Savings	✓		

<b>Program</b>	<b>Action</b>	<b>Impact</b>	<b>Process</b>	<b>Details</b>
Small C&I CFL Intro Kit	Phone Survey with Participants	✓	✓	Installation rate, free rider, spillover and process issues
Central Air Conditioning Cycling	Comparison of new participant characteristics to existing participants	✓		Verify applicability of existing impact estimates from metered sample

# 3 PORTFOLIO LEVEL RESULTS AND RECOMMENDATIONS

This section will present an overview at the portfolio level of the results and recommendations from the impact and process evaluations.

## 3.1 Portfolio Level Impact Results

The ComEd program tracking systems reported 268,844 MWh of savings at the portfolio level for PY1 (Table 6). Evaluation review of these ex-ante gross savings estimates on a program-by-program basis concluded that 89% of those estimated gross savings had been realized. Additional evaluation work to estimate free riders and spillover effects resulted in an overall net-to-gross ratio of 68%. The results of all the individual program reviews was an ex-post estimate of 163,717 MWh of verified net savings at the portfolio level.

**Table 6. Portfolio Level Program Year 1 Results**

	Ex-Ante Gross (MWh)	Realization Rate	Ex-Post Gross (MWh)	Net-to-Gross Ratio	Ex-Post Net (MWh)
Residential Energy Star Lighting	119,151	0.74	87,917	0.68	60,789
Appliance Recycling	21,570	0.73	15,698	0.73	11,478
All-Electric Efficiency Upgrade	2,568	0.90	2,315	0.80	1,852
Business Prescriptive	90,571	1.33	120,550	0.67	80,932
Business Custom	8,411	0.79	6,606	0.72	4,761
C&I Retro-Commissioning	1,509	0.90	1,363	0.80	1,090
Small C&I CFL Intro Kit	25,064	0.20	5,025	0.56	2,815
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### Definitions

- Ex-Ante Gross MWh are the expected total savings based on installed measures under the program. This information comes from ComEd’s data tracking system.
- The realization rate represents the % of Gross MWh accepted after verification by evaluators
- Ex-Post Gross MWh are the accepted savings from program after verification by evaluators
- Net-to-Gross (NTG) is the ratio of accepted program savings due to program influence over accepted program savings
- Ex-Post Net MWh are the accepted savings due to program influence

## 3.2 Portfolio Level Process Results

The primary objective of the process evaluation effort is to gather market intelligence to help program designers and managers structure their programs to achieve cost-effective savings while maintaining high levels of customer satisfaction. Specific process evaluation methods and objectives vary based on each individual program's needs and stage of development, and detailed process findings will be reported separately for each program in the following section. However, customer satisfaction is a key component of each process evaluation and a comparison of customer satisfaction scores across programs is presented in Table 7 to give a portfolio level view of the results. While there are slight differences in how each score is assessed, it can be seen that all scores indicate high levels of customer satisfaction.

**Table 7. Summary of Customer Satisfaction Scores**

	Sector	Customer Satisfaction	
Energy Efficiency		Score	Details
Residential Energy Star Lighting	Residential	86% to 90%	<i>Satisfaction with bulbs purchased Score of 6 to 10 on a 10-point scale Higher score is for Coupon program</i>
Appliance Recycling	Residential	96%	<i>Score of 6 to 10 on a 10-point scale</i>
All-Electric Efficiency Upgrade	Residential	98%	<i>Score of 5 on a 5-point scale Self-selected response to leave-behind</i>
Business Prescriptive	C&I	94%	<i>Score of 7 to 10 on a 10-point scale</i>
Business Custom	C&I	87%	<i>Score of 7 to 10 on a 10-point scale Small sample size</i>
C&I Retro-Commissioning	C&I	NA	<i>Pilot program with several customers</i>
Small C&I CFL Intro kit	C&I	86%	<i>Score of 7 to 10 on a 10-point scale</i>
Demand Response			
Central Air Conditioning Cycling	Residential	NA	<i>No process evaluation in PY1</i>

## 3.3 Portfolio Level Cost Effectiveness

Cost effectiveness was determined for individual programs and for the portfolio of programs as a whole. It is assessed through the use of the Total Resource Cost (TRC) test. The TRC test is defined in the Illinois Power Agency Act SB1592 as follows:

*“ ‘Total resource cost test’ or ‘TRC test’ means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric*

*utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.*<sup>4</sup>

ComEd uses DSMore™ software for the calculation of the TRC test.<sup>5</sup> The DSMore model accepts information on program parameters, such as number of participants, gross savings, free ridership and program costs, and calculates a TRC which fits the requirements of the Illinois legislation.

One important feature of the DSMore model is that it performs a probabilistic estimation of future avoided energy costs. It looks at the historical relationship between weather, electric use and prices in the MISO region and forecasts a range of potential future electric energy prices. The range of future prices is correlated to the range of weather conditions that could occur, and the range of weather is based on weather patterns seen over the historical record. This method captures the impact on electric prices that comes from extreme weather conditions. Extreme weather creates extreme peaks which create extreme prices. These extreme prices generally occur as price spikes and they create a skewed price distribution. High prices are going to be much higher than the average price while low prices are going to be only moderately lower than the average. DSMore is able to quantify the weighted benefits of avoiding energy use across years which have this skewed price distribution.

Table 8 shows that all of the individual ComEd programs, except C&I Retro-commissioning,<sup>6</sup> are cost effective, with TRC values greater than one which means that total benefits are greater than total costs. The overall TRC for ComEd programs was 2.14 at the portfolio level. At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

**Table 8. Cost Effectiveness of ComEd Portfolio**

	Ex-Post Net (MWh)	Total Resource Cost Test
Residential Energy Star Lighting	60,789	3.77
Appliance Recycling	11,478	2.58
All-Electric Efficiency Upgrade	1,852	1.89
Business Prescriptive	80,932	2.43
Business Custom	4,761	1.29
C&I Retro-Commissioning	1,090	0.79
Small C&I CFL Intro Kit	2,815	1.88
Central Air Conditioning Cycling	NA	3.33
ComEd TOTAL	163,717	2.14

*Note: The Central Air Conditioning Cycling program saves 14.4 MW of demand, but no energy.*

Additional costs are included in the determination of the TRC ratio at the portfolio level. These are costs related to the overall delivery of energy efficiency and demand response that cannot be assigned to any of

<sup>4</sup> Illinois Power Agency Act SB1592, pages 7-8.

