NAVIGANT

Evaluation of ComEd's CY2018 Total Resource Cost Test

Energy Efficiency / Demand Response Plan: Calendar Year 2018 (CY2018) (2018.01.01 to 2018.12.31)

Presented to
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FINAL

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Navigant CY2018 Total Resource Cost Test Evaluation

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1. OVERVIEW

As part of Navigant's evaluation of ComEd's energy efficiency programs for calendar year 2018 we developed the program input values and calculated program level cost effectiveness for the Utility Cost Test (UCT) and the Illinois Total Resource Cost (TRC) test 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 UCT also reported. Navigant created a cost model and built up the analysis at the measure and program level to conduct the 2018 cost analysis. The summary of the program level inputs in the accompanying cost workbook is available separate from this report.

The savings numbers and cost-benefit results included in this report are reflective of ComEd's Energy Efficiency Portfolio Standard (EEPS) programs. 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[1]:

> *"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 and including avoided costs associated with reduced use of natural gas or other fuels, avoided costs associated with reduced water consumption, and avoided costs associated with reduced operation and maintenance costs, as well as other quantifiable societal benefits, 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. In discounting future societal costs and benefits for the purpose of calculating net present values, a societal discount rate based on actual, long-term Treasury bond yields should be used. Notwithstanding anything to the contrary, the TRC test shall not include or take into account a calculation of market price suppression effects or demand reduction induced price effects.*

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) and the use of the societal discount rate. This difference adds an additional benefit to investments in efficiency programs that are typically included in the Societal test in other jurisdictions. Navigant included avoided GHG costs and the societal discount rate in its TRC calculations. The UCT calculations do not include avoided GHG costs and use the weighted average cost of capital instead of the societal discount rate.

Navigant initially completed the 2018 cost report on August 15, 2019. ComEd requested Navigant to update both TRC and UCT numbers to reflect the updated avoided costs provided by ComEd on October 16th, 2019. The new avoided electric costs were approximately 15% lower than the original costs provided by ComEd. This resulted in an overall reduction in both the TRC and UCT values for the CY2018 portfolio. The new TRC and UCT values went down to 1.78 from 1.97 and 1.85 from 2.08 respectively.

[1] See Section 1-10 Definitions of the Illinois Power Agency Act: http://www.ilga.gov/legislation/ilcs/ilcs5.asp?ActID=2934&ChapterID=5

1.1 Summary

Table 1-1 below show a summary of the CY2018 TRC and UCT test values for all the EEPS programs in ComEd's CY2018 portfolio. The values were calculated by Navigant using a spreadsheet tool.
Overall, the CY2018 portfolio aggregate TRC and UCT tests show the portfolio was cost effective, with an aggregate TRC and UCT test value of 1.78 and 1.85 respectively.

Table 1-1. Summary of ComEd Program CY2018 TRC and UCT Test values

Program	TRC Test	UCT Test
Appliance Rebates	1.88	1.59
Elementary Education Kits	8.60	1.73
Fridge and Freezer Recycling	1.20	0.89
Heating and Cooling (HVAC) Rebates	2.75	1.76
Weatherization - Market Rate	2.38	2.77
Home Energy Assessment	1.57	0.89
Home Energy Reports	4.63	4.40
Lighting Discounts	5.27	2.49
Middle School Take-Home Kits	1.28	0.70
Multi-Family Market Rate	1.54	0.76
Residential New Construction	0.99	0.84
Residential Total	**3.18**	**1.87**
Air Care Plus	2.87	1.36
Custom	1.17	2.70
Data Centers	2.41	3.84
Energy Advisor Monitoring-Based Commissioning	0.92	0.41
Industrial Systems Optimization	1.65	1.53
Instant Discounts	4.75	8.57
Business New Construction	2.03	2.68
Operational Efficiency/Facility Assessments	0.21	0.19
Public Housing Authority	1.37	0.54
Public Small Facilities	2.49	1.51
Retrocommissioning	2.01	1.21
Rural Small Business Kits	2.63	1.31
Small Business	1.11	1.90
Standard	1.68	2.53
Strategic Energy Management	1.73	1.58
Street Lighting	0.91	1.95
Business Total	**1.73**	**2.54**
Portfolio Total (Excluding IE):	**1.80**	**1.94**
Affordable Housing New Construction	0.53	0.66
Food Bank LED Distribution	3.94	1.99
Retail (Lighting) Discounts - Income Eligible	6.53	3.17
Multi-Family IHWAP	0.26	0.28
Multi-Family Retrofits	0.76	0.52
Single Family Retrofit - CBA	0.71	0.45
Single Family Retrofit - IHWAP	0.39	0.30

