



ComEd Review of PY7 Total Resource Cost Test Assumptions

Energy Efficiency / Demand Response Plan:
Plan Year 7 (PY7)
(6/1/2014-5/31/2015)

Presented to
Commonwealth Edison Company

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1. OVERVIEW

As part of Navigant's evaluation of Commonwealth Edison Company's (ComEd) energy efficiency programs for program year seven we developed the program input values and reviewed the outputs of DSMore, an excel based tool, that calculates program level cost effectiveness for various tests, including the Utility, Ratepayer Impact Measure (RIM), Participant, Total Resource Cost (TRC) and Societal tests. The focus of this review is on the basis and reasonableness of the assumptions used to conduct the Illinois TRC test, with the results of the Utility Cost Test (UCT) also reported.

The savings numbers and cost-benefit results included in this report are reflective of the Energy Efficiency Portfolio Standard (EEPS) portion of the ComEd energy efficiency programs, and are not inclusive of the Illinois Power Agency (IPA) portion. Additionally, for programs that are jointly implemented by ComEd and one or more Illinois gas utilities (including Nicor Gas, Peoples Gas, and/or North Shore Gas), only the electric portion of the program savings and cost-benefit calculations are included here. The combined joint calculations for these programs will be shared in a follow-up memo.

The Illinois TRC test is defined in the Illinois Power Agency Act (see 20 ILCS 3855/1-10) as follows:

'Total resource cost test' or 'TRC test' means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, as well as other quantifiable societal benefits, including avoided natural gas utility costs, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.¹

The Illinois TRC test differs from traditional TRC tests in its requirement to include a reasonable estimate of the financial costs associated with future regulations and legislation on the emissions of greenhouse gases (GHG). This difference adds an additional benefit to investments in efficiency programs that are typically included in the Societal Test in other jurisdictions. However, the Illinois TRC test differs from the Societal test in that it only includes benefits associated with avoided GHGs and the discount rate applied to future benefits is the electric utilities Weighted Average Cost of Capital (WACC), which is typically used in TRC calculations, as opposed to a societal discount rate. ComEd included avoided GHG costs in its TRC calculations.

1.1 Summary

Table 1-1 shows a summary of the PY7 TRC and UCT test values reported by ComEd. The values were calculated by ComEd using the DSMore tool. The table shows the results for all the EEPS programs in ComEd's PY7 portfolio.

Navigant observed some discrepancies in the DSMore outputs and made appropriate adjustments. The TRC value for Elementary Energy Education program was reduced from 17.49 to 2.17. This did not have a large impact on the overall EEPS portfolio TRC and it reduced slightly from 2.872 to 2.867. Additionally,

¹ See Section 1-10 Definitions of the Illinois Power Agency Act:
<http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=002038550K1-10>

Navigant reviewed the ComEd provided UCT values of all the programs and increased them by recalculating the UCT with the incentives versus the measure cost in the calculation for the EEPS portfolio UCT test value. Table 3-3 details the UCT test values proposed by Navigant for each program. A detailed discription of all the adjustments made to both the UCT and TRC test values can be found in Section 3.3.

Overall, the PY7 EEPS portfolio was cost-effective, with an aggregate TRC and UCT test value of 2.87 and 3.51 respectively.

Table 1-1 - Summary of ComEd Program PY7 TRC and IL UCT Test values

Program	Total Resource Cost Test (TRC)	IL Utility Cost Test (UCT)
Residential Energy Star Lighting *	19.84	3.83
Home Energy Assessment	1.08	0.45
Elementary Energy Education	2.17	2.28
Multifamily - Tenant Area	3.03	0.85
Home Energy Rebates	1.37	3.95
Residential Fridge and Freezer	3.15	3.19
Residential New Construction	0.71	3.67
Business Instant Lighting Discounts *	13.21	5.31
Business New Construction	1.55	3.09
Business Custom	3.40	5.03
Business Data Center	2.46	5.87
Industrial Systems	1.76	2.37
LED Streetlighting	1.68	0.66
Retro-Commissioning	1.89	1.90
Small Business Energy Saver	2.34	2.53
Business Standard	1.72	3.52
Aggregate EEPS Portfolio	2.87	3.51

* Both the Residential Lighting and Business Instant Lighting Discount Programs have extremely high TRCs due to including avoided incandescent replacement bulb costs and greater number of LEDs in the TRC (this is stated as a finding below).