<sup>5</sup> Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

<sup>6</sup> The Retro-commissioning was a pilot effort in PY1. It is expected that the TRC will be greater than one in PY2 since administrative costs will moderate and participation will increase.

the individual evaluated programs, like evaluation, measurement and verification costs, portfolio-level administration costs, research and development costs, educational outreach costs and Energy Insight Online (EIO) costs. Costs for programs like CACES and C&I New Construction are also included at the portfolio level because these programs do not have any direct association of energy savings.

## **3.4 Portfolio Level Conclusions and Recommendations**

This section will address portfolio level conclusions and recommendations, beyond the program specific discussions presented in the next section.

### **Program Tracking Systems**

The program tracking systems are found to be generally well designed and populated with the information needed for program evaluation purposes. However, for several programs, including Appliance Recycling, Business Custom, and All Electric Efficiency Upgrade, demand savings values are not included in the program tracking data, or the demand savings values are often left blank.

In addition, for Appliance Recycling, the program implementation contractor collects amp readings on the appliances picked up at the time of pick-up. However, this information is not included in the program tracking database, and should be for PY2.

### **Gross Savings Estimates**

The gross savings realization rates were significantly less than 1.0 for three programs (Residential Lighting, Business Custom, and Small C&I Intro Kit), were greater than 1.0 for two programs (Appliance Recycling and Business Prescriptive), and were within 10% of 1.0 for three programs (All Electric Efficiency Upgrade, Business Recommissioning, and Central Air Conditioning Cycling) . ComEd should consider revising its tracking system estimates for some key parameters for the programs for which the realization rates were found to be significantly different than 1.0.

### **Net-to-Gross Ratios**

The estimated net-to-gross (NTG) ratios for most programs were below ComEd's program planning assumptions, which were generally 80% NTG. However, for PY1, the evaluations were generally only able to estimate free ridership rates, and not spillover rates. In PY2 spillover rates will be estimated for most programs. So the evaluation team suggests that ComEd wait to revise its planning assumptions for NTG until the PY2 evaluations are completed.

### **Customer Satisfaction**

Customer satisfaction rates are quite high, usually 86% positive or higher, for all programs for which participant surveys were conducted. This indicates that the programs are being well run, and no major changes are needed to address program process issues.

### **Evaluation Funding**

Evaluation budgets are set at 3% of program spending for each year. In the first year program spending was relatively small compared to subsequent years as the programs were just beginning, however, many evaluation activities had to be fully funded to get the evaluation planned and set up data collection and

analysis procedures. As a result, evaluation budgets in the first year were extremely tight, which limited the amount of primary data collection that could be afforded. Adding flexibility to move evaluation funds across program years would go a long way to ameliorating this problem.

### 3.5 Summary of DCEO ComEd Programs

Energy efficiency resources are also delivered to ComEd customers through programs administered by the Illinois Department of Commerce and Economic Opportunity (DCEO). DCEO programs focused on low income customers in the residential sector, and on public facilities (like schools and government buildings) in the business sector.

Table 9 shows that these special focus programs achieved 18,638 annual MWh of savings with an overall TRC ratio of 1.83.

**Table 9. Cost Effectiveness of DCEO Programs for ComEd Customers**

	Ex-Post Net (MWh)	Total Resource Cost Test
Residential Retrofit Weatherization	3,567	1.97
Residential Retrofit Home Improvement	690	0.80
Residential Energy Efficient Affordable Housing Construction	1,294	1.84
Lights for Learning	769	1.36
Public Sector Standard Incentives	8,224	2.12
Public Sector Custom Incentives	4,092	4.27
DCEO Programs Delivered to ComEd Customers TOTAL	18,636	1.83

All of the individual programs, except Residential Retrofit Home Improvement, were cost effective. The Residential Retrofit Home Improvement program TRC is at 0.80 showing that energy savings benefits are 80% of the total costs of the program.

Additional costs are included in the determination of the TRC ratio at the portfolio level. These additional costs cover DCEO’s three market transformation activities (Smart Energy Design Assistance Program (SEDAP), Large Customer Energy Analysis Program (LEAP) and Efficiency Training), along with some administrative costs.

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio and they may be sufficient to create a TRC greater than one for the Residential Retrofit Home Improvement program.

# 4 PROGRAM LEVEL RESULTS AND RECOMMENDATIONS

In this section a summary of the impact and process evaluation results will be presented for each individual program. Major program recommendations will also be discussed.

## 4.1 Residential Energy Star Lighting

The goal of this program was to sell 2.6 million discounted CFLs to residential customers within ComEd service territory. A total of 3,001,366 CFL bulbs were sold as part of the program resulting in a program sales realization rate of 115%. Table 10 below provides both the program reported and evaluation verified key gross and net savings parameter estimates (displaced watts, average daily hours of use, installation rate and net-to-gross ratio), as well as the first-year gross and net energy savings estimates.

**Table 10. PY1 Gross and Net Parameter and Savings Estimates**

Gross and Net Parameter and Savings Estimates	Program Reported	Evaluation Verified		
	Overall	Coupon	Upstream	Overall
Program Bulb Sales	3,001,366	21,836	2,979,531	3,001,367
Average Displaced Watts (Delta Watts)	48.9 †	48.7		
Average Daily Hours of Use ‡	2.34	2.34		
Gross kWh Impact per unit	41.8 †	41.6		
Gross kW Impact per unit	0.05 †	0.05		
Installation Rate	95%	79%	70%	70%
Peak Load Coincidence Factor	0.081	0.081		
<b>Total First-Year Gross MWh Savings</b>	<b>119,151 †</b>	<b>87,917</b>		
<b>Total First-Year Gross MW Savings</b>	<b>139.5 †</b>	<b>102.9</b>		
<b>Total First-Year Gross Peak MW Savings</b>	<b>11.3</b>	<b>8.3</b>		
Net-to-Gross Ratio (1-FR)	80%	69%		
<b>Total First-Year Net MWh Savings</b>	<b>95,321</b>	<b>60,789</b>		
<b>Total First-Year Net MW Savings</b>	<b>111.6 †</b>	<b>71.2</b>		
<b>Total First-Year Net Peak MW Savings</b>	<b>9.0</b>	<b>5.8</b>		

†Evaluation team derived from program reported net savings and gross and net savings assumptions.

‡Residential daily HOU estimates are taken from DEER.