Program	TRC Test	UCT Test
UIC ERC Low Income Kits	1.62	0.97
Income Eligible (IE) Total	**1.62**	**0.98**
Portfolio Total (Including IE):	**1.78**	**1.85**

Source: Navigant analysis

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

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

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

Equation 3. IL TRC Costs

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

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
RC = NPV of replacement costs of incandescent equivalents

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

And:
d = Societal discount rate

The Illinois TRC test allows for utilities to account for the net present value (NPV) of the avoided cost of purchasing incandescent 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 Technical Reference Manual (IL 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.

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

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

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

Equation 6. UCT Costs

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

Where the new terms, *PINt*, is defined as the program incentives provided by the utility in year t and WACC is defined as the weighted average cost of capital, used as the discount rate.

1.4 Cost-Effectiveness Data Requirements

The data points needed to conduct the Illinois TRC test are provided in Table 1-2 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 ($/kWh) • Avoided Capacity Costs ($/kW) • Avoided T&D Electric ($/kWh) • Avoided Gas Production ($/Therm)[2] • Avoided Water Costs ($/gallon) • Escalation Rates • Environmental Damages (GHG Adders)	ComEd
	• Discount Rate	Policy
Program Specific	• Participants / Measure Count • Verified Ex-Post Energy and Demand Savings • Realization Rate • Net to Gross Ratio • Measure life • Incremental measure costs • NPV Replacement Costs	Navigant
	• Non-Incentive Costs • Utility Incentive Costs • Direct Install Costs • Incremental Measure Costs • Load Shapes	ComEd

Source: Navigant analysis

This document provides a summary of the results for the total ComEd EEPS portfolio 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 avoided electric production and capacity costs were calculated by annualizing the loadshapes provided by ComEd.

The calculations show ComEd's EEPS portfolio is cost effective under all scenarios.