1.2 IL TRC Equation

The equation used to calculate the Illinois TRC is presented below:

Equation 1 – Illinois TRC

$$BCR_{ILTRC} = B_{ILTRC} / C_{ILTRC}$$

Where,

- BCR_{ILTRC}** = Benefit-cost ratio of the Illinois total resource cost test
- B_{ILTRC}** = Present value of benefits of an Illinois program or portfolio
- C_{ILTRC}** = Present value of costs of an Illinois program or portfolio

The benefits of the Illinois TRC are calculated using the following equation:

Equation 2 – IL TRC Benefits

$$B_{ILTRC} = \sum_{t=1}^N \frac{UAEP_t + UATD_t + UAA_t + EB_t}{(1 + d)^{t-1}} + \sum_{t=1}^N \frac{UAC_{at} + PAC_{at}}{(1 + d)^{t-1}}$$

The costs of the Illinois TRC are calculated using the following equation:

Equation 3 - IL TRC Costs

$$C_{ILTRC} = \sum_{t=1}^N \frac{PNIC_t + IMCN_t + UIC_t}{(1 + d)^{t-1}} - RC$$

Where benefits are defined as:

- UAEPt = Utility avoided electric and capacity production costs in year t
- UATDt = Utility avoided transmission and distribution costs in year t
- UAAt = Utility avoided ancillary costs in year t
- EBt = Environmental Benefits in year t
- UACat = Utility avoided supply costs for the alternate fuel in year t
- PACat = Participant avoided costs in year t for alternate fuel devices

And costs are defined as:

- PNICt = Program Non-Incentive costs in year t
- IMCNt = Net Incremental costs in year t
- UICt = Utility increased supply costs in year t
- d = Utility weighted average cost of capital, used as discount rate
- RC = NPV of replacement costs of incandescent (or CFL) equivalents

The Illinois TRC test allows for utilities to account for the net present value (NPV) of the avoided cost of purchasing incandescent or CFL bulbs that accrues to program participants because of the significantly longer lifetimes of efficient CFLs and LED light bulbs. In general, the avoided cost per bulb is determined by comparing the estimated useful life of efficient and baseline bulbs to determine the number of baseline bulb purchases that are avoided. Based on the average purchase price of baseline bulbs, an NPV is determined by discounting the value of these avoided purchases over the course of the lifetime of the efficient bulb. The Illinois TRM provides deemed NPV values per bulb based on efficient bulb-type, socket type (commercial or residential), and lumen range. These benefits were included in the program calculations provided below.

1.3 UCT Equation

The results of the Utility Cost Test are also presented in Section 2 of this report. The UCT approaches cost effectiveness from the perspective of the utility, in this case ComEd. It determines whether the energy supply and capacity costs avoided by the utility exceed the overhead and cost outlays that the utility incurred to implement energy efficiency programs. The structure of the calculation is similar to the IL TRC with a few key changes. Since the UCT is primarily focused on utility outlays, incentives paid by the utility to either participants or third-party implementers are included in the calculation in place of

incremental or participant costs. Additionally, since non-energy benefits accrue to society rather than to the utility implementing energy efficiency programs, these benefits are not included in the UCT formula.

Using the equation terms previously defined for the IL TRC equation, the UCT equation is defined as:

Equation 4 – UCT

$$BCR_{UCT} = B_{UCT} / C_{UCT}$$

Where,

- BCR_{UCT}** = Benefit-cost ratio of the Utility Cost Test
- B_{UCT}** = Present value of benefits to a utility of a program or portfolio
- C_{UCT}** = Present value of costs to a utility of a program or portfolio

The benefits of the UCT are calculated using the following equation:

Equation 5 – UCT Benefits

$$B_{UCT} = \sum_{t=1}^N \frac{UAEP_t + UATD_t + UAA_t}{(1 + d)^{t-1}} + \sum_{t=1}^N \frac{UAC_{at}}{(1 + d)^{t-1}}$$

The costs of the UCT are calculated using the following equation:

Equation 6 - UCT Costs

$$C_{UCT} = \sum_{t=1}^N \frac{PNIC_t + UIC_t + PIN_t}{(1 + d)^{t-1}}$$

Where the new term, *PIN_t*, is defined as the program incentives provided by the utility in year t.

1.4 Cost-Effectiveness Data Requirements

The data points needed to conduct the Illinois TRC test are provided in Table 1-1 below and are divided into generic and program specific categories. The program specific data points are further subdivided into those that are provided by ComEd versus those that are a result of the Navigant’s evaluation activities.

Table 1-2 - Data points needed to conduct EEPS TRC

Category	Data Point	Source
Generic	• Avoided Energy Costs (\$/kWh)	ComEd
	• Avoided Capacity Costs (\$/kW)	
	• Avoided T&D Electric (\$/kWh)	
	• Avoided Gas Production (\$/Therm)	
	• Discount Rate	
	• Escalation Rates	
	• Environmental Damages (GHG Adders)	
Program Specific	• Participants / Measure Count	Navigant
	• Verified Ex-Post Energy and Demand Savings	
	• Realization Rate	
	• Net to Gross Ratio	
	• Measure life	

Category	Data Point	Source
	<ul style="list-style-type: none"> • Non-Incentive Costs • Utility Incentive Costs • Incremental Measure Costs • Load Shapes 	ComEd

Source: Navigant analysis

This document provides a summary of the results for the total ComEd EEPS and at the program level, the program specific inputs and range of assumptions, a description of each of the data points, the basis of their determination and their reasonableness.

