



ComEd Review of PY8 Total Resource Cost Test Assumptions

Energy Efficiency / Demand Response Plan:
Plan Year 8 (PY8)
(6/1/2015-5/31/2016)

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 eight we developed the program input values and calculated program level cost effectiveness for various tests, including the Utility, Total Resource Cost (TRC) and IL TRC tests using a Navigant developed spreadsheet tool. 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 PY8 TRC and UCT test values reported by ComEd. The values were calculated by Navigant using a spreadsheet tool. The table shows the results for all the EEPS programs in ComEd's PY8 portfolio.

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

In doing the work, Navigant observed that the approach for the IL TRC based on the energy efficiency policy manual.² resulted in negative TRC values. As a result, the policy manual will undergo a revision accordingly and the TRCs presented here is based on the draft revision provided in the appendix.

Overall, the PY8 EEPS portfolio was cost-effective, with an aggregate TRC and UCT test value of 2.55 and 3.28 respectively.

Table 1-1 - Summary of ComEd Program PY8 TRC and UCT Test values

Program	TRC Test	UCT Test
Appliance Rebates	1.05	0.63
Elementary Energy Education	3.04	2.50
Home Energy Assessments	0.45	0.37
HVAC and Weatherization	1.33	1.66
Meter Genius Pilot	0.00	0.00
Multifamily - Tenant Area	3.01	3.73
Res ES Lighting (Carryover)	n/a	n/a
Res Fridge and Freezer	1.07	1.03
Residential New Construction	0.66	3.79
Residential Total	2.77	2.96
AirCare Plus	1.64	1.07
Business Instant Lighting Discount	2.46	6.60
Business Instant Lighting Discount (Carryover)	n/a	n/a
Business New Construction	2.08	5.38
Business Custom	1.14	4.64
Data Centers	0.91	3.02
Energy Analyzer	4.09	4.09
Industrial Systems	2.78	2.38
Retro-Commissioning	1.17	1.20
Strategic Energy Management Pilot	0.92	0.92
Business Standard	3.24	2.07
C&I Total	2.50	3.41
EEPS Total:	2.55	3.28

Source: Navigant analysis

1.2 IL TRC Equation

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

²

http://ilsagfiles.org/SAG_files/Subcommittees/IL_EE_Policy_Manual_Subcommittee/2017_Revision/IL_EE_Policy_Manual_Version_1.1_5-5-17_FINAL.pdf (p. 25 section 8.4)

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

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

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:

- UAEP_t = Utility avoided electric and capacity production costs in year t
- UATD_t = Utility avoided transmission and distribution costs in year t
- UAA_t = Utility avoided ancillary costs in year t
- EB_t = Environmental Benefits in year t
- UAC_{at} = Utility avoided supply costs for the alternate fuel in year t
- PAC_{at} = Participant avoided costs in year t for alternate fuel devices
- RC = NPV of replacement costs of incandescent (or CFL) equivalents

And costs are defined as:

- PNIC_t = Program Non-Incentive costs in year t
- IMCN_t = Net Incremental costs in year t
- UIC_t = Utility increased supply costs in year t

And:

- d = Utility weighted average cost of capital, used as discount rate

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) ³	
	• Avoided Water Costs (\$/gallon)	
	• Discount Rate	
	• Escalation Rates	
Program Specific	• Environmental Damages (GHG Adders)	Navigant
	• Participants / Measure Count	
	• Verified Ex-Post Energy and Demand Savings	
	• Realization Rate	
	• Net to Gross Ratio	
	• Measure life	
	• Non-Incentive Costs	
• Utility Incentive Costs		
• Incremental Measure Costs		
	• Load Shapes	

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.