The 2008 net claimed energy savings for this program were 95,321 MWh<sup>7</sup>, resulting in a net savings realization rate of 64%. The two primary drivers for this realization rate include:

1. The *Installation Rate* which was found to be 70%; 25% lower than program plans (95%). The majority of these uninstalled bulbs are reportedly in storage and will be installed when another bulb burns out. The energy savings from these stored bulbs was not counted as PY1 savings, but savings resulting from these future installations will be estimated in PY2 and PY3 evaluations.
2. The *Net-to-Gross Ratio* was found to be 69% based on customer self-reports, which is 86% of the estimate that was used for program planning (80%).

It is important to keep in mind when reviewing these PY1 results that this analysis is restricted by the lack of presales data from participating retailers (of which none is currently available), customer lighting logger data (which will be collected as part of the PY2 evaluation but was not available for PY1), and the sample sizes of upstream program participants (which are limited due to the lack of participant contact information that results from the upstream program delivery method). PY2 and PY3 evaluations will also include in-store intercept surveys that will seek to identify upstream non-coupon program participants at the time of program purchase in order to increase the sample sizes within the upstream channel.

Additionally, in a predominantly upstream lighting program such as this, marking the bulbs as program bulbs, either at the manufacturer with a Smart Ideas logo on the bulb itself or at the retailer level with a sticker on the package, can help in identifying program bulbs during both phone and on-site surveys. It allows customers and/or field staff to confirm the bulbs are truly program bulbs by checking for this program identification. In the case of the stickers, it still may be impossible to confirm installed bulbs, however any bulbs in storage may be confirmed if the sticker is still in place.

### Key Process Findings

1. The main marketing effort of the program was in-store activities and displays. A majority of coupon program participants learned of the program in the store, which was consistent with this approach. However, most markdown participants were unaware of the ComEd discount.
2. Awareness of CFLs is not a barrier to participation in the program or to greater CFL use. Eighty-six percent of ComEd customers have heard of CFLs without being offered a description of the bulbs. Another 10% say they have heard of CFLs once they have been described.
3. Lack of knowledge of the benefits of CFLs is a barrier to greater CFL use. Those who have not purchased CFLs give reasons that suggest misinformation such as their high cost and lack of energy saving benefit. Many also are waiting for their incandescent bulbs to burn out rather than replace the still functioning bulbs with CFLs.
4. CFL usage has increased based on self-reported counts of CFLs installed this year compared to last year. However, there is still much that can be done to expand the CFL market in ComEd territory. Forty-four percent of ComEd customers purchased at least one incandescent bulb in the past year. Eighty percent of those purchasers bought the bulbs for use in a regular light fixture. Over one-third of program participants also purchased incandescent bulbs during the past year.

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<sup>7</sup> Original goals for the Residential Lighting program were 75,809 MWh and 7.2 MW.

5. Program participants and other purchasers of CFLs appear to be more motivated by the money saved on their utility bills from using CFLs than the environmental benefits.
6. Concern about mercury and CFL disposal is not widespread and does not pose a significant barrier to CFL adoption. However, the flip side to this lack of concern is use of improper disposal methods. A majority of those who have already disposed of CFLs simply threw them away rather than disposing of them in an environmentally safe manner.

## 4.2 Appliance Recycling

A total of 11,979 units were picked up by the program during PY1. About 70% of these units were refrigerators, another 26% were freezers, and the remaining 4% were room air conditioners. Table 11 below provides the first-year evaluation-adjusted gross and net savings estimates for each measure and for the program overall. Verified gross savings were 15,698 MWh and verified net savings were 11,478, reflecting an overall net-to-gross ratio of 73%.

**Table 11. PY1 Gross and Net Impact Parameter and Savings Estimates (kWh)**

<b>Gross and Net Impact Parameter and Savings Estimates</b>	<b>Refrigerators</b>	<b>Freezers</b>	<b>Room AC</b>	<b>Total Program</b>
Total units recycled through the Program	8,438*	3,076	465	11,979
<b>Verified Annual kWh Savings Impacts</b>				
Verified annual Gross kWh savings per unit (full-load operating hours)	1,893	2,027		---
Part-Use Factor	75%	59%		---
Verified annual Gross kWh savings per unit <i>adjusted for part-use</i>	1,420	1,196	80	--
Verified Program Gross MWh	11,982	3,678	37	15,698
Net-to-Gross Ratio (1-Free Rider %)	0.70	0.83	1.00	
<b>Total First-Year Evaluation-Adjusted Net MWh Savings</b>	<b>8,388</b>	<b>3,053</b>	<b>37</b>	<b>11,478</b>

\*Includes one unit that was unlabeled.

**Table 12. PY1 Gross and Net Impact Parameter and Savings Estimates (kW)**

<b>Gross and Net Impact Parameter and Savings Estimates</b>	<b>Verified kW Savings</b>			
	<b>Refrigerators</b>	<b>Freezers</b>	<b>Room AC</b>	<b>Total Program</b>
Total units recycled through the Program	8,438	3,076	465	11,979
<b>Verified kW Savings Impacts</b>				
Annual kW savings per unit (full-load operating hours)	0.30	0.26	0.04	---
Program Gross kW	2,531.4	799.8	18.6	3,350
Net-to-Gross Ratio (1-Free Rider %)	0.7	0.83	1.00	
<b>Total PY1 Net kW Savings</b>	<b>1,772</b>	<b>664</b>	<b>19</b>	<b>2,454</b>

Verified gross savings per unit are fairly similar to the program planning estimate of kWh savings for refrigerators. The verified gross savings estimate is somewhat higher than the ex-ante estimate for freezers, which reflects the fact that the program collected more older units than anticipated in PY1. Fully

40% of the freezers picked up by the program are over 30 years old and another 42% are between 20 and 30 years old. Nearly all (92%) of the freezers collected by the program were manufactured before the 1993 standards change. The standards change resulted in a dramatic improvement in efficiency. Pre-1993 units are generally considered ‘energy hogs’ that use 3 to 4 times the energy of units made since the standards change.

The verified NTG ratio (including the part-use adjustment) of 0.52 (=75% x 0.70) for refrigerators proved to be considerably higher than the ex ante value of 0.35 assumed in the program plan. This has a significant impact on the verified savings impact, since refrigerators are the largest source of energy savings for the program.

## **Key Process Findings**

The amount of marketing that was done for this campaign was sufficient to achieve the target goal for the number of appliances picked up. The primary marketing tool, bill inserts, was also effective. When asked unprompted where they had heard of the program, nearly three of four participants (74%) recalled seeing the program mentioned in a bill insert with over two-thirds (69%) saying that was where they first learned of the program. When prompted, another 11% recalled seeing the program in a bill insert bringing both unprompted and prompted recall of bill inserts to 85%.

