ComEd Energy Efficiency Potential Study Report, 2013–2018

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Executive Summary

This report summarizes the ComEd energy efficiency potential analysis performed by ICF International and Opinion Dynamics Corporation. The analysis covers the 2013 through 2018 timeframe and the residential, commercial, and industrial sectors. The study was commissioned by ComEd to comply with Illinois law, and to provide information useful for ComEd's program planning. A bottom-up approach was used to estimate economic, program achievable and maximum achievable potential. Total estimated cumulative economic potential equals 32% of load, or 30 TWh, in 2018; total annual program achievable potential equals approximately 1.0% of load per year, and; total annual maximum achievable estimates equal 1.3% of load in 2013, and 2.4% of load in 2018.

Total annual program costs in the program achievable scenario are estimated to equal $125 Million in 2013 and grow to $157 Million in 2018. In the maximum achievable scenario, total program costs equal $265 Million in 2013 and grow to $527 Million in 2018. Over the six-year timeframe of the study, net Total Resource Cost ("TRC") benefits are estimated to equal $0.8 Billion in the program achievable scenario and $2.4 Billion in the maximum achievable scenario. Both the program and maximum achievable scenarios have TRC benefit-cost ratios of 2.2.

Study Objectives and Scope

ComEd's objectives for this study were to comply with the provision of the Illinois Public Utility Act requiring a potential study, and to gain insights for their program planning about additional energy efficiency savings that could be achieved in a maximum achievable potential scenario.

Estimates developed for this study cover the 2013 through 2018 time horizon (six years) and the residential, commercial, and industrial sectors in ComEd's service territory.

Types of Potential Estimated

Three levels of energy efficiency potential were estimated: economic potential, maximum achievable potential, and program achievable potential. Definitions for each level of potential are below.

- **Economic Potential** is the amount of savings that would result from replacing all existing equipment that uses electricity with the most technically-efficient, cost-effective commercially available equipment.
- **Maximum Achievable Potential** is the amount of cost-effective program potential that could be achieved absent program budget constraints. Incentives are set to 100% of incremental costs in this scenario.
- **Program Achievable Potential** is the amount of cost-effective program potential that could be achieved assuming ComEd is operating under its current budget cap (approximately 2% of annual customers' total electric costs). Incentives in this scenario are consistent with existing program budgets, and are generally between 25% and 75% of incremental costs.

It is important to note that economic potential is a theoretical construct. Economic potential estimates do not account for customer or other market barriers to energy efficiency, and do not reflect budget constraints. In addition, economic potential does not inform measure or program market adoption rates. For these reasons, economic potential estimates are informative at a high level, but provide limited value to program planners concerning achievable levels of measure-specific potential. Given these limitations, this study focuses on the achievable potential estimates, restricting discussion on the economic estimates to describing the upper limit of cost-effective potential.

Approach Summary

ICF used a bottom-up approach to estimate energy efficiency potential. "Bottom-up," in the context of potential studies, refers to an approach that begins with characterizing the eligible stock, screening measures for cost-effectiveness, estimating savings first at the measure-level, then summing savings at the end-use, sector, and overall service territory levels. Top-down approaches usually develop sector level estimates, which are disaggregated to end-use or measure estimates.

Stakeholder Process

Stakeholders were engaged throughout the conduct of ComEd's potential study analysis. They were provided with draft documents for review and their feedback was considered and incorporated into the analysis. Draft results were also presented by ICF and Opinion Dynamics in person to the Illinois Stakeholder Advisory Group ("SAG") in mid-June, 2013, where additional feedback was provided. Some of this feedback was incorporated into the final analysis presented in this report.

Uncertainty

Energy efficiency potential studies are forecasts, and all forecasts have forecast error, or uncertainty. This study includes thousands of assumptions, including baseline data, measure parameters, avoided costs, program assumptions, and other inputs. While it is impossible to eliminate uncertainty, it can be mitigated through certain analytical strategies. The most basic strategy is to use the best information available at the time of the analysis. This study made extensive use of primary and secondary data specific to ComEd's service territory. Where ComEd-specific data was unavailable ICF used the most accurate proxy data available. Another basic strategy is to use a bottom-up approach.

Finally, it is also important to include multiple perspectives when developing and reviewing potential estimates. This helps minimize confirmation bias (the estimates seeming accurate because they reflect one's previous experience). Estimates developed in this study included several viewpoints, including those of ICF program planners and managers, ComEd program planners and managers, and ComEd implementation contractors and evaluators. In addition, benchmarking data gathered on program performance in other jurisdictions was used to help gauge the reasonableness of the estimates.

Energy Efficiency Potential

Figure ES-1 shows the total energy efficiency potential forecasts and total annual program costs.

ICF estimates that, with the current budget cap, ComEd can achieve annual savings equal to 1.0% of load per year. Without a budget cap (in the maximum achievable scenario) annual savings estimates are 150% higher in 2013 and 250% higher than program achievable savings in 2018. These additional cost-effective savings would cost an additional $1.3 Billion and result in an additional $1.6 Billion in net TRC benefits over the six years.

On a cumulative basis, achievable savings equal 5% of load in 2018 in the program scenario, and 10% of load in the maximum scenario.

Figure ES-1. Total Achievable Potential, by Scenario and Year

	2013	2014	2015	2016	2017	2018
Cumulative Savings Forecast—GWh						
Economic potential	7,610	28,162	28,679	29,161	29,634	30,009
Maximum achievable potential	1,122	2,453	3,767	5,430	7,104	8,693
Program achievable potential	824	1,649	2,294	3,043	3,778	4,387
Cumulative Savings Forecast— % of load						
Maximum achievable potential	1%	3%	4%	6%	8%	10%
Program achievable potential	1%	2%	3%	3%	4%	5%
Incremental Savings Forecast—GWh						
Maximum achievable potential	1,122	1,438	1,602	1,865	1,956	2,111
Program achievable potential	766	868	827	846	828	846
Incremental Savings Forecast— % of load						
Maximum achievable potential	1.3%	1.6%	1.7%	2.1%	2.1%	2.4%
Program achievable potential	0.9%	1.0%	0.9%	1.0%	0.9%	1.0%
Program Costs (Millions, Real 2013$)						
Maximum achievable potential	$265	$349	$426	$487	$488	$527
Program achievable potential	$125	$137	$139	$146	$152	$157

The above estimates include program estimates for both ComEd and Department of Commerce and Economic Opportunity ("DCEO") programs. Although DCEO conducted its own potential study, ICF developed independent estimates for DCEO programs funded by ComEd for the purposes of this study. While important, DCEO programs are not a focus of this report.

Savings and cost estimates by rate class are shown in Figure ES-2, below.

Figure ES-2. Cumulative Achievable Potential and Total Program Costs, by Rate Class

	Residential Ratepayers	C&I Ratepayers	
		<1 MW Demand	>=1MW Demand
Cumulative Net GWh Savings (2018)			
Maximum Achievable	2,219	3,733	2,741
Program Achievable	1,372	1,697	1,318
Total program Costs, $Millions (2013-2018)			
Maximum Achievable	$125	$1,682	$804
Program Achievable	$45	$332	$257

Organization of the Report

The body of this report begins with a detailed discussion on the potential study approach. Next, there are sections devoted to total energy efficiency potential, and to potential within each sector covered in this study (residential, commercial, industrial). The conclusion summarizes this study's findings.

The appendices include information on measure and program assumptions, and more detailed distributions of the forecasts.

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1 Analysis Approach

1.1 Overview of Approach

ICF used a bottom-up approach to estimate energy efficiency potential. The approach is illustrated in Figure 1. "Bottom-up," in the context of potential studies, refers to an approach that begins with characterizing the eligible stock, screening measures for cost-effectiveness, estimating savings first at the measure-level, then summing savings at the end-use, sector and overall service territory levels.

This study involved extensive collection of primary and secondary baseline, measure and program data. Primary data included the 2012 ComEd baseline study, ComEd tracking data and evaluation reports, and customer and trade ally survey data. Utility data, such as customer counts, avoided costs and load forecasts were acquired from ComEd. Secondary data included information from ICF baseline, measure and program databases, and program performance research for benchmarking.

Estimating the eligible stock of efficiency options was the first step of the analysis. The eligible stock is the size of the market for efficiency measures, in measure units, such as bulbs, tons of cooling, or homes. ICF estimated the eligible stock for each measure within each end-use and sector. The 2012 ComEd baseline study, conducted by Opinion Dynamics Corporation, was the primary source of information for this stage in the analysis.

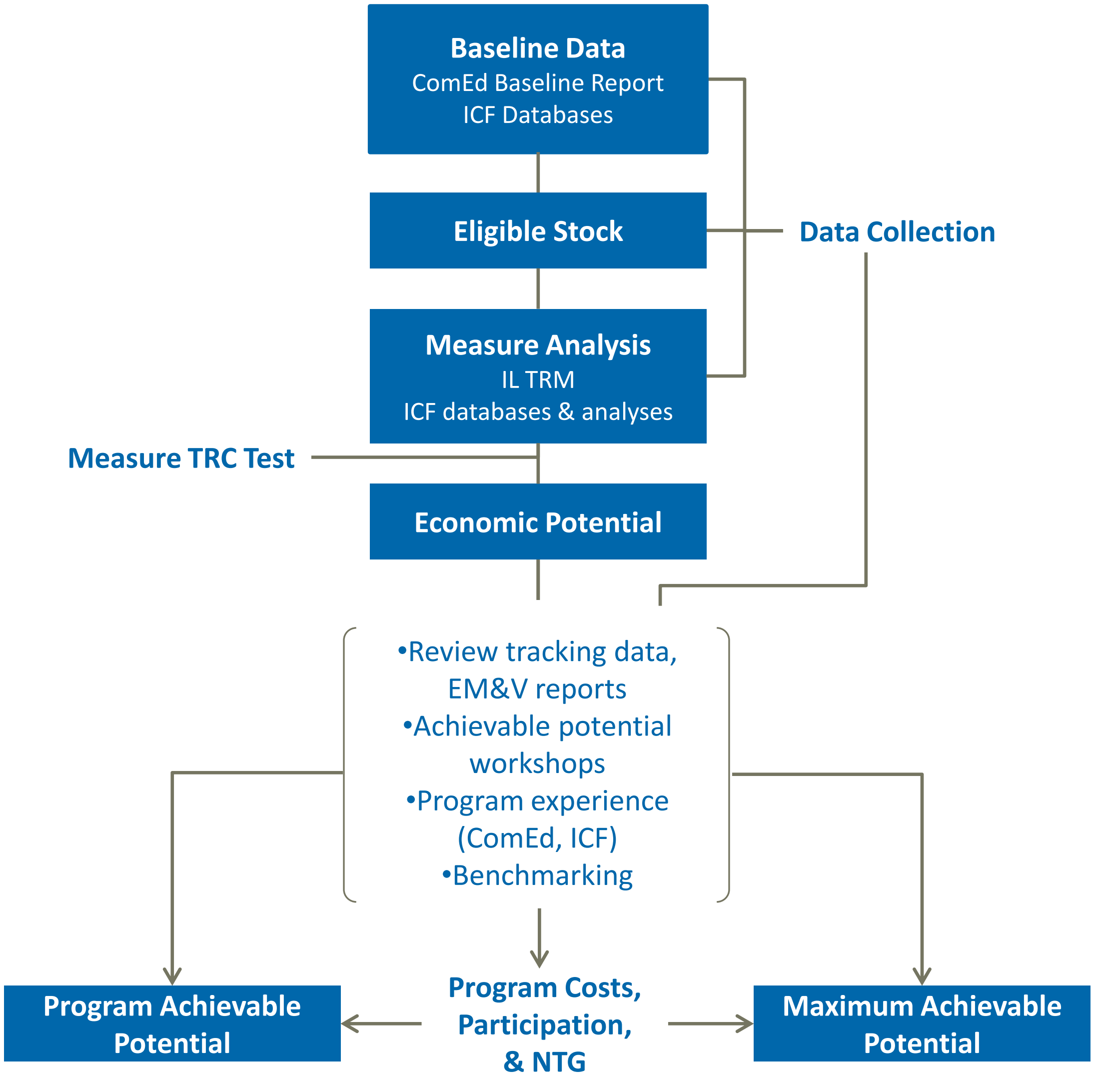
Next, ICF developed a comprehensive measure database. The database includes all the measures in the Illinois Technical Reference Manual ("TRM") plus additional measures included based on a gap analysis. The final database includes commercially available measures covering each relevant savings opportunity within each end-use and sector. The database includes prescriptive or "deemed" type measures, whole building options (such as commercial custom projects), and behavioral measures (such as residential Home Energy Report).

ICF then used DSMore to estimate measure cost-effectiveness. Measures with an Illinois Total Resource Cost Test ("TRC") result of 1.0 or greater were included in the economic potential analysis.

With the eligible stock and measures defined, ICF then calculated economic potential. Economic potential is theoretical maximum level of cost-effective savings. It is the estimated savings that would result from replacing the entire eligible stock with the most technically-efficient cost-effective measures.

Finally, ICF performed the achievable potential analysis. Program achievable potential is the level of cost-effective savings achievable under ComEd's total program budget cap. Maximum achievable potential is the level of cost-effective savings absent the budget cap. ICF's approach to estimating achievable potential involved extensive review of primary and secondary measure and program data, the conduct of achievable potential workshops, and program performance benchmarking.

Figure 1. Potential Study Approach



In the sub-sections below, we discuss each step in the analysis in further detail.

1.2 Data Collection

The sources of information used in the analysis are shown in Figure 2. Every effort was made to use information that was as current as possible, to use primary data, and to use assumptions specific to ComEd's service territory. For example:

- Opinion Dynamics provided ICF with data from the 2012 baseline surveys and building audits.
- Current program tracking databases were provided to ICF by ComEd.
- ComEd also provided the most recent draft program evaluation reports as soon as they were available.

- ICF used the most recently available program reports from other jurisdictions in conducting benchmarking research.
- The Illinois TRM was the primary source of measure assumptions.

