NAVIGANT
A Guidehouse Company

ComEd CY2020-2021 Evaluation Plan

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1. INTRODUCTION

This compendium of evaluation plans provides an overview of evaluation activities for the Calendar Year (CY) 2020-2021 cycle. This compendium amends last year's evaluation plans[1] with updates and additions. An overview of the evaluation's goals includes:

- **Evaluation, measurement, and verification (EM&V) of energy efficiency programs.** These evaluations will meet the requirements of the Future Energy Jobs Act (FEJA) and Section 8-103B(g)(6) of the Illinois Public Utilities Act (PUA), which states that the utility shall provide for an annual independent evaluation of the performance of the cost-effectiveness of the utility's portfolio of programs, as well as a full review of the four-year results of the broader net program impacts and for adjustment of the measures on a going forward basis as a result of the evaluations. Our general approach to this work for the 2020-2021 period will be to focus on programs that require deeper analysis. We will continue to conduct thorough, high-quality annual impact evaluations for ComEd's largest energy efficiency (EE) programs and those undergoing significant changes. However, we will not over-evaluate any EE program. For example, for programs whose recent net-to-gross (NTG) ratios have been relatively consistent over time, we propose to conduct about two NTG evaluations over the four-year program cycle instead of doing NTG analysis every year. Using this approach more funds will be available for pressing evaluation research. Navigant plans to work with government and public interest parties, including the Illinois Stakeholder Advisory Group (SAG) and the Illinois Commerce Commission (ICC) Staff to ensure issues and topics relevant to EM&V are addressed in an efficient manner.

- **Reduce the cost of the CY2020 evaluation.** ComEd requested that the cost of evaluation for CY2020 be reduced significantly. The plans presented in this document reflects that reduction. Reductions include the following:

    - Reduced process evaluations, which will reduce the evaluations' ability to identify potential program enhancements.
    - Reduced frequency of NTG analyses and eliminated some spillover and free ridership research.
    - Reduced sample sizes for some impact evaluations.
    - Not conducting desk reviews represents lost opportunity to increase evaluation rigor.
    - Reduced tests of evaluation approaches using AMI data.
    - Shifting more responsibility onto ComEd staff for preparing PJM submittals.
    - Fewer stakeholder meetings to support advanced thermostat and voltage optimization studies.
    - Fewer monthly program evaluation conference calls.
    - Converted annual face-to-face program evaluation planning meetings to conference calls
    - Reduced research into EULs.
    - Reduced scope for supporting new initiatives in Pilots, market transformation, and established programs.

- **EM&V oversight and support that provides continuous improvement of ComEd's EE programs and processes**. As stated in ComEd's Plan 5 filing, evaluation efforts will support the program administrator's continuous improvement process by identifying the program's actual performance, showing how this performance differs from the planned performance, and identifying opportunities to improve the program processes over time.

[1] ComEd 2019-2021 Evaluation Plan:
https://s3.amazonaws.com/ilsag/ComEd_CY2019-CY2021_Evaluation_Plan_Final_2019-02-19.pdf

Several elements of Future Energy Jobs Act (FEJA) drive the specifics of our evaluation research, as described below.

Focus on CPAS. Under the Future Energy Jobs Act, ComEd's annual energy savings goals will be based on cumulative persisting annual savings (CPAS). As indicated in ComEd Plan 5, "the CPAS methodology is a new concept for energy efficiency in Illinois and emphasizes a shift to valuing the lifetime savings of the measure versus only the first-year savings, which was the focus of the prior energy efficiency framework."[2] One focus of evaluation research is thus to enable effective evaluation of CPAS. Key evaluation research initiatives include estimating measure effective useful life (EUL) and measure persistence, both of which are required to calculate CPAS. Concurrently, the team will be participating in continuous improvement efforts to update the IL TRM in conjunction with the IL SAG, such as researching and updating individual measure energy savings *estimates* to improve accuracy and reduce evaluation risk.

Non-electric savings. Up to 10 percent of ComEd's annual energy savings goal can be derived from gas savings or savings from other fossil fuels. Priority for these savings must be given to income eligible programs. For joint programs, gas conversion does not start until the gas company discontinues funding for the program. For non-joint programs, any gas (or other fuel savings, such as propane or fuel oil) can be counted. Each therm of natural gas savings at the customer's premise is equivalent to 29.3 kWh of electric savings.

Voltage Optimization. Voltage optimization (VO) is categorized as energy efficiency and must be evaluated as such. VO is estimated to contribute 12 percent to 15 percent of the savings each year, and has a measure life of 15 years, per the new legislation. Savings will be annualized based upon requirements of any ComEd stipulation agreements. Driven by ComEd's stipulation, discussions are still ongoing about the CY2020 evaluation approach.

Timeline. FEJA changed the program year to be based on the calendar year. It specified that ComEd will deliver final program year data by January 30th each year and the evaluation reports will be finalized by April 30th each year. To meet that deadline (and to improve other aspects of the evaluation), we are separating reporting on energy impacts, which will be completed by the April 30th deadline, from reporting on process evaluation research and NTG results. Where possible, NTG research will be completed by August 1 each year, so that reports can be reviewed and finalized in time for the September 1 initial evaluator NTG recommendations to SAG required by the Illinois NTG Policy Manual. Process evaluation research results will be reported as the research is completed so that it is available as soon as possible.

Non-Energy Impacts. Navigant is investigating a range of participant, utility, economic and societal non-energy impacts (NEIs) for ComEd. The initial focus for NEIs research has been quantifying NEIs associated with income eligible programs, since previous research has shown NEIs to often be particularly significant for these programs. [3][4][5][6] In addition, we will analyze the results from our screening questions in our participant surveys to explore NEIs in other programs. Based on the responses to the screening questions, as well as secondary research, we will conduct primary NEIs research to quantify NEIs associated with additional programs.

[3] Northeast Energy Efficiency Partnerships (2017). Non-Energy Impacts Approaches and Values: An Examination of the Northeast, Mid-Atlantic, and Beyond
[4] NMR Group (2011), Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts Evaluation
[5] Oak Ridge National Laboratory (2014). Health and Household-Related Benefits Attributable to the Weatherization Assistance Program
[6] Three[3], Inc. and NMR Group (2016). Massachusetts Special Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study

Navigant will determine:

- Economic NEIs including job creation (direct, indirect, and induced)
- Utility NEIs including reduced collections, arrearages, and shut-off costs
- Societal NEIs including reduced particulates
- Participant NEIs including improved health and reduced missed work and school days. Beyond income eligible programs, which specific programs show evidence of NEIs based on participants' responses to screening questions
- Which NEIs for non-income eligible program participants are good candidates for primary research

Summary Report

Navigant will produce a summary report providing a program-by-program and portfolio-level summary of the key results from the impact evaluations. The report will consist mostly of tables and figures to show the energy and demand impacts produced from the ComEd programs. The tables will include

- Ex post savings template tables agreed to by the SAG – those tables will be provided in the summary report as well as in an accompanying spreadsheet.
- Portfolio total and program-specific ex ante gross, verified gross, and verified net savings for energy, demand, and peak demand.
- Savings by sector (Residential, Business, Income Eligible, and Pilots)
- Savings spread over time based on measure-specific EULs and the calculation of CPAS.
- Calculation of the Weighted Average Measure Life (WAML).
- Gas savings converted to electricity in total and the amount that ComEd can claim.
- Savings by end use type (broad measure categories such as lighting, HVAC, refrigeration, etc.)
- A table of the high impact measures (those with the largest savings across the portfolio).
- Program costs.

Schedule: Navigant will deliver the first draft within days of the final first draft of the individual program impact evaluation reports. We will deliver the final report on April 30th after the last report is finalized.

ComEd 4 Year Plan Savings

Navigant will be evaluating the following 2018-2021 savings – this four-year detail was filed and approved by the Illinois Commerce Commission in ComEd's four year plan (2018-2021), dated June 30, 2017.

Savings/Budget	2018	2019	2020	2021
Statutory CPAS (MWh)	6,130,858	7,152,667	8,174,477	9,274,887
Legacy Savings (MWh)	4,558,843	4,087,238	3,537,033	3,144,030
Applicable Annual Incremental Goal (MWh)	943,209	1,021,810	1,021,810	1,100,410
Annual Budget	$351.3	$351.3	$351.3	$351.3

2. EVALUATING PROGRAMS

Business, Income Eligible, and Residential specific-evaluation tasks are shown in each program-specific evaluation plan attached in the Appendix and also shown in Appendix A. “Program-Specific Four-Year Tasks.” Navigant also develops evaluation plans for Pilot programs with energy savings. Navigant will approach each sector in a unique way given the needs of sector-specific needs. Below we discuss specific evaluation needs for the Business, Income Eligible, and Residential sectors, as well as our approach to Pilots.