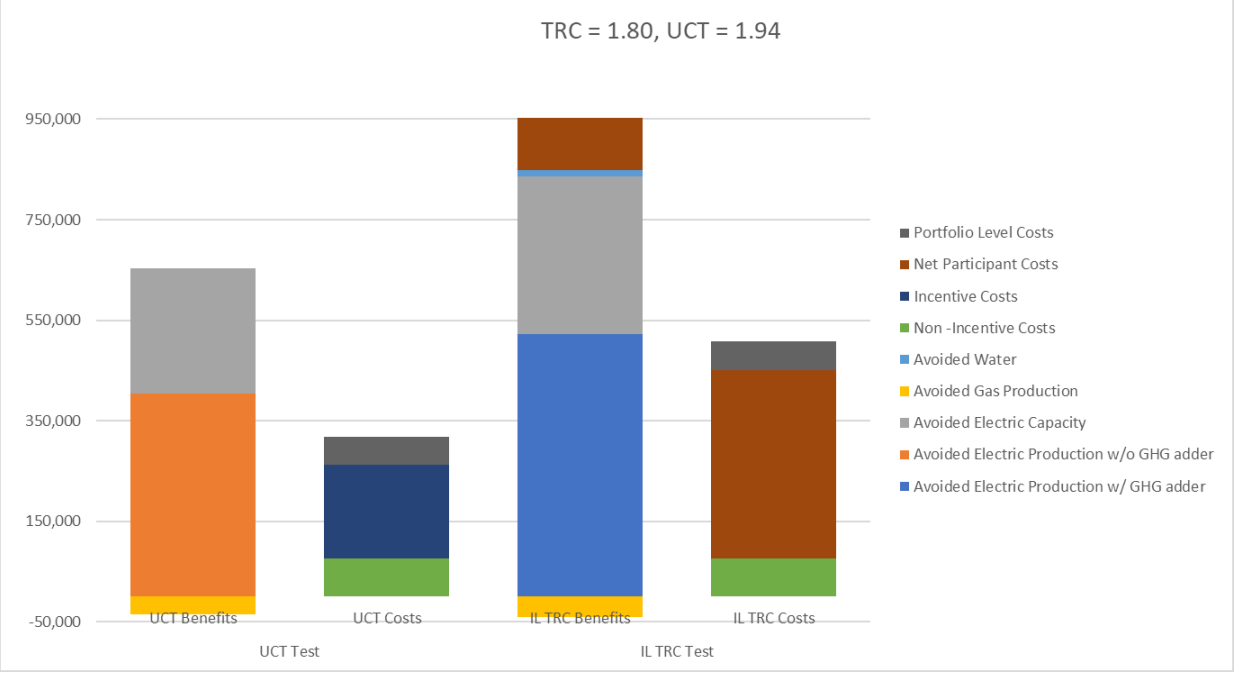
[2] From local gas utility

Table 2-1. Summary of ComEd Portfolio (Excluding Income Eligible) Costs & Benefits ($ in 000's)

Data Point	UCT Test		IL TRC Test	
	UCT Benefits	UCT Costs	IL TRC Benefits	IL TRC Costs
Avoided Electric Production w/ GHG adder			$ 521,828.96	
Avoided Electric Production w/o GHG adder	$ 404,227.87			
Avoided Electric Capacity	$ 248,521.57		$ 314,242.03	
Avoided Gas Production	$ (34,341.89)		$ (40,512.49)	
Avoided Water			$ 12,388.36	
Non -Incentive Costs		$ 76,542.72		$ 76,542.72
Incentive Costs		$ 185,115.22		
Net Participant Costs			$ 104,153.76	$ 374,970.23
Portfolio Level Costs		$56,443		$56,443
Present Value Totals	$ 618,407.56	$ 318,100.89	$ 912,100.61	$ 507,955.90
Ratio	1.94		1.80	

Source: Navigant analysis

Figure 2-1. Summary of ComEd Portfolio (Excluding Income Eligible) 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 ratio of 1.94 exceeds the EEPS IL TRC test ratio of 1.80.

2.1 Avoided Costs

Table 1-2 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 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.
- **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. The Avoided Water Costs of $7.76/1000 Gallons[3] was used for the analysis.

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.

[3] https://www.cityofchicago.org/city/en/depts/fin/supp_info/utility-billing/water-and-sewer-rates.html

2.3 Incentives[4]

Incentives[5] include financial incentives paid to customers plus incentives paid to third parties. Financial incentives paid to customers means payment[6] 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 payments 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. Incentives paid to third parties also includes payment made by a program administrator to a third party to cover the full cost of study-based services (e.g., facility energy audits, energy surveys, energy assessments, retro-commissioning) that are truly necessary for a customer to implement efficient measures, as opposed to being principally intended to be a form of marketing. Incentives paid to third parties also includes payment made by a program administrator to an implementation contractor to cover the cost of pickup and recycling of duplicative functioning equipment before its expected life is over (e.g., appliance recycling programs), for the portion not covered by the Customer.

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:

[4] Incentives definitions can be found in Section 8.4 TRC Costs of the Illinois Energy Efficiency Policy Manual Version 1.1.

[5] 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.

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

- 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 or 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 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 the societal discount rate as defined in the legislation to be the actual, long-term Treasury bond yields. ComEd weighted average cost of capital of 7% is used to calculate the UCT and a Societal Discount rate of 2.38% is used to calculate the TRC.