Figure 2. Data Used in Analysis

Data/Information Type	Source	Type of Data	Primary Purpose in Analysis
Utility Information			
Avoided costs	ComEd	Forecast	Cost-effectiveness testing
Customer counts	ComEd	Actual	Calculating eligible stock
Load forecast	ComEd	Forecast	Calculating load impacts of EE potential
Retail rates	ComEd	Actual	Achievable potential analysis
Baseline Data			
ComEd Baseline Report	Opinion Dynamics Corporation	Primary	Calculating eligible stock
ICF baseline databases	ICF International	Secondary	Calculating eligible stock
Measure Assumptions			
Illinois TRM	IL Stakeholder Advisory Group	Measure parameters	Measure database development
ICF measure databases	ICF International	Measure parameters	Measure database development
Program Information			
Program tracking data	ComEd	Actual	Estimating achievable potential
Program evaluation reports	ComEd, DCEO	Primary	Estimating achievable potential
Program expenditures	ComEd	Actual	Estimating achievable potential
PY4-PY6 Program Plan	ComEd	Plan	Estimating achievable potential
ICF program data	ICF International	Secondary	Estimating achievable potential
Program benchmarking data	Program reports	Secondary	Estimating achievable potential
ComEd customer survey data	Opinion Dynamics, ICF	Primary	Estimating achievable potential
Trade ally survey data	Opinion Dynamics, ICF	Primary	Estimating achievable potential

1.3 Eligible Stock

Estimating the eligible stock of efficiency options was the first step of the analysis. The eligible stock is the size of the market for efficiency measures, in measure units, such as bulbs, tons of cooling, or homes. ICF estimated the eligible stock for each measure within each end-use and sector. The ComEd baseline study was the primary source of information for this stage in the analysis. Key data from the baseline study included items such as:

- The percent of homes with a particular type of equipment (e.g., light bulbs, central air conditioner, refrigerator),
- Equipment counts (e.g., number of bulbs per home, tons of cooling per home, refrigerators per home),
- Equipment efficiency level (e.g., bulb type, SEER rating, ENERGY STAR Rating), and
- Equipment age.

A simple example of an eligible stock calculation for residential specialty bulbs is shown below. This example shows there are 15 million incandescent specialty screw-in bulbs installed in homes in ComEd's service territory (row g). This is equivalent to 70% of all specialty light bulbs installed (row f), and equals the total eligible stock for this particular opportunity. That is, 70% percent of the existing stock of residential specialty screw-in bulbs could be replaced with more efficient units (e.g., a specialty CFL or LED).

Since this is a "replace-on-burnout" measure, the eligible stock must account for stock turnover (row h). Stock turnover is the rate at which existing equipment expires and requires replacement. It is the inverse of equipment age, or one divided by the equipment's effective useful life (EUL).[1] After the application of the stock turnover rate the total number of specialty bulbs eligible to be replaced in 2013 equals 13.7 million (row i).[2]

Figure 3. Example Eligible Stock Calculation

	Variable	Value	Source/Calc.
	Efficient unit	15 Watt Specialty CFL	
	Baseline unit	60W Incandescent Specialty Lamp	
a	Baseline unit effective useful life	1.1 years	IL TRM
b	# Residential Customers	3,456,945	ComEd
c	# Bulbs per Home	57	ComEd Baseline Study
d	% Applicability (% of bulbs that are specialty applications)	11%	ComEd Baseline Study
e	Efficient unit saturation	30%	ComEd Baseline Study
f	Not yet adopted rate	70%	1-e
g	Total eligible stock in 2013	15,092,676	b*c*d*f
h	Annual replacement eligibility (stock turnover rate)	91%	1/a
i	Total # bulbs eligible to be replaced in 2013	13,720,615	b*c*d*f*h

For many measures, this information is broken down further in ICF's energy efficiency potential model. For example, the eligible stock for residential central air conditioners is further broken down by:

- Efficiency rating (SEER level),
- Home heating type (electric or gas), and
- Decision type (replace-on-burnout, retrofit, new construction).

In summary, calculating the eligible stock is the foundation of the study. It tells us how big the total market is for each efficiency opportunity in each year. What it does not tell us is the magnitude of the savings or costs associated with each opportunity. These are accounted for in estimates of economic and achievable potential.

1 For retrofit measures, annual replacement eligibility equals 100%.

2 ICF's potential model updates the eligible stock in every year of the analysis to account for measures installed in previous years.

1.4 Measure Analysis

1.4.1 Summary

ICF developed a comprehensive measure database for this study. The database includes all the measures in the Illinois Technical Reference Manual ("TRM") plus additional measures included based on a gap analysis. The final database includes commercially available measures covering each relevant savings opportunity within each end-use and sector. The database includes prescriptive or "deemed" type measures, whole building options (such as commercial custom projects), and behavioral measures (such as residential Home Energy Report).[3] Each measure has the characteristics shown in Figure 4.

Figure 4. Measure Characteristics

Measure Characteristic	Value*
1. Applicable sector	Residential
2. Applicable subsector	Single Family
3. Building type	Gas-heated
4. End-use	Lighting
5. Measure name	LED Downlight
6. Measure definition	14 LED Reflector Lamp
7. Baseline definition	35W Incandescent/Halogen MR16/ PAR16 pin-based lamps
8. Measure unit	Lamp
9. Measure delivery type	Time-of-Sale (Replace-on-burnout)
10. Incremental cost	$25.00
11. Baseline unit effective useful life	2 years
12. Efficient unit effective useful life	10 years
13. Incremental (annual) kWh savings	21 kWh
14. Incremental kW savings	0.0021 kW
15. Gas savings	-0.48 therms[4]

**Example shown is for LED downlights, also known as reflector lamps.*

1.4.2 Number of Measures Evaluated

In total, ICF analyzed 192 measure types. An example of a measure type is a residential central air conditioner ("CAC"). Many measures required permutations for different applications, such as different building types, lamp wattages, efficiency levels and decision types. For example, there are permutations of CACs by SEER level, subsector, and building type. As shown in Figure 5, ICF developed a total of 3,799 measure permutations for this study.

[3] Retrocommissioning includes some behavior-based measures for the commercial sector, and System measures include behavior-based options for the industrial sector.

[4] For a gas heated home, installing an LED results in an increase in annual gas usage because LEDs produce less waste heat.

ICF tested all measures for cost-effectiveness using DSMore, the Integral Analytics software tool used by Illinois utilities for this purpose. Of the 3,799 measures analyzed, about half, or 1,926 measures had a measure TRC benefit-cost ratio of 1.0 or higher.[5] This is shown in Figure 5. Of this cost-effective subset of measures, ICF used 1,452 in calculating economic potential. The number of measures used is less than were cost-effectiveness because of the definition of economic potential: only the most technically-efficient cost-effective measures were applied. For example, if a florescent lamp and a LED lamp were both applicable to a particular lighting opportunity (and both were cost-effective), the LED was applied, since it has a high lumen per watt rating that the florescent option.

Figure 5. Number of Measures Evaluated and Included

Sector	# Measure Types Evaluated	Total # Measures Evaluated (All Measure Permutations)	# with TRC≥1	Total # Included in Economic Potential	Total # Included in Achievable Potential
Residential	52	1,147	266	266	556
Commercial	69	1,392	818	344	868
Industrial	70	1,204	842	842	842
Total	**191**	**3,743**	**1,926**	**1,452**	**2,266**

Figure 5 also shows that ICF used 2,266 measures in the achievable potential analysis. This is more than the number of cost-effective measures. Including non-cost-effective measures was a decision process that occurred on a case-by-case basis. Most of the non-cost-effective measures included are LED lamps and residential CACs. Some LED lamps were not cost-effective based upon current costs. However, there is ample evidence that LEDs costs will decline rapidly.[6] For this reason ICF included all LED measures in the achievable potential analysis.

Like LEDs, residential CACs were considered a special case in the measure cost-effectiveness analysis. Efficient residential CACs (units with a SEER rating of 14.5 or higher) are not cost-effective as standalone measures. However, they can be cost-effective when paired with an efficient gas furnace in a complete system replacement ("CSR"). This is the basis of ComEd's Residential CSR program, which ComEd delivers jointly with the gas utilities. For the purposes of the achievable potential analysis, ICF included residential CAC measures under the assumption that they would only be installed as part of a CSR package.

There were also a small number of cases where ICF included non-cost-effective permutations of a measure when the majority of similar permutations were cost-effective. For example, if a measure was cost-effective for a majority of, but not all building types, ICF included the measure for all building types

5 Measure TRC benefits are avoided costs. Measure TRC costs are incremental costs. The measure TRC test does not include program costs.

6 U.S. Department of Energy. *Product Snapshot: LED Replacement Lamps.* Prepared by D&R International. July 2012.
U.S. Department of Energy. *Solid-State Lighting Research & Development: Multi-Year Program Plan.* Prepared by Bardsley Consulting et al. April 2012.

in the achievable potential analysis. This is because it can be impractical in implementation to exclude participation in specific building types.

ICF also applied the converse principal in screening measures in a small number of cases. If a measure was cost-effective for a minority of, but not all measure permutations, ICF excluded all permutations of the measure in the achievable potential analysis, since it can be impractical in implementation to limit participation to certain building types.

1.4.3 Treatment of Codes and Standards

ICF accounted for adopted codes and standards in this study. Key baseline changes are discussed below:

- Residential general service lighting baselines reflect the minimum efficiency standards and schedule set forth in the Energy Independence and Security Act of 2007 ("EISA 2007") and by the U.S. Department of Energy ("DOE").[7] EISA 2007 results in a 30% increase in baseline efficiency for general service lighting. This is important because standard CFLs account for the largest portion of ComEd's historical residential savings.
- New construction and retrofit measure baselines reflect prevailing state building codes (International Energy Conservation Code, or "IECC 2012"). IECC 2012 requires a 15% improvement in baseline efficiency over IECC 2009. This is important because it impacts the cost-effectiveness of retrofit and new construction programs, such as Single Family Home Performance, and Commercial New Construction.
- U.S. DOE rules pertaining to commercial lamps and ballasts are reflected in baselines for linear florescent lighting.[8] These rules result in a 20% improvement in baseline efficiency for linear florescent lamps.[9] This is important because linear florescent retrofits (e.g., replacing T12s with T8s or T5s) account for the largest portion of ComEd's historical commercial lighting savings.

1.5 Economic Potential Approach

Economic potential is the amount of electric energy savings that would result if the entire eligible stock in ComEd's service territory were replaced with the most technically-efficient, cost-effective energy efficiency measures.

Calculating economic potential required four steps:

1. Estimating the eligible stock,
2. Defining and testing measures for cost-effectiveness,
3. Estimating savings in 2013, and
4. Estimating savings in 2014 through 2018.

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7 ICF followed the IL TRM specifications for these measures, which reflect EISA 2007.

8 Consistent with the U.S. Energy Policy Act of 2005.

9 The rules specify a switch from magnetic ballast baseline to an electronic ballast baseline.

The approaches to estimating the eligible stock and defining and testing measures are discussed above. Steps three and four are discussed below.

Economic potential is calculated once the eligible stock and cost-effective measures are established. The remaining steps included:

- Applying all available opportunities to the eligible stock in 2013. In theory, this means replacing all electricity-using equipment at once with the most technically-efficiency cost-effective options *except* in cases where existing equipment is equally or more efficient than such options. Retrofit, replace-on-burnout and new construction measures were applied in 2013. Savings associated with these applications in2013 is the "instantaneous" economic potential.
- For every subsequent year of the analysis (2014 through 2018) all available replace-on-burnout and new construction measures were applied to the eligible stock. Replace-on-burnout measures were applied where there is stock turnover. New construction measures were applied to new buildings.[10]

1.6 Achievable Potential Approach

Achievable potential is the amount of savings that could be realistically achieved by utility programs. ICF estimated two levels of achievable potential in this study: program and maximum. Program achievable potential is the amount of savings that could be realistically achieved by ComEd if program spending is subject to current legislative restrictions (2% of customers' total electric costs per year). Maximum achievable potential is the estimated amount of savings that could be attained if there were no program spending limits. Cost-effectiveness is still a constraint in the maximum achievable scenario.

ICF developed achievable potential estimates on a measure-by-measure basis through a combination of extensive research, expert input, and program performance benchmarking. Measure-level estimates were summed to the program or end-use level, then to the sector and service-territory levels for analysis and reporting.

The ICF approach to estimating achievable potential involved eight steps:

1. Program data review,
2. Achievable potential workshops,
3. ICF program manager review,
4. ComEd implementation contractor review,
5. Program performance benchmarking,

   and, for the maximum achievable scenario,

6. Additional review of the eligible stock,
7. Comparative incentive analysis, and
8. Additional benchmarking analysis.

[10] A retrofit measure can only be applied in year one of the analysis since the baseline changes to the efficient unit once it is installed.

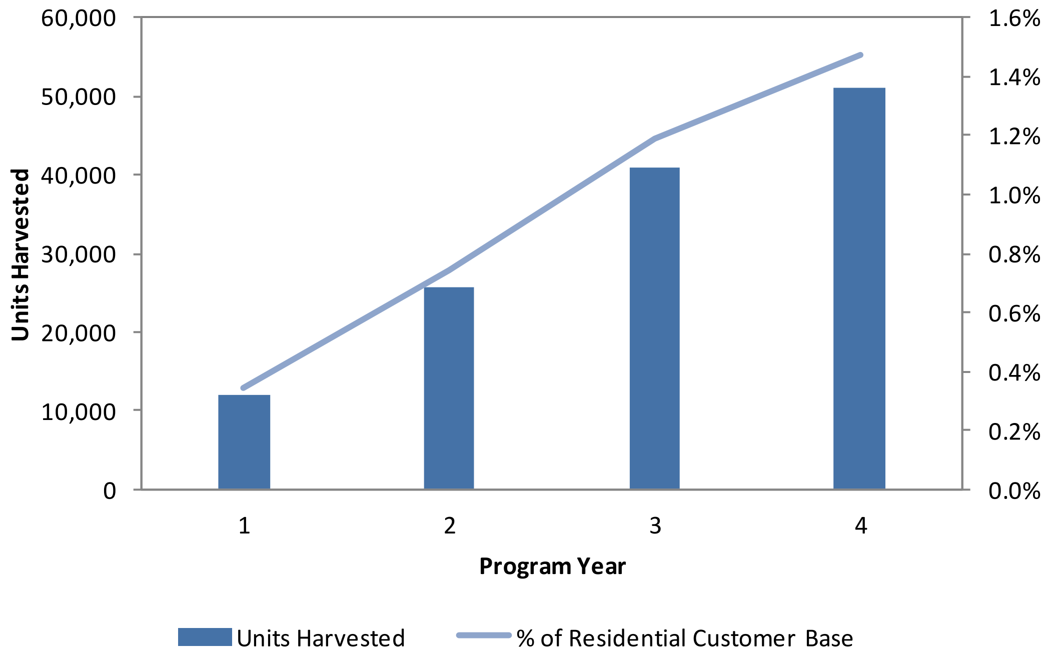
Each step is discussed in more detail below.

1.6.1 Program Data Review

ICF conducted an in depth review of all available information pertaining to ComEd's current energy efficiency programs. This information included program tracking data, evaluation reports, the PY4-PY6 program plan, and other information. The purpose of this step was to understand historical program delivery and performance, and to prepare for the achievable potential workshops.

For example, reviewing evaluation reports for the Appliance Recycling program provided insight into historical participation, savings and net-to-gross levels. Figure 6 shows total historical program participation and participation impacts as a percentage of the residential customer base.

Figure 6. Historical Appliance Recycling Program Participation



Sources: ComEd evaluation reports and customer data.