Business Sector

Our evaluation strategy for the business sector programs includes (1) impact analysis in each of the four years leveraging the IL TRM, when appropriate (e.g., Standard, Small Business and Instant Discounts) and custom evaluation for other business programs (e.g., Custom, Industrial, CHP, etc.), (2) NTG research at least twice during the four-year plan cycle corresponding with changes in program design, delivery, or market changes, (3) process analysis is planned with ComEd (conducted in conjunction with NTG research to reduce participant fatigue) to seek actionable recommendations for program enhancements no later than the end of September each year, (4) process and NTG reporting will be separate from impact reporting which will be completed every April 30th, (5) market effects research for programs that appear to be impacting market change (e.g., Instant Discounts), (6) screening questions in program participant surveys looking for evidence of non-energy impacts associated with these programs, (7) research of proper measure-level effective useful lives will be undertaken for various programs on an as-needed basis – this has been done for RCx, Custom, Industrial, SEM, and (8) evaluation of Public Sector savings as part of the relevant business program. We will also continue to focus on ways EISA 2007 influences bulb decisions and the implications for the Instant Discounts program.

Income Eligible Sector

Navigant’s evaluation of income eligible programs will focus on (1) impact analyses, (2) evaluating program processes for potential enhancements, (3) identifying gaps in participation or underserved regions, (4) identifying potential updates to the IL TRM and (5) coordination with stakeholders, including the Income Qualified Energy Efficiency Advisory Committee.

In 2020, we will conduct strategic process research for the Income Eligible Multi-Family program. This process research will include building owner and property manager interviews as well as participant surveys. The findings from this effort will produce recommendations to enhance the Income Eligible Multi-Family program. In 2021, we will conduct strategic process research for the Affordable Housing New Construction Program including developer interviews and program materials review.

For each income eligible program, we will conduct program manager and implementer interviews focused on better understanding the implementation and goals of the program.

We will prioritize impact research that will result in updates to the IL TRM parameters for these programs. In addition to conducting an engineering review resulting in the prioritization of IL TRM measure updates, we plan to (1) conduct custom engineering analysis (site-specific billing analysis, metering, or modeling depending on program participation) for the Multi Family Retrofits program in 2020, and (2) conduct a billing analysis using a quasi-experimental design for the Single Family Retrofits program in 2021, and Navigant will use the results of this higher rigor impact research to update the applicable IL TRM measures and the results will inform both recommendations to enhance income eligible programs as well as additional impact related research efforts for the income eligible programs.

Finally, we will coordinate with Illinois stakeholders interested in income eligible programs and incorporate feedback from these stakeholders into our evaluation plans and research as applicable. The Illinois stakeholders will provide input to an NTG research strategy, if needed, for the income eligible programs.

Residential Sector

Our evaluation strategy for the residential-sector programs includes (1) robust impact analysis based on the IL TRM and regression analysis for behavior based programs (2) episodic NTG research corresponding with changes in program design, delivery, or market changes (3) process analysis (often conducted in conjunction with NTG research to reduce participant fatigue) to seek actionable recommendations for program enhancements, which will be reported separately from impact reporting and (4) screening questions in program participant surveys looking for evidence of non-energy impacts associated with the program..

We plan to conduct process evaluation activities early in the program year and report results to ComEd as valuable information becomes available.

Market Transformation

ComEd's plan also contains market transformation activities including: a Commercial Food Service Equipment pilot, Building Operator Certifications, and Residential and Business Building Codes. This compendium includes an evaluation plan for the Commercial Food Service Equipment pilot. Other evaluation plans are forthcoming in 2020 as ComEd informs Navigant of evaluation needs on market transformation activities.

Pilots

ComEd's plan includes pilots to test feasibility for inclusion in ComEd's portfolio as well as adding new measures to the IL TRM. For the pilots that require evaluation, Navigant conducts impact and process evaluations in a similar manner to the programs in the portfolio including:

- Determining the data needed to conduct impact evaluations
- Tracking system review
- Engineering file review
- Impact analyses
- Assessing feasibility of measure added to a future IL TRM using primary and secondary research as needed
- Research on behavioral measure savings and custom measure savings and evaluation approaches
- Process evaluations (including trade ally, participant and non-participant interviews)

Navigant will produce evaluation plans and reports for pilots, as needed.

3. COST-EFFECTIVENESS RESEARCH

The primary objective of the cost-effectiveness research and calculations is to comply with the Illinois legislative requirement that all energy efficiency portfolios be shown to be cost-effective. The key tasks of the cost-effectiveness analysis are to: (1) develop a cost model reflecting ComEd's costs by program, (2) evaluate the assumptions provided by ComEd and included in Navigant's cost model, (3) after agreement on the cost model and inputs, develop the Total Resource Costs (TRC) for each program, and (4) provide a report with any recommended improvements and comments on the costs and the resulting TRCs. As part of Navigant's evaluation of ComEd energy efficiency and demand response programs, we will develop a cost model and resulting TRCs, as well as joint TRCs for programs that are jointly implemented by ComEd and one or both of Nicor and/or Peoples Gas / North Shore Gas Companies. The joint TRC calculations will be completed after each utility completes their relevant cost-effectiveness analysis – the joint analysis will focus on the joint programs between the companies.

We anticipate that the TRC assumptions review will support evaluation, measurement and verification and regulatory reporting objectives for ComEd and will also inform future ComEd planning efforts. The Navigant team will work with ComEd to ensure that the proper data is available for the modeling and evaluation. We will apply the most recent Illinois cost-effectiveness methodology and ICC rulings in reviewing the TRC test calculations. 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 the joint programs will be included in a separate memo attached as an appendix to the report.

Navigant will comply with the Illinois Energy Efficiency Policy Manual v2, Sections 8 or any other future relevant Policy Manual sections. The Illinois TRC test is defined by the Illinois General Assembly 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 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 any 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.*[7]

The Illinois TRC test was modified by the Illinois General Assembly in December 2016 (for application starting in CY2019) to explicitly include a societal discount rate, avoided water and avoided operations and maintenance costs, and exclude market price suppression effects. The Illinois test makes it clear that the TRC requirement for plan approval is only at the portfolio level and excludes income eligible

[7] See http://www.ilga.gov/legislation/publicacts/99/099-0906.htm

programs. Individual measures need not be cost effective. 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.

Illinois TRC Equation used in the Assessment

The benefit-cost formulas will include avoided water costs, avoided O&M costs and other quantifiable societal benefits. Consistent with the principles laid out in the new *National Standard Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources*, cost-effectiveness analyses other quantifiable benefits can include quantified participant NEIs and evaluation will make every attempt to quantify this in the cost effectiveness calculations.

The equation that will be 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 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

Navigant will include all relevant costs outlined in Section 8.4 of the Illinois Energy Efficiency Policy Manual v 1.1 or any future relevant section, example costs are defined as:

RC = NPV of replacement costs of incandescent equivalents

PNICt = Program Non-Incentive costs in year t
IMCNt = Net Incremental costs in year t
UICt = Utility increased supply costs in year t
d = discounting future societal costs and benefits for the purpose of calculating net present values

The Illinois TRC test allows for utilities to account for the avoided baseline replacement measure costs that would accrue 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 IL TRM provides deemed NPV values per bulb based on efficient bulb-type, socket type (commercial or residential), and lumen range.

UCT Equation used in the Assessment

The results of the Utility Cost Test are also presented in Section 2 of this report. The UCT (a subset of the Program Administrator Cost Test) approaches cost effectiveness from the perspective of the utility. 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 impacts 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 that will be used 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

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

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

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

Cost-Effectiveness Data Requirements

The data points needed to conduct the Illinois TRC test are provided in Table 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. Navigant drafted the "ComEd 2019 TRC Inc Meas Cost and Incentives Assumptions Memo 2019-11-08" (Memo) which was circulated and discussed with the parties – that Memo and its assumptions and cost requirements outlined in that Memo are incorporated herein by reference.

Table 1. Data Points Needed to Conduct EEPS TRC

Category	Data Point	Source
Generic	• Avoided Energy Costs ($/kWh) • Avoided Capacity Costs ($/kW-year) • Discount Rate • Escalation Rates • Line Losses • Avoided GHG Emission Costs	ComEd and Relevant Joint Program Gas Company Costs
Program Specific	• Participants / Measure Count • Verified Ex-Post Energy Savings (kWh) • Verified Ex-Post Capacity Savings (kW) • Realization Rate • Net to Gross Ratio	Navigant and Relevant Joint Program Gas Company Costs
	• Measure life • Non-Incentive Costs • Utility Incentive Costs • Incremental Costs (Gross) • Incremental Costs (Net)	ComEd and Relevant Joint Program Gas Company Costs

Source: Navigant analysis

Our cost model will build-up from the measure and project level, cost detail by program which will roll-up into a portfolio level cost analysis. That cost analysis will be used to run the TRCs for each program so to arrive at final program TRCs and finalize a portfolio-level TRC.

TRM measures that require actual cost data is set forth in the following table.