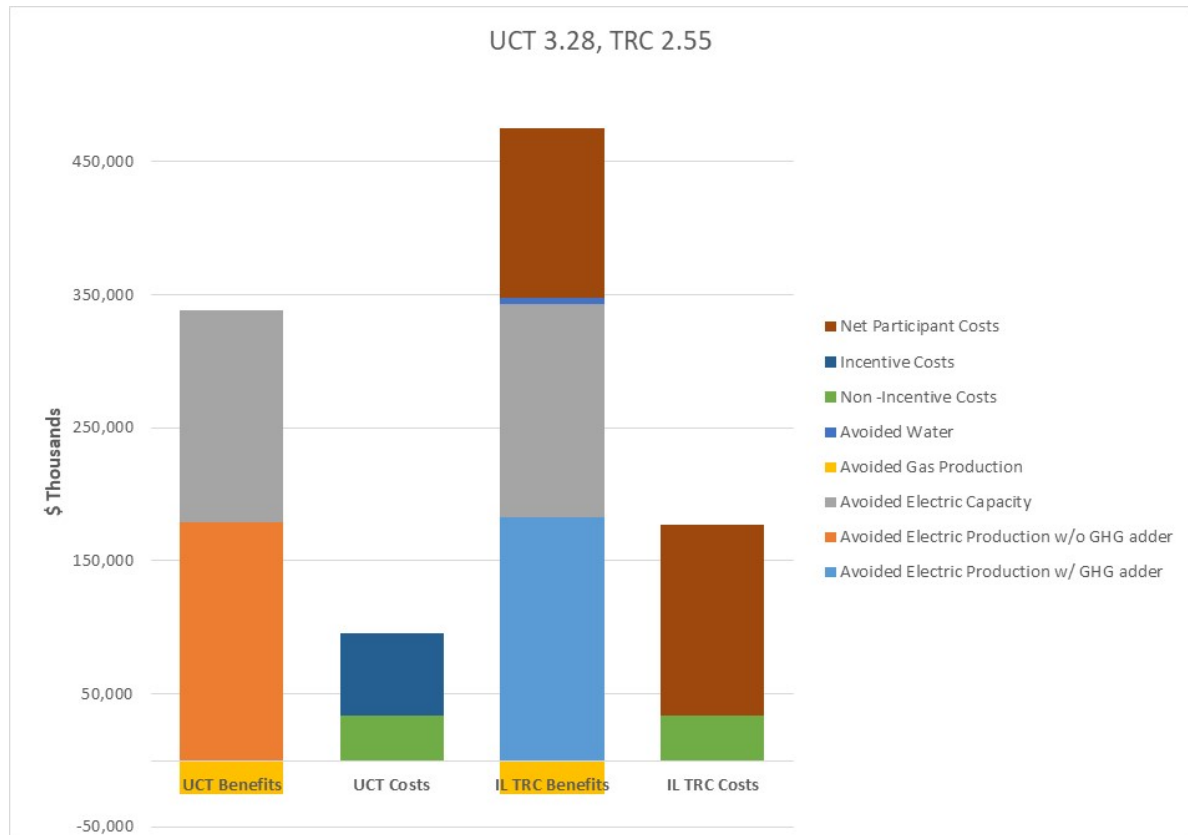
³ From local gas utility

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 w/ GHG adder			183,155	
Avoided Electric Production w/o GHG adder	178,940			
Avoided Electric Capacity	159,733		159,733	
Avoided Gas Production	-24,935		-24,935	
Avoided Water			4,480	
Non -Incentive Costs		34,025		34,025
Incentive Costs		61,565		
Net Participant Costs			127,813	143,279
Present Value Totals	313,738	95,590	450,245	177,304
Ratio	3.28		2.54	

Source: Navigant 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 and capacity..

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 sum of all incentives is less than the sum of all net incremental costs. Therefore, the EEPS UCT test ratio of 3.28 exceeds the EEPS IL TRC ratio of 2.55.

2.1 Avoided Costs

Table 1-1 shows the generic data points used for doing the cost-benefit calculations. The following includes the definitions of each generic data point and their sources. These values are typically updated annually.

- **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 the unweighted around the clock (ATC) price.
- **Avoided Electric Capacity Costs (\$/kW-year)** - Avoided electric capacity costs are those associated with the construction of addition 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.
- **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.
- **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.
- **Avoided Gas Costs (\$/therm)** – This value is from the PG/NSG utility and used to account for gas interactive effects due to lighting.
- **Avoided Water Costs (\$/gal)** – This is to account for savings associated with efficient water fixtures and clothes washers.