Program Costs

Historical program expenditures were provided by ComEd to ICF. These were used to help guide program costs for the forecast. For existing programs, ICF's cost forecasts were reviewed by ComEd program managers. For measures or programs not offered historically by ComEd, ICF developed program cost estimates based on ICF's program implementation experience.

Net-to-Gross Ratios

ICF used the most currently available ComEd evaluation reports and ComEd planning values as net-to-gross assumptions for this forecast. These values are static for the time horizon of the study. Net-to-gross assumptions are shown in the Appendix.

1.6.2 Achievable Potential Workshops

ICF conducted achievable potential workshops with ComEd. The purpose of the workshops was to develop participation estimates for representative measure types. The workshops involved in-depth discussion and analyses of key measures representing each end-use, program, or sector. ComEd and ICF program managers and planners attended each workshop. ComEd program evaluators attended some workshops.

Workshop content varied depending on whether the measure or program was offered historically by ComEd, but the general structure of each workshop was as follows:

1. **Introduction and purpose**.
2. **List of measure-types for discussion in workshop.** Since it is impractical to review all cost-effective measures during workshops, representative measures were selected by ICF for discussion. A measure was considered "representative" if the market's response to the measure could be generalized to similar measures. For example, 14 watt CFLs were selected as the representative "standard CFL" measure for discussion in the residential lighting workshop.

Then, for each representative measure the following was discussed:

3. **Measure parameters.** Savings, costs, lifetime, etc.
4. **Measure cost-effectiveness***.* Measure TRC results from DSMore were discussed.
5. **Level setting (if historical measure).** Review of historical program participation savings and costs.[11]
6. **Market barriers**. Market barriers to participation were identified and discussed.
7. **Solutions.** Where possible, solutions to overcome each market barrier were identified and discussed.
8. **Achievable participation** was then estimated based on the workshop attendees' understanding of the measure, historical participation, and market barriers and solutions. Program and maximum achievable participation was estimated for 2013 and 2018. Then, various market penetration curves were presented by ICF.[12] These curves were discussed and the workshop attendees' selected a curve they believed would most likely represent the trajectory of the measure.

In total, ICF conducted 10 workshops in the course of the achievable potential analysis.

Note that in order to estimate measure-level participation, a measure first has to be part of a program, since the program is the vehicle through which savings are delivered. Each program represents a specific set of strategies and tactics designed to overcome barriers to energy efficiency. Each measure analyzed

[11] In some cases it was difficult to interpret program tracking data. ComEd program managers helped clarify historical program participation and costs.

[12] Examples of market penetration curves include: linear, exponential, "S-curves," and growth-and-decline (where participation peaks then declines due to the size of the eligible stock or other factors). Custom curves can also be developed in ICF's potential model to account for factors such as baseline changes.

was assigned to a specific program type. Most of these program types are consistent with ComEd's current program designs, or what ICF or ComEd thought would be the next generation of a program. These programs are described in the sector-level energy efficiency potential sections of this report.

1.6.3 ICF Program Manager Review

ICF program implementation managers also provided input to the achievable potential analysis. ICF managers reviewed information on ComEd measure and program market size, existing program performance, and program design in light of ICF program information in other jurisdictions to inform the analysis.

1.6.4 ComEd Implementation Contractor Review

ComEd's prime commercial program implementation contractor reviewed ICF's draft commercial potential estimates and added insight into program tracking data, market size and participation estimates.

1.6.5 Program Performance Benchmarking

ICF also conducted research on the performance of other utility programs that exhibit best practices, are ComEd's peers, or both. Benchmarking program performance helped put ComEd program performance and draft achievable potential estimates into context. For example, Figure 7 shows the performance of appliance recycling programs in other jurisdictions, and that of ComEd's program.

Figure 7. Appliance Recycling Program Performance Benchmarking

Administrator	State	ACEEE 2012 EE State Scorecard Ranking	Program Expen-ditures ($Millions)	MWh Savings (Net)	$ Per 1st Year kWh	Year	Savings as % of Residential Sales
Alliant Energy—Iowa (Interstate P&L)	IA	11	$1.6	14,014	$0.11	2011	0.33%
ComEd	IL	14	$8.2	72,302	$0.11	PY4	0.26%
DTE Energy	MI	12	$2.9	35,109	$0.08	2011	0.22%
PECO	PA	20	$3.0	25,908	$0.12	2011	0.19%
Southern California Edison (SCE)	CA	2	$12.1	45,982	$0.26	2011	0.16%
Arizona Public Service	AZ	12	$1.3	14,168	$0.09	2011	0.11%
Con Edison	NY	3	$1.8	6,349	$0.28	2011	0.04%
Xcel Energy—Minnesota	MN	9	$0.7	3,717	$0.18	2011	0.04%

Sources: Utility program reports, ACEEE, U.S. EIA.

Energy efficiency program performance benchmarking is a tricky exercise. It is difficult to compare even similar programs on an apples-to-apples basis due to differences in regulation, codes and standards, evaluation, electricity costs and retail rates, market size, demographics, and other factors. Because of such differences "averaging" results across jurisdictions is not particularly useful, nor is it reasonable to assume savings impacts achieved in one jurisdiction in one particular year in the past could be replicated in another jurisdiction in future year. Nonetheless, when done carefully benchmarking can shed light on program performance or savings forecasts.

For the purposes of this study, ICF selected program benchmarks from states exhibiting best practices in energy efficiency,[13] or that are ComEd's peer in some manner, or both. For example, Xcel Energy-Minnesota is a ComEd peer because it is a relatively large investor owned utility operating in a similar climate zone.

It is worth noting a few items to help put Figure 7 in context. First, DTE Energy operates in Michigan, which has a deemed net-to-gross ratio of 0.9 for all programs. This is much higher than evaluated net-to-gross results for most appliance recycling programs. If 0.9 is an overestimate, then DTE's net savings are overestimated and the cost-effectiveness estimate (8 cents per first year kWh) is low. Also, SCE has operated its recycling program for many years. The relatively high dollar per kWh value for SCE's program may reflect a depleting eligible stock. That is, most of the very old and inefficient refrigerators and freezers may have been harvested, and the marginal unit may have become less cost-effective to harvest.

Compared to the other programs in Figure 7, ComEd's program had one of the biggest impacts (as a % of residential sales) and was among the more cost-effective programs in that year. Prior to this benchmarking exercise, ICF already had a strong grasp on ComEd's program design, and understood it to exhibit best practices based on our experience as an implementation contractor. The added value of the benchmarking data is that it helped provide perspective beyond ICF's and ComEd's experience. If ComEd's program performed poorly relative to the benchmarks ICF would need to dig deeper and figure out whether this was likely due to the budget cap or to other factors.

Program benchmarking data was collected for many program types, and at the portfolio level.

1.6.6 Additional Steps in the Maximum Achievable Analysis

The maximum achievable scenario involved increasing all incentives to 100% and reconsidering program designs. ICF conducted further analyses to help estimate additional savings that could be gained in such a scenario, including:

- **Re-reviewing the eligible stock.** While budget is not a constraint under the maximum achievable scenario, market size is. We carefully reviewed the eligible stock to help inform how much more savings ComEd could gain beyond the program achievable scenario. For example, data from the baseline study showed the average age of installed chillers is 15 years. The lifetime of a chiller is 20 years. Therefore, the market size for chillers is fairly limited since most chillers will burnout after the six year time horizon of this study.
- **Comparative incentive analysis.** Incentive levels in the program achievable potential scenario are consistent with ComEd's current incentive levels, and are generally between 25% and 75% of measure incremental cost. All incentives in the maximum achievable scenario are 100% of incremental cost. ICF analyzed the additional impact increased incentives would have on program participation. For measures or programs where incentives are less important, the additional

13 Indicated by the ACEEE state scorecard ranking.

incentive has little to no impact. This is the case with the commercial New Construction program. In other cases, the 100% incentive has a large impact, as is the case with the Small Business program.

Where relevant, ICF compared customer payback acceptance for measures [14] in the program and maximum scenarios. A large increase in payback acceptance could indicate there is large amount of additional potential for that measure type, all else equal.

- *Benchmarking*. In some cases, ICF used data from high performing programs around the country to help gauge the upper limits of ComEd program performance in the maximum scenario.

1.7 Participation Examples

As discussed above, ICF assessed achievable participation on a measure-by-measure basis. Because there is such a wide variety of measures included in this study, we could not apply just one formulaic approach to estimating program participation for all measures. In order to better describe the steps taken in this study to forecast participation, we provide two examples, below.

ICF underwent each step outlined above, in Section 1.6, to forecast participation for the below measures. Note, however, that some forecasting tactics varied by measure. For example, for the first measure, industrial sub-metering and interval metering, ICF relied largely on data from outside ComEd's service territory, since this is not a measure offered historically by ComEd, nor is it a deemed measure. Nor did we consider customer payback a factor in estimating participation for this measure, as we believe payback is generally not a significant factor in customers decision making processes to install sub-meters. On the other hand, LED case lighting is a measure offered historically by ComEd; therefore, ICF was able to consider program tracking data in forecasting participation. And unlike for sub-metering, ICF did consider customer payback as one factor in estimating participation for LED case lighting.

1.7.1 Example 1: Industrial Sub-Metering & Interval Metering

Industrial facility sub-metering and interval metering is a retrofit measure designed to help industrial facility managers better manage energy use. Sub-metering is considered a behavioral measure, since savings result not from the physical installation of the measure, but through actions taken based upon information gained through sub-metered data (e.g., the identification of equipment scheduling issues, or sub-optimal equipment performance). This is not a measure offered historically by ComEd, nor is it a deemed measure. Therefore, ICF relied largely on data from outside ComEd's service territory, including ICF databases and other sources,[15] along with information gained during the industrial achievable potential workshop, to develop measure parameters and participation estimates.

[14] Customer payback acceptance is the estimated portion of customers that state they will install a measure given its simple payback. Simple payback is the dollar amount invested by the customer in the measure (the incremental cost minus the incentive) divided by the annual bill savings due to the measure, expressed in months or years. Customer payback acceptance rates were estimated for residential and non-residential customers based on self-reported values collected through surveys instrumented in the course of this study. These surveys are shown in the Appendix.

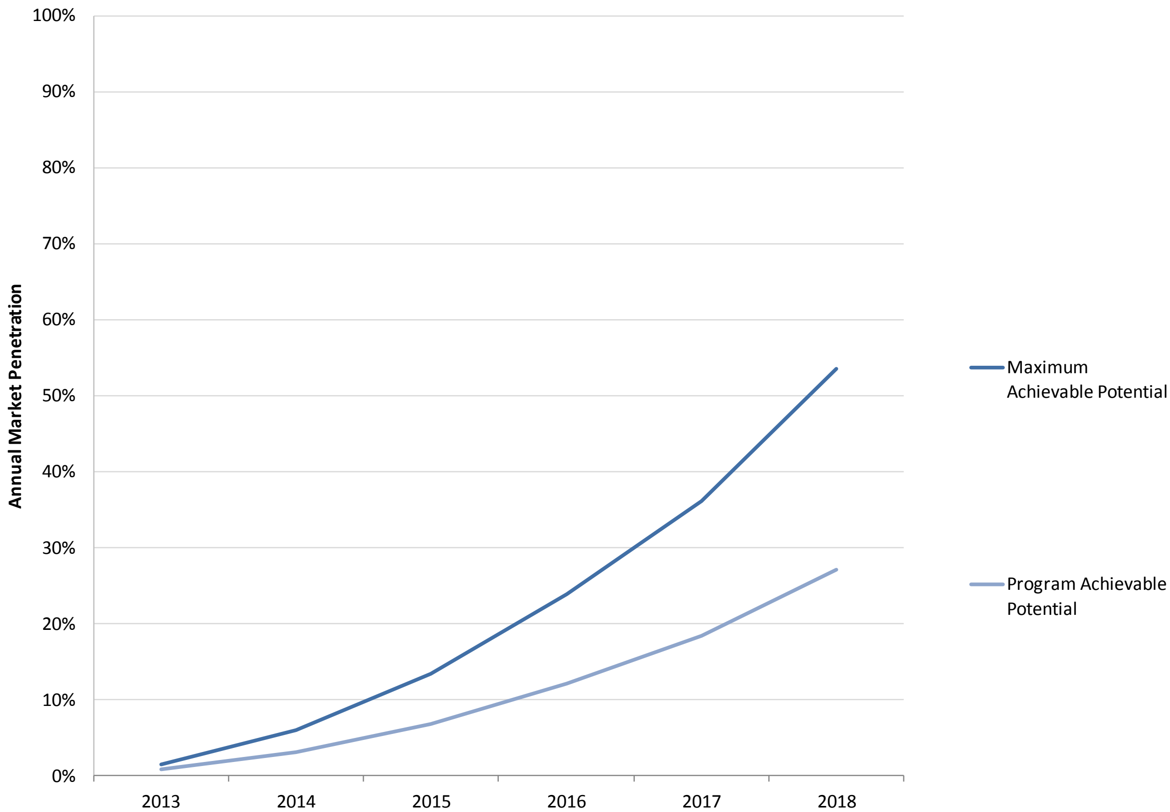
[15] Worrel, E.; Galitsky, C. *Energy Efficiency Improvement and Cost Saving Opportunities for Breweries, an Energy Start Guide for Energy and Plant Managers.* Ernest Orlando Lawrence Berkeley National Laboratory. 2003.

Figure 8 shows key measure assumptions, and participation estimates, for industrial sub-metering and interval metering. Participation estimates for this measure were developed during the industrial achievable potential workshop through the process discussed in Section 1.6.2, above. Figure 9 shows the resulting participation curves for this measure under each achievable potential scenario. The consensus during the workshop was that potential growth for this measure is exponential. This reflects the maturity of the technology, its relatively low current market saturation, and its strong value proposition for industrial customers.