Table 2. TRM Measures Requiring Actual Cost Data

	Measures		
Commercial	Combination Oven	Faucet Aerators*	Chiller
	Ice maker*	Showerheads*	Other Types (non air-source) of Heat Pumps
	Pre-rinse sprayer*	Ozone Laundry*	Variable Speed Drives Pumps and CT Fans, >20hp
	Storage Water Heater	Heat Recovery Grease Trap Filter	Small Com Programmable Thermostat and Adjustment*

	Measures		
	VSD on HVAC Fans >75 HP	Combined Heat and Power	Economizer Repair
	Covers and Gap Sealers for Room AC*	Advanced Rooftop Controls	Com Advanced Thermostat
	Packaged RTU Sealing*	Com. Ground (and Ground Water) Source Heat Pump*	Adsorbent Air Cleaning*
	LED Bulbs and Fixtures*	Com LED Exit Signs*	LED Traffic and Pedestrian Signals
	Lighting Power Density	Miscellaneous Commercial/Industrial Lighting	Multi-Level Lighting Switch*
	Lighting Controls*	Solar Light Tubes*	T5 Fixtures and Lamps*
	Occupancy Controlled Bi-Level Lighting Fixtures*	Com ENERGY STAR Specialty Compact Fluorescent Lamp (RET)*	LED Open Sign
	LED Streetlighting*	Beverage and Snack Machine Controls*	Q-Sync Motors for Reach-in Coolers/Freezers*
	Variable Frequency Drive for Condenser Fans*	Pump Optimization	Roof Insulation for C&I Facilities*
	Advanced Power Strip – Tier 1 Com	High Efficiency Transformer	ENERGY STAR and CEE Tier 2 Refrigerator (ER)*
Residential	ENERGY STAR Room Air Conditioner (ER)*	Refrigerator and Freezer Recycling*	Room Air Conditioner Recycling
	Advanced Power Strip – Tier 1 (DI)*	Tier 2 Advanced Power Strips (APS) – Residential Audio Visual	Air Source Heat Pump (ER)*
	Central Air Conditioning (ER)*	Duct Insulation and Sealing	Ground Source Heat Pump*
	HVAC Tune Up (Central AC or Air Source Heat Pump)*	Programmable Thermostats*	Ductless Heat Pumps*
	Residential Furnace Tune-Up	Advanced Thermostats*	Heat Pump Water Heaters*
	Low Flow Faucet Aerators*	Low Flow Showerheads*	Water Heater Wrap
	Thermostatic Restrictor Shower Valve*	Shower Timer	Compact Fluorescent Lamp (CFL)*
	ENERGY STAR Specialty Compact Fluorescent Lamp (CFL)*	LED Specialty Lamps*	LED Exit Signs*
	LED Screw Based Omnidirectional Bulbs*	LED Fixtures*	Holiday String Lighting*
	LED Nightlights*	Air Sealing	Basement Sidewall Insulation
	Floor Insulation Above Crawlspace	Wall Insulation	Celling/Attic Insulation
	Rim/Band Joist Insulation		

*Default values are available. When there is a reference to a DI, ER, or RET, then the actual value is preferred for the replacement type.

Data Sources and Assumptions

Table 3 provides the sources and assumptions for the measure costs by program. This table provides the baseline of identifying gaps in data and recommendations to improve cost data in future TRC analyses.

Table 3. CY2018 Program Cost Data Sources and Assumptions

Activity/Deliverables	Responsible Party	Date Delivered
Appliance Rebates	TRM	TRM deemed values are used for the analysis.
Elementary Education Kits	ComEd	Actual cost per kit used
Fridge and Freezer Recycling	Incentives	Net incentive* costs equal measure costs. Program level Incentive costs provided by ComEd are prorated by energy savings for each measure.

Activity/Deliverables	Responsible Party	Date Delivered
Heating and Cooling (HVAC) Rebates	TRM	Used the average unit capacity of all the units installed in 2018 to align the savings and cost units (tons vs per unit).
Weatherization - Market Rate	Project Invoices	Navigant calculates the average cost of installing a sample of projects from ComEd provided implementer invoices. This average cost for each weatherization measure type is used to calculate the overall measure cost for the program.
Home Energy Assessment	Project Invoices	Since most of the measures are DI, Navigant calculates the average cost of installing a sample of projects from ComEd provided implementer invoices. This average cost for each measure type is used to calculate the overall measure cost for the program.
Home Energy Reports	NA	There are no incentives or measure costs and only program administration costs.
Lighting Discounts	TRM	Includes analysis of the mix of lamps and the NPV replacement costs
Middle School Take-Home Kits	Incentives	ComEd doesn't track the cost of the kit as they only pay for the kWh savings. Assumption made that net Incentive costs equal total measure (kit) costs.
Multi-Family Market Rate	Project Invoices	Since most of the measures are DI, Navigant calculates the average cost of installing a sample of projects from ComEd provided implementer invoices. This average cost for each measure type is used to calculate the overall measure cost for the program.
Residential New Construction	ComEd	Navigant used data analyzed by ComEd and Nicor Gas to calculate the incremental cost per the different qualifying tiers of efficiency, $/tier
Air Care Plus	TRM and Project Invoices	Custom projects use a value of $0.15/kWh based on the performance payment by ComEd. Other measures use the TRM deemed cost.
Custom	ComEd	Sample of project files, average $/kWh
Data Centers	ComEd	Sample of project files, average $/kWh
Energy Advisor Monitoring-Based Commissioning	ComEd	Based on the average $/kWh from the RCx program
Industrial Systems Optimization	ComEd	Sample of project files, average $/kWh
Instant Discounts	TRM	Includes analysis of the mix of lamps and the NPV replacement costs
Business New Construction	ComEd	The program implementer analyzed project costs of construction meeting code versus exceeding code to calculate a $/kWh and a $/therm saved cost.
Operational Efficiency/Facility Assessments	Not Applicable	ComEd doesn't track the measure costs for this program. Navigant makes the assumption that the implementation contractor and marketing costs are the only costs associated with this program and there is no measure cost.
Public Housing Authority	ComEd (Multi-Family Market Rate Program) and TRM	Measure costs weren't tracked by ComEd. Navigant had to make the assumption that the measures costs for DI projects was similar to the DI measures installed in MF MR program. TRM deemed incremental cost values were used for Non-DI measures.
Public Small Facilities	TRM	TRM deemed values are used for the analysis.
Retrocommissioning	ComEd	Sample of project files, average $/kWh
Small Business Kits	Incentives	ComEd doesn't track the cost of the kit as they only pay for the kWh savings. Assumption made that net Incentive costs equal measure (kit) costs.
Small Business	TRM, DNV GL workpaper, assumptions	Certain assumptions on unit definition

Activity/Deliverables	Responsible Party	Date Delivered
Standard	TRM, DNV GL workpaper, assumptions	Certain assumptions on unit definition
Strategic Energy Management	Incentives	Assume measure cost equals incentives
Street Lighting	Project Invoice	ComEd provides this value based on their internal calculations.
Affordable Housing New Construction	Res New Const	$/kWh ratio from the res NC program
Food Bank LED Distribution	Incentives	ComEd doesn't track the measure costs for this program. Navigant makes the assumption that incentives are equal to the measure cost since this is a net payment program and ComEd pays for the energy savings.
Manufactured Housing - Retrofit	TBD	TBD
Product Discounts	TRM	Includes analysis of the mix of lamps and the NPV replacement costs
Multi-Family IHWAP	Incentive	ComEd Invoices aren't setup to track the measure level costs for this program. Navigant had to make the assumption that the total cost was twice the ComEd incentive since ComEd only covers half the cost of each installation.
Multi-Family Retrofits	TRM, ComEd (Weatherization – Market Rate Program, Multi-Family Market Rate Program)	ComEd Invoices aren't setup to track the measure level costs for this program. Navigant had to make the assumption that the weatherization measure costs were similar to the costs from the Market Rate Weatherization program. The TRM deemed cost was used for other non-DI measures. For DI measures Navigant made the assumption that the incentives were the same as the measure costs.
Single Family Retrofit - CBA	ComEd (MF IHWAP Program)	ComEd invoices aren't setup to track the measure level costs for this program. Navigant had to make the assumption that the incentive amount is the same as the measure cost as ComEd covers all the measure costs for the program.
Single Family Retrofit - IHWAP	Incentive	ComEd Invoices aren't setup to track the measure level costs for this program. Navigant had to make the assumption that the total cost was twice the ComEd incentive since ComEd only covers half the cost of each installation.
Income Eligible Energy Savings Kits	Incentives	ComEd doesn't track the measure costs for this program. Navigant makes the assumption that incentives are equal to the measure cost since this is a net payment program and ComEd pays for the energy savings.

* Net refers to incentives calculated as net incentives = NTG x paid incentives

Custom Program Cost Method

Custom programs may contain a mix of retrofit and replace on burnout type of measures in one project or across projects. In most cases, the project invoices will contain full costs of installations and maybe additional non-energy related costs. Since the program currently doesn't require the implementer (or the installation contractor) to do a detailed incremental cost analysis for each measure installed or a detailed line-item invoice as a part of the program, the issue is that the fully encumbered project costs tracked for the program will not represent the true incremental cost.

The savings calculation, though, for replace on burnout type of measures will be incremental to the standard (industry standard practices or equipment code baseline efficiency). The incremental cost calculations will vary for each project as there is no common approach that can be applied to all custom projects. Navigant is recommending doing a preliminary TRC test using the actual project costs which would lead to a conservatively low TRC value since the actual project costs will either be equal or greater than the incremental measure costs. Navigant only recommends a detailed incremental cost analysis for a sample of projects in the program to develop a program level incremental costs estimate ($/kWh) only if the program fails the initial TRC test performed using the conservative cost assumptions.