Participants were asked, unprompted, why they chose the ComEd Appliance Recycling Program to dispose of their appliance instead of some other disposal method. The convenience of the home pick-up was the main selling point of the program for more participants than any other reason. An additional 13% said the home pick-up was a secondary reason. The \$25 cash incentive was also a factor, but it plays more of a secondary role with 25% saying it was the main reason and an additional 28% a secondary reason. Overall, 96% of participants were satisfied with their experience with the Appliance Recycling Program, with 86% saying they were “very satisfied”.

The program was well-administered. Participants reported a high degree of satisfaction with the sign-up process and appliances were picked up and payments processed in timely fashion. The implementation plan stipulates that 90% of customers will not have to wait for more than 14 days to have their appliance to be picked up. A large majority of participants surveyed (84% of those who could recall) scheduled a pick-up date within two weeks of when they called. Nearly all participants surveyed (98%) said they were able to schedule a pick-up date that was convenient for them.

Overall, 92% of respondents were satisfied with the collection team who came to pick up the appliance, with 80% reporting that they were “very satisfied”. Only two respondents said they were dissatisfied, with the reason being that the collection team was not careful removing the appliance.

Three of four respondents (74%) said that they were very satisfied with the amount of the incentive payment. No respondents reported being dissatisfied with the size of the payment. Of the participants who recalled when they received their incentive check, 91% said that they received payment within four weeks of pickup. Only one respondent was dissatisfied with the amount of time it took to receive payment (4 weeks).

## 4.3 All-Electric Efficiency Upgrade

A total of 4,119 tenant spaces received direct installation of efficiency measures as part of the program.<sup>8</sup> Table 13 below provides the first-year evaluation-adjusted gross savings estimates for each direct install measure type.

**Table 13. PY1 Gross and Net Savings Estimates**

Gross and Net Parameter and Savings Estimates	Multifamily All-Electric Efficiency Upgrade
CFLs directly installed through the Program	19,428
Showerheads directly installed through the Program	3,786
Aerators directly installed through the Program	7,073
Water heater wraps directly installed through the Program	4
Program Tracking System MWh	2,568
Program Tracking System Coincident MW	<i>Not recorded</i>
<b>Total First-Year Evaluation-Adjusted Gross MWh Savings</b>	<b>2,315 MWh</b>
<b>Gross Realization Rate (MWh)</b>	<b>90%</b>
<b>Total First-Year Evaluation-Adjusted Gross Coincident MW Savings</b>	<b>0.20 MW</b>
Net-to-Gross Ratio (1-FR) ( <i>ComEd Program Assumption</i> ) <sup>9</sup>	80%
<b>Total First-Year Evaluation-Adjusted Net MWh Savings</b>	<b>1,852 MWh</b>
<b>Total First-Year Evaluation-Adjusted Net Coincident MW Savings</b>	<b>0.16 MW</b>

Source: Analysis of program tracking data.

### Key Impact Findings

The evaluated gross realization rate was 90%, lower than the value of 95% used in program planning.<sup>10</sup> There were three primary reasons for changes to the ex ante savings estimates:

<sup>8</sup> Rebates and energy savings for recommended measures installed in common areas are evaluated within the Business Custom or Prescriptive programs.

<sup>9</sup> The PY1 evaluation did not estimate the net to gross ratio. The value of 80% is drawn from the program plan presented in ComEd's 2008-2010 Energy Efficiency and Demand Response Plan (November 15, 2007). Page D-2 of the ComEd plan provides a footnote stating the net to gross ratio of 80% is drawn from the California Energy Efficiency Policy Manual, version 2 (2003).

<sup>10</sup> The value of 95% is drawn from the program plan presented in ComEd's 2008-2010 Energy Efficiency and Demand Response Plan (November 15, 2007). Page D-2 of the ComEd plan provides a footnote stating the value is an assumption by ICF Consulting.

1. The default planning assumption for showerheads of 355 kWh savings per unit used in the tracking system assumed each showerhead installed counts as a unit, even when multiple showerheads are installed in a single tenant apartment or condominium. If the program seeks to claim higher savings for units with multiple showerhead installations, it will be necessary to document a greater number of occupants per tenant unit taking more showers than assumed in the default of 355 kWh. ***The total reduction from tracking savings for this adjustment was 219 MWh.***
2. Similarly, installations of bathroom and kitchen faucet aerators counted 52 kWh saved for each aerator installed, even in tenant units with multiple installations. ***The total reduction from tracking savings for this adjustment was 45 MWh.***
3. ComEd's default savings for compact fluorescent lamps was based on the replacement of a 75 watt incandescent with an 18 watt integral CFL, at 2.34 hours per day, with a 90% in-service rate for a savings of 44 kWh per lamp. The CFL product installed by the program is rated at 20 watts, reducing savings slightly, but we estimated the in-service rate at 95%, for a savings of 44.6 kWh per lamp when replacing a 75 watt incandescent. The planned 90% in-service rate adjusts for both failure to install and removal after installation. As a direct installation program, we are only adjusting for later bulb removal, estimated by ComEd's PY1 Residential Lighting program evaluation at 5%. ***The total increase from tracking savings for this adjustment was 12 MWh.***

We recommend the program create a technical reference manual to document the default savings values, similar to that used by the C&I Prescriptive program to establish default savings. The technical reference can build off of the default savings review and revise the assumptions for each measure to fit local ComEd conditions and the multifamily program. This activity should be done in coordination with the evaluation team, as certain key assumptions will be examined through the impact evaluation process.

We also recommend the program tracking data receive periodic data quality reviews and clean up, and that data entry include checks for values outside of limits. Data exported for the evaluation team should also be checked for anomalies.

## **Key Process Findings**

Although the MFEE program met its customer participation goals for PY1, there are some changes that could be made to the program processes to improve operations and ensure the program continues to meet its goals in the future. Key findings are provided below.

1. Due to the varied nature of the buildings targeted for inclusion in the program, the marketing plan does not make use of more common methods such as mailers, bill stuffers and mass media. Honeywell contacts the buildings directly and then relies on owners and managers to market the program to the tenants to gain access to units. Honeywell has experience with multifamily programs in other markets and has found their current approach to be most effective. However, the program should consider targeted mailings to tenants in advance of the visit to ensure that tenants are aware of the program and its benefits.
2. The audits of the common areas are to include an introduction to the existing Custom and Prescriptive C&I programs so that building owners can participate in these programs to make the recommended changes. Because the C&I programs had already met their PY1 goals when most audits were conducted, it was not possible for owners to participate. The programs should do a better a job of coordinating activities to allow building owners the opportunity to participate in the C&I programs as well.