Figure 8. Industrial Sub-Metering & Interval Metering Measure and Participation Assumptions

Measure Characteristic	Value	Source
1. Applicable sector	Industrial	ICF
2. Applicable subsector(s)	All	ICF
4. End-use(s)	All	ICF
5. Measure name	Sub-metering & interval metering	ICF
6. Measure definition	Sub-meters installed	ICF
7. Baseline definition	Existing level of sub-metering	ICF
9. Measure delivery type	Retrofit	ICF
10. Measure unit	Facility	ICF
11. Incremental cost	$363,000	LBNL, ICF
12. Effective useful life	15 years	LBNL, ICF
13. Incremental (annual) kWh savings	5% of facility baseline energy use	LBNL, ICF
14. Current measure saturation rate	19%	LBNL, ICF
15. Incentive, Program Achievable Scenario	$0.07 per kWh (29% of incremental cost)	ICF
16. Incentive, Maximum Achievable Scenario	$0.24 per kWh (100% of incremental cost)	ICF
17. Annual market acceptance rate in 2013, Program Achievable Potential Scenario	1.0%	Achievable potential workshop
18. Annual market acceptance rate in 2013, Maximum Achievable Potential Scenario	1.5%	Achievable potential workshop
19. Annual market acceptance rate in 2018, Program Achievable Potential Scenario	27.0%	Achievable potential workshop
20. Annual market acceptance rate in 2018, Maximum Achievable Potential Scenario	53.0%	Achievable potential workshop
21. Market penetration curve type	Exponential distribution function	Achievable potential workshop

Figure 9. Industrial Sub-Metering & Interval Metering Participation Curves



1.7.2 Example 2: Commercial LED Refrigerated Case Lighting

LED refrigerated case lighting involves retrofitting florescent lighting with LED lamps in refrigerated display cases in grocery stores and other commercial facilities. Measure savings and costs were sourced using information in the IL TRM and through ICF research. Current market saturation was sourced from the ComEd baseline report. LED case lighting is a measure offered historically by ComEd, and ICF used ComEd tracking data to help estimate participation in the first year of the analysis (2013). The forecast for the remaining years of the analysis (2014-2018) was developed based on secondary research,[16] primary research on C&I customer decision making,[17] and ICF commercial program experience.

Figure 10 shows key measure assumptions, and participation estimates, for LED case lighting. Figure 11 shows the resulting participation curves for this measure under each achievable potential scenario. At the estimated incentive levels, and based on ICF's understanding of the market for this measure in ComEd's service territory, and nationwide, ICF believes this measure will move out of the "early-adopter" phase and into the "mid-adopter" phase over the next five years. Our forecast for the diffusion of LED case lighting in the marketplace is represented by a logistic distribution function; such functions in ICF's potential model are based in part on well-known research conducted by Frank Bass,[18] and others.

Figure 10. Commercial LED Refrigerated Case Lighting Measure & Participation Assumptions

Measure Characteristic	Value	Source
1. Applicable sector	Commercial	ICF
2. Applicable subsector(s)	All	ICF
4. End-use(s)	Refrigeration	ICF
5. Measure name	LED Case Lighting	ICF
6. Measure definition	LED Refrigerated Case Lighting (29W or less)	ICF
7. Baseline definition	T12 Refrigerated Case Lighting	IL TRM, ICF
9. Measure delivery type	Retrofit	IL TRM, ICF
10. Measure unit	Linear ft.	IL TRM, ICF
11. Incremental cost	$43.75	IL TRM, ICF
12. Effective useful life	10 years	IL TRM, ICF
13. Incremental (annual) kWh savings	56 kWh	IL TRM, ICF
14. Current LED saturation rate	2.0%	ComEd 2012 Baseline Study, Opinion Dynamics Corporation
15. Incentive, Program Achievable Scenario	$32.81 (75% of incremental cost)	ICF assumption

16 U.S. Department of Energy. *Product Snapshot: LED Replacement Lamps.* Prepared by D&R International. July 2012.

U.S. Department of Energy. *Solid-State Lighting Research & Development: Multi-Year Program Plan.* Prepared by Bardsley Consulting et al. April 2012.

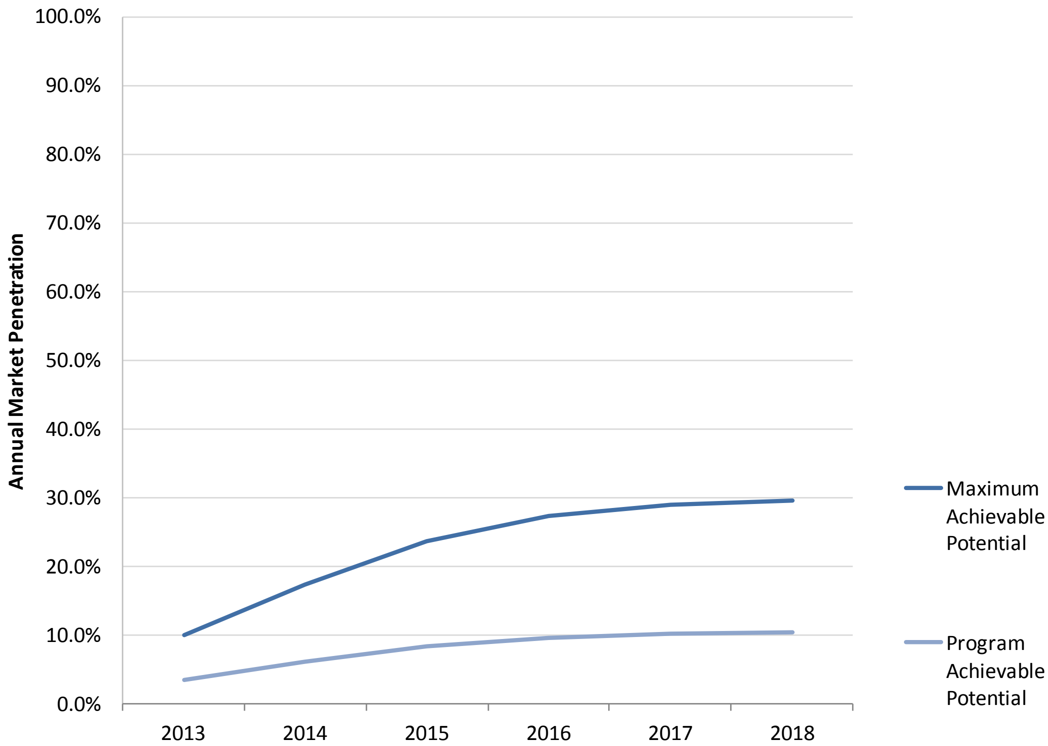
Southern California Edison. *The Southern California Edison (SCE) Advanced Light Emitting Diode (LED) Ambient Lighting Program Customer Preference and Market Pricing Trial*. Prepared by Opinion Dynamics Corporation et al. December 2012.

17 See discussion on comparative incentive analysis in Section 1.6.6, above. Based on ComEd C&I customer survey data (see Appendix for survey), ICF estimated that two-thirds of customers would accept the payback terms for LED case lighting under the program achievable scenario (1.7 years); under the maximum achievable scenario, we estimated 100% of customers would accept the payback terms (0 years). However, since there are many market barriers to measure adoption, payback acceptance rates were only factor considered in estimating participation for this measure

18 Bass, Frank M. *A New Product Growth Model for Consumer Durables*. Management Science, Vol. 14 No. 5. 1969.

Measure Characteristic	Value	Source
16. Incentive, Max. Achievable Scenario	$43.75 (100% of incremental cost)	Max. achievable scenario assumption
17. Post-incentive simple payback, Program Achievable Scenario	1.7 years	(Incremental Cost-Incentive)/ Customer energy bill savings
18. Post-incentive customer payback acceptance estimate, Program Achievable Scenario	66.0%	ComEd C&I Customer Adoption Survey, ICF Calculation
19. Post-incentive simple payback, Maximum Achievable Scenario	0 years	(Incremental Cost-Incentive)/ Customer energy bill savings
20. Post-incentive customer payback acceptance estimate, Maximum Achievable Scenario	100.0%	ComEd C&I Customer Adoption Survey, ICF Calculation
21. Annual market acceptance rate in 2013, Program Achievable Potential Scenario	3.5%	ComEd tracking data, ICF estimate
22. Annual market acceptance rate in 2013, Maximum Achievable Potential Scenario	10.0%	ICF estimate based upon research (U.S. DOE, SCE, ComEd C&I Customer Adoption Survey), and ICF commercial program manager experience
23. Annual market acceptance rate in 2018, Program Achievable Potential Scenario	10.5%	ICF estimate based upon research (U.S. DOE, SCE, ComEd C&I Customer Adoption Survey), and ICF commercial program manager experience
24. Annual market acceptance rate in 2018, Maximum Achievable Potential Scenario	30.0%	ICF estimate based upon research (U.S. DOE, SCE, ComEd C&I Customer Adoption Survey), and ICF commercial program manager experience
25. Market penetration curve type	Logistic distribution function	ICF assumption

Figure 11. Commercial LED Refrigerated Case Lighting Participation Curves



1.8 DCEO Programs

ICF included estimates of DCEO achievable potential in this study. Estimates for DCEO programs were developed based upon an analysis of DCEO program evaluation reports and historical program costs. Average per project savings were developed for each program and adjusted to reflect adopted baseline changes. Next, program costs per project were estimated based on historical participation and costs. Participation was then extrapolated for each year according to ComEd's spending cap for DCEO programs, historical program performance, and ICF's understanding of market size and market barriers for each program.

2 Total Energy Efficiency Potential

This section includes the presentation and analysis of ICF's estimates of total economic and achievable potential for ComEd's service territory for 2013 through 2018. Total potential is the sum of residential, commercial, and industrial potential. Electric savings and program cost estimates are shown, as well as benefit-cost estimates.

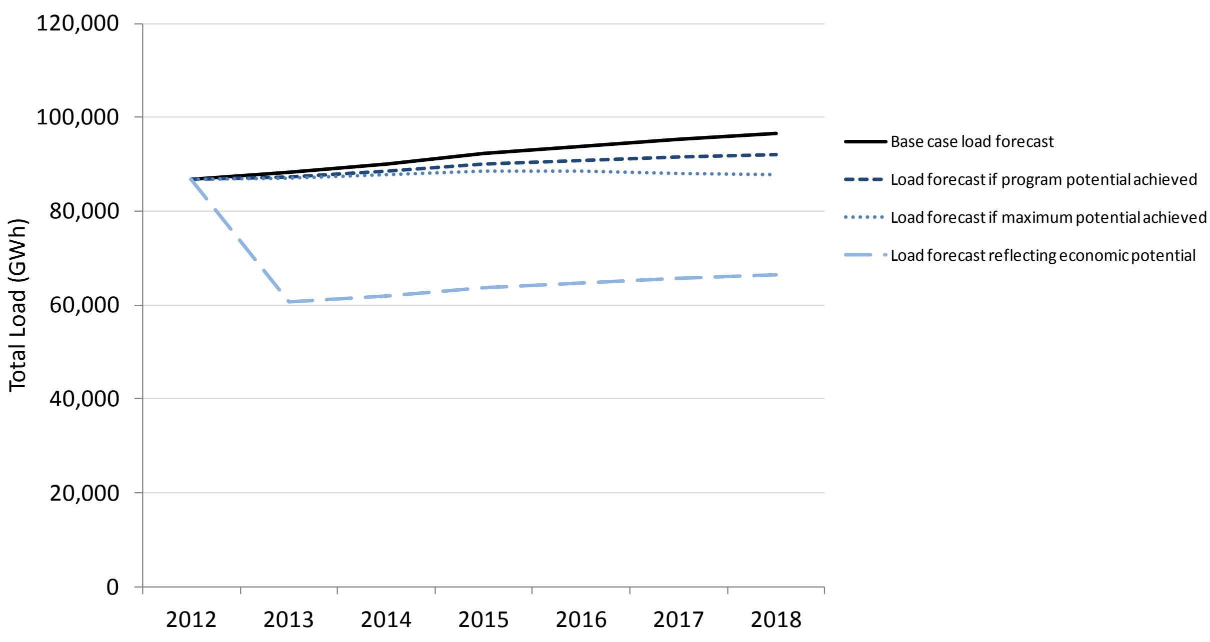
2.1 Summary

Figure 12 shows ComEd's base case total load forecast, as well as alternative total load forecasts generated by ICF that account for savings estimated under each scenario in this study.[19] 2012 is the base year for this analysis, and 2013 through 2018 are the study years. In the base case, load grows at an average rate of 1.7% per year. The program potential scenario savings would cut load grow by over half, whereas savings under the maximum achievable scenario would completely offset load growth by 2016, and would result in a decrease in annual load in 2017 and 2018.

The load forecast accounting for economic potential has a "hockey stick" shape because all retrofit measures are applied in 2013, whereas only replace-on-burnout and new construction measures are applied in 2014 through 2018.[20] Most measures in the analysis are retrofit in nature.

Note that all estimates shown include values for DCEO programs unless otherwise noted.

Figure 12. Alternative Total Load Forecasts



[19] To develop the alternative load forecasts, cumulative savings forecasts were subtracted from the base case load forecast.

[20] Replace-on-burnout and new construction measures are also applied in 2013.

2.2 Total Economic Potential

Figure 13 shows the distribution of economic potential by sector. As discussed above, economic potential is the amount of savings due to installing the most technically-efficient cost-effective measures.

The distribution of economic potential reflects three constraints: the portion of load by sector, the size of the eligible stock by sector, and the number and type of cost-effective measures by sector.[21]

Figure 13. Distribution of Total Cumulative Economic Potential, by Sector, 2018 (30,009 GWh, 32% of Total Load in 2018)