Therefore, for the custom programs (i.e., Industrial Systems, Custom, RCx), Navigant recommends the following steps for assessing appropriate measure costs for a program:

1. Use the documented invoices for the program's measure costs
2. Calculate the TRC
3. If the TRC is less than one, then: [8]
    a. Sample project invoices and project measures, to reassess if the cost represents incremental or other services.
    b. Calculate the $/kWh saved for all projects and troubleshoot the high and low values for reasonableness

As a result, the overall documented measure costs should be aligned with the policy manual guidance and result in a more accurate assessment of the cost-effectiveness.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as assessment and evaluation activities progress or changes in program delivery may be required. The SAG TRC template tables will be used for reporting purposes.

Plan start and delivery dates will be the same in most cases for CY2020 and subsequent years, except for potential changes in the timelines and specific calendar dates in CY2020 and following years. Navigant will strive to provide timely delivery of the results outlined above, but all are contingent upon ComEd delivering timely cost detail and proper back-up assumption detail to Navigant.

[8] There may be a need to do further analysis even if the program TRC exceeds 1.0. If the overall portfolio is not cost-effective, a deeper review of the custom programs may be necessary to help bolster the portfolio.

Table 4. Schedule – Key Deadlines for the TRC Analysis

Activity/Deliverables	Responsible Party	Date Delivered
Cost Assumptions and Detail	ComEd	Sept 1, 2020 (annually) *
Navigant Develops Initial Cost Model	Navigant	Dec 15, 2020 (annually)
Iterative Cost and Assumptions Discussions w/ComEd	ComEd / Navigant	Jan-May 2021
Finalize Cost Model	Navigant	Feb 1, 2021 (annually)
Navigant Develops Initial TRCs	Navigant	Feb 30, 2021 (annually)
Discussion of Initial TRCs	ComEd / Navigant	Feb-April 2021 (annually)
Navigant Draft TRC Report – Delivered (15 Bus Day R'vw)	ComEd/ICC	May 21, 2021 (annually)
Comments on Draft TRC Report due from Parties	ComEd / Navigant	June 11, 2021 (annually)
Navigant Re-Draft TRC Report – Delivered (5 Bus Day R'vw)	ComEd/ICC	June 18, 2021 (annually)
Final TRC Report to ComEd and SAG	Navigant	June 29, 2021 (annually)
Navigant Draft Joint TRCs (15 Bus Day R'vw)	Navigant	November 15, 2021 (annually)
Comments on Navigant Draft of Joint TRC Report	ComEd / Navigant	Dec 6, 2021 (annually)
Navigant Re-Draft of Joint TRC Report (5 Bus Day R'vw)	ComEd	Dec 15, 2021 (annually)
Final Joint TRC Report	Navigant	Dec 23, 2021 (annually)

*Note: Receipt of the initial assumption and cost data from ComEd is the initial step and without timely receipt of data and detail, the entire schedule shifts by an equal amount of time – each date will be delayed. Dates above for Joint TRC analysis are also contingent on timely receipt of joint program cost detail from ComEd, Peoples Gas, North Shore Gas and Nicor Gas.

4. CROSS-CUTTING RESEARCH

Cross-cutting evaluation includes initiatives that contribute toward the calculating CPAS, such as EUL and measure persistence research, net-to-gross (NTG) research, non-energy impact (NEI) research, and working with the IL SAG and the IL TRM administrator to update the IL TRM. Evaluation research is coordinated statewide with the evaluators for Ameren Illinois, Nicor Gas, Peoples Gas and North Shore Gas. A list of current activities is included in the tables below with specific evaluation research plans following in Appendix F.

EE FRU Proceeding

The Stipulation Agreement Joint Exhibit 1.0 from Docket Number 19-0580 of the annual energy efficiency formula rate update includes clauses that address the independent evaluator. The EE FRU section II-5 contains the following, which the evaluation team will address:

a. Subject to any Commission rulings or orders, the Parties agree that in its capacity as a "non-party participant" in the remaining Plan 5 EE FRU proceedings, the independent evaluator is expected to:

i. file concise direct testimony (A) providing a high-level summary of its summary report; (B) providing high level overviews of each annual program evaluation report; and (C) describing any disputes that have been documented in any of the evaluation reports in accordance with the Settlement Stipulation approved by the Commission in ICC Docket No. 17-0312. The independent evaluator will make best efforts to file its direct testimony within days of ComEd filing the annual EE FRU petition;

ii. respond to any data requests served on it by the parties to the proceeding pursuant to 83 Ill. Admin. Code Part 200;

iii. file testimony responding to an issue with the evaluation reports that is raised by a party in a given proceeding; and

iv. be available to provide oral testimony at the evidentiary hearing in a given proceeding regarding its evaluation reports submitted in the proceeding.

Illinois TRM Measure Updates

The goal of IL TRM evaluation research is to improve IL TRM input parameter assumptions and formulas. All evaluators in Illinois, including Navigant, are part of the Illinois SAG Technical Advisory Committee (TAC) and are charged with providing materials to continually update and improve the IL TRM to provide the most accurate input parameter assumptions and impact evaluation methodology. Navigant will continue to produce IL TRM measure workpapers including primary and secondary research. Each year, Navigant reviews current IL TRM measures and priority recommendations from the TAC to develop evaluation research based on energy savings, historical realization rate, variability and uncertainty in measure impacts, feasibility to update, relative contributions of measures and planned future use, among others. Each year, we will develop research for high priority measures identified by the IL TRM subcommittee and measures with high portfolio impact or outdated references. The team plans to revisit this list on an ongoing basis as, for example, the IL SAG releases new updates on IL TRM research priorities and the ComEd portfolio measure mix shifts over time. This ongoing review will ensure Navigant's research will focus on the most important topics for ComEd and IL SAG stakeholders. Over the course of the next two years, we expect to continue updating IL TRM measures using the criteria above.

As new measures are proposed to the IL TRM, Navigant will conduct secondary research in coordination with the IL TRM administrator to determine whether the measure has been evaluated in other locations,

such as TRMs from other states. Working with stakeholders, we will analyze a range of savings values for a particular measure, if such values are known.

In CY2020, we will participate in the lighting mid-life adjustment working group. This working group is focused on confirming and developing assumptions for mid-life adjustments to lighting savings.

Non-Energy Impact Research

In CY2020, Navigant will continue non-energy impact (NEI) research to quantify and monetize NEIs associated with both income eligible and non-income eligible programs. We will complete the economic, utility and societal NEI research, and start to conduct participant and non-participant surveys. In addition, we will provide updates via SAG NEI Working Group meetings. We will also begin the process of including the monetized NEIs in the TRM or policy manual.

Net-to-Gross Evaluation Research

In CY2020, Navigant will continue to lead the NTG working group as it seeks to improve the IL TRM net-to-gross (NTG) methodologies. We will present the results of our research and facilitate working meetings to deliberate on translating our research results into specific improvements to the methodology. As in previous years, we will also solicit other proposals for improvements from the Working Group and will facilitate discussions of these and will manage the proposed updates to the TRM.

This will involve focusing on several aspects of the methodologies:

- Exploring key concerns (about the current IL TRM methodologies) that were articulated in 2019 Illinois SAG NTG Working Group meetings
- Conducting sensitivity analyses of Navigant's recent free ridership research results to identify problematic questions
- Analyzing the dynamics of recent research results where quantitative responses conflict with open ended responses
- Analyzing other problematic results of recent free ridership research

Research Tasks

Tables 5 and 6 summarize evaluation research tasks currently underway and being planned. The research team plans to revisit this list on an ongoing basis as, for example, the IL SAG releases new updates on IL TRM research priorities and the ComEd portfolio measure mix shifts over time. This ongoing review will ensure Navigant's research will focus on the most important topics for ComEd's evaluation and IL SAG stakeholders. Updates to required and planned research will occur on an ongoing basis and the detail below will be updated on an ongoing basis.

Note, the check marks (✓) in Table 5 and Table 6 indicate the year in which the research is planned and will occur.

Table 5. Evaluation Research Tasks: IL TRM Measure Research

Research Task	Description	2017	2018	2019	2020	2021
IL TRM 5.2.2: Advanced Power Strip Tier 1 - ISR/Persistence	Research study to determine the in-service rate and persistence of savings from Tier 1 Advanced Power Strips	✓	✓	✓	✓	
IL TRM 5.3.16 Advanced Thermostats - Cooling Savings Factor	Billing analysis to estimate cooling savings factors for advanced thermostats	✓	✓	✓	✓	
IL TRM 5.6.1-5.6.4: Shell Measures - Savings Verification	Engineering and billing analysis to update de-rating factors for air sealing and insulation	✓	✓			
IL TRM 6.1.1: Weather Normalization for Behavior Measures	Billing analysis to determine whether weather normalization is required for evaluating behavior measure savings	✓				
IL TRM 6.1.1: Adjustments to Behavior Savings to Account for Persistence	Billing analysis to estimate decay rates for behavior measure savings	✓	✓	✓	✓	
LED Street Lighting O&M Cost Savings Research (separate municipal and ComEd)	Secondary research to determine avoided operations and maintenance costs from upgrading to LED street lighting	✓	✓			
IL TRM 4.4.17: Variable Speed Drives for HVAC Pumps and Cooling Tower Fans - Measure Cost	Secondary research to update incremental cost estimates for VSDs	✓	✓			
IL TRM 4.4.19: Demand Controlled Ventilation - Savings Factors	Secondary research to update savings factors for demand-controlled ventilation	✓	✓			
IL TRM 4.5.4, 5.5.6, and 5.5.8: LED Bulbs and Fixtures - Incremental Costs	Secondary research to determine need for an update to LED product incremental costs	✓	✓			
Retro-commissioning Measure Persistence Study	Study to determine the persistence of savings from Retro-commissioning measures	✓	✓			
IL TRM 4.4.17: Variable Speed Drives for HVAC Pumps and Cooling Tower Fans – Measure Impacts	Metering study to update TRM savings estimates and input parameters for VSDs		✓	✓		