2. SUMMARY OF RESULTS & GENERIC DATA POINTS

A summary of the ComEd EEPS results, separated by benefits and cost components, is presented in Table 2-1 and Figure 2-1 below. The DSMore output provided by ComEd included both the IL TRC and UCT test values. Navigant made small adjustments to the DSMore outputs provided by ComEd. The reasons for the adjustments are highlighted in Section 3.3

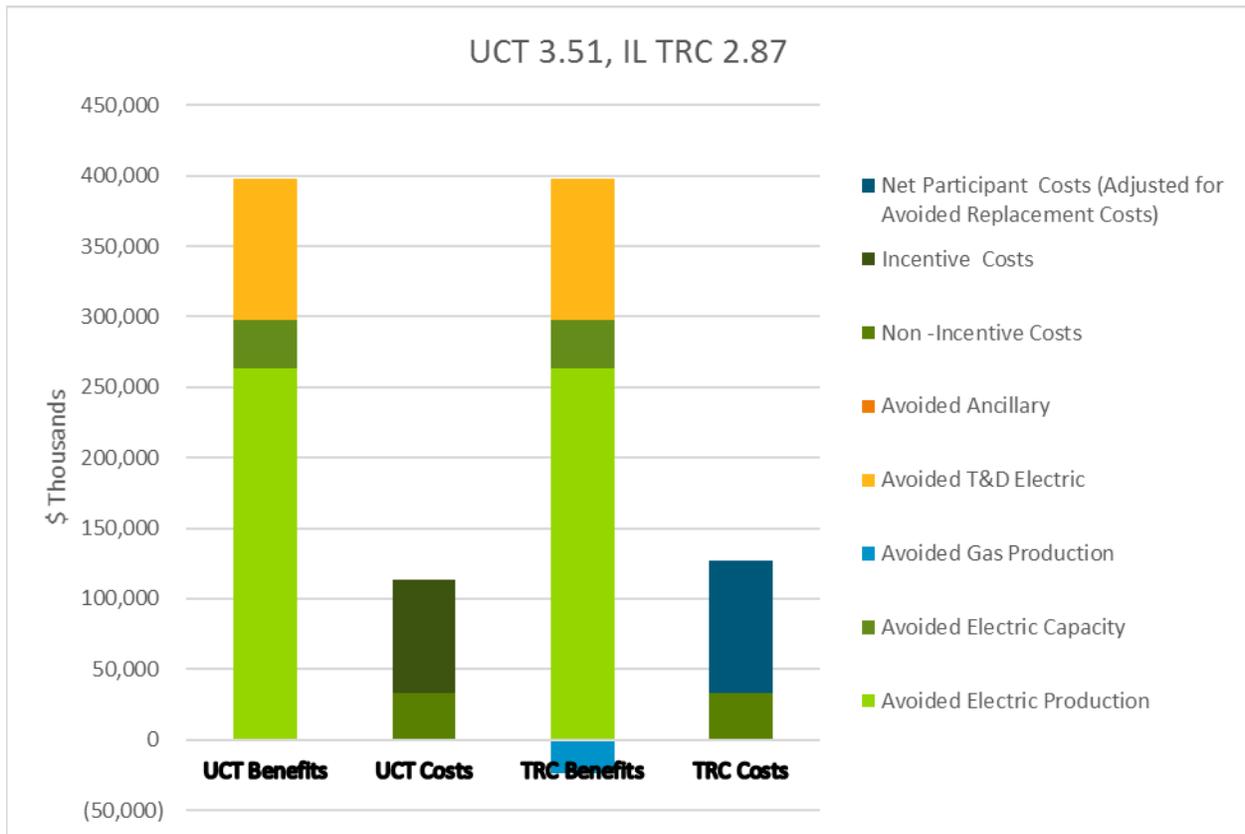
The calculations show the EEPS total to be cost effective under all scenarios.

Table 2-1 – Summary of ComEd EEPS Costs and Benefits (\$ in 000’s)

	UCT Test		IL TRC Test	
	UCT Benefits	UCT Costs	IL TRC Benefits	IL TRC Costs
Avoided Electric Production	263,254		263,254	
Avoided Electric Capacity	34,851		34,851	
Avoided Gas Production			(23,822)	
Avoided T&D Electric	99,348		99,348	
Avoided Ancillary	0		0	
Non -Incentive Costs		33,371		33,371
Incentive Costs		79,930		
Net Participant Costs (Adjusted for Avoided Replacement Costs)				96,918
Present Value Totals	397,453	113,301	373,631	130,289
Ratio		3.51		2.87

Source: Navigant and ComEd analysis

Figure 2-1 – Summary of ComEd EEPS Benefits and Costs



Source: Navigant analysis

As shown in Figure 2-1, the majority of the benefits in the UCT and TRC tests are derived from avoided electric production. The value of avoided electric capacity and T&D also contribute to overall EEPS benefits.