2.2 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.

There are currently some performance-based programs where the third-party program implementer is paid a \$/kWh that includes incentives and non-incentives. Navigant worked with ComEd to separate out the costs appropriately.

2.3 Incentives

Incentives⁴ include financial incentives paid to customers plus incentives paid to third parties. Financial incentives paid to customers means payment⁵ 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.

2.4 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 as a benefit. 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).

⁴ 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" are 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.

⁵ Payments include non-Measure items of value that would be treated as transfer payments, e.g. gift cards.

- 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 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.

2.5 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).

2.6 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.

2.7 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.

2.8 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.

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 and UCT calculations. The table includes 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 and UCT Test – ComEd EEPS Specific w/o Gas Data from Joint Programs

Program	Benefits						Costs			IL Total Resource Cost (TRC) Test (NPV replacement cost as benefit)				IL Utility Cost Test (UCT)			
	Avoided Electric Production (w/GHG adder)	Avoided Electric Production (w/o GHG adder)	Avoided Electric Capacity	Avoided Water Costs	Avoided Gas Production	Non-Incentive Costs	Incentive Costs	NPV Replacement costs	Incremental Costs (Net)	IL TRC Benefits	IL TRC Costs	IL TRC Test Net Benefits	IL TRC Test	IL UCT Benefits	IL UCT Costs	IL UCT Test Net Benefits	IL UCT Test
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k) = (b+d+e+f+i)	(l) = (g+j)	(m) = (k-l)	(n) = (k/l)	(s) = (c+d+f)	(t) = (g + h)	(u) = (s-l)	(v) = (s/t)
Appliance Rebates	\$1,757,095	\$1,718,794	\$1,092,008	\$1,666,648	\$0	\$2,315,462	\$2,124,717	\$0	\$1,977,006	\$4,515,752	\$4,292,468	\$223,284	1.05	\$2,810,802	\$4,440,178	-\$1,629,377	0.63
Elementary Energy Education	\$500,702	\$496,932	\$201,740	\$2,528,666	-\$28,936	\$70,717	\$196,720	\$58,042	\$1,000,687	\$3,260,214	\$1,071,403	\$2,188,811	3.04	\$669,736	\$267,437	\$402,299	2.50
Home Energy Assessments	\$1,635,644	\$1,628,570	\$568,202	\$61,668	-\$344,363	\$3,450,795	\$1,525,264	\$748,394	\$2,541,643	\$2,669,545	\$5,992,438	-\$3,322,893	0.45	\$1,852,409	\$4,976,059	-\$3,123,650	0.37
HVAC and Weatherization	\$8,977,509	\$8,457,386	\$8,792,069	\$0	\$0	\$2,891,134	\$7,491,992	\$0	\$10,504,132	\$17,769,578	\$13,395,266	\$4,374,312	1.33	\$17,249,454	\$10,383,126	\$6,866,329	1.66
Meter Genius Pilot	\$281	\$281	\$0	\$0	\$0	\$71,474	\$0	\$0	\$0	\$281	\$71,474	-\$71,193	0.00	\$281	\$71,474	-\$71,193	0.00
Multifamily - Tenant Area	\$848,450	\$842,589	\$321,924	\$222,633	-\$148,780	\$41,815	\$230,821	\$283,319	\$465,230	\$1,527,545	\$507,046	\$1,020,500	3.01	\$1,015,733	\$272,636	\$743,097	3.73
Res ES Lighting (Carryover)	\$11,283,539	\$11,260,519	\$42,340,713	\$0	-\$5,414,126	\$0	\$0	\$3,269,257	\$0	\$51,479,382	\$0	\$51,479,382	n/a	\$48,187,105	\$0	\$48,187,105	n/a
Res Fridge and Freezer	\$4,536,673	\$4,497,707	\$1,728,420	\$0	\$0	\$4,428,871	\$1,637,091	\$0	\$1,400,973	\$6,265,094	\$5,829,844	\$435,250	1.07	\$6,226,127	\$6,065,962	\$160,165	1.03
Residential New Construction	\$358,837	\$337,620	\$695,603	\$0	\$0	\$121,210	\$151,249	\$0	\$1,471,058	\$1,054,440	\$1,592,268	-\$537,828	0.66	\$1,033,223	\$272,459	\$760,764	3.79
Residential Total	\$29,898,731	\$29,240,397	\$55,740,678	\$4,479,615	-\$5,936,205	\$13,391,478	\$13,357,854	\$4,359,012	\$19,360,729	\$88,541,831	\$31,944,402	\$56,597,429	2.77	\$79,044,870	\$26,749,332	\$52,295,539	2.96
AirCare Plus	\$330,262	\$330,113	\$123,393	\$0	\$0	\$204,976	\$217,033	\$0	\$72,249	\$453,655	\$277,224	\$176,431	1.64	\$453,506	\$422,008	\$31,498	1.07
Business Instant Lighting Discount	\$46,895,649	\$46,556,268	\$37,320,167	\$0	-\$8,370,514	\$1,869,852	\$9,577,323	\$7,397,195	\$31,996,944	\$83,242,498	\$33,866,795	\$49,375,703	2.46	\$75,505,922	\$11,447,175	\$64,058,747	6.60
Business Instant Lighting Discount (Carryover)	\$3,387,199	\$3,376,973	\$2,868,908	\$0	-\$907,963	\$0	\$0	\$1,039,989	\$0	\$6,388,132	\$0	\$6,388,132	n/a	\$5,337,917	\$0	\$5,337,917	n/a
Business New Construction	\$22,432,129	\$21,063,900	\$21,641,542	\$0	\$0	\$2,853,161	\$5,089,094	\$0	\$18,357,664	\$44,073,671	\$21,210,825	\$22,862,846	2.08	\$42,705,442	\$7,942,255	\$34,763,187	5.38
Business Custom	\$7,936,518	\$7,697,243	\$5,958,866	\$0	\$0	\$812,244	\$2,132,347	\$0	\$11,429,288	\$13,895,384	\$12,241,532	\$1,653,852	1.14	\$13,656,109	\$2,944,591	\$10,711,518	4.64
Data Centers	\$5,973,085	\$5,707,024	\$3,426,637	\$0	\$0	\$1,495,035	\$1,528,189	\$0	\$8,849,578	\$9,399,722	\$10,344,614	-\$944,892	0.91	\$9,133,660	\$3,023,224	\$6,110,436	3.02