Research Task	Description	2017	2018	2019	2020	2021
LED Streetlighting Impacts	Secondary research and metering study to update savings estimates for LED Streetlighting measures		✓	✓		
IL TRM 4.4.1 Air Conditioner Tune-Up: Deemed Savings Percentages	Metering and AMI study to update deemed savings percentages for AC Tune-up measures		✓	✓		
IL TRM 4.4.18: Small Commercial Programmable Thermostat - Savings Verification	Billing analysis to update deemed savings estimates		✓	✓	✓	
Load Shape and Coincidence Peak Research	Secondary research to update TRM load shapes and determine need for additional primary research		✓	✓		
IL TRM 5.1.8: Refrigerator and Freezer Recycling – Secondary Review	Secondary research to update incremental cost estimates for VSDs			✓		
IL TRM Measures	Additional measures added each year, to be determined			✓	✓	✓

Table 6. Cross-Cutting Evaluation Research

Research Task	Description	2017	2018	2019	2020	2021
Income Eligible Program NEIs	Research to estimate non-energy impacts from income-eligible program measures	✓	✓			
Business Program NEIs	Conduct primary research on selected programs based on results from screening questions			✓	✓	✓
Residential Program NEIs	Conduct primary research on selected programs based on results from screening questions			✓	✓	✓
EUL Research: Technical Measure Life	Research to refine estimates of effective useful life for high priority measures	✓	✓	✓		
EUL Research: Persistence	Staged study to investigate persistence for high priority measures		✓	✓	✓	✓
Evaluating AMI for Individual Programs	Conduct secondary research and document in memorandum summarizing possible applications for using AMI data in evaluation	✓	✓	✓		
Pilot M&V 2.0 approaches for select programs	Conduct pilot evaluations using innovative M&V 2.0 approaches		✓	✓	✓	✓
PJM Bid Support	Provide savings values for ComEd's PJM M&V Plan in March, and their PJM M&V Report in May.	✓	✓	✓	✓	✓

APPENDIX A. PROGRAM-SPECIFIC FOUR-YEAR TASKS

Table 1. Business Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Agriculture Offering	Tracking System Review			X	X
Agriculture Offering	Process – Participant and Implementer Interviews			X	X
Agriculture Offering	Data Collection – Program Manager and Implementer Interviews			X	X
Agriculture Offering	Impact – Engineering Review			X	X
Agriculture Offering	Impact – Verification and Gross Realization Rate			X	X
Agriculture Offering	Impact – Net Verification and Evaluation Report			X	X
Custom	Tracking System Review	X	X	X	X
Custom	Data Collection – Participant Surveys	X	X	X	X
Custom	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Custom	Impact – Engineering Review	X	X	X	X
Custom	Impact – Modeling (as needed)	X	X	X	X
Custom	Impact – Verification & Realization Rate	X	X	X	X
Custom	Net-to-Gross – Customer Self-Report Surveys		X	X	X
Custom	Net-to-Gross – EESP Interviews		X	X	X
Custom	Process Analysis	X	X		
Grocery	Tracking System Review			X	X
Grocery	Data Collection – Program Manager and Implementer Interviews			X	X
Grocery	Impact – Measure-Level Savings Review			X	X
Grocery	Impact – Detailed Project-Level Desk Review			X	X
Grocery	Impact – Verification & Gross Realization Rate			X	X
Grocery	Process Evaluation				X
Industrial Systems Optimization	Tracking System Review	X	X	X	X
Industrial Systems Optimization	Data Collection – Participant Surveys	X	X	X	X
Industrial Systems Optimization	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Industrial Systems Optimization	Impact – Engineering Review	X	X	X	X
Industrial Systems Optimization	Impact – Modeling (as needed)	X	X	X	X
Industrial Systems Optimization	Impact – Verification & Realization Rate	X	X	X	X
Industrial Systems Optimization	Net-to-Gross – Customer Self-Report Surveys		X	X	X
Industrial Systems Optimization	Net-to-Gross – EESPs Interviews		X	X	X
Industrial Systems Optimization	Net-to-Gross – Technical Service Provider Interviews			X	X
Industrial Systems Optimization	Process Analysis	X	X		X

Program	Task	2018	2019	2020	2021
Instant Discounts	Tracking System Review	X	X	X	X
Instant Discounts	Data Collection – Participant Surveys	X	X	X	X
Instant Discounts	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Instant Discounts	Data Collection – EESPs Interviews/Roundtables	X	X		X
Instant Discounts	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Instant Discounts	Impact – Verification & Realization Rate	X	X	X	X
Instant Discounts	Net-to-Gross – Participant Self-Report Surveys	X			X
Instant Discounts	Net-to-Gross – EESPs Interviews	X			X
Instant Discounts	Process Analysis	X	X		X
LED Street Lighting	Tracking System Review	X	X	X	X
LED Street Lighting	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
LED Street Lighting	Data Collection – Stakeholder Interviews	X	X		
LED Street Lighting	Impact – Engineering Review	X	X	X	X
LED Street Lighting	Impact – Measure-Level Deemed Savings Review	X	X	X	X
LED Street Lighting	Net-to-Gross – Customer Self-Report Surveys		X		
LED Street Lighting	Process Analysis	X			
Nonprofit Organizations	Tracking System and Data Flow Review			X	X
Nonprofit Organizations	Data Collection – Program Manager and Implementer Interviews			X	X
Nonprofit Organizations	Impact – Project Level Desk Reviews including Deemed Savings Review			X	X
Nonprofit Organizations	Impact – Project Level Site Visits and Installation Verification			X	X
Nonprofit Organizations	Impact – Verification & Gross Realization Rate			X	X
Nonprofit Organizations	Impact – Gross and Net Savings Verification			X	X
Non-Residential New Construction	Tracking System Review	X	X	X	X
Non-Residential New Construction	Data Collection – Materials Review			X	X
Non-Residential New Construction	Data Collection – Participant Surveys	X	X	X	X
Non-Residential New Construction	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Non-Residential New Construction	Impact – Engineering Review	X	X	X	X
Non-Residential New Construction	Impact – Building Energy Simulation Modeling	X	X	X	X
Non-Residential New Construction	Impact – Verification & Gross Realization Rate	X	X	X	X
Non-Residential New Construction	Net-to-Gross – Free Ridership Self-Report Surveys	X	X		X
Non-Residential New Construction	Net-to-Gross – Trade Ally Interviews		X		

Program	Task	2018	2019	2020	2021
Non-Residential New Construction	Process Research	X	X		X
Operational Efficiency	Gross Impact Approach	X	X	X	X
Operational Efficiency	Gross Sampling Frequency	X	X	X	X
Operational Efficiency	Verified Net Impact Approach	X	X	X	X
Operational Efficiency	Researched NTG Approach		X		X
Operational Efficiency	Program Manager and Implementer Interviews/Review Materials	X	X	X	X
Operational Efficiency	Participant Interviews	X	X		X
Operational Efficiency	Effective Useful Life Determination	X	X	X	X
Operational Efficiency	Process Evaluation	X	X		X
Public Buildings in Distressed Communities	Tracking System Review			X	X
Public Buildings in Distressed Communities	Process – Participant surveys and implementer interviews				X
Public Buildings in Distressed Communities	Data Collection – Program Manager and Implementer Interviews			X	X
Public Buildings in Distressed Communities	Impact – Engineering Reviews			X	X
Public Buildings in Distressed Communities	Impact – Verification of Gross and Net Impacts			X	X
Public Buildings in Distressed Communities	Impact – Verification and Gross Realization Rate			X	X
Public Small Facilities	Tracking System Review			X	X
Public Small Facilities	Data Collection – Program Manager and Implementer Interviews			X	X
Public Small Facilities	Impact – Engineering Review			X	X
Public Small Facilities	Impact – Measure-Level Deemed Savings Review			X	X
Public Small Facilities	Impact – Verification & Gross Realization Rate			X	X
Public Small Facilities	Net-to-Gross – Customer Self-Report Surveys				X
Public Small Facilities	Net-to-Gross – EESP Interviews				X
Public Small Facilities	Process Research		X		X
Retro-commissioning	Tracking System Review	X	X	X	X
Retro-commissioning	Data Collection – Program Manager and Implementer Interviews	X	X		X
Retro-commissioning	Impact – Project-specific Billing Analysis	X	X	X	X
Retro-commissioning	Impact – Engineering Review	X	X	X	X
Retro-commissioning	Impact – Verification & Gross Realization Rate	X	X	X	X
Retro-commissioning	Net-to-Gross – CY2019 Customer Self-Report Surveys			X	
Retro-commissioning	Net-to-Gross – CY2019 Service Provider Interviews			X	