On the cost side, net participant costs represent the largest component followed by the non-incentive costs of program implementation, such as administration and marketing. For the UCT, the sum of all incentives provided is used in place of net participant costs. The net participant costs are also adjusted for the avoided incandescent replacement costs. The sum of all incentives is less than the sum of all net incremental costs. Therefore, the EEPS UCT test ratio of 3.51 exceeds the EEPS IL TRC ratio of 2.87.

2.1 Generic Data Points

Table 1-1 shows the generic data point used for doing the cost-benefit calculations. The following section includes the definitions of each generic data point and their sources.

2.2 Avoided Electric Production Costs (\$/MWh)

Avoided electric production costs are those associated with purchasing energy from PJM. As per ComEd, avoided energy costs are based on NYMEX “ATC” for NI-Hub for the first 3 years. ComEd does not typically use a single value for avoided electric production costs. The DSMore model calculates electric production costs under a wide variety of scenarios. The value included above is a weighted average of the probability of each scenario occurring.

2.3 Avoided Electric Capacity Costs (\$/kW-year)

Avoided electric capacity costs are those associated with the construction of additional electricity generation facilities to meet peak demand. Incremental reductions in the amount of electricity demand during peak hours can delay or eliminate the need to build additional generation. ComEd is a participant in the Reliability Pricing Model (“RPM”), which is PJM’s forward capacity market. The DSMore model uses actual RPM clearing prices for avoided demand costs through the 2014 program year (EPY7).

2.4 Avoided T&D Electric (\$/kW)

Avoided transmission and distribution (T&D) costs are a benefit associated with not needing to build transmission and distribution infrastructure to meet demand at peak times.

2.5 Avoided Ancillary (\$/kW)

Avoided Ancillary is a benefit associated with avoided costs attributable to the Open Access Transmission Tariff (OATT) that utilities participating in the PJM market are required to pay based on demand.

2.6 Non-Incentive Costs

Non-incentive costs are program administrator costs (related to energy efficiency) that are not otherwise classified as financial incentives paid to customers or incentives paid to third parties. In other words, non-incentive costs are equal to all program administrator costs minus incentives.

Examples of non-incentive costs include:

- Costs for overhead, labor and materials required to develop, deliver, and administer functions related to the implementation of energy efficiency programs or portfolio. This can include such things as rebate processing, measurement and verification, quality assurance, advertising and marketing, or customer relations, among others.
- Program administrator payment to a third party whose principal purpose is not to reduce the cost of the efficient measure to the customer.
- Program administrator payment to a third party to cover the cost of services that are principally intended to be a form of marketing, as opposed to being truly necessary for any customer implementation of efficient measures, should be classified as non-incentive costs.

2.7 Incentives

Incentives² include financial incentives paid to customers plus incentives paid to third parties. Financial incentives paid to customers means payment³ made by a program administrator directly to an end-use customer to encourage the customer to participate in an efficiency program and offset some or all of the customer's costs to purchase and install a qualifying efficient measure, ultimately resulting in a reduction in the net price paid by the customer for the efficient measure. This rebate type of incentive is often referred to as a downstream incentive which has the result that the net price to the customer of an energy efficiency program-sponsored measure is reduced by the amount of the incentive.

Incentives paid to third parties means payment made by a program administrator to a third party that is principally intended to reduce the net price to the customer of purchasing and installing a qualifying efficient measure. Incentives paid to third parties include payments made by a program administrator to trade allies, manufacturers, wholesalers, distributors, contractors, builders, retailers, implementation contractors, or other non-customer stakeholders that are principally intended to defray the incremental cost to the customer of purchasing and installing an efficient measure. Incentives paid to third parties also includes payment made by a program administrator to an implementation contractor to cover the full cost of direct installation measures (materials and labor), for the portion not covered by the customer, or the full cost of study-based services that are truly necessary for a customer to implement efficient measures, as opposed to being principally intended to be a form of marketing.

2.8 Incremental Costs

Incremental costs mean the difference between the cost of the efficient measure and the cost of the most relevant baseline measure that would have been installed (if any) in the absence of the efficiency Program. Installation costs (material and labor) and Operations and Maintenance (O&M) costs shall be included if there is a difference between the efficient measure and the baseline measure. In cases where the efficient measure has a significantly shorter or longer life than the relevant baseline measure (e.g., LEDs versus halogens), the avoided baseline replacement measure costs should be accounted for in the TRC analysis. The incremental cost input in the TRC analysis is not reduced by the amount of any incentives.