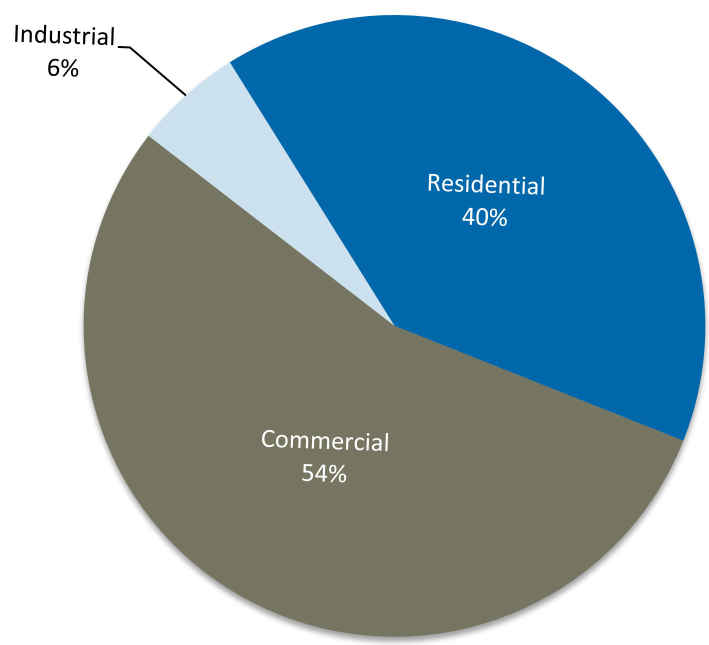
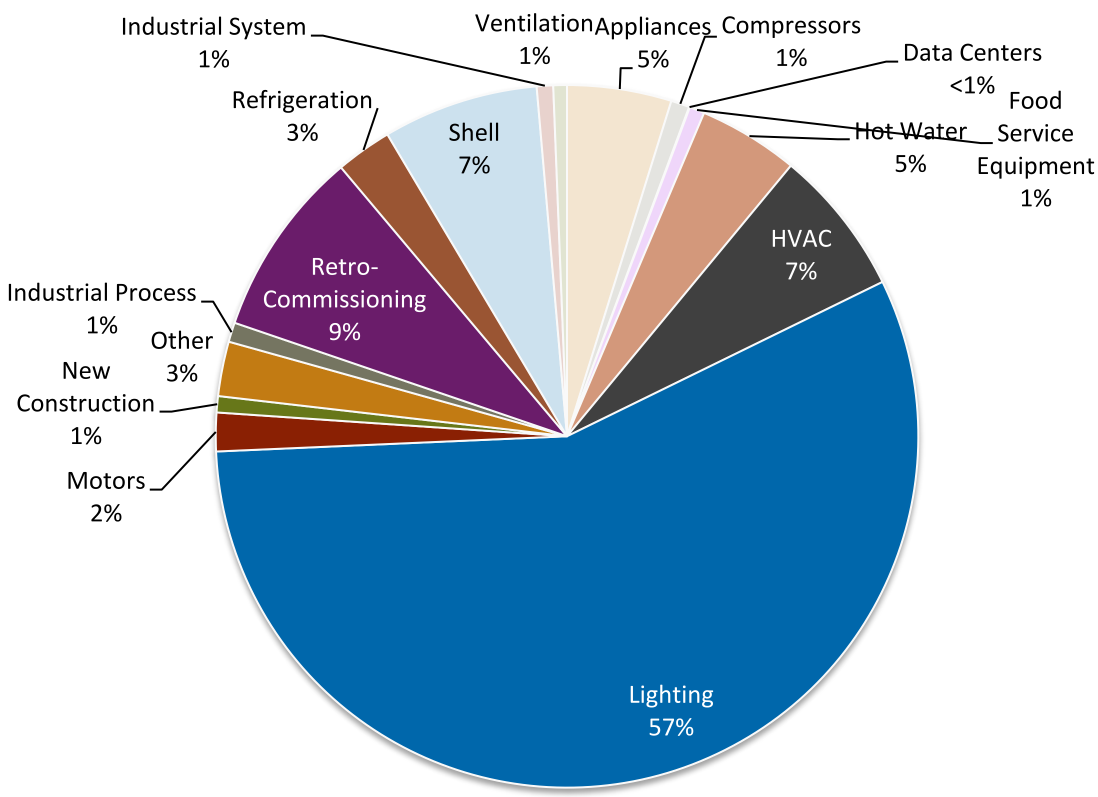


Figure 14 shows the distribution of total economic potential by end-use. Lighting represents a large portion, 57%, of cost-effective potential across all sectors. This is because there is a high saturation of lighting in every sector (i.e., every building has lighting), and because there is still a large eligible stock for efficient lighting. For example, about 70% of residential lighting could be replaced with CFLs or LEDs, and nearly 60% of commercial linear florescent lighting could be replaced with more efficient T8/T5 or LED options.

[21] ComEd updated its avoided costs in June 2013, following the completion of this analysis. In July 2013, all measures were re-run in DSMore using the updated avoided costs to examine changes in measure cost-effectiveness. Several additional measures were found to be cost-effective. If these measures are included in the analysis of economic potential, total cumulative economic potential would increase 2,848 GWh, or 2% in 2018. Load impacts would increase from 32% to 34% in 2018.

It is also important to note that retrocommissioning ("RCx") is the second largest opportunity, because RCx is much different than lighting. RCx is a "comprehensive" opportunity involving a commercial building tune-up and building manager education. Shell measures, such as insulation and air sealing represent the third largest economic savings potential.

Figure 14. Distribution of Total Cumulative Economic Potential by End-Use, 2018[22]



2.3 Total Achievable Potential

Total achievable potential is the sum of achievable potential estimated for each measure in the analysis. Total incremental and cumulative achievable potential estimates are shown in Figure 15, as well as load impacts. ICF estimates that, with the budget cap, ComEd can achieve annual savings equal to 1.0% of load per year. Without a budget cap (in the maximum achievable scenario) annual savings estimates are 150% higher in 2013 and 250% higher than program achievable savings in 2018.

On a cumulative basis, these savings equal 5% of load in 2018 in the program scenario, and 10% of load in the maximum scenario.

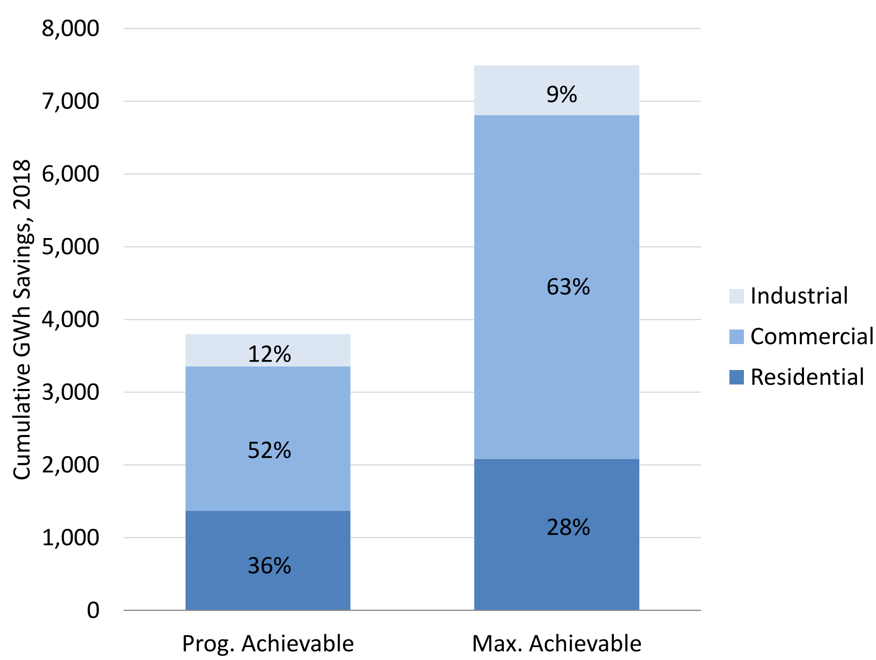
[22] Note economic potential does not account for savings due to the residential Home Energy Report benchmarking program.

Figure 15. Total Achievable Potential, by Scenario and Year

	2013	2014	2015	2016	2017	2018
Cumulative Savings Forecast—GWh						
Economic potential	27,610	28,162	28,679	29,161	29,634	30,009
Maximum achievable potential	1,122	2,453	3,767	5,430	7,104	8,693
Program achievable potential	824	1,649	2,294	3,043	3,778	4,387
Cumulative Savings Forecast— % of load						
Maximum achievable potential	1%	3%	4%	6%	8%	10%
Program achievable potential	1%	2%	3%	3%	4%	5%
Incremental Savings Forecast—GWh						
Maximum achievable potential	1,122	1,438	1,602	1,865	1,956	2,111
Program achievable potential	766	868	827	846	828	846
Incremental Savings Forecast—% of load						
Maximum achievable potential	1.3%	1.6%	1.7%	2.1%	2.1%	2.4%
Program achievable potential	0.9%	1.0%	0.9%	1.0%	0.9%	1.0%
Program Costs (Millions, Real 2013$)						
Maximum achievable potential	$265	$349	$426	$487	$488	$527
Program achievable potential	$125	$137	$139	$146	$152	$157

Figure 16 shows the distribution of cumulative savings by sector for each scenario, for ComEd programs only (i.e., excluding DCEO program savings). Commercial achievable potential is 11% higher in the maximum scenario; as discussed in the commercial achievable potential analysis, efficient lighting constitutes most of the additional commercial potential.

Figure 16. Cumulative Achievable Savings by Sector and Scenario, 2018



2.4 Total Benefits and Costs

Figure 17 shows total TRC benefits, costs, net benefits, and cost-effectiveness estimated under both achievable potential scenarios. Net TRC benefits are $0.8 Billion in the program scenario and $2.4 Billion in the maximum scenario.

Benefits and costs both triple in the maximum scenario; overall, the scenarios are equally cost-effective. In the maximum scenario, increasing incentives to 100% does not impact cost-effectiveness because incremental, not incentive costs, count as TRC costs. Further, program experience shows that larger programs tend to benefit from economies of scale. Therefore, non-incentive costs do not escalate at the same rate as incentive costs in the maximum scenario. These economies of scale help maintain cost-effectiveness.[23]

Figure 17. Total Benefits, Costs and Costs-Effectiveness (2013-2018)

Sector	Program Achievable				Max Achievable			
	Benefits ($Millions)	Costs ($Millions)	Net Benefits ($Millions)	TRC B/C Ratio	Benefits ($Millions)	Costs ($Millions)	Net Benefits ($Millions)	TRC B/C Ratio
Residential	$356	$247	$109	1.4	$1,762	$960	$802	1.8
Commercial	$963	$394	$569	2.5	$2,213	$900	$1,313	2.5
Industrial	$155	$37	$118	4.2	$335	$69	$266	4.8
Total	**$1,474**	**$678**	**$796**	**2.2**	**$4,310**	**$1,930**	**$2,380**	**2.2**

2.5 Portfolio benchmarking

Total estimated savings impacts in 2018 in this study's maximum achievable scenario are higher than the impacts of some of the top performing portfolios' shown in Figure 18, below. This is most likely due to the 100% incentive assumption in this study. Program achievable estimates are comparable to, or higher than actual program savings in some top-ranked states.[24]

However, as discussed in the approach section of this report, it is very difficult to compare program performance on an apple-to-apples basis. There are many differences between ComEd's territory and each territory in Figure 18. For example, ComEd's retail rates are a third or more lower than rates in most Northeastern states. Higher retail rates generally mean efficiency measures are more financially attractive to customers. It is hotter in Southern California than in Illinois. Therefore, more cooling measures are likely to be cost-effective there than in ComEd's territory.

Further, EISA 2007 went into effect in 2012, after the program reporting periods shown below. On the other hand, the market for LEDs has also changed significantly since 2011.

23 Since all non-incentive program costs are TRC costs a large increase in the share of non-incentive costs would result in lower cost-effectiveness.

24 Based on ACEEE's state scorecard ranking.

Figure 18. Program portfolio benchmarking

Administrator	State	Year	Reporting Type	ACEEE 2012 EE State Scorecard Ranking	Program Expen-ditures ($Millions)	GWh Savings (Net)	$ Per 1st Year kWh	Savings as % of Load
Con Edison	NY	2011	Program report/actual	3	$119	430	$0.28	0.8%
Connecticut Light & Power	CT	2010	Program report/actual	6	$154	591	$0.26	1.2%
DTE Energy	MI	2011	Program report/actual	12	$55	472	$0.12	1.0%
Efficiency Vermont	VT	2011	Program report/actual	5	$32	101	$0.32	1.8%
National Grid	MA	2011	Program report/actual	1	$110	370	$0.30	1.7%
NSTAR	MA	2010	Program report/actual	1	$149	362	$0.41	1.7%
PECO	PA	2011	Program report/actual	20	$60	356	$0.17	0.9%
Southern California Edison	CA	2011	Program report/actual	2	$335	1,087	$0.31	1.3%
Xcel Energy - Minnesota	MN	2011	Program report/actual	9	$88	419	$0.21	1.3%
ComEd—PY6 Plan	IL	PY6 Plan	Program plan/forecast	14	$163	775	$0.21	0.9%
ComEd Potential Study Program Achievable	IL	2018	Potential study/forecast	14	$157	966	$0.19	0.9%
ComEd Potential Study Max Achievable	IL	2018	Potential study/forecast	14	$527	2,111	$0.25	2.4%

There are too many differences to describe here, but what we can infer from this benchmarking data is that even with the current budget cap, ComEd could achieve savings impacts comparable to that of higher performing administrators' around the country, and that without a budget cap, ComEd's portfolio impacts could be amongst the highest in the country.

In reality, we would obviously not expect all program incentive levels to equal 100% of incremental costs. They are set to this level in potential studies to show an upper limit on incentive impacts. Setting 100% incentive levels on all measures is, in all likelihood, politically infeasible, and significant additional savings could be gained for many measures at incentive levels between current program incentive and maximum incentive levels. In some cases, 100% incentive levels are economically inefficient and unnecessary. For example, it is important that most customers have some buy-in to efficiency, as they are more likely to take better care of the efficiency assets over the long-run. For some programs, incentives are not the primary driver of participation, and 100% incentives may in theory result in dead weight loss.[25]

[25] If equal participation could be gained at incentives lower than 100%, the dead weight loss would be the value of the 100% incentives paid minus the estimated value of the optimal incentives paid, where the optimum level is an incentive level lower than 100% that results in maximum market acceptance.

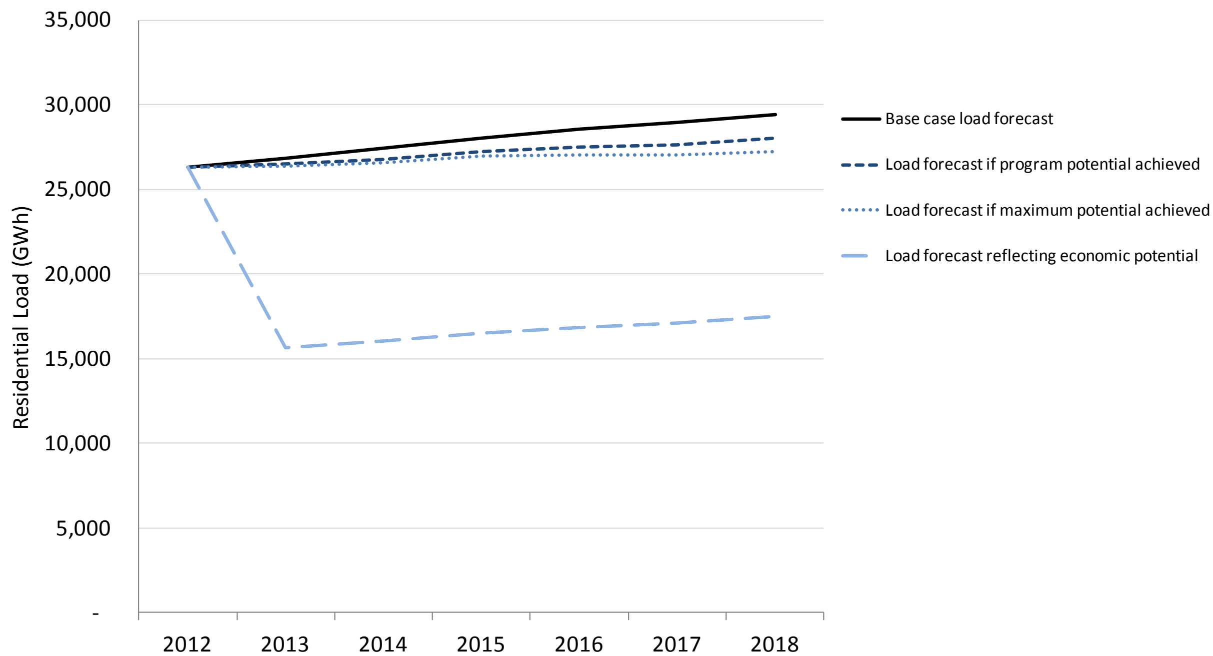
3 Residential Energy Efficiency Potential

3.1 Summary

Figure 19 shows ComEd's base case residential load forecast, as well as alternative load forecasts generated by ICF that account for savings estimated under each scenario in this study.[26] 2012 is the base year for this analysis, and 2013 through 2018 are the study years. In the base case load forecast, residential load grows at an average rate of 1.9% per year. Program potential savings would cut average load growth by 70%, and savings in the maximum achievable scenario would more than offset load growth by 2016.