Program	Task	2018	2019	2020	2021
Retro-commissioning	Process Analysis	X	X		X
Small Business (private sector)	Tracking System Review	X	X	X	X
Small Business (private sector)	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Small Business (private sector)	Impact – Billing Analysis	X	X	X	X
Small Business (private sector)	Impact – Engineering Review	X	X	X	X
Small Business (private sector)	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Small Business (private sector)	Impact – Modeling (as needed)	X		X	
Small Business (private sector)	Impact – Verification & Realization Rate	X	X	X	X
Small Business (private sector)	Net-to-Gross – Customer Self-Report Surveys	X		X	
Small Business (private sector)	Net-to-Gross – EESP Interviews	X		X	
Small Business (private sector)	Process Analysis	X	X		X
Small Business Kits	Tracking System Review			X	X
Small Business Kits	Data Collection – Program Manager and Implementer Interviews			X	X
Small Business Kits	Impact – Measure-Level Deemed Savings Review			X	X
Small Business Kits	Impact – Verification & Gross Realization Rate			X	X
Small Business Kits	Net-to-Gross – Customer Self-Report Surveys				X
Small Business Kits	Process Analysis				X
Standard	Tracking System Review	X	X	X	X
Standard	Data Collection – Participant Surveys	X	X		X
Standard	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Standard	Data Collection – Literature Review				X
Standard	Impact – Billing Analysis	X		X	X
Standard	Impact – Engineering Review	X	X	X	X
Standard	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Standard	Impact – Verification & Realization Rate	X		X	X
Standard	Net-to-Gross – Customer Self-Report Surveys		X		X
Standard	Net-to-Gross – EESP Spillover Research		X		X
Standard	Process Analysis	X	X		
Strategic Energy Management	Tracking System Review	X	X	X	X
Strategic Energy Management	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Strategic Energy Management	Impact – Billing Analysis	X	X	X	X
Strategic Energy Management	Impact – Engineering Review	X	X	X	X

Program	Task	2018	2019	2020	2021
Strategic Energy Management	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Strategic Energy Management	Impact – Modeling	X	X	X	X
Strategic Energy Management	Impact – Verification & Realization Rate	X	X	X	X
Strategic Energy Management	Process Analysis	X	X		X
Telecommunications Optimization	Tracking System Review			X	X
Telecommunications Optimization	Data Collection – Program Manager and Implementer Interviews			X	X
Telecommunications Optimization	Impact – Measure-Level Deemed Savings Review			X	X
Telecommunications Optimization	Impact – Project Level Desk Reviews			X	X
Telecommunications Optimization	Impact – Project Level Site Visits & Metering				X
Telecommunications Optimization	Impact – Verification & Gross Realization Rate			X	X
Telecommunications Optimization	Process Analysis				X
Virtual Commissioning	Tracking System Review	X	X	X	X
Virtual Commissioning	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Virtual Commissioning	Impact – Regression Analysis (Customer-Specific)			X	X
Virtual Commissioning	Net-to-Gross – Customer Self-Report Surveys				X
Virtual Commissioning	Impact – Regression Analysis	X	X	X	X
Virtual Commissioning	Process – Customer Self-Report Surveys			X	
Voltage Optimization	Tracking System Review			X	X
Voltage Optimization	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Voltage Optimization	Data Collection – AMI and SCADA Data from VO Substations/feeders	X	X	X	X
Voltage Optimization	Impacts – Measure Net Savings Impact of VO in Affected Feeders	X	X	X	X
Voltage Optimization	TRM Research – Develop Method for Measuring Future VO Impacts			X	

Table 2. Income Eligible Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Affordable Housing New Construction	Tracking System Review	X	X	X	X
Affordable Housing New Construction	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Affordable Housing New Construction	Data Collection – Stakeholder Interviews	X	X		X
Affordable Housing New Construction	Data Collection – Program Materials Review				X
Affordable Housing New Construction	Impact – Engineering Review	X	X	X	X
Affordable Housing New Construction	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Affordable Housing New Construction	Impact – Verification & Realization Rate	X	X	X	X
Affordable Housing New Construction	Impact Research – Calibrated Simulation Modeling		X		
Affordable Housing New Construction	Process Analysis	X			X
Food Bank Distribution	Tracking System Review	X		X	X
Food Bank Distribution	Data Collection – Participant Surveys	X			X
Food Bank Distribution	Data Collection – Program Manager and Implementer Interviews	X		X	X
Food Bank Distribution	Impact – Engineering Review	X		X	X
Food Bank Distribution	Impact – Measure-Level Deemed Savings Review	X		X	X
Food Bank Distribution	Impact – Verification & Gross Realization Rate	X		X	X
Food Bank Distribution	Process Analysis	X			X
Income Eligible Multi-Family Energy Efficiency	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Income Eligible Multi-Family Energy Efficiency	Data Collection – Building Owners and Property Manager Surveys (Lead Lifecycle Analysis)	X		X	
Income Eligible Multi-Family Energy Efficiency	Impact – Billing Analysis		X		
Income Eligible Multi-Family Energy Efficiency	Impact – Engineering Review	X	X	X	X
Income Eligible Multi-Family Energy Efficiency	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Income Eligible Multi-Family Energy Efficiency	Impact – Verification & Realization Rate	X	X	X	X
Income Eligible Multi-Family Energy Efficiency	Impact – Field Work			X	
Income Eligible Multi-Family Energy Efficiency	Impact – Custom Analysis to Confirm TRM Savings Estimates				X

Program	Task	2018	2019	2020	2021
Income Eligible Multi-Family Energy Efficiency	Net-to-Gross – Customer Self-Report Surveys		X		
Income Eligible Multi-Family Energy Efficiency	Process Analysis	X	X	X	X
Income Eligible Product Discounts	Tracking System Review	X	X	X	X
Income Eligible Product Discounts	Data Collection – In-store Intercepts Participant Surveys	X	X	X	
Income Eligible Product Discounts	Data Collection – In-store Shelf Surveys				
Income Eligible Product Discounts	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Income Eligible Product Discounts	Data Collection – EESP Interviews				
Income Eligible Product Discounts	Impact – Engineering Review	X	X	X	X
Income Eligible Product Discounts	Impact – Modeling	X	X	X	X
Income Eligible Product Discounts	Impact – Verification & Gross Realization Rate	X	X	X	X
Income Eligible Product Discounts	Net-to-Gross – Customer Self-Report Surveys				
Income Eligible Product Discounts	Process Analysis	X	X		
Income Eligible Single-Family Retrofit	Tracking System Review	X	X	X	X
Income Eligible Single-Family Retrofit	Data Collection – Participant Surveys	X			
Income Eligible Single-Family Retrofit	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Income Eligible Single-Family Retrofit	Data Collection – EESP Interviews	X			
Income Eligible Single-Family Retrofit	Impact – Billing Analysis		X		X
Income Eligible Single-Family Retrofit	Impact – Engineering Review	X	X	X	X
Income Eligible Single-Family Retrofit	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Income Eligible Single-Family Retrofit	Impact – Verification & Realization Rate	X	X	X	X
Income Eligible Single-Family Retrofit	Impact – Field Work	X			

Program	Task	2018	2019	2020	2021
Income Eligible Single-Family Retrofit	Process Analysis	X	X		
Manufactured Homes Energy Efficiency	Tracking System Review			X	X
Manufactured Homes Energy Efficiency	Impact – Measure-Level Deemed Savings Review			X	X
Manufactured Homes Energy Efficiency	Data Collection – Program Manager and Implementer Interviews			X	X
Manufactured Homes Energy Efficiency	Impact – Verification & Gross Realization Rate			X	X
Manufactured Homes Energy Efficiency	Impact – Field Work				X
Income Eligible Energy Savings Kit	Tracking System Review	X		X	X
Income Eligible Energy Savings Kit	Data Collection – Program Manager and Implementer Interviews	X		X	X
Income Eligible Energy Savings Kit	Impact – Engineering Review	X		X	X
Income Eligible Energy Savings Kit	Impact – Measure-Level Deemed Savings Review	X		X	X
Income Eligible Energy Savings Kit	Impact – Verification & Realization Rate	X		X	X
Income Eligible Energy Savings Kit	Process Analysis	X			
Public Housing Retrofits Program	Tracking System Review			X	X
Public Housing Retrofits Program	Data Collection – Program Manager and Implementer Interviews			X	X
Public Housing Retrofits Program	Data Collection – Resident Interviews				X
Public Housing Retrofits Program	Data Collection – EESP and Stakeholder Interviews				X
Public Housing Retrofits Program	Impact – Measure-Level Deemed Savings Review			X	X
Public Housing Retrofits Program	Impact – Verification & Gross Realization Rate			X	X
Public Housing Retrofits Program	Process Analysis				X