Examples of incremental cost calculations include:

- The incremental cost for an efficient measure that is installed in new construction or is being purchased at the time of natural installation, investment, or replacement is the additional cost incurred to purchase an efficient measure over and above the cost of the baseline/standard (i.e., less efficient) measure (including any incremental installation, replacement, or O&M costs if there is a difference between the efficient measure and baseline measure).
- For a retrofit measure where the efficiency program caused the customer to update their existing equipment, facility, or processes, where the customer would not have otherwise made a

² The Illinois TRC test requires that "all incremental costs of end use measures (including both utility and participant contributions)" should be reflected as costs in the TRC test calculation. As long as we ensure that "all incremental costs of end-use measures" is included in the TRC test calculation, there is no need to add Program Administrator Contribution costs (i.e., Incentives) and Participant Contribution costs as separate components to the TRC test. However, Program Administrator Contribution costs (i.e., Incentives) are needed for purposes of calculating the Program Administrator Cost Test/Utility Cost Test (PACT/UCT) since those are a component of the Program Administrator expenses. Most TRC modeling software requires users to input the Incentives as a separate input in addition to providing all Incremental Costs such that the PACT/UCT can be calculated; for this reason, the separate Incentives input in the TRC model is not "used" when calculating the TRC test because these costs are already reflected in the Incremental Cost input, and if the model were to use both the Incentives input and the Incremental Cost input, it would result in double counting of costs in the TRC analysis.

³ Payments include non-Measure items of value that would be treated as transfer payments, e.g. gift cards.

purchase, the appropriate baseline is zero expenditure, and the incremental cost is the full cost of the new retrofit measure (including installation costs).

- For the early replacement of a functioning measure with a new efficient measure, where the customer would not have otherwise made a purchase for a number of years, the appropriate baseline is a dual baseline that begins as the existing measure and shifts to the new standard measure after the expected remaining useful life of the existing measure ends. Thus, the incremental cost is the full cost of the new efficient measure (including installation costs) being purchased to replace a still-functioning measure less the present value of the assumed deferred replacement cost of replacing the existing measure with a new baseline measure at the end of the existing measure's life.
- For study-based services that are truly necessary for a customer to implement efficient measures, as opposed to being principally intended to be a form of marketing, the incremental cost is the full cost of the study-based service.
- For the early retirement of duplicative functioning equipment before its expected life is over (e.g., appliance recycling programs), the incremental costs are composed of the customer's value placed on their lost amenity, any customer transaction costs, and the pickup and recycling cost. The incremental costs include the actual cost of the pickup and recycling of the equipment because this is assumed to be the cost of recycling the equipment that would have been incurred by the customer if the customer were to recycle the equipment on their own in the absence of the efficiency program. The payment a program administrator makes to the customer serves as a proxy for the value the customer places on their lost amenity and any customer transaction costs.

2.9 Discount Rate

The discount rate is an important determinant of overall cost effectiveness. The avoided electric production, capacity T&D, and ancillary benefits accrue over the life of the measures included in each program. These benefits are discounted to determine the present value of the cumulative benefits. The discount rate should reflect ComEd's weighted average cost of capital (WACC).

2.10 Line Losses

Line losses are important to incorporate in the calculation of total benefits. The energy and demand savings included in the evaluations are estimated at the customer or meter level. The savings that accrue to ComEd rate payers are those at the generator level and therefore the estimated savings are increased by the line losses within ComEd's transmission and distribution network.

The line losses of 11.02 percent are based on ComEd's internal analysis. These line losses are in the higher end of the range that Navigant has seen, but are reasonable.

2.11 Miscellaneous EEPS Portfolio Costs

In addition to costs allocated directly to energy efficiency programs, portfolio level costs not directly incurred by specific programs are also included. These costs may include administrative, research and development, outreach, advertising, evaluation, measurement, and verification, legal, and other expenses. Since statutory costs effectiveness is measured at the portfolio level, ComEd does not allocate these costs to individual programs.

2.12 Gas Interactive Effects

Gas interactive effects is an issue to be assessed going forward – Navigant does not have the detail for this TRC assumptions review to incorporate gas interactive effects. To be included in future TRC reviews, gas interactive effects should be addressed during the program year evaluations and should be incorporated in individual program reports going forward, as needed.

3. PROGRAM SPECIFIC DATA

A summary of the components of the cost effectiveness calculations for each program are shown in Table 3-1 for the TRC calculations and Table 3-2 for the Utility Cost Test calculations. The tables include the value of each benefit and cost component for each program, as well as EEPS totals for each component. The cost-benefit results included in these tables are reflective of only the Energy Efficiency Portfolio Standard (EEPS) portion of the ComEd energy efficiency programs, and are not inclusive of the Illinois Power Agency (IPA) portion. Additionally, for programs that are jointly implemented by ComEd and one or more Illinois gas utility, only the electric portion of the program savings and cost-benefit calculations are included here.