Program	Benefits						Costs				IL Total Resource Cost (TRC) Test (NPV replacement cost as benefit)				IL Utility Cost Test (UCT)			
	Avoided Electric Production (w/GHG adder)	Avoided Electric Production (w/o GHG adder)	Avoided Electric Capacity	Avoided Water Costs	Avoided Gas Production	Non-Incentive Costs	Incentive Costs	NPV Replacement costs	Incremental Costs (Net)	IL TRC Benefits	IL TRC Costs	IL TRC Test Net Benefits	IL TRC Test	IL UCT Benefits	IL UCT Costs	IL UCT Test Net Benefits	IL UCT Test	
Energy Analyzer	\$2,148,837	\$2,148,837	\$0	\$0	\$0	\$525,000	\$0	\$0	\$0	\$2,148,837	\$525,000	\$1,623,837	4.09	\$2,148,837	\$525,000	\$1,623,837	4.09	
Industrial Systems	\$9,172,482	\$9,091,032	\$5,518,628	\$0	\$0	\$1,697,339	\$4,443,060	\$0	\$3,587,118	\$14,691,111	\$5,284,457	\$9,406,654	2.78	\$14,609,661	\$6,140,399	\$8,469,262	2.38	
Retro-Commissioning	\$4,852,118	\$4,842,224	\$349,503	\$0	\$0	\$1,657,230	\$2,672,836	\$0	\$2,792,730	\$5,201,622	\$4,449,959	\$751,662	1.17	\$5,191,727	\$4,330,066	\$861,661	1.20	
Strategic Energy Management Pilot	\$246,828	\$246,828	\$0	\$0	\$0	\$269,363	\$0	\$0	\$0	\$246,828	\$269,363	-\$22,536	0.92	\$246,828	\$269,363	-\$22,536	0.92	
Business Standard	\$49,881,231	\$48,639,371	\$26,784,260	\$0	-\$9,720,562	\$9,249,387	\$22,547,657	\$115,016,344	\$46,832,359	\$181,961,273	\$56,081,747	\$125,879,526	3.24	\$65,703,069	\$31,797,044	\$33,906,025	2.07	
C&I Total	\$153,256,338	\$149,699,811	\$103,991,904	\$0	-\$18,999,039	\$20,633,586	\$48,207,538	\$123,453,528	\$123,917,929	\$361,702,731	\$144,551,516	\$217,151,215	2.50	\$234,692,677	\$68,841,124	\$165,851,552	3.41	
EEPS Total	\$183,155,069	\$178,940,208	\$159,732,582	\$4,479,615	-\$24,935,243	\$34,025,064	\$61,565,392	\$127,812,540	\$143,278,658	\$450,244,562	\$176,495,918	\$273,748,644	2.55	\$313,737,547	\$95,590,456	\$218,147,091	3.28	