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, there are portfolio level costs not directly incurred by specific programs. 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. Table 2-2 below details all the Portfolio level costs included in the analysis.

Table 2-2. Breakdown of Portfolio Level Costs ($ in 000's)

Portfolio Level Cost Component	Value ($)
Measurement & Verification (M&V)	$ 9,936.87
R&D*	$ 8,812.13
Market Research	$ 182.80
Legal	$ 198.67
Tracking System	$ 1,752.36
Labor (non-program specific)	$ 6,301.81
General Program Costs	$ 4,541.03
General Education & Awareness	$ 7,071.64
Market Transformation	$ 3,151.14
Demand Response	$ 821.34
Dist. Ops. Streetlight Capital	$ 8,959.53
On Bill Financing (OBF)	$ 85.49
Total	$ 51,814.80

** The costs for the Pilot programs are included in the Portfolio Level Costs. The benefits are not included since Navigant did not conduct a program level TRC test for each pilot as the savings were not significant compared to the overall portfolio. Source: Navigant analysis*

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 sector. 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 – ComEd EEPS Specific Without Gas Data from Joint Programs

Program	Benefits						Costs			IL Total Resource Cost (TRC) Test			
	Avoided Electric Production (w/GHG adder)	Avoided Electric Production (w/o GHG adder)	Avoided Electric Capacity	Avoided Water Costs	Avoided Gas Production	NPV Replacement costs	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)	(j)	(k) = (b+d+e+f+g)	(l) = (g+j)	(m) = (k-l)	(n) = (k/l)
Appliance Rebates	$12,565	$12,245	$12,485	$2,870	$9,586	$0	$5,107	$12,696	$14,839	$37,507	$19,946	$17,561	1.88
Elementary Education Kits	$1,693	$1,656	$794	$8,687	$641	$548	$44	$1,461	$1,394	$12,364	$1,438	$10,925	8.60
Fridge and Freezer Recycling	$6,526	$6,448	$3,821	$0	$0	$0	$7,311	$2,596	$1,347	$10,347	$8,658	$1,689	1.20
Heating and Cooling (HVAC) Rebates	$6,343	$5,830	$9,702	$0	$1,830	$0	$1,940	$5,029	$4,562	$17,875	$6,502	$11,373	2.75
Weatherization - Market Rate	$569	$523	$735	$0	$401	$0	$117	$303	$598	$1,704	$715	$989	2.38
Home Energy Assessment	$7,891	$7,697	$4,028	$153	-$1,609	$5,696	$2,953	$6,546	$7,369	$16,160	$10,322	$5,838	1.57
Home Energy Reports	$24,663	$24,527	$0	$0	$0	$0		$5,323		$24,663	$5,323	$19,339	4.63
Lighting Discounts	$83,003	$80,591	$45,153	$0	-$35,042	$49,286	$5,152	$25,171	$21,864	$142,400	$27,016	$115,384	5.27
Middle School Take-Home Kits	$378	$372	$243	$228	-$32	$95	$55	$657	$657	$912	$712	$200	1.28
Multi-Family Market Rate	$3,860	$3,756	$1,790	$151	-$628	$713	$1,454	$3,885	$2,357	$5,886	$3,811	$2,075	1.54
Residential New Construction	$167	$153	$315	$0	$0	$0	$197	$195	$287	$482	$484	-$3	0.99
Residential Total	$147,657	$143,798	$79,066	$12,090	-$24,853	$56,339	$29,654	$58,538	$55,274	$270,299	$84,928	$185,371	3.18
Air Care Plus	$3,101	$3,085	$2,515	$0	$714	$0	$1,250	$2,985	$956	$6,330	$2,207	$4,124	2.87
Custom	$8,717	$8,197	$6,589	$0	$14	$0	$1,142	$2,985	$11,935	$15,320	$13,077	$2,242	1.17
Data Centers	$11,712	$10,797	$10,723	$0	$0	$0	$1,104	$2,886	$8,195	$22,435	$9,299	$13,135	2.41
Energy Advisor Monitoring-Based Commissioning	$1,464	$1,460	$0	$0	$0	$0	$1,168	$2,109	$424	$1,464	$1,592	-$128	0.92
Industrial Systems Optimization	$7,263	$6,891	$3,383	$0	$0	$0	$2,526	$2,686	$3,940	$10,647	$6,466	$4,180	1.65
Instant Discounts	$98,602	$94,628	$87,583	$0	-$14,141	$30,033	$3,904	$11,705	$38,595	$202,077	$42,499	$159,578	4.75
Business New Construction	$15,941	$14,657	$14,036	$0	$187	$0	$3,322	$4,246	$11,565	$30,164	$14,886	$15,277	2.03
Operational Efficiency/Facility Assessments	$590	$590	$0	$0	$116	$0		$3,354		$706	$3,354	-$2,648	0.21
Public Housing Authority	$994	$958	$270	$0	-$76	$148	$504	$1,229	$470	$1,336	$974	$362	1.37
Public Small Facilities	$2,962	$2,877	$1,607	$0	-$551	$237	$387	$1,748	$1,321	$4,256	$1,707	$2,549	2.49
Retro-commissioning *	$10,428	$10,303	$2,041	$0	$336	$0	$3,211	$5,797	$3,144	$12,805	$6,355	$6,450	2.01
Rural Small Business Kits	$849	$804	$707	$236	-$33	$555		$879		$2,314	$879	$1,436	2.63
Small Business	$82,562	$78,713	$55,812	$63	-$7,375	$16,841	$9,495	$42,918	$124,009	$147,902	$133,504	$14,399	1.11