Note that all estimates shown include values for DCEO programs unless otherwise noted.

Figure 19. Alternative Residential Load Forecasts



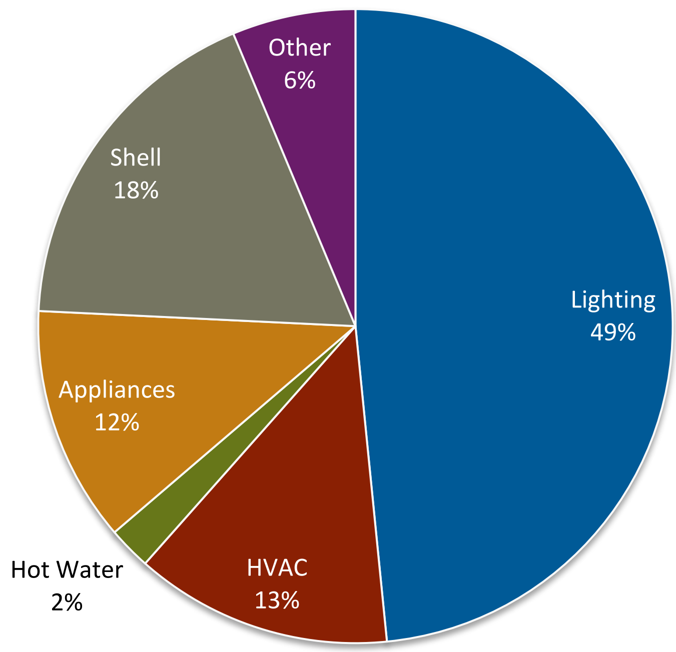
3.2 Residential Economic Potential

Figure 20 shows the distribution of residential economic potential by end-use. Lighting comprises about half the cost-effective potential in homes. CFLs account for most lighting savings. Other significant measure types include air sealing, duct insulation and sealing, wall and attic insulation, refrigerator recycling, and specialty CFLs. Together these measures comprise 80% of residential economic potential.

[26] To develop the alternative load forecasts, ICF's cumulative savings forecasts were subtracted from the base case load forecast.

Figure 20. Distribution of Cumulative Residential Economic Potential, by End-use, 2018

(11,978 GWh, 41% of Residential Load)



3.3 Residential Achievable Potential

3.3.1 Summary

Residential achievable potential is the sum of achievable potential estimated for each residential measure in the analysis. Incremental and cumulative achievable potential estimates are shown in Figure 21, as well as load impacts. ICF estimates that, in the program achievable scenario, ComEd residential programs could reach annual savings equal to 1.3% to 1.5% of residential load per year. In the maximum scenario, estimated load impacts are 0.2% higher in 2013 and 0.9% higher in 2018.

On a cumulative basis, these savings equal 5% of load in 2018 in the program scenario, and 8% of load in the maximum scenario.

Figure 21. Residential Achievable Potential, by Scenario and Year

	2013	2014	2015	2016	2017	2018
Cumulative Savings Forecast—GWh						
Maximum achievable potential	443	850	1,099	1,535	1,947	2,219
Program achievable potential	352	658	816	1,059	1,272	1,372
Cumulative Savings Forecast— % of residential load						
Maximum achievable potential	2%	3%	4%	6%	7%	8%
Program achievable potential	1%	2%	3%	4%	5%	5%
Incremental Savings Forecast—GWh						
Maximum achievable potential	443	499	491	575	625	660
Program achievable potential	363	407	380	384	369	366
Incremental Savings Forecast—% of residential load						
Maximum achievable potential	1.6%	1.9%	1.8%	2.1%	2.3%	2.4%
Program achievable potential	1.4%	1.5%	1.4%	1.4%	1.3%	1.3%
Program Costs (Millions, Real 2013$)						
Maximum achievable potential	$92	$104	$123	$132	$115	$125
Program achievable potential	$44	$44	$43	$44	$45	$45

3.3.2 Residential Program Savings

As discussed in the approach section of this report, measures were assigned to programs for the purposes of estimating achievable potential. Each program represents a specific set of market interventions designed to increase uptake of efficiency measures. In most cases, the programs modeled are consistent with ComEd's program designs. The residential programs modeled in this study are described briefly below.

- **Residential Lighting** is a "midstream" lighting program that buys down the cost of efficient lighting products at the retail level.
- **Single Family Home Performance** performs diagnostic energy audits of single family homes, directly installs low-cost measures, provides customer education on further efficiency options, and pays rebates to customers who agree to install additional measures, such as air sealing and attic insulation. This program is operated jointly with the gas utilities.
- **Multifamily Home Performance** installs low-cost measures in apartments and pays rebates to multifamily building owners who agree to have common area efficiency projects performed. This program is operated jointly with the gas utilities.
- **Residential Complete System Replacement** pays rebates to customers who install both a high efficiency furnace and a high efficiency air conditioner. This program is operated jointly with the gas utilities.
- **Appliance recycling** pays rebates to residential customers for the removal and proper disposal of their secondary and older inefficient but functioning refrigerators, freezers, and room air conditioners.

- **Residential Benchmarking (Home Energy Report or "HER")** provides information to residential customers on their latest energy usage compared to their historical use, and compared to that of customers in similar homes.
- **Department of Commerce and Economic Opportunity ("DCEO")** programs include the Low-Income Residential Retrofit Program, Public Housing Authority Efficient Living, and Energy Efficient Affordable Housing Construction.
- **Other** includes efficient pool pumps.

3.3.3 Savings in 2013

Figure 22[27] shows total annual residential savings estimates for ComEd residential programs and the distribution of savings by program for each achievable scenario in 2013 and 2018.

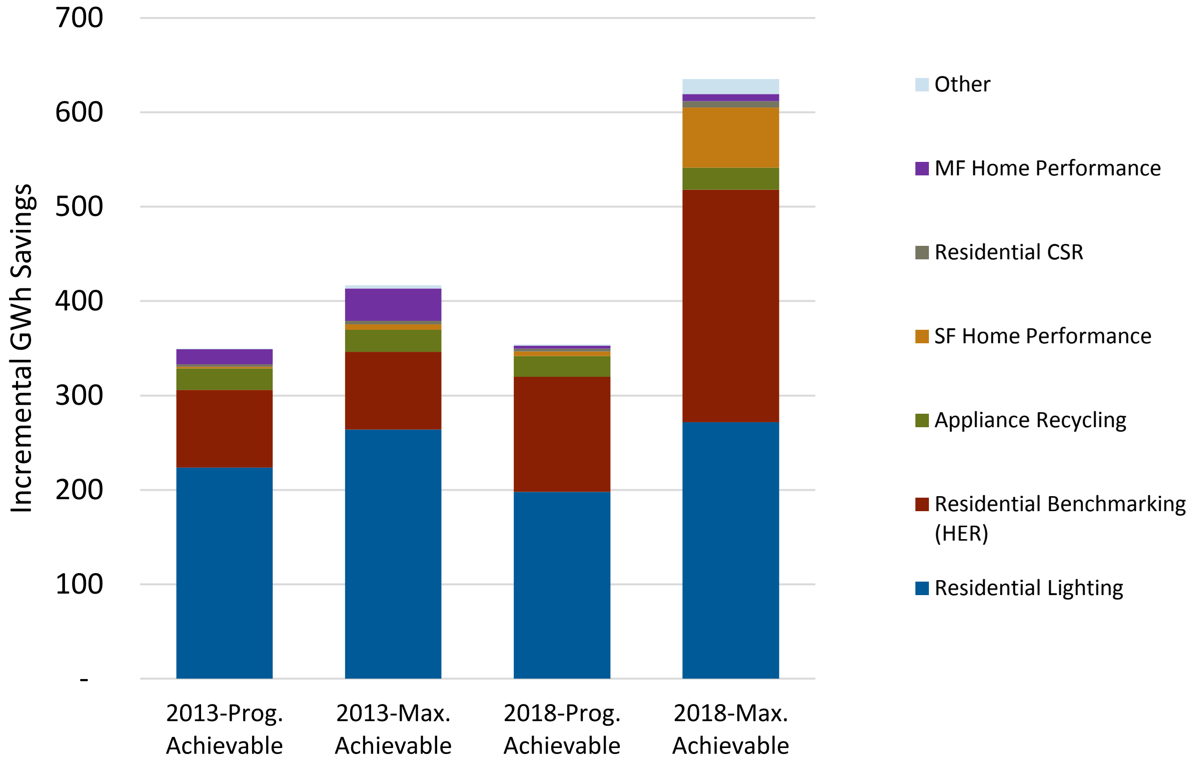
Estimated Savings in 2013 are 19% higher in the maximum scenario. In absolute terms, lighting savings increase the most (40 GWh) in the maximum scenario in 2013. In percentage terms, Multifamily savings increases the most (212%) because incentives double to 100% in the maximum scenario, which removes first-cost and split-incentive barriers.[28]

Taken together, Residential Lighting and Multifamily account for 87% of the additional achievable residential savings in the maximum scenario in 2013.

[27] Estimates shown exclude DCEO program savings. DCEO programs are 3% of total estimated annual residential savings in the program scenario in 2013 and 4% in 2018. They are 4% of total residential savings in the maximum scenario in 2013, and 6% in 2018.

[28] The split incentive barrier exists because renters see direct financial benefits of efficiency upgrades paid for by owners (i.e., owners do not see a direct financial return on their investments). The split-incentive barrier is a key market barrier to multifamily program participation.

Figure 22. Annual Residential GWh Savings by Program and Scenario, 2013 and 2018



3.3.4 Savings in 2018

Major changes across years and between scenarios illustrated Figure 22 reflect technology baseline improvements, and other forecasted changes to certain residential programs.

EISA 2007 represents one of the most important impacts to residential savings in this study. The effects of EISA 2007 impact overall Lighting program savings, as well the program's measures mix. Baseline improvements required by EISA drop savings per standard CFL about 30%, on average. Other factors will also impact the Lighting program. For example, retailers are stocking fewer CFLs and more LEDs, and prices for high-quality LEDs,[29] while coming down, are still high. Also, in this analysis, fewer dollars are assumed to be spent on LEDs in the program scenario than in the maximum scenario.[30] This is because at current LED costs, the Lighting program cannot afford to spend too much more on LED rebates given the budget cap.

29 Some retailers are also stocking more less-expensive but lower-quality LEDs (those that do not meet Design Lights Consortium, "DLC," standards) than higher-quality, but pricier DLC-approved models.

30 Cumulative residential LED lighting savings are 214% higher in the maximum scenario than in the program scenario in 2018.

HER savings are also higher in the program scenario in 2018. This is not because there are more assumed participants in this scenario, but because average annual savings increases each year for existing participants.[31] HER savings are substantially higher in 2018 in the maximum scenario than in the program scenario. This is because ICF assumed that in this scenario, a large group of additional participants would receive the report beginning in 2016. This additional group would be comprised of residential customers with above median annual electricity use; current HER recipients are in the top quartile (25%) of annual household consumption.

Third, Multifamily program savings is lower in 2018 than in 2013. ComEd has implemented this program for several years and has already served many larger multifamily buildings. Therefore, the eligible stock is depleting and program marginal costs per building are increasing.[32] Both factors suggest a downward trend in savings. This trend also occurs in the maximum scenario. ICF also modeled a common area retrofit project for this program. Participation in this program element is forecasted to increase over time.

In the maximum achievable scenario, ICF forecasts substantially higher savings for Single Family Home Performance in 2018. The savings level for this program in this scenario is commensurate with that of top performing home performance programs in other jurisdictions, and with what ICF believes to be the long-term market response to "free" home energy audits and home energy retrofits.

On a cumulative basis, Residential Lighting, HER, and SF Home Performance account for 83% of additional savings[33] in the maximum scenario in 2018.

[31] Based on the PY4 Home Energy Report evaluation and information provided to ComEd by the HER contractor, OPower.

[32] It takes more effort (marketing, scheduling, traveling) to reach two smaller buildings than one larger building.

[33] Savings incremental to program scenario savings in 2018.

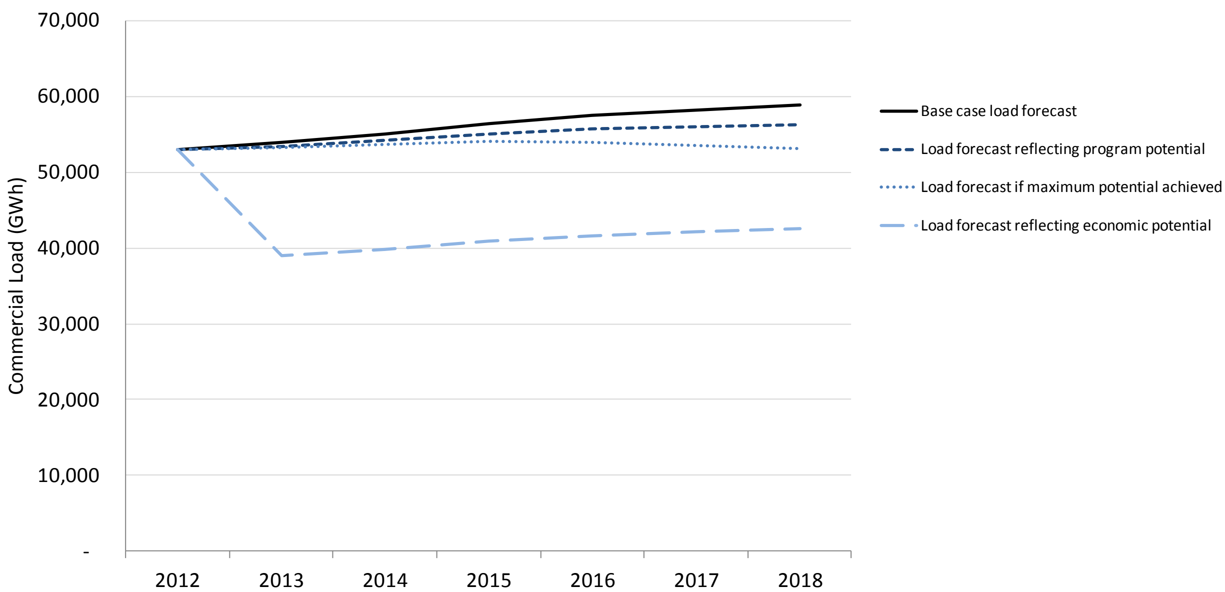
4 Commercial Energy Efficiency Potential

4.1 Summary

Figure 23 shows ComEd's base case commercial load forecast, as well as alternative load forecasts generated by ICF that account for savings estimated under each scenario in this study.[34] 2012 is the base year for this analysis, and 2013 through 2018 are the study years. In the base case, commercial load grows at an average rate of 1.6% per year. The program potential scenario cuts commercial load growth by about half, whereas savings under the maximum achievable scenario would completely offset load growth by 2015, and would result in a decrease in annual commercial load in 2016, 2017 and 2018.