Table 3. Residential Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Appliance Rebates	Tracking System Review	X	X	X	X
Appliance Rebates	Data Collection – Participant Surveys	X			
Appliance Rebates	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Appliance Rebates	Data Collection – Retailer Interviews	X			
Appliance Rebates	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Appliance Rebates	Impact – Verification & Realization Rate	X	X	X	X
Appliance Rebates	Net-to-Gross (Spillover) – Customer Self-Report Surveys	X			
Appliance Rebates	Process Analysis	X	X		X
Elementary Education Kits	Tracking System Review	X	X	X	X
Elementary Education Kits	Data Collection – Parent, Teacher, and Student Surveys	X	X	X	X
Elementary Education Kits	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Elementary Education Kits	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Elementary Education Kits	Impact – Verification & Gross Realization Rate	X	X	X	X
Elementary Education Kits	Process Analysis – Analyze Teacher Surveys (collected by RAP)	X	X	X	
Fridge/Freezer Recycling	Tracking System Review	X	X	X	X
Fridge/Freezer Recycling	Data Collection – Participant Surveys	X	X	X	X
Fridge/Freezer Recycling	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Fridge/Freezer Recycling	Data Collection – Retailer Interviews		X		X
Fridge/Freezer Recycling	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Fridge/Freezer Recycling	Impact – Verification & Gross Realization Rate	X	X	X	X
Fridge/Freezer Recycling	Net-to-Gross – Customer Self-Report Surveys	X	X	X	X
Fridge/Freezer Recycling	Net-to-Gross Analysis		X	X	X
Fridge/Freezer Recycling	Process Evaluation		X		X
Heating and Cooling Rebates	Tracking System Review	X	X	X	X
Heating and Cooling Rebates	Data Collection – Participant Surveys	X	X		X
Heating and Cooling Rebates	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Heating and Cooling Rebates	Data Collection – EESP Interviews	X			X
Heating and Cooling Rebates	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Heating and Cooling Rebates	Impact – Verification & Realization Rate	X	X	X	X

Program	Task	2018	2019	2020	2021
Heating and Cooling Rebates	Net-to-Gross – Customer Self-Report Surveys	X			X
Heating and Cooling Rebates	Net-to-Gross – EESP Interviews	X			X
Heating and Cooling Rebates	Process Analysis	X			X
HEA - Single Family	Tracking System Review	X	X	X	X
HEA - Single Family	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
HEA - Single Family	Data Collection – Participant Survey				X
HEA - Single Family	Impact – Measure-Level Deemed Savings Review	X	X	X	X
HEA - Single Family	Impact – Verification & Gross Realization Rate	X	X	X	X
HEA - Single Family	Net-to-Gross – Customer Self-Report Surveys				X
HEA - Single Family	Process Analysis	X			X
Home Energy Reports	Tracking System Review	X	X	X	X
Home Energy Reports	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Home Energy Reports	Impact – Regression Analysis	X	X	X	X
Lighting Discounts	Tracking System Review	X	X	X	X
Lighting Discounts	Data Collection – In-store Intercept Participant Surveys	X			
Lighting Discounts	Data Collection – In-store Shelf Surveys	X			
Lighting Discounts	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Lighting Discounts	Data Collection – EESP Interviews	X			
Lighting Discounts	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Lighting Discounts	Impact – Verification & Gross Realization Rate	X	X	X	X
Lighting Discounts	Net-to-Gross – Customer Self-Report Surveys	X			
Lighting Discounts	Process Analysis	X			
Multi-Family Market Rate	Tracking System Review	X	X	X	X
Multi-Family Market Rate	Data Collection – Building Owner and Property Manager Surveys	X			X
Multi-Family Market Rate	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Multi-Family Market Rate	Data Collection – EESP Interviews	X			
Multi-Family Market Rate	Impact – Engineering Review	X	X	X	X
Multi-Family Market Rate	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Multi-Family Market Rate	Impact – Verification & Realization Rate	X	X	X	X
Multi-Family Market Rate	Net-to-Gross	X			X
Multi-Family Market Rate	Process Analysis	X			X
Residential New Construction	Tracking System Review	X	X		

Program	Task	2018	2019	2020	2021
Residential New Construction	Data Collection – Program Manager and Implementer Interviews	X			
Residential New Construction	Data Collection – Builder and Rater Interviews				
Residential New Construction	Impact – Calibrated Simulation Modeling	X			
Residential New Construction	Impact – Verification & Realization Rate	X	X		
Weatherization – Market Rate	Tracking System Review	X	X		
Weatherization – Market Rate	Data Collection – Participant Surveys	X			
Weatherization – Market Rate	Data Collection – Program Manager and Implementer Interviews	X			
Weatherization – Market Rate	Data Collection – EESP Interviews	X			
Weatherization – Market Rate	Impact – Measure-Level Deemed Savings Review	X	X		
Weatherization – Market Rate	Impact – Verification & Realization Rate	X	X		
Weatherization – Market Rate	Net-to-Gross – Customer Self-Report Surveys	X			
Weatherization – Market Rate	Literature Review – NTG Values for Wall Insulation		X		
Weatherization – Market Rate	Process Analysis	X			

APPENDIX B. BUSINESS PROGRAMS EVALUATION PLANS

ComEd Agriculture Program CY2020 to CY2021 Evaluation Plan

Introduction

The Agriculture Program targets the full vertical market including farms (dairy, poultry, hogs, cash crops, etc.), greenhouses, indoor agriculture facilities, supply houses, and on-site processing facilities, as well as farm facilities on residential properties (excluding the residence). It serves both existing facilities and new construction and offers standard and custom incentives.

There were several updates to the Agriculture offering for CY2020 including:

- The addition of eight (8) new standard measures including dairy refrigeration heat recovery, milk pre-cooler, VSD with plate cooler heat exchanger, LED grow lights, low pressure sprinkler nozzles, and fan thermostat controllers
- Enhanced incentives for LED fixtures, TLED retrofits and occupancy sensors
- Transition primary outreach efforts to a sector-based focus concentrating on fewer sectors including:
    - Dairy
    - Greenhouses/indoor agriculture
    - Poultry/swine
- An updated approach to indoor agriculture measures targeting the cannabis industry

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Process – Participant and Implementer interviews	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Verification and Gross Realization Rate	X	X
Impact – Net Verification and Evaluation Report	X	X

The evaluation of ComEd's Agriculture Program will entail a review of tracking data for consistency and accuracy, including verifying the proper application of the Illinois Technical Reference Manual (TRM). In addition, the evaluation will include a desk review of a sample of projects submitted through the Agriculture Program to confirm completeness of project documentation, alignment with the tracking database, agreement with the savings assumptions in the IL TRM, and sound savings assumptions.

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent.

Evaluation Research Topics

The primary objectives of the evaluation of the Agriculture Program are to: (1) quantify gross and net savings impacts from the program, and (2) as the program evolves, make recommendations to enhance it.

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the program's verified gross energy and demand savings?
2. What is the program's verified net energy and demand savings?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

The evaluation team will conduct a process evaluation for the Agriculture Program in CY2020. Navigant will conduct implementer interviews and deploy automated, web-based participant surveys to those involved in the program. Navigant recognizes the availability to reach agriculture customers varies by season for the different agribusiness types and ; uptake is also low during the holiday season. Therefore, survey deployment will occur in the winter of 2020-2021.

Evaluation Approach

The evaluation team determined the evaluation approach for the CY2020-2021 period (see Table 2) based upon the current and expected near-term needs of the program. However, Navigant realizes that the program is relatively new and will likely change as it matures over the next two years. Therefore, Navigant also notes that the evaluation approach may also change over the next two years in response to program updates and growth. Regardless of future shifts in evaluation focus, the evaluation approach will include the following in each of the next two years:

- Gross and net impact analyses,
- Program manager interviews.

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. NTG will not be researched in CY2020.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Nov 2020†	Tracking Data Review
PM and IC Interviews	Program Management and Implementers	2	May-June 2020	Augment with bi-monthly calls
Gross Impact	Engineering File Review	Census	June 2020 - Feb 2021	Engineering File Review; Three Waves‡

† Tracking data review will occur in Waves; starting preliminary review in June 2020, with primary update in Nov 2020, and a final confirmation including end of year updates in early 2021.
‡ Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave; with these dates expected to sync with the tracking data schedule outlined in the footnote above.

Tracking System Review

Navigant will review tracking system data and conduct project sampling activities in waves; with the first wave covering half of the year, a second wave in the fall, and the last wave occurring only after all program data is finalized for the year.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Gross Impact Evaluation

The primary program gross impact evaluation activities for CY2020 are:

- Reviewing the tracking system to determine whether all fields are appropriately populated
- Reviewing savings methodology and, if necessary, providing recommendations for improvement
- Cross-checking measure totals and savings recorded in the tracking database

Verified Net Impact Evaluation

The evaluation team will apply the NTG ratios approved by the Stakeholder Advisory Group (SAG) to the estimate of evaluation-verified gross savings to compute verified net savings. These NTG values are provided in Table 3.