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Program	Benefits						Costs			IL Total Resource Cost (TRC) Test			
	Avoided Electric Production (w/GHG adder)	Avoided Electric Production (w/o GHG adder)	Avoided Electric Capacity	Avoided Water Costs	Avoided Gas Production	NPV Replacement costs	Non-Incentive Costs	Incentive Costs	Incremental Costs (Net)	IL TRC Benefits	IL TRC Costs	IL TRC Test Net Benefits	IL TRC Test
Standard	$86,029	$82,489	$49,911	$0	$5,149	$0	$11,824	$30,905	$72,251	$141,090	$84,075	$57,015	1.68
Strategic Energy Management	$2,523	$2,516	$0	$0	$0	$0	$1,317	$142	$142	$2,523	$1,459	$1,064	1.73
Street Lighting	$40,432	$38,738	$0	$0	$0	$0	$1,502	$14,236	$42,749	$40,432	$44,252	-$3,819	0.91
Business Sector Outreach								$4,628					
Business Total	$374,172	$357,704	$235,176	$299	-$15,659	$47,814	$46,888	$126,577	$319,696	$641,802	$371,213	$270,589	1.73
Overall Portfolio Costs†								**$51,815**					
Portfolio Total (Excluding IE)	$521,829	$501,502	$314,242	$12,388	-$40,512	$104,154	$76,543	$185,115	$374,970	$912,101	$507,956	$404,145	1.80
Affordable Housing New Construction	$900	$851	$809	$0	-$77	$0	$677	$1,111	$2,390	$1,632	$3,067	-$1,435	0.53
Food Bank LED Distribution	$7,597	$7,483	$3,130	$0	-$2,006	$6,268		$3,800		$14,989	$3,800	$11,189	3.94
Retail (Lighting) Discounts - Income Eligible	$13,013	$12,664	$7,055	$0	-$3,430	$8,352	$472	$3,832	$3,357	$24,990	$3,829	$21,161	6.53
Multi-Family IHWAP	$248	$234	$153	$0	$28	$29	$209	$937	$1,554	$458	$1,763	-$1,305	0.26
Multi-Family Retrofits	$1,565	$1,497	$620	$433	$2,735	$76	$1,267	$5,695	$5,891	$5,429	$7,157	-$1,728	0.76
Single Family Retrofit - CBA	$1,229	$1,135	$1,826	$139	$1,990	$203	$1,359	$6,236	$6,236	$5,387	$7,594	-$2,207	0.71
Single Family Retrofit - IHWAP	$467	$433	$722	$37	$369	$52	$652	$2,991	$3,553	$1,647	$4,205	-$2,557	0.39
UIC ERC Low Income Kits	$2,805	$2,759	$1,413	$844	-$363	$733		$3,360		$5,432	$3,360	$2,071	1.62
Income Eligible Outreach								$2,291					
Income Eligible Total	**$27,824**	**$27,057**	**$15,730**	**$1,454**	**-$756**	**$15,713**	**$11,795**	**$20,801**	**$22,980**	**$59,965**	**$37,067**	**$22,898**	**1.62**
Portfolio Total (Including IE)	$549,653	$528,559	$329,972	$13,842	-$41,268	$119,867	$88,338	$205,916	$397,950	$972,065	$545,023	$427,043	1.78