Note that all estimates shown include values for DCEO programs unless otherwise noted.

Figure 23. Alternative Commercial Load Forecasts



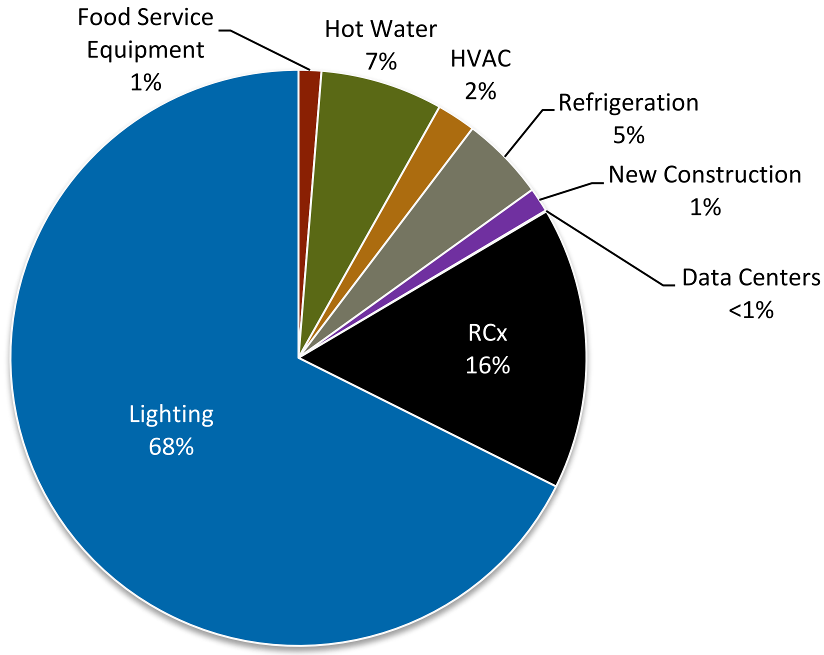
4.2 Commercial Economic Potential

Figure 24 shows the distribution of commercial economic potential by end-use. Lighting accounts for 68% of cost-effective potential in commercial buildings. The most significant lighting measure types include lighting occupancy sensors, LED bulbs, and high performance T8/T5s. Other significant measures types include retrocommissioning, and tankless water heaters. Together these five measures types comprise 80% of commercial economic potential.

34 To develop the alternative load forecasts, cumulative savings forecasts were subtracted from the base case load forecast.

Figure 24. Distribution of cumulative commercial economic potential, by end-use, 2018

(16,339 GWh, 28% of commercial load)



4.3 Commercial Achievable Potential

4.3.1 Summary

Commercial achievable potential is the sum of achievable potential estimated for each commercial measure in the analysis. Incremental and cumulative achievable potential estimates are shown in Figure 25, as well as load impacts. ICF estimates that, in the program achievable scenario, ComEd commercial programs can gain annual savings equal to 0.8% to 0.9% of commercial load per year. In the maximum scenario, annual load impact estimates are 0.3% higher in 2013 and 1.6% higher in 2018.

On a cumulative basis, these savings equal 5% of load in 2018 in the program scenario, and 11% of load in the maximum scenario.

Figure 25. Commercial Achievable Potential, by Scenario and Year

	2013	2014	2015	2016	2017	2018
Cumulative Savings Forecast—GWh						
Maximum achievable potential	595	1,420	2,373	3,479	4,621	5,791
Program achievable potential	432	898	1,318	1,744	2,178	2,572
Cumulative Savings Forecast— % of commercial load						
Maximum achievable potential	1%	3%	4%	6%	9%	11%
Program achievable potential	1%	2%	2%	3%	4%	5%
Incremental Savings Forecast—GWh						
Maximum achievable potential	595	841	998	1,169	1,212	1,303
Program achievable potential	432	479	453	470	481	486
Incremental Savings Forecast— % of commercial load						
Maximum achievable potential	1.1%	1.6%	1.8%	2.2%	2.3%	2.5%
Program achievable potential	0.8%	0.9%	0.8%	0.8%	0.9%	0.9%
Program Costs (Millions, Real 2013$)						
Maximum achievable potential	$161	$231	$286	$337	$354	$378
Program achievable potential	$77	$87	$89	$94	$98	$100

4.3.2 Commercial Program Savings

As discussed in the approach section of this report, cost-effective measures were assigned to programs for the purposes of estimating achievable potential. Each program represents a specific set of market interventions designed to increase uptake of efficiency measures. In most cases, the programs modeled are consistent with ComEd's program designs. The commercial programs modeled in this study are described briefly below.

- **Lighting** is comprised of two program elements: prescriptive and midstream. The prescriptive element offers customers rebates for deemed measures. The midstream element buys-down the cost of certain light bulb types at the distributor level.[35]
- **HVAC** savings shown in this section[36] are for prescriptive measures, such as VFDs and room air conditioners, as well as for chillers.
- **Refrigeration** savings shown in this section[37] were modeled as a prescriptive program element.
- **Small Business** serves commercial customers with less than 100 kW in peak demand. The program conducts energy audits, installs free measures, such as CFLs, and provides rebates for retrofit projects.
- **Retrocommissioning** provides incentives for building engineering studies, installs building system optimization measures, and provides building manager education.

35 The Custom program also includes lighting savings.

36 There are also HVAC savings in the Custom, Retrocommissioning, and Data Center programs.

37 There are also refrigeration savings in the Custom and Small Business programs.

- **New construction** provides technical assistance and incentives to building designers and architects for new construction and major retrofit projects that are at least 15% more efficient that code.
- **Custom** offers incentives to customers for projects that install non-prescriptive measures.
- **Data center** is a custom program that offers incentives for measures installed in new and existing data centers.
- **Department of Commerce and Economic Opportunity (DCEO)** programs include Building Operator Certification, Public Sector Custom Incentives, Public Sector Retrocommissioning, Public Sector New Construction, Public Sector Standard Incentives, and Lights for Learning.
- **Other** includes food service and hot water measures.

4.3.3 Savings in 2013

Figure 26[38] shows total annual commercial savings estimates for ComEd programs and the distribution of savings by program for each achievable scenario in 2013 and 2018.

Estimated annual commercial savings in 2013 are 31% higher in the maximum scenario. Custom, refrigeration, and lighting savings increase the most, in percentage terms, over their respective 2013 program scenario savings estimates. Participation in the Custom program could increase substantially because incentives in the maximum scenario more than double the program scenario incentives, and payback acceptance would increase an estimated 50%.[39] Refrigeration measure installations would be higher in the maximum scenario partly because of the bigger incentive, but also because ICF assumed an alternative program design could be implemented by a contractor specializing in this end-use. The lighting measures accounting for the biggest share of additional estimated lighting savings in 2013 in the maximum scenario include:

- Reduced wattage T8/T5 lamps (through midstream delivery),
- Permanent delamping[40] (through prescriptive delivery), and
- LED bay and recessed lighting applications (through prescriptive delivery).

Some program savings increase very little in the maximum scenario in 2013, Small Business for example. This is because in the program scenario ICF accounted for an additional $18 Million in approved Illinois Power Agency ("IPA") funding for Small Business in program year six.[41]

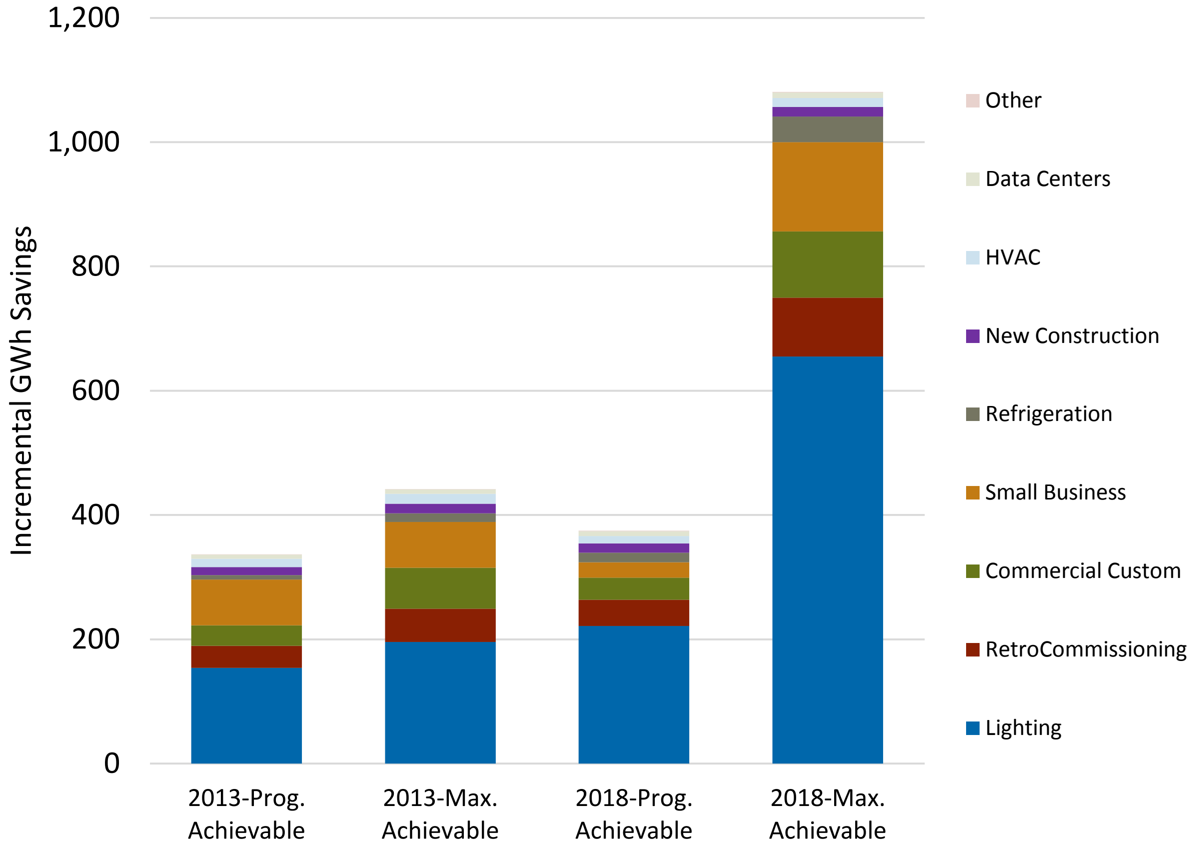
[38] Excludes DCEO programs. DCEO programs account for 22% of total estimated annual commercial savings in the program scenario in 2013 and 23% in 2018; they account for 26% of total commercial savings in the maximum scenario in 2013 and 17% in 2018.

[39] While custom projects can have long lead times, the "free" nature of the custom projects in the maximum scenario could motivate customers to implement a certain number of planned projects that were delayed for financial reasons.

[40] Delamping involves permanent removal and existing T12 or T8 systems, and retrofit replacement with high performanceT8, reduced-wattage T8 or T5/T5 high-output lamps and qualifying ballasts.

[41] Small Business spending drops to normal levels in the program scenario after 2014.

Figure 26. Commercial GWh Savings by Program and Scenario, 2013 and 2018



4.3.4 Savings in 2018

Commercial annual savings estimated for 2018 nearly triple in the maximum scenario. In percentage terms, Small Business is the program with the greatest increase in savings over the program scenario. This is because the incentives are double the program scenario incentives in 2015 through 2018, and because the program could continue the momentum gained with the additional IPA funding in 2013 and 2014.

In absolute savings terms, lighting accounts for the greatest increase in additional commercial savings estimated in the maximum scenario in 2018. This makes sense for several reasons:

1. Lighting accounts for 68% of economic potential;
2. Lighting measures tend to have fewer market barriers than other measures;[42]
3. Lighting measures are some of the most cost-effective to implement from the perspective of the utility and of the customer;
4. Lighting programs are easier to scale than most programs; and

[42] For example, lighting is easier to understand than most end-uses. And customers can literally see the non-energy benefits of lighting right away (e.g., the improved color spectrum of LEDs over florescent options).

5. The 100% incentive under the maximum scenario eliminates first cost and other financial barriers to LEDs.

The measures with largest share of additional lighting savings in 2018 under the maximum scenario are the same as those noted above in the analysis of 2013 savings. Note that cumulative commercial LED lighting savings are 321% higher in the maximum scenario than in the program scenario in 2018.

On a cumulative basis, Lighting, Small Business, and Custom account for 88% of additional savings in 2018 in the maximum scenario.[43]

ICF would not expect much of a savings increase in the maximum scenario (above the program scenario) for the New Construction program. This is because this program is driven less by incentives, and more by the technical support it provides. Further, there is a limited eligible stock of new construction opportunities.[44] Similarly, the Data Centers program has a small number of facilities it can target.

[43] Savings incremental to program scenario savings in 2018.

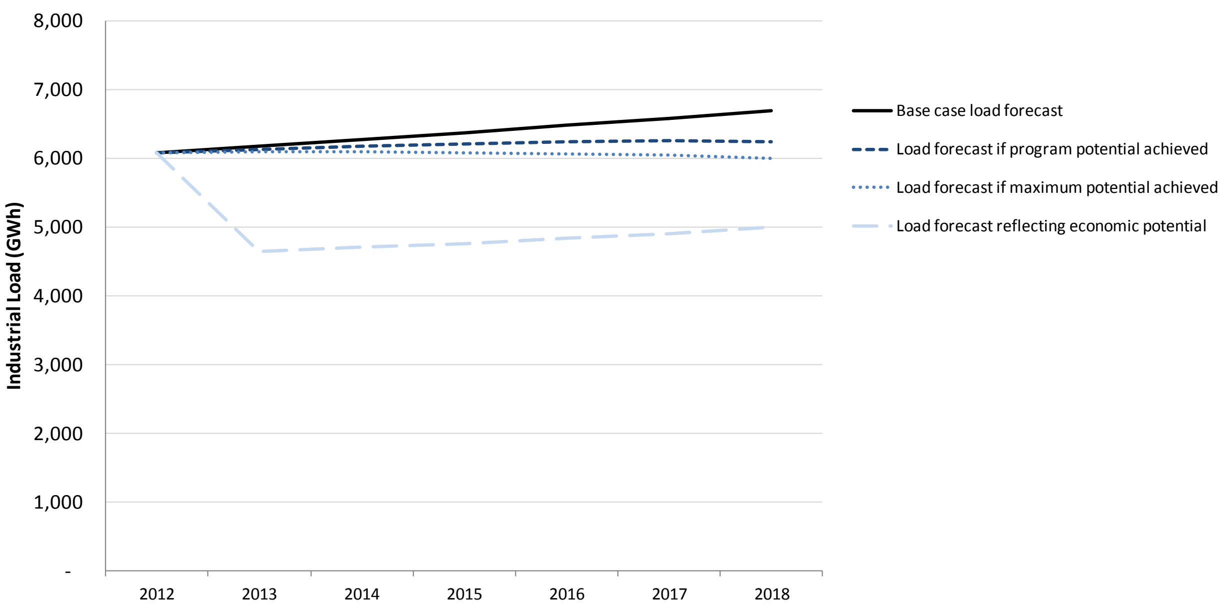
[44] In addition, ICF assumed Illinois will adopt IECC 2015 building codes in 2016. This will like improve the baseline efficiency for new construction and major retrofits 15% over current adopted codes (IECC 2012).