3. Honeywell does not regularly collect tenant contact information, thus it is difficult for ComEd to do random follow up checks and for the evaluation team to do its work. Though tenants should not be required to provide contact information, they should be encouraged to do so.
4. ComEd conducts “ride alongs” and places follow-up phone calls to evaluate the work of Honeywell energy specialists. The method for selecting which buildings to visit and tenants to call is not defined or documented. The results of these activities are also not documented. The program should set a system for conducting the “ride alongs” and placing the calls on a regular basis and tracking the results. The phone calls could be rolled into the follow up survey discussed below.

The survey Honeywell leaves with tenants to get feedback on the program has a 13.6% response rate and participants can choose to participate. In order to obtain feedback from a more representative sample of participants, ComEd should consider replacing or supplementing the survey left with tenants with phone calls to a random sample of participants. This effort could be combined with the follow up phone calls discussed above to get an assessment of both the energy specialists’ work as well as satisfaction with the installed measures.

## 4.4 Business Prescriptive

The Prescriptive program launched in June 2008 and quickly reached its funding target for the first program year. As a result, ComEd closed the PY1 program to new applicants effective November 1, 2008. Projects were placed on a wait list for participation as replacements and additions to program year 1 as cancellations and budget allowed, and as potential participants for the second program year.

Table 14 shows that verified gross impacts were significantly higher than savings reported in ComEd’s tracking system, as indicated by the realization rate of 1.33 for MWh savings (realization rate = verified gross / tracking system gross). However, the verified net-to-gross ratio was lower than ComEd’s planning value of 0.80. This had the effect of moderating the increase in the savings estimate that came from the realization rate alone. The final verified estimate of net savings for the program was 80,932 MWh, slightly lower than the tracking system estimate of 90,571 MWh for gross savings.

**Table 14. PY1 Prescriptive Program Gross and Net kWh Savings**

End Use	Tracking Gross kWh	Verified Gross kWh	Realization Rate	Verified Net kWh	NTGR (verified gross)
Lighting	83,461,120	110,155,743	1.32	73,767,540	0.67
HVAC	6,598,992	9,851,596	1.49	6,770,708	0.69
Refrigeration	494,488	521,752	1.06	378,940	0.73
Motors	16,822	20,475	1.22	14,449	0.71
Program	90,571,422	120,549,567	1.33	80,931,636	0.67

Source: Tracking savings from ComEd online tracking system, July 7, 2009.

**Table 15. PY1 Prescriptive Program Gross and Net kW Savings**

End Use	Tracking Gross kW	Verified Gross kW	Realization Rate	Verified Net kW	NTGR (verified gross)
Lighting	17,971	17,934	1.00	12,192	0.68
HVAC	885	1,403	1.58	950	0.68
Refrigeration	33	31	0.94	22	0.73
Motors	3	3	1.05	2	0.70
Program	18,893	19,370	1.03	13,166	0.68

Source: Tracking savings from ComEd online tracking system, July 7, 2009.

## Key Impact Findings

- Program participation and net impacts were highly concentrated in large projects, in certain buildings types (warehouse, industrial), and in a subset of measures. Lighting measures accounted for 91% of net energy savings. Warehouses and manufacturing provided 63% of net energy savings by building type. The measure “New T8/T5 fixture” accounted for 56% of net energy savings, while occupancy sensors added another 7% to net savings. Among non-lighting measures, HVAC VSDs accounted for 6% of total net energy savings. The 27 largest projects (out of 450 total) provided 31% of net savings.
- With only a few exceptions, ComEd’s default savings values, both kW and kWh, are well documented, reasonable, and conservative in the savings they claim. Our recommended changes are included in the full report. When we encountered a ComEd default value in the engineering file review process or during on-site visits that we concluded should be revised, the savings for the measure were adjusted either higher or lower.
- To support the impact evaluation, the evaluation team was given direct access to ComEd’s online tracking system and data. The project documentation in the tracking system was complete and greatly facilitated the evaluation. We did not find any savings data in the tracking system that we judged to be outliers. There were some instances of missing values and inconsistencies that we have identified in the report.
- The PY1 evaluation found that verified gross impacts were significantly higher than the savings recorded in ComEd’s tracking system. As noted in the default savings review, ComEd’s default savings assumptions were generally conservative in their savings claims. Through use of data from the phone survey, engineering review and on site visits, many of the lighting measures received significant hours of use increases relative to default assumptions.
- Although the program-level realization rate is greater than 1.0, the evaluation adjustments to tracking savings for individual measures resulted in increases (59% of measures reviewed), decreases (31%), and no change (10%) to reported savings. Reasons for adjustments are discussed in the report.
- The evaluated net-to-gross ratio is substantially lower than the value of 0.80 assumed by ComEd in their plan. Scoring results for the net-to-gross ratio are interpreted in this report.
- The PY1 evaluation found evidence of likely spillover for lighting in 20% of phone survey respondents (17 of 85). Spillover for this program will be evaluated in PY2.

## Key Process Findings

### Program Participation

The Business Prescriptive Program was well received in PY1. Over 340 customers conducted more than 450 projects that accounted for 81 GWh and 13 MW of net savings. While lighting accounted for the vast

majority of projects and savings – a typical observation for a new prescriptive program – PY1 participants represented a good range of business sectors, including warehouses, light and heavy industry, offices, and retail/service.

## **Customer Satisfaction**

Customer satisfaction with various processes and components of the program was high, and few participants reported encountering problems during their participation. Participants provided the highest ratings for the Smart Ideas Program overall, the program measures offered, and the incentive amounts. Participants were less satisfied with the call center than with other program components. Some customers noted issues with reaching someone who could answer questions, receiving inconsistent information, and questions not being understood. When asked to suggest program improvements, participants most often cite higher incentives and better marketing/publicity.

## **Program Oversubscription**

In PY1, interest in the program was so high that it became oversubscribed in September 2008 and ComEd had to begin wait-listing projects. While the oversubscription was a mark of success for the program it also presented a challenge as some customers had to be waitlisted and others were not able to participate in PY1. Program staff therefore had to manage customer expectations for PY1 while at the same time maintaining customer confidence and interest in the program for future program years. Another concern with this quick oversubscription is the possibility of free-ridership. Program staff referred to “pent up demand” in ComEd’s service territory, which points to the possibility of projects being delayed until incentive money became available.