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 PY8 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 5.0 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 PY8 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 PY8, 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 were 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.
- For the Elementary Energy Education program, the per kit costs were used to calculate incremental measure cost versus the incentives.

3.3 Findings and Recommendations

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

Finding 1. Given that Navigant in PY8 used the avoided costs developed within DSMore calculations, it makes sense now for the CY2018 TRC analysis for Navigant to develop the underlying costs with ComEd and the ICC’s input.

Recommendation 1. Navigant should undertake developing the CY2018 underlying avoided costs going forward.

Finding 2. 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 2. For the PY9 TRC analysis, ComEd should provide all incentive and non-incentive costs for each program to Navigant for their analysis.

A.1 Energy Efficiency Policy Manual Guidance

The current policy manual⁶ includes guidance on how to treat the “avoided baseline replacement measure costs” which is application for the LED lamp measure. Per the manual, this specific concept, the “avoided baseline replacement measure costs”, is considered as part of the “incremental costs” within the TRC costs section. We interpret this as being a value incorporated in the denominator (cost) in the TRC benefit cost ratio and shown in the following equation:

$$TRC = \frac{Benefits}{Admin Costs + Measure Cost - Avoided Baseline Replacement Measure Costs}$$

Following this approach leads to very large or negative TRC values due to large "avoided baseline replacement measure costs" for LED measures. However, we believe that the “avoided baseline replacement measure costs” is truly a benefit related in reducing customer O&M costs. This is also consistent with the http://www.calmac.org/publications/California_Evaluation_Framework_June_2004.pdf (p.387), which states the TRC benefits includes “The avoided participant capital and operating costs, including reduced water bills and reduced maintenance costs (e.g., less frequent lamp replacements)”.

Therefore, we used the following equation to calculate the TRC values:

$$TRC = \frac{Benefit + Avoided Baseline Replacement Measure Costs}{Admin Costs + Measure Cost}$$

This second approach properly values the “the avoided participant capital and operating costs” as a benefit and doesn’t lead to negative or very large TRC values.

Subsequent to this proposal, the Policy Manual subcommittee changed the policy manual language. This language will be adopted and has been approved for use in the ComEd PY8 TRC analysis:

The following definitions should be adhered to for purposes of classifying costs when performing the TRC test analysis⁷:

⁶

http://ilsagfiles.org/SAG_files/Subcommittees/IL_EE_Policy_Manual_Subcommittee/2017_Revision/IL_EE_Policy_Manual_Version_1.1_5-5-17_FINAL.pdf, p. 25 section 8.4

⁷ Portfolio-level cost categories can be found in Section 5.2 of the Policy Manual, Portfolio Cost Categories.

- i. **Operations and Maintenance (O&M) and/or Deferred Baseline Replacement Cost Changes:** Any avoided costs are treated as benefits and any increased costs are treated as Incremental Costs. 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.

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