5 Industrial Energy Efficiency Potential

5.1 Summary

Figure 27 shows ComEd's base case industrial load forecast,[45] as well as alternative load forecasts generated by ICF that account for savings estimated under each scenario in this study. 2012 is the base year for this analysis, and 2013 through 2018 are the study years. In the base case industrial load grows at an average rate of 1.6% per year. The program potential scenario completely offsets industrial load growth in 2018. Savings under the maximum achievable scenario would completely offset load growth by 2015, and would result in a decrease in annual industrial load in 2016, 2017, and 2018.

Figure 27. Alternative Industrial Load Forecasts

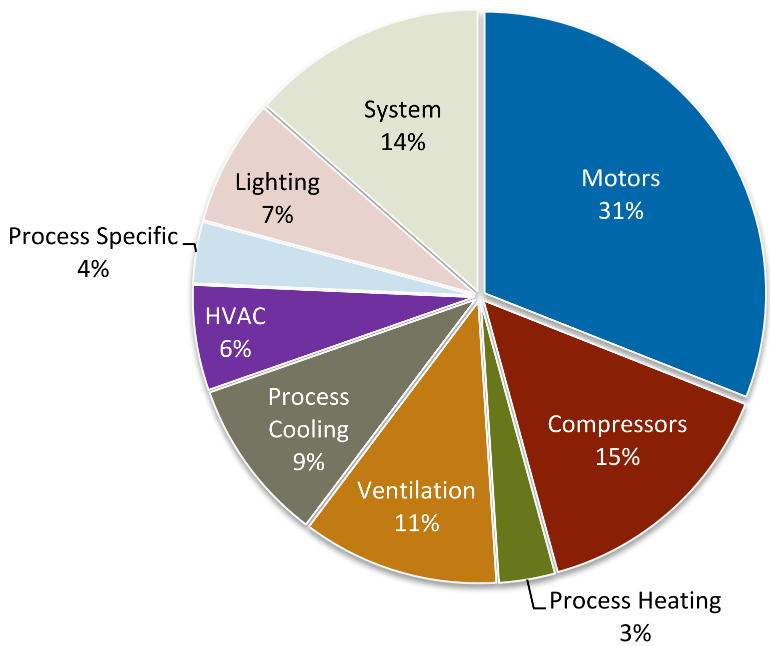


[45] ComEd provided ICF with commercial and industrial customer load by SIC and NAICS code. ICF summed load for industrial NAICS codes to develop an estimate of total industrial load. Industrial NAICS codes were identified as those where actual manufacturing takes place within facilities designated by that code. Some NAICS codes identified as "industrial" are in fact commercial in nature, such as warehouses or distribution centers. Load associated with these types of NAICS codes was included in commercial load totals.

5.2 Industrial Economic Potential

Figure 28 shows the distribution of industrial economic potential by end-use. Motors have the largest economic potential, followed by compressors and system upgrades. [46]

Figure 28. Distribution of Industrial Economic Potential, by End-use, 2013 (1,537 GWh, 25% of Industrial Load)



[46] "System" refers to measures that reduce energy consumption in an entire facility, whereas the other categories affect one end-use only. System measures include Sub-Metering and Interval Metering, and High Efficiency Dry-Type Transformers.

Unlike the commercial and residential sectors, industrial measures tend to be specific to applicable subsectors, therefore there are few single measures comprising large savings levels across industry. Savings associated with the 11 measures below comprise about two-thirds of industrial economic potential.

End-use	Measure Type
Compressors	Minimize operating air pressure
	Replace compressed air use with mechanical or electrical use
Lighting	High Efficiency Light fixtures
Motors	Premium Efficiency Control with ASDs
	Optimization of pumping system
	Impeller Trimming
Process Cooling	VSD on chiller compressor
System	Sub-Metering and Interval Metering
	HE Dry-Type Transformers
Ventilation	Premium efficiency ventilation control with VSD
	Ventilation Optimization

5.3 Industrial Achievable Potential

5.3.1 Summary

Whereas the commercial and residential sectors involve multiple program offerings, most industrial measures are custom in nature.[47] Therefore, it is more appropriate to discuss industrial achievable potential by end-use.

Industrial achievable potential is the sum of achievable potential estimated for each industrial measure in the analysis. Incremental and cumulative achievable potential estimates are shown in Figure 29, as well as load impacts. ICF estimates that, in the program achievable scenario, ComEd industrial programs could gain annual savings equal to 0.7% of industrial load per year in 2013, growing to 1.8% 2018. In the maximum scenario, forecasted load impacts increase 1.0% in 2013 and 0.7% in 2018. Estimated load impacts are higher in the program scenario for the industrial sector than for the residential and commercial sectors. This is in part due to historically lower ComEd program participation by industrial customers;[48] therefore, there are a larger number of opportunities in this sector, all else equal.

[47] Meaning that industrial measures are not included in the TRM because measure baseline and upgrade calculations are unique to each application.

[48] Due to the economic recession and other factors.

Figure 29. Industrial Achievable Potential, by Scenario and Year

	2013	2014	2015	2016	2017	2018
Cumulative Savings Forecast—GWh						
Maximum achievable potential	84	182	295	416	535	683
Program achievable potential	40	94	161	240	329	442
Cumulative Savings Forecast— % of industrial load						
Maximum achievable potential	1%	3%	5%	7%	9%	11%
Program achievable potential	1%	2%	3%	4%	5%	7%
Incremental Savings Forecast—GWh						
Maximum achievable potential	84	98	113	121	119	148
Program achievable potential	40	53	67	79	89	113
Incremental Savings Forecast— % of industrial load						
Maximum achievable potential	1.4%	1.6%	1.9%	2.0%	2.0%	2.5%
Program achievable potential	0.7%	0.9%	1.1%	1.3%	1.4%	1.8%
Program Costs (Millions, Real 2013$)						
Maximum achievable potential	$12	$14	$17	$19	$19	$24
Program achievable potential	$4	$5	$7	$8	$9	$11

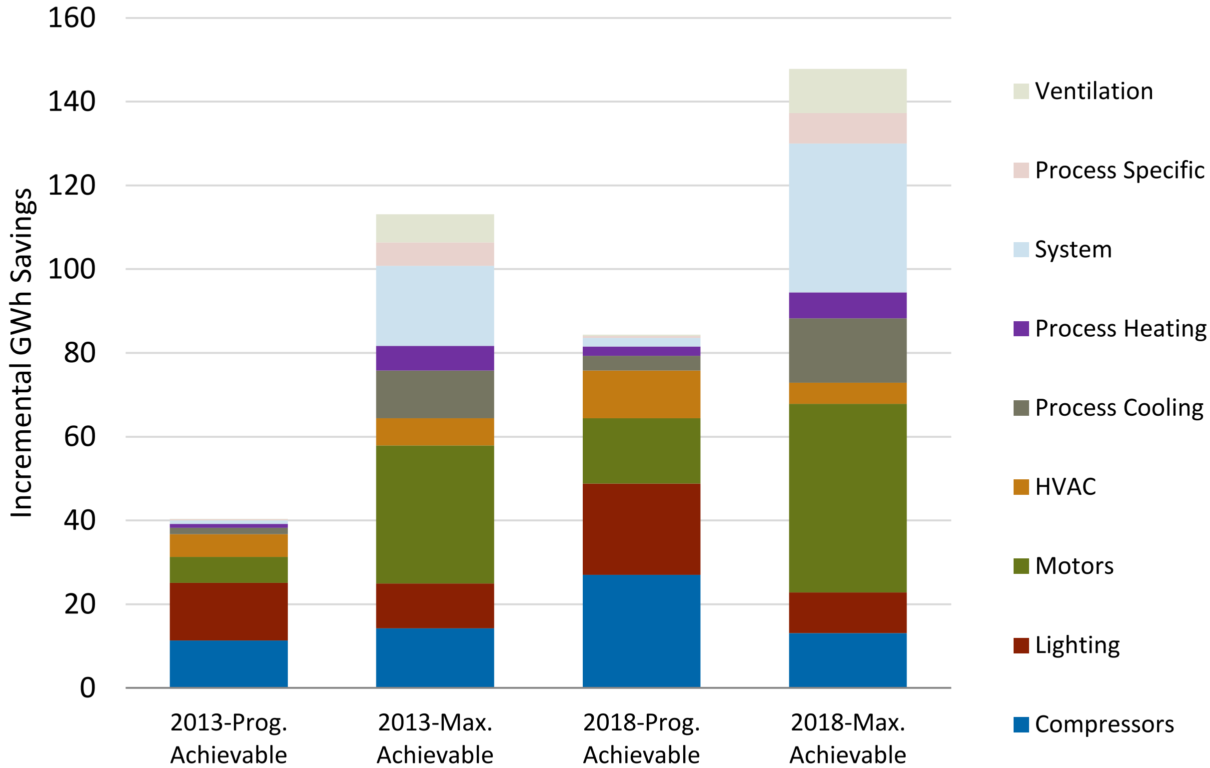
Estimated annual industrial savings in 2013 are approximately double program achievable savings in the maximum scenario. This is largely because incentives are 3.5 times higher in the maximum scenario. Motor and system measure savings show the highest increases in savings in the maximum scenario over the program scenario in 2013. In both cases the savings are approximately 150% higher.

Figure 30 shows total annual industrial savings estimates for the industrial sector and the distribution of savings by end-use for each achievable scenario in 2013 and 2018.

5.3.2 Savings in 2013

Estimated annual industrial savings in 2013 are approximately double program achievable savings in the maximum scenario. This is largely because incentives are 3.5 times higher in the maximum scenario. Motor and system measure savings show the highest increases in savings in the maximum scenario over the program scenario in 2013. In both cases the savings are approximately 150% higher.

Figure 30. Industrial GWh Savings by End-Use and Scenario, 2013 and 2018



Compressors, lighting, motors and HVAC account for 90% of the additional savings in the maximum scenario in 2013. Short-term savings potential can be found primarily in these end-uses due to the impact of existing ComEd programs, and to the relatively high acceptance of well-known opportunities within these end-uses. The following measures account for 65% of the maximum potential savings in 2013:

End-use	Measure
Compressors	Minimize operating air pressure
	Eliminate air leaks
	Premium efficiency air dryer for compressors
	Replace compressed air use with mechanical or electrical
HVAC	High-efficiency rooftop AC
Lighting	High efficiency light fixtures
	High efficiency ballasts for lighting
Motors	Impeller trimming or inlet guide vanes
	Preventative Motor Maintenance

5.3.3 Savings in 2018

Maximum scenario savings in 2018 are 31% greater than the program achievable scenario savings. It is evident in Figure 30 that there is less difference in program and maximum achievable savings in 2018 when compared to the savings differences between scenarios in 2013. This reflects the adoption curves that were agreed upon by participants in the industrial achievable potential workshops. For certain measure types it was assumed that with greater incentive levels measure adoption could grow exponentially. The nature of these exponential adoption curves for these measures would yield more savings in the earlier years of the analysis than in the later years.

Motor and system measures account for 55% of the additional savings in 2018 in the maximum scenario. Motors, system measures, and compressors account for two-thirds of the additional cumulative industrial savings in 2018. It is expected that motors and compressors account for such a large portion of the potential savings for the several reasons:

1. Motors and compressors consume 60% of the total electricity at industrial facilities, therefore they are obvious end-uses to consider for energy savings;
2. There are many commercially available, economically feasible efficiency opportunities that can be applied to these end-uses, and;
3. The current market penetration of these opportunities is relatively low (especially in the case of motors). Therefore, the eligible stock for these measures is large.

The following measures account for 50% of the maximum potential savings in 2018.

End-use	Measure
System	Sub-metering and interval metering
Compressors	Minimize operating air pressure
	Eliminate air leaks
Motors	Premium Efficiency Control with ASDs
	Impeller trimming or inlet guide vanes
Lighting	High efficiency ballasts for lighting
	High efficiency light fixtures
Process Cooling	VSD on chiller compressor
HVAC	High-efficiency rooftop AC

Sub-metering and interval metering is the single largest contributor to the cumulative 2018 maximum scenario savings potential, accounting for almost 13% of the total savings. The savings for this measure results from operational changes identified through data provided by sub-metering. To avoid double counting, sub-metering and interval metering savings does not include savings that could potentially be found if the sub-metered data leads to the implementation of other equipment measures already included in this study.

6 Conclusion

This study involved a detailed bottom-up analysis of energy efficiency potential in ComEd's territory covering the 2013 through 2018 timeframe and the residential, commercial and industrial sectors. ICF estimates that with the current budget cap ComEd can achieve annual savings equal to 1.0% of load per year. Without the budget cap, ICF estimates ComEd could achieve annual savings equal to 1.3% of load in 2013, growing to 2.4% of load in 2018. On a cumulative basis, ComEd could achieve an additional 4.3 TWh in savings by 2018 based on assumptions made in the maximum scenario.

On a cumulative basis, Residential Lighting, Home Energy Report, and Single Family Home Performance account for 83% of additional estimated savings[49] in the maximum achievable scenario in 2018. Lighting, Small Business, and Custom account for 88% of additional commercial savings in 2018 in the maximum achievable scenario. And, motors, system measures, and compressors account for two-thirds of the additional cumulative industrial savings in the maximum achievable scenario in 2018.

[49] Savings incremental to program scenario savings in 2018.

7 Appendices

Appendix A: Program level impacts and costs

Appendix B: Net-to-gross assumptions

Appendix C: Market penetration estimates

Appendix D: Residential measure assumptions

Appendix E: Commercial measure assumptions

Appendix F: Industrial measure assumptions

Appendix G: Adoption rate survey instruments blank page