How well program staff managed the oversubscription of the program could not be fully measured in this evaluation as no primary research with non-participants or market actors was conducted. However, this is a key area of concern for the program, especially since early results from PY2 show that the program is likely to become oversubscribed again. The PY2 evaluation should focus on how the oversubscription is handled and communicated to customers, non-participant and market actor perception of the program and issues of oversubscription, and how early oversubscription can be avoided in the future.

## **Marketing and Outreach**

Necessarily, the oversubscription also meant that program implementation had to be adjusted. Specifically, some of the anticipated promotional channels (ComEd Account Managers, marketing materials) were not utilized as much as planned since there was no need for additional program promotion. The limited marketing that was conducted during PY1 was memorable and well received by program participants. The most successful efforts were promotion via contractors/trade allies and ComEd Account Managers as well as the website, and e-mail.

## **Trade Ally Network**

During PY1, trade allies were the main channel of promotion and communication for the Prescriptive program. Approximately 160 market actors joined the trade ally network during PY1. ComEd has put in place a good process for its trade ally network. Market actors have to complete an application and attend a seminar or webinar that explains the program and program processes before they can become a trade ally. In return, ComEd trade allies are listed in a searchable directory on the ComEd website and can make use of the ComEd call center and technical staff. Additional support for trade allies to help promote the program is planned for future program years.

Awareness of contractor affiliation with the program is low among customers, and many customers do not think that program affiliation is important. Despite this, the trade ally network provides an excellent opportunity to promote program opportunities as contractors often specify the details of the installed equipment, inform the customers of the ComEd program and available incentives, and discuss the program with their customers. The program is therefore well justified in emphasizing trade allies in its program delivery and should be commended for building a solid foundation for its trade ally network in PY1. Given the importance of trade allies to program delivery, this should be another emphasis for evaluation in PY2.

## 4.5 Business Custom

ComEd's three-year Energy Efficiency and Demand Response Plan, filed in November 2007 and approved in February 2008,<sup>11</sup> anticipates that the Custom program will provide 24% of the business portfolio nonresidential energy savings. Prescriptive and Custom program goals and budgets were combined prior to PY1. However, the Prescriptive program quickly over-subscribed, which led to a reduction of activity for the Custom program compared to the plan for PY1.

Table 16 shows that the PY1 evaluation found verified (ex post) gross impacts to be 21 percent lower than ex ante savings in ComEd's tracking system, as indicated by the realization rates (realization rate = ex post gross / ex ante gross). The verified net-to-gross ratio, 0.72, was lower than ComEd's planning value of 0.80.

**Table 16. Program-Level Evaluation-Adjusted Net kWh Impacts for PY1**

Segment	Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
Other	4,226,226	2,421,841	0.57	1,708,550	0.71
Lighting	4,184,620	4,184,620	NA	3,051,976	0.73
Total	8,410,846	6,606,461	0.79	4,760,526	0.72

An ex post gross impact evaluation was not completed for the Custom-Lighting segment.

Ex post gross impacts for the Custom-Lighting segment are set equal to the ex ante gross impacts for that segment of the program population.

Source: Tracking savings from ComEd online tracking system, July 7, 2009.

<sup>11</sup> Commonwealth Edison Company's 2008 – 2010 Energy Efficiency and Demand Response Plan, Docket No. 07-0540, ComEd Ex. 1.0, November 15, 2007.

**Table 17. Program-Level Evaluation-Adjusted Net kW Impacts for PY1**

Segment	Ex Ante Gross kW	Ex Post Gross kW	kW RR	Ex Post Net kW	NTGR (ex post gross)
Other	98	208	2.12	146	0.71
Lighting	241	241	NA	176	0.73
Total	339	448	1.32	323	0.72

An ex post gross impact evaluation was not completed for the Custom-Lighting segment.

Ex post gross impacts for the Custom-Lighting segment are set equal to the ex ante gross impacts for that segment of the program population.

Source: Tracking savings from ComEd online tracking system, July 7, 2009.

## Key Impact Findings

- Based on the relatively small sample sizes evaluated in PY1 it appears that ComEd is doing a good job of screening viable Custom energy efficiency projects for incorporation in the program. Some common Custom program issues were not encountered. The project documentation presented a reasonably clear description of how a given project saves energy and the energy efficiency measures included in the program all appear to have a reasonable basis for claiming energy savings. Ex ante savings estimates were reasonably technically accurate, although some equations applied were not well supported or sourced. The baseline condition selected for the impact calculations was generally reasonable. No apparent project fraud or thoroughly unreasonable impact claims were encountered.
- The program needs to do a better job of estimating peak demand savings. Not only are peak demand values not well populated in the program tracking system, but for most measures it appears that accurate estimation of peak demand is given a lower priority than energy savings, due to the fact that incentive levels are tied to energy savings and not peak demand reduction. Additional effort is needed within the program to enhance the estimation of demand savings and the tracking of those resulting impact estimates.
- Free-ridership levels measured are better than expected for a Custom program at roughly 30%. Custom-Other is doing especially well – on par with the Custom-Lighting segment of the population. Participants report the program being a strong motivating factor in their decision to upgrade to efficient equipment at the time they elected to do so. Low free-ridership was observed across all project size categories (sampling strata).
- It is recommended that selected ComEd and implementation staff review the content of the individual site M&V reports to better understand the reasons underlying the ex post realization rate results.

## Key Process Findings

### Program Participation

Participation in the Custom Program was outpaced by the Prescriptive Program in PY1. Goals and incentive budgets for the two programs were combined, and a majority of the savings goals were met by Prescriptive lighting projects. In fact, only 64 customers completed a total of 87 Custom projects.

## **Customer Satisfaction**

Customer satisfaction with various processes and components of the program was high, and few participants reported encountering problems during their participation. Some participants noted not receiving the full incentive amount as an issue, which in some cases resulted from an insufficient pre-review process by the implementer.

## **Program Oversubscription**

The Smart Ideas for Your Business program experienced unexpectedly strong demand for prescriptive measures immediately after launch in June 2008. The program became oversubscribed in September 2008 and had to begin wait-listing projects. Because the budgets and goals for the Prescriptive and Custom Programs had been combined prior to the start of PY1, the strong demand for prescriptive measures presented several challenges to the Custom Program: the Custom Program experienced a slower than expected start and fell short of its original, individual goals for PY1.