Table 3-1 - Summary of Program Level Benefits, Costs (\$ in 000's) and IL TRC Test – ComEd EEPS Specific w/o Gas Data from Joint Programs

Program	Benefits				Costs			IL Total Resource Cost (TRC) Test			
	Avoided Electric Production	Avoided Electric Capacity	Avoided T&D Electric	Avoided Gas Production	Non-Incentive Costs	Incentive Costs	Incremental Costs (Net)	IL TRC Benefits	IL TRC Costs	IL TRC Test Net Benefits	IL TRC Test
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) = (b+c+d+e)	(j) = (f+h)	(k) = (i-j)	(l) = (i/j)
Residential Energy Star Lighting	\$54,157,802	\$6,410,806	\$17,531,011	-\$13,596,122	\$3,390,175	\$16,983,936	-\$139,673	\$64,503,496	\$3,250,502	\$61,252,994	19.84*
Home Energy Assessment	\$866,050	\$91,410	\$250,605	-\$128,670	\$1,757,633	\$933,281	-\$755,208	\$1,079,395	\$1,002,425	\$76,970	1.08
Elementary Energy Education	\$375,570	\$38,681	\$107,696	-\$27,129	\$28,288	\$200,137	\$152,104	\$494,819	\$180,392	\$314,427	2.74
Multifamily - Tenant Area	\$822,981	\$98,559	\$271,609	-\$181,424	\$853,466	\$557,273	-\$519,112	\$1,011,725	\$334,353	\$677,372	3.03
Home Energy Rebates	\$2,534,997	\$2,138,721	\$6,342,200	\$0	\$476,430	\$2,311,556	\$7,550,361	\$11,015,918	\$8,026,791	\$2,989,127	1.37
Residential Fridge and Freezer	\$7,481,135	\$864,639	\$2,518,498	\$0	\$1,979,368	\$1,424,255	\$1,473,476	\$10,864,273	\$3,452,844	\$7,411,428	3.15
Residential New Construction	\$298,473	\$147,621	\$435,873	\$0	\$91,909	\$148,291	\$1,157,248	\$881,967	\$1,249,158	-\$367,191	0.71
Business Instant Lighting Discounts	\$47,767,324	\$9,158,762	\$25,839,747	-\$5,452,713	\$3,874,677	\$11,725,776	\$1,976,863	\$77,313,120	\$5,851,541	\$71,461,579	13.21*
Business New Construction	\$11,284,847	\$1,455,642	\$4,239,954	\$0	\$2,334,400	\$3,167,410	\$8,598,684	\$16,980,442	\$10,933,084	\$6,047,358	1.55
Business Custom	\$13,090,019	\$1,751,491	\$5,113,492	\$0	\$1,142,155	\$2,824,731	\$4,725,841	\$19,955,002	\$5,867,996	\$14,087,006	3.40
Business Data Center	\$5,406,594	\$321,645	\$953,958	\$0	\$1,138,942	\$0	\$1,580,752	\$6,682,198	\$2,719,694	\$3,962,504	2.46
Industrial Systems	\$6,050,236	\$472,331	\$1,357,988	\$0	\$1,295,448	\$2,029,517	\$3,171,294	\$7,880,555	\$4,466,741	\$3,413,814	1.76
LED Streetlighting	\$141,209	\$27,858	\$81,260	\$0	\$0†	\$379,802	\$149,389	\$250,328	\$149,389	\$100,939	1.68
Retro-Commissioning	\$6,715,433	\$385,799	\$1,032,240	\$0	\$1,817,415	\$2,462,991	\$2,482,904	\$8,133,471	\$4,300,319	\$3,833,152	1.89
Small Business Energy Saver	\$28,606,557	\$4,322,982	\$12,562,477	-\$1,917,506	\$3,446,675	\$14,517,549	\$15,150,314	\$43,574,511	\$18,596,989	\$24,977,522	2.34
Business Standard	\$77,654,307	\$7,164,320	\$20,709,611	-\$2,517,975	\$9,743,825	\$20,263,333	\$50,114,782	\$103,010,263	\$59,858,607	\$43,151,657	1.72
Aggregate EEPS Portfolio	\$263,253,534	\$34,851,268	\$99,348,221	-\$23,821,540	\$33,370,806	\$79,929,838	\$96,717,915	\$373,631,482	\$130,088,722	\$243,542,761	2.87

* The reasons for relatively higher TRC values compared to PY6 are highlighted in Finding 2 of Section 3.3. Note, the PY6 Carryover for this program is also included in this table.

† Was a pilot program in PY7 and the non-incentives costs were very small (a few dollars), which were probably buried in the R&D expenses.

Note: The cost-benefit results included here are reflective of only the EEPS portion of the ComEd portfolio and are not inclusive of the Illinois Power Agency (IPA) portion.

Source: Navigant analysis

Table 3-2. Summary of Program Level Benefits, Costs (\$ in 000's) and Utility Cost Test (UCT) – ComEd EEPS Specific w/o Joint Program Gas Data