Note: For jointly implemented programs by ComEd and one or more Illinois gas utility, only the electric portion of the program savings and cost-benefit calculations are included here. The costs for the Voltage Optimization program were not available at this time and the program has not been included in the TRC analysis. The program will be analyzed once the costs are available and a separate memo will be issued summarizing the finding.

* Upon review that the Retro-commissioning (RCx) incentives were significantly higher than the incremental costs in Navigant's TRC analysis, the Illinois Commerce Commission Staff (ICC Staff) commented that the RCx incentive amounts used to pay the implementation contractor for the study-based services should be included as an incremental cost in the TRC analysis consistent with the IL-TRM definition of Incremental Costs, otherwise Navigant's approach is understating the costs in its TRC analysis of the RCx program resulting in an inaccurate TRC ratio. Unfortunately, ComEd did not separately track and report study-based incentive costs from other incentive costs and thus Navigant did not completely agree with this comment since Navigant applied RCx measures actual project costs for incremental costs and adding in the entire incentive cost amount to those incremental costs would overstate the costs in the TRC analysis - thus, the TRC shown above was not changed, that is the final TRC. But to document the ICC Staff's proposed RCx TRC incremental cost analysis, we are providing the ICC Staff's proposed TRC calculation for comparison purposes. Based on the ICC Staff's proposed approach, the RCx TRC would be equal to 1.2. Note that this is a positive TRC even with incentive costs being applied as incremental costs.

† A detailed breakdown of the Overall Portfolio costs can be found in Table 2-2.

Source: Navigant analysis

Table 3-2. Summary of Program Level Benefits, Costs ($ in 000's) and UCT Test – ComEd EEPS Specific Without Gas Data from Joint Programs