Early results from PY2 show that the program is likely to become oversubscribed again. Assuming that each individual program in the portfolio is striving to meet their program-specific goals, the PY2 evaluation should focus on how program design and/or implementation can be adjusted to avoid the negative consequences of oversubscription on the Custom Program.

## **Marketing and Outreach**

Necessarily, the oversubscription also meant that program implementation had to be adjusted. Specifically, some of the anticipated promotional channels (Account Managers, marketing materials) were not utilized as planned since there was no need for additional program promotion overall. However, it is noted that this de-emphasis on marketing, following oversubscription, will not generate a pipeline of Custom projects in the waitlist for PY2 and PY3. The limited marketing that was conducted during PY1 was recalled and well received by program participants. The most successful efforts were promotion via contractors/trade allies and account managers as well as the website, and e-mail.

## **Trade Ally Network**

While ComEd laid a strong foundation for the Prescriptive program Trade Ally Network in PY1, staff for the Custom Program noted that the right supplier/trade ally support for more complex custom projects had not yet been reached by the program. This is underscored by responses to the participant survey which show that contractors play an important role in the implementation of custom-lighting projects, but less so in the implementation of custom-other projects.

## **4.6 C&I Retro-Commissioning**

Program Year 1 represented the pilot phase for the Smart Ideas Retro-Commissioning Program. A total of four sites participated in the program and 19 measures were implemented among those sites.

Table 18 below provides the first-year evaluation-adjusted gross savings estimates for the Program. The adjustments are based on engineering review of the savings estimates. Additional evaluation activities are planned for 2009 and 2010 to improve verification of gross and net impact estimates.

**Table 18. PY1 Gross and Net Savings Estimates**

Gross and Net Parameter and Savings Estimates	PY1	Realization Rate
Evaluation-Adjusted Gross MWh Savings	1,363	90.3%
Evaluation-Adjusted Gross kW Savings	150.0	72.4%
Net-to-Gross Ratio (1-FR) ( <i>ComEd Program Assumption</i> ) <sup>12</sup>	0.80	
Evaluation-Adjusted Net MWh Savings	1,090	72.2%
Evaluation-Adjusted Net kW Savings	120.0	57.9%

Source: Analysis of program data.

## Key Impact Findings

The PY1 gross *ex ante* energy savings for this program were 1,509 MWh. The resulting adjusted gross saving realization rate is 90.3%. The reasons for a realization rate less than 100% include minor errors in engineering calculations and assumptions that affect those estimates. Among these factors are:

1. Failure to systematically include latent cooling effects, both in mechanical cooling and economizer savings estimates.
2. Inconsistent application of assumed values for motor loading, the effects of VFD efficiency and other baseline assumptions that affect measure savings.
3. Estimates of peak demand savings for some measures that only have impacts during un-occupied hours (not during system peak).
4. Failure to provide measured data for verification or substantiated “rule-of-thumb” for one implemented measure.

Summit Blue recommends that ComEd introduce policies and/or default assumptions to address these issues. Consistent application of methods and assumptions will enhance the repeatability, consistency and veracity of savings estimates as the program rolls out with third party Retro-Commissioning Service Providers (RSPs) as the primary delivery and savings estimation entities.

## 4.7 Small C&I CFL Intro Kit

The goal of this program was to give away 100,000 free CFLs to small businesses within ComEd service territory. A total of 156,883 free CFL offers were mailed and 34,720 customers responded (yielding a response rate of 22%) resulting in a total of 104,160 free CFLs being given away as part of the program.

Table 19 below provides the key gross and net savings parameter estimates (displaced watts, average daily hours of use, installation rate, peak coincidence factor, energy and demand interactive effects and net-to-gross ratio), as well as the program reported and evaluation verified gross and net energy savings

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<sup>12</sup> The value of 80% is based on the program plan presented in ComEd’s 2008-2010 *Energy Efficiency and Demand Response Plan* (November 15, 2007). Section 5.5 of the ComEd plan contains text specifying the net-to-gross ratio of 80% is drawn from the California Energy Efficiency Policy Manual, version 2 (2003). The Net Savings adjustment is supported by participant interviews discussed in section 3.1.5.

estimates. Although the free CFLs were intended for small business customers, approximately one-third of the program bulbs ended up in residential locations which typically turn on their lights for fewer hours per day. Since the telephone surveys were with the small businesses that were the intended target of the program, none of the survey data were applicable to these inadvertent residential participants. Therefore, we applied data from California's 2005 Residential DEER Database to estimate energy savings for these program bulbs. Specifically, we used the DEER residential hours of use estimate (2.34 hours per day) and the DEER residential peak load coincidence factor (0.081). DEER does not currently have estimates of interactive effects for residential installations and thus these were set equal to 1.

**Table 19. PY1 Gross and Net Parameter and Savings Estimates**

Gross and Net Parameter and Savings Estimates	Program Reported	Evaluation Verified	
	Small Business	Small Business	Residential
CFLs Distributed through the Program	104,160	73,593	30,567
Average Displaced Watts (Delta Watts)	62.9 watts	48.3 watts	
Average Daily Hours of Use <sup>1</sup>	10.4	10.0	2.34
Gross kWh Impact per unit	239 kWh	176 kWh	41 kWh
Gross kW Impact per unit	0.06 kW	0.05 kW	
Installation Rate	90%	32%	
Energy Interactive Effects	1.12	1.12	1.00
Demand Interactive Effects	1.21	1.19	1.00
Peak Load Coincidence Factor	0.84	0.86	0.081
<b>Total First-Year Gross MWh Savings</b>	<b>25,064 MWh</b>	<b>5,025 MWh</b>	
<b>Total First-Year Gross MW Savings</b>	<b>7.1 MW</b>	<b>1.8 MW</b>	
<b>Total First-Year Gross Peak MW Savings</b>	<b>6.0 MW</b>	<b>1.2 MW</b>	
Net-to-Gross Ratio (1-FR)	80%	56%	
<b>Total First-Year Net MWh Savings</b>	<b>20,051 MWh</b>	<b>2,815 MWh</b>	
<b>Total First-Year Net MW Savings</b>	<b>5.7 MW</b>	<b>1.0 MW</b>	
<b>Total First-Year Net Peak MW Savings</b>	<b>4.8 MW</b>	<b>0.7 MW</b>	

<sup>1</sup>Small Business and Residential daily HOU estimates are taken from DEER.