Program	Benefits				Costs			IL Utility Cost Test (UCT)			
	Avoided Electric Production	Avoided Electric Capacity	Avoided T&D Electric	Avoided Gas Production	Non-Incentive Costs	Incentive Costs	Incremental Costs (Net)	IL UCT Benefits	IL UCT Costs	IL UCT Test Net Benefits	IL UCT Test
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i) = (b+c+d)	(j) = (f+g)	(k) = (i-j)	(l) = (i/j)
Residential Energy Star Lighting*	\$54,157,802	\$6,410,806	\$17,531,011	-\$13,596,122	\$3,390,175	\$16,983,936	-\$139,673	\$78,099,618	\$20,374,111	\$57,725,507	3.83
Home Energy Assessment	\$866,050	\$91,410	\$250,605	-\$128,670	\$1,757,633	\$933,281	-\$755,208	\$1,208,065	\$2,690,914	-\$1,482,849	0.45
Elementary Energy Education	\$375,570	\$38,681	\$107,696	-\$27,129	\$28,288	\$200,137	\$152,104	\$521,948	\$228,425	\$293,523	2.28
Multifamily - Tenant Area	\$822,981	\$98,559	\$271,609	-\$181,424	\$853,466	\$557,273	-\$519,112	\$1,193,149	\$1,410,739	-\$217,590	0.85
Home Energy Rebates	\$2,534,997	\$2,138,721	\$6,342,200	\$0	\$476,430	\$2,311,556	\$7,550,361	\$11,015,918	\$2,787,986	\$8,227,932	3.95
Residential Fridge and Freezer	\$7,481,135	\$864,639	\$2,518,498	\$0	\$1,979,368	\$1,424,255	\$1,473,476	\$10,864,273	\$3,403,623	\$7,460,650	3.19
Residential New Construction	\$298,473	\$147,621	\$435,873	\$0	\$91,909	\$148,291	\$1,157,248	\$881,967	\$240,200	\$641,766	3.67
Business Instant Lighting Discounts*	\$47,767,324	\$9,158,762	\$25,839,747	-\$5,452,713	\$3,874,677	\$11,725,776	\$1,976,863	\$82,765,833	\$15,600,454	\$67,165,379	5.31
Business New Construction	\$11,284,847	\$1,455,642	\$4,239,954	\$0	\$2,334,400	\$3,167,410	\$8,598,684	\$16,980,442	\$5,501,810	\$11,478,632	3.09
Business Custom	\$13,090,019	\$1,751,491	\$5,113,492	\$0	\$1,142,155	\$2,824,731	\$4,725,841	\$19,955,002	\$3,966,886	\$15,988,117	5.03
Business Data Center	\$5,406,594	\$321,645	\$953,958	\$0	\$1,138,942	\$0	\$1,580,752	\$6,682,198	\$1,138,942	\$5,543,256	5.87
Industrial Systems	\$6,050,236	\$472,331	\$1,357,988	\$0	\$1,295,448	\$2,029,517	\$3,171,294	\$7,880,555	\$3,324,964	\$4,555,591	2.37
LED Streetlighting	\$141,209	\$27,858	\$81,260	\$0	\$0	\$379,802	\$149,389	\$250,328	\$379,802	-\$129,474	0.66
Retro-Commissioning	\$6,715,433	\$385,799	\$1,032,240	\$0	\$1,817,415	\$2,462,991	\$2,482,904	\$8,133,471	\$4,280,406	\$3,853,066	1.90
Small Business Energy Saver	\$28,606,557	\$4,322,982	\$12,562,477	-\$1,917,506	\$3,446,675	\$14,517,549	\$15,150,314	\$45,492,017	\$17,964,224	\$27,527,793	2.53
Business Standard	\$77,654,307	\$7,164,320	\$20,709,611	-\$2,517,975	\$9,743,825	\$20,263,333	\$50,114,782	\$105,528,239	\$30,007,158	\$75,521,080	3.52
Aggregate EEPS Portfolio	\$263,253,534	\$34,851,268	\$99,348,221	-\$23,821,540	\$33,370,806	\$79,929,838	\$96,918,052	\$397,453,023	\$113,300,645	\$284,152,378	3.51

* UCT values in this table also include the PY6 Carryover Benefits for this program.

Note: The cost-benefit results included here are reflective of only the EEPS portion of the ComEd portfolio and are not inclusive of the Illinois Power Agency (IPA) portion.

Source: Navigant analysis

3.1 Program specific data collection

The program specific data collection for each measure in ComEd's PY7 portfolio is described below:

- Navigant leveraged the program tracking data and evaluation reports to compile measure level savings, quantity and realization rate values.
- IL TRM v 3.0 was used to compile measure life and incremental cost data.
- The utility incentives costs, non-incentive costs and actual measure costs were requested from ComEd.
- A cost assumption review was performed on all the cost data.

3.2 PY7 Cost assumption review

3.2.1 Incremental Measure Cost

There were instances where the program tracking data and the look up value from the reference sources may not be aligned or potential misinterpretation of the program unit definition. In retrofit-type measures, this cost is the full measure cost and not incremental installation costs (material and labor). Operations and Maintenance (O&M) costs shall be included if there is a difference between the efficient measure and the baseline measure. In cases where the efficient measure has a significantly shorter or longer life than the relevant baseline measure (e.g., LEDs versus halogens), the avoided baseline replacement measure costs should be accounted for in the TRC analysis. The incremental cost input in the TRC analysis is not reduced by the amount of any incentives. Here are specific considerations highlighted in our analysis:

- Residential New Construction – Navigant used data analyzed by ComEd and Nicor Gas to calculate the incremental cost per the different qualifying tiers of efficiency.
- Business New Construction – The program implementer analyzed project costs of construction meeting code versus exceeding code to calculate a \$/kWh and a \$/therm saved cost.
- Retrocommissioning – Both the study and measure implementation costs are included.
- Data Centers, Custom & Industrial System Optimization – The costs on a project level must be analyzed to determine if the full measure cost or an incremental cost is to be used. An accurate analysis is difficult and an estimated cost per kWh saved (tied to avoided cost) is typically used in relation to the average project payback to remain cost effective. In PY7, Navigant used the reported project costs provided by ComEd.
- Prescriptive programs (SBES, Standard, CSR, MF, etc.) – Navigant researched the incremental measure cost data from the TRM and the DNV GL workpapers to calculate the program measure costs. This data is supported by notes provided in the input assumptions workbook. For any direct install programs, ComEd provided the measure costs by measure. For joint programs, only the ComEd portion of the costs were included.
- Early retirement (Home Energy Rebates) – There were air conditioners installed that assumed to accelerate replacement and hence savings were calculated as the full measure cost difference versus incremental costs compared to standard efficiency baseline costs. The TRM provides data for using the NPV cost differential for early retirement with guidance to use actual program data for early retirement first year costs. Actual program data was used.
- LED Street Lighting – Navigant used the incremental cost data provided by ComEd, which included the incremental cost difference between the existing fixture and new fixture along with the cost of removing the old fixture and the remaining book value of the old fixture.

3.3 Findings and Recommendations

Navigant performed a top down review of the DSMore outputs provided by ComEd and found some discrepancies.

Finding 1. The DSMore calculation for the Elementary Energy Education (EEE) program doesn't include the measure cost when determining the total cost incurred by the program, leading to a very high TRC value of 17.49. In PY6, the TRC for EEE was equal to 2.14, which is very different from the PY7 value and indicates that certain costs were not included. Since this is a kit program and all the measure costs are covered by the incentives, the correct "Total Costs" values for the program should be the sum of the Administration Cost (\$28,288) and the Incentive Costs (\$200,137) which is \$228,425 instead of the \$28,288 used. Navigant calculated a TRC using high-level estimates and the benefits calculated by ComEd and that produces a TRC = 2.17. Navigant believes this is an appropriate PY7 value.

Recommendation 1. This program clearly has a positive TRC – EEE has always had a positive TRC and the program costs and benefits for PY7 haven't changed dramatically. Rather than correct the PY7 EEE TRC, ComEd should note this issue for PY8 and ensure that the proper approach is used to calculate the EEE TRC for PY8. The "Total Costs" values for the program should be used and the TRC value should be closer to a final TRC of 2.17, rather than 17.49

Finding 2. The TRC values for the Business Instant Lighting Discounts (BILD) and the Residential Energy Star Lighting (Res Lighting) program are higher than the corresponding PY6 values, 13.21 and 19.84 respectively in PY7 compared to 1.95 and 7.27 respectively in PY6. Following are the reason for the higher TRC values:

- Both the Residential Lighting and Business Instant Lighting Discount Programs have very high TRCs due to including avoided incandescent replacement bulb costs and greater number of LEDs in the TRC for PY7.
- A larger number of LEDs were installed as part of the program in PY7. This led to higher avoided incandescent replacement costs as LEDs have higher effective useful lives than CFLs.

Finding 3. The TRC values for BILD and Res Lighting program in Table 3-1 do not match the corresponding DSMore outputs provided by ComEd, 13.21 and 19.84 respectively in Table 3-1 compared to 12.48 and 16.45 respectively in the DSMore outputs. This is because the values in Table 3-1 also includes the benefits from PY6 carryover lamps.

Finding 4. The IL UCT values for BILD and Res Lighting program in Table 3-2 do not match the corresponding DSMore outputs provided by ComEd, 4.40 and 3.19 respectively in Table 3-2 compared to 4.15 and 2.64 respectively in the DSMore outputs. This is because the values in Table 3-2 also includes the benefits from PY6 carryover lamps.

Finding 5. The cost allocation values used in the DSMore calculations for the following joint programs were verified to match ComEd's share of the values provided earlier to Navigant for analysis:

- Residential New Construction
- Business New Construction
- C&I Retrocommissioning
- Elementary Energy Education
- Home Energy Assessment
- Multifamily - Tenant Area

Finding 6. Given that Navigant in PY7 developed the underlying costs for the DSMore calculations, it makes sense now for the PY8 TRC analysis for Navigant to develop the

underlying costs with ComEd and the ICC's input as well as create and complete the TRC outputs.

Recommendation 2. Navigant should undertake developing the PY8 underlying costs and calculate and complete the TRC outputs for PY8 and going forward.

Finding 7. Various incentive and non-incentive costs were provided to Navigant as zero costs which does not appear to be correct and should be corrected for the PY8 analysis.

Recommendation 3. For the PY8 TRC analysis, ComEd should provide all incentive and non-incentive costs for each program to Navigant for their analysis.