Program	Benefits			Costs		Utility Cost Test (UCT)			
	Avoided Electric Production (w/o GHG adder) Using WACC	Avoided Electric Capacity Using WACC	Avoided Gas Production Using WACC	Non-Incentive Costs	Incentive Costs	UCT Benefits	UCT Costs	UCT Test Net Benefits	UCT Test
(a)	(b)	(c)	(d)	(e)	(f)	(g) = (b+c+d)	(h) = (e + f)	(i) = (g-h)	(j) = (g/h)
Appliance Rebates	$10,120	$10,262	$7,865	$5,107	$12,696	$28,247	$17,802	$10,445	1.59
Elementary Education Kits	$1,400	$673	$527	$44	$1,461	$2,600	$1,505	$1,095	1.73
Fridge and Freezer Recycling	$5,530	$3,289	$0	$7,311	$2,596	$8,820	$9,907	-$1,088	0.89
Heating and Cooling (HVAC) Rebates	$4,116	$6,766	$1,411	$1,940	$5,029	$12,294	$6,969	$5,325	1.76
Weatherization - Market Rate	$368	$520	$277	$117	$303	$1,165	$420	$745	2.77
Home Energy Assessment	$10	$3,340	-$1,331	$2,953	$6,546	$5	$9,499	-$1,083	0.89
Home Energy Reports	$6,407	$0	$0	$5,323	$0	$8,416	$5,323	$18,104	4.40
Lighting Discounts	$23,428	$37,601	-$29,407	$5,152	$25,171	$23,428	$30,323	$45,040	2.49
Middle School Take-Home Kits	$67,170	$208	-$29	$55	$657	$75,364	$712	-$213	0.70
Multi-Family Market Rate	$320	$1,483	-$521	$1,454	$3,885	$499	$5,339	-$1,266	0.76
Residential New Construction	$3,111	$220	$0	$197	$195	$4,073	$392	-$63	0.84
Residential Total	**$122,089**	**$64,364**	**-$21,215**	**$29,654**	**$58,538**	**$165,238**	**$88,192**	**$77,046**	**1.87**
Air Care Plus	$2,836	$2,271	$632	$1,250	$2,985	$5,739	$4,235	$1,504	1.36
Custom	$6,158	$4,964	$11	$1,142	$2,985	$11,133	$4,127	$7,005	2.70
Data Centers	$7,712	$7,605	$0	$1,104	$2,886	$15,317	$3,990	$11,327	3.84
Energy Advisor Monitoring-Based Commissioning	$1,339	$0	$0	$1,168	$2,109	$1,339	$3,277	-$1,939	0.41
Industrial Systems Optimization	$5,358	$2,627	$0	$2,526	$2,686	$7,986	$5,213	$2,773	1.53
Instant Discounts	$75,477	$69,655	-$11,295	$3,904	$11,705	$133,838	$15,609	$118,229	8.57
Business New Construction	$10,380	$9,802	$132	$3,322	$4,246	$20,315	$7,567	$12,747	2.68
Operational Efficiency/Facility Assessments	$541	$0	$106	$3,354	$0	$647	$3,354	-$2,707	0.19
Public Housing Authority	$771	$222	-$66	$504	$1,229	$928	$1,732	-$804	0.54
Public Small Facilities	$2,355	$1,326	-$457	$387	$1,748	$3,224	$2,135	$1,090	1.51
Retro-commissioning	$8,833	$1,750	$288	$3,211	$5,797	$10,871	$9,008	$1,863	1.21

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Program	Benefits			Costs		Utility Cost Test (UCT)			
	Avoided Electric Production (w/o GHG adder) Using WACC	Avoided Electric Capacity Using WACC	Avoided Gas Production Using WACC	Non-Incentive Costs	Incentive Costs	UCT Benefits	UCT Costs	UCT Test Net Benefits	UCT Test
Rural Small Business Kits	$624	$541	-$13	$879	$0	$1,152	$879	$273	1.31
Small Business	$61,494	$43,829	-$5,866	$9,495	$42,918	$99,457	$52,413	$47,044	1.90
Standard	$65,343	$39,565	$3,399	$11,824	$30,905	$108,307	$42,729	$65,578	2.53
Strategic Energy Management	$2,306	$0	$0	$1,317	$142	$2,306	$1,459	$848	1.58
Street Lighting	$30,611	$0	$0	$1,502	$14,236	$30,611	$15,738	$14,873	1.95
Business Sector Outreach					$4,628				
Business Total	$282,139	$184,158	-$13,127	$46,888	$126,577	$453,169	$178,094	$275,076	2.54
Overall Portfolio Costs†				**$51,815**					
Portfolio Total (Excluding IE)	$404,228	$248,522	-$34,342	$76,543	$185,115	$618,408	$318,101	$300,306	1.94
Affordable Housing New Construction	$653	$590	-$64	$677	$1,111	$1,179	$1,788	-$609	0.66
Food Bank LED Distribution	$6,577	$2,751	-$1,764	$3,800	$0	$7,564	$3,800	$3,764	1.99
Retail (Lighting) Discounts - Income Eligible	$10,591	$5,911	-$2,869	$472	$3,832	$13,633	$4,304	$9,329	3.17
Multi-Family IHWAP	$182	$122	$17	$209	$937	$321	$1,146	-$825	0.28
Multi-Family Retrofits	$1,185	$490	$1,948	$1,267	$5,695	$3,623	$6,961	-$3,339	0.52
Single Family Retrofit - CBA	$812	$1,251	$1,322	$1,359	$6,236	$3,385	$7,594	-$4,210	0.45
Single Family Retrofit - IHWAP	$318	$518	$249	$652	$2,991	$1,085	$3,643	-$2,558	0.30
UIC ERC Low Income Kits	$2,362	$1,206	-$313	$3,360	$0	$3,255	$3,360	-105	0.97
Income Eligible Outreach					**$2,291**				
Income Eligible Total	**$22,680**	**$12,840**	**-$1,475**	**$11,795**	**$20,801**	**$34,044**	**$34,887**	**-$843**	**0.98**
Portfolio Total (Including IE)	$426,908	$261,361	-$35,817	$88,338	$205,916	$652,452	$352,988	$299,464	1.85