The PY1 reported net energy savings for this program were 20,051 MWh, compared to an evaluation verified net savings of 2,815 MWh. We identified three primary drivers for this substantial reduction in estimated savings. They include:

1. The *Installation Rate* was found to be 32%; 58% lower than program plans (90%). The majority of these uninstalled bulbs are reportedly in storage and will be installed when a bulb burns out. The energy savings from these stored bulbs was not counted as PY1 savings, but savings resulting from these future installations will be estimated in the PY2 evaluation.

2. The Hours of Use (HOU) estimate for the CFLs installed in business locations is similar to that used in program planning<sup>13</sup>. However the HOU estimate for Residential locations, where one-third of program bulbs ended up, is significantly lower; just 25% of the business HOU.
3. The self-reported Net-to-Gross ratio was found to be 56%, which is 70% of the estimate that was used for program planning (80%).

### **Key Process Findings**

- Customer satisfaction with the free CFL component of the program was high, with 86% of participants reporting being very satisfied.
- Customers who participated in the free CFL component of this program were typically aware of CFLs *before* receiving the direct mail offer from ComEd (73% of participants). Nearly half of program participants had previously purchased CFLs for their facilities.
- Almost all program participants who had installed at least one of the three free CFLs are “very likely” (64%) or “somewhat likely” (22%) to purchase CFLs for their business in the future.
- Recall of the mini catalog among participants in the free CFL offer was high (46%), showing that including the catalog with the free product is an effective strategy for reaching customers. However, only half of the customers who recalled the catalog had looked through it at the time of the survey and none of the customers we interviewed had made a purchase from the catalog.
- A majority of customers (62%) who recalled the catalog reported that they would or might purchase something in the future, with the most likely item being additional CFLs.
- Only about one-third of surveyed customers are aware that ComEd has a program that offers rebates for the installation of energy efficient equipment to its business customers.

## **4.8 Central Air Conditioning Cycling**

ComEd has a target of recruiting an additional 22,682 participants over three years for the Central Air Conditioning Cycling program as part of the Energy Efficiency and Demand Response Plan. Their plan calls for 8,092 new customers in Program Year 1 (PY1), 7,695 in Program Year 2 (PY2) and 6896 in Program Year 3 (PY3). Adding 8,092 new customers in PY1 is expected to create 11.7 MW of demand savings. Since this is a demand response program, there are no associated energy savings goals. The demand reduction achieved from these additional participants is expected to meet the statutory Demand Response goal, which is to reduce peak demand by 0.1% over the prior year for eligible customers.

### **Verification and Due Diligence**

Verification of participation in this program is overseen by the program implementer, GoodCents Solutions. They are responsible for reporting on load control switches that have been installed and removed as part of the program. All indications are that the GoodCents Solutions records of installations and removals are accurate and in good order.

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<sup>13</sup> Program plans and energy savings goals for both the residential and small business lighting programs used HOU estimates from DEER. The final small business HOU estimate used in this evaluation was also based on DEER but was bulb-weighted to reflect the distribution of businesses participating in the program.

## Tracking System Review

We did not find any serious issues in the tracking system data for this program. In fact, we found the data to be consistent, clean and in good order. This is not surprising since the data is used for paying annual incentives, and there are financial consequences for poor program tracking.

## Comparison of Existing and New Customers

Upon examining the data for existing and new participants in the Central Air Conditioning Cycling program, there appears to be no significant difference between the two groups that would indicate a need to adjust the gross savings estimates for new participants. Characteristics that were examined for similarities were geographic location, energy use, presence of multiple central AC units in the home, and selection of cycling level.

The most significant factor affecting the impact from direct load control is the cycling level chosen by the participant. Participants who choose 100% cycling (load shed) will contribute twice as much demand reduction as participants who choose 50% cycling. If new participants have different preferences than existing participants regarding this choice, the average impact for the new group could be very different. The data shows significant consistency in this choice between new and existing participants. Sixty percent of existing customers are on the 100% cycling option, and 61% of new customers selected the same option.

## Verified Gross and Net Savings

Table 20 compares ComEd's gross and net ex ante savings estimates for the program to the final program ex post verified savings.

**Table 20. Summary of Verified Gross and Net Savings**

Central Air Conditioning Cycling Program PY1	MWh Savings		MW Savings		Participation	
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Gross Savings	-	-	14.2	14.4	9,810	9,810
Net-to-Gross Ratio	-	-	1	1	-	-
Net Savings	-	-	14.2	14.4	9,810	9,810

The difference in impacts comes from the fact that the 100% cycling option was chosen by 61.1% of new customers, compared to the original estimate of 59.1%. This small difference in shares contributed to a small increase in the average impact per customer. The ex post weighted average impact per customer turned out to be 1.464 kW instead of 1.446, as shown in the equations below. This contributed to an overall achievement of 14.4 MW of load reduction from new participants.

$$(0.909 \times 40.9\%) + (1.818 \times 59.1\%) = 1.446 \text{ kW per participant}$$

$$(0.909 \times 38.9\%) + (1.818 \times 61.1\%) = 1.464 \text{ kW per participant}$$

There is no traditional free ridership or spillover for this demand response program. Consequently, the Net-to-Gross ratio for this program is one. The net savings equal the gross savings.

## **Process Evaluation**

The three year evaluation plan for this program prescribes an impact evaluation each year and a process evaluation for Program Year 2 (PY2). The original plan was to conduct a participant survey after the summer of 2009 as part of the Year 2 process evaluation; part of the survey would explore issues around how customers recognized and responded to control events that were called.

June, July and August of 2009 proved to be very cool for the Chicago area, and there was only one control event called for system-wide load reductions. Given that there had been very few high temperature days during the summer, it is likely that customers would not have been attuned to a single load control event at these temperatures.

Rather than getting atypical responses to some very important customer perception questions, it was decided to delay the participant survey to the summer of 2010. If temperatures are higher next summer, the surveys will provide more relevant data. Another advantage of waiting one summer is that the survey can be prepared in advance and implemented within days after the occurrence of control events. This will aid with customer recall and improve the accuracy of the survey results.

# 5 APPENDICES

The program-specific reports will be attached as separate appendices.

A. Residential Energy Star Lighting

B. Appliance Recycling

C. All-Electric Efficiency Upgrade

D. Business Prescriptive

E. Business Custom

F. C&I Retro-Commissioning

G. Small C&I CFL Intro Kit

H. Central Air Conditioning Cycling