† A detailed breakdown of the Overall Portfolio costs can be found in Table 2-2.

3.1 Program Specific Data Collection

The program specific data collection for each measure in ComEd's CY2018 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 6.0 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 Cost Review

3.2.1 Incremental Measure Cost

There were instances where the program tracking data and the incremental cost value from the reference sources did not align due to 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). 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 CY2018, Navigant used the reported project costs provided by ComEd and adjusted, as necessary, to ensure it includes the incremental cost only.
- Prescriptive programs (Small Business Energy Savings, Standard, HVAC, Multi-Family, etc.) – Navigant researched the incremental measure cost data from the IL 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 with some exceptions. For joint programs, only the ComEd portion of the costs were included.
- Early retirement (HVAC) –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 IL 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 and other similar programs, the per kit costs were used to calculate incremental measure cost versus the IL TRM deemed incremental costs of the measures included in the kits.

3.3 Findings and Recommendations

Navigant performed a bottom up analysis for each program in ComEd's CY2018 portfolio and found some discrepancies.

Finding 1. The project invoices for the Single Family and Multi-family Income Eligible programs do not include the Direct Install (DI) and non-DI measure costs.
Recommendation 1. Navigant recommends breaking down the project invoices by measure and providing per-unit and total measure costs for all projects and programs or provide Navigant with those costs broken out for the TRC analysis.

Finding 2. Various incentive and non-incentive costs were provided to Navigant as zero costs which does not appear to be correct or comply with the Illinois Energy Efficiency Policy Manual definitions and should be corrected for the CY2019 analysis.
Recommendation 2. For the CY2019 TRC analysis, ComEd should track the program level incentive and non-incentive costs based on the definitions in the Illinois Energy Efficiency Policy Manual. Navigant, ComEd and ICC Staff will work through the required cost and incentive break down soon after this 2018 TRC report is finalized to ensure that ComEd provides proper cost and incentive starting in 2019. This should be done for at least the following programs: Retro-commissioning, Custom, Industrial Services, Non-Residential New Construction, CHP, Small Business Kits, Public Housing and any program with incentives that are greater than the incremental costs.

Finding 3. The cost reconciliation spreadsheet provided by ComEd does not include a breakdown of the incentive amounts used to pay the implementation contractor for study-based services for the retro-commissioning program.
Recommendation 3. ComEd should track the incentives paid to the implementation contractor for study-based services separately.

Finding 4. The tracking data for the Business Standard and Small Business Energy Savings programs do not contain the units of measure counts.
Recommendation 4. ComEd should provide the units information for measure count in the tracking data. This will help calculate the total measure costs inputs accurately.

Finding 5. The Policy Manual does not clearly define what portfolio level costs should be included in the TRC analysis.
Recommendation 5. The Illinois Stakeholder Advisory Group (SAG) should update the policy manual to make it clear what costs should be included in the portfolio level costs.