Table 3. Deemed NTG Values for CY2020

Measure	NTG Value
Lighting Measures	0.83
Non-Lighting Measures	0.78
Custom Measures	0.70 kWh, 0.63 kW

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Research NTG Impact Evaluation

NTG will not be researched in CY2020. The Standard and Custom Program NTG values deemed by the Illinois SAG will be applied to this program.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by FEJA, the measure-specific and total ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Deliverable	Responsible Party	Date Delivered
Review initial project documentation, engineering review and memo	Evaluation	August 31, 2020
Review entire program savings and complete engineering review	Evaluation	February 26, 2021
Internal Report Draft by Navigant	Evaluation	March 1, 2021
Draft Report to ComEd and SAG	Evaluation	March 8, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 29, 2021
Revised Draft by Navigant	Evaluation	April 5, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 12, 2021
Final Report to ComEd and SAG	Evaluation	April 19, 2021
Draft Process Memo	Process Memo	June 25, 2021
Final Process Memo	Process Memo	July 25, 2021

ComEd Custom Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Custom Incentive (Custom) Program provides a custom incentive to commercial, industrial and public sector customers, based on a formula, for less common or more complex energy-saving measures installed in qualified retrofit and equipment replacement projects. Custom incentives are available based on the project's kWh savings, provided the project meets all program eligibility requirements. For eligible projects, ComEd pays an incentive between $0.07 and $0.21 per first-year kWh saved, depending on the technology, and caps the incentives at 100% of the incremental project cost. In CY2019, the Data Center Program and merged with the Custom Program and in CY2020 Combined Heat & Power (CHP) will be offered under the Custom Program.

The objective of the CY2020 evaluation is to quantify net savings impacts from the Custom Program. Evaluation activities for CY2020 will be like CY2019. The CY2020 gross impact evaluation will not vary from previous years, but adjustments will be made to reflect specific measure and project characterizations. For the CY2020 evaluation, the evaluation team will continue working towards real-time verification and analysis. The main purpose of this is that it allows earlier engineering review and M&V work, ensuring that critical impact issues are resolved in early stages. Since large projects are likely to be selected in the sample, the evaluation team will review them in early stages of the project and provide feedback to ComEd as needed. This is to help ensure that the evaluation and implementation teams reach agreement on the calculation methodology and M&V plans before the project is finalized and documented in the tracking system.

The evaluation will include a participating customer free ridership and spillover study. The findings from the study will inform recommended net-to-gross (NTG) values for Illinois Stakeholder Advisory Group (SAG) approval and future program application.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Modeling (as needed)	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys	X	X
Net-to-Gross – EE Service Provider	X	X
Process Analysis		

The evaluation team determined the evaluation approach for the 2020-2021 period based upon the needs of the program and the program's prior history. As we did in CY2019, the evaluation will continue to

evaluate any potential gas savings that may occur because of the program. The team will evaluate both first-year savings and savings over the lifetime of the equipment. Real-time (parallel) evaluation will also be conducted for the largest projects where requested, and early feedback provided for complex projects. Open communication between the evaluation team and the ComEd Custom team will continue to be key in successfully meeting evaluation requirements. The two-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Monthly review of completed and pipeline projects
- Multiple waves of sample pull throughout the year, based on completion rates of projects
- Site-specific M&V (SSMVP) plans provided to the ComEd team for all sampled points receiving an on-site survey
- Final Site Reports (FSRs) and detailed calculations for every sampled site
- Real-time evaluation for the largest sampled points or early feedback provided, upon request
- NTG analysis and reporting every other year when programs are stable and NTG results are consistent over time
- NTG analysis each year when markets or program designs are changing
- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of the Future Energy Jobs Act (FEJA)

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Note that coordination with other utilities has not typically been needed for this program; if issues arise, the evaluation team will coordinate needed discussion and evaluation.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the program's annual total lifetime verified gross savings?
2. What is the research estimate of gross savings (energy, peak demand, and total demand) for the program?
3. What is the program's lifetime verified net savings? What is ComEd's program influence versus other factors in installing energy efficient equipment?
4. What are the gas savings from the program?
5. What is the estimated free-ridership and spillover for participating customers?
6. What are the opportunities for improvement for program impact calculations?
7. Are the ex-ante per-unit gross impact savings correctly implemented by the tracking system and reasonable for this program?

8. Are the effective useful life (EUL) assumptions of typical measures to report lifetime savings in the CY2019 program valid and up-to-date?

Process Evaluation and Other Research Topics

There will be no process evaluation in CY2020.

Navigant might conduct process research for the program in CY2021. Navigant will consult with ComEd program leads on focused, key process questions to be answered to help improve and inform the program.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Three waves	Three Waves and Early Feedback for Large Projects
PM and IC Interviews	Program Management and Implementers	2	Fall/Winter 2020	Augment with monthly calls
Gross Impact	Early Feedback File Review	TBD	April 2020 – Sept 2020	Early Feedback for Large Projects, Engineering File Review and On-site M&V
Gross Impact	Engineering File Review	TBD	April 2020 – February 2021	Three Waves†
Gross Impact	On-site M&V	TBD	April 2020 – February 2021	
Verified Net Impact	Calculation using deemed NTG ratio	NA	June 2020 – May 2021	Deemed Value
Surveys: NTG and Process	Telephone Survey with Participating Customers	TBD	June 2020 – May 2021	FR & SO, Process. Two Waves
Interviews: NTG ‡	Telephone Interviews with Influential Trade Allies Triggered by Customer Responses	TBD	Fall/Winter 2020 – May 2021	FR & SO, Process. Two Waves

Note: FR = Free Ridership; SO = Spillover
† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
‡ Trade ally surveys are triggered by high importance ratings by participating customers to the trade ally or vendor. Therefore, the number of trade ally or vendor surveys is dependent on the results of the participating customer surveys.

In line with program changes and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform tracking system review and M&V project sampling in waves in 2020. The first wave of M&V sampling is expected to cover about one-third of the projects.

Tracking System Review

In line with program changes and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform tracking system review and M&V project sampling in waves in 2020. Navigant will perform tracking system review and M&V project sampling in three waves in CY2020. The first wave of M&V sampling is expected to cover about one-third of projects completed in CY2020. Proposed gross impact sampling timelines are shown below.

a) First wave sample drawn in April 2020 and completed in July 2020
b) Second wave sample drawn in August 2020 and completed November 2020
c) Final wave starts February 2021 (or projects completion date)

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK. This latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

Gross Impact Evaluation

The gross impact evaluation is a combination of desk reviews and on-site audits:

- **On-site audits** On-site metering (full M&V) activity is expected to be performed for approximately half of the selected sample (approximately 14 sites). Note that the evaluation team will not perform metering if facility owned meters are already installed for data collection.
- **Desk reviews** will be performed for the rest of the sample (estimated to be 14 sites). The ex-ante data, including metering data, will be the primary data source for ex post analysis. This desk review approach is like the Retro-Commissioning (RCx) Program's desk review approach- auditing ex ante calculations and adjusting, if needed, based on any additional customer provided data, such as production data.

These evaluation approaches will provide the evaluation team sufficient detail and information to verify program achievements and provide recommendations to improve program performance. Also, these activities will allow the evaluation team to adjust the CY2020 evaluation approach (by reducing or increasing on-site activity). Since the program involves industrial facilities, where conditions may vary more than commercial facilities, the evaluation team believes the proposed approach will help verify the conditions and allow for informed adjustments to savings estimates for such sites. This will also help the evaluation team provide actionable recommendations to improve program M&V guidelines.

The evaluation will analyze program-level savings data by project size for this population of heterogeneous measures. Using the tracking data extract provided by ComEd, we will sort the projects from largest to smallest ex ante kWh claim and place them into one of three strata such that each stratum contains about one-third of the program total kWh claim.

The sample size will be calculated using the following equation:

$$n = \frac{ER^2}{\left(\frac{RP^2}{1.282^2} + \frac{ER^2}{N}\right)}$$

Where:

n	= Sample Size
ER	= Error Ratio (based on CY2019 results)
RP	= Relative Precision (10%)
N	= Estimated CY2020 Project Population
1.282	= One-tailed Z-Value for 90% Confidence

The error ratio for each sample will be calculated from a combination of prior program year results. The evaluation team expects a sample size of approximately 20 custom projects and eight data centers projects but will increase the cap of sample size up to a total of 33 projects if necessary. The final number will be determined when the final count of the CY2020 population is known. Other than splitting the population into two categories, this approach is consistent with prior program evaluations. If the population variability in CY2020 remains close to that in CY2019, this cap will allow us to achieve the overall portfolio-level 90/10 requirements. We will conduct onsite M&V audits to confirm custom project savings and verify project details. We will perform onsite visits if there is uncertainty associated with the savings or if enough documentation was not provided for the desk review sites. These will be performed prior to January 2021.

We will perform sampling for both custom and data center categories in three phases during the CY2020 evaluation period. We will draw the sample for the first wave around May 2020 based on the number of paid projects completed. We will draw the sample for the second wave around October 2020 after most of the projects have been finalized. The final sample will be drawn after we receive final program data at the end of January 2021. Final program gross and net impact results will be based upon the three waves combined.

Core data collection activities will include the following:

- If available, we will collect pre-metering and post-installation interval data from the program implementers for the sampled projects. The evaluators will also request all available production data and other pertinent records and files from the implementers for all projects selected in the sample.
- We will perform on-site M&V audits for approximately 10 Custom and four Data Center projects. [9] Evaluators will select these projects for metering from stratum one and stratum two sample points based on the verified conditions and available ex ante project documentation so that evaluation metering efforts can contribute significantly to developing ex post analysis. On-site audits will also include collecting information from dedicated facility meters for the system power usage or load profile (e.g., air-flow profile), when available. Production data and spot measurements will be collected to support ex post savings calculations.
- Engineering desk reviews will be performed for approximately ten Custom and four Data Center projects to complete ex post analysis. Desk reviews do not incorporate on-site audits. Desk reviews involve review of project documentation provided by the program, an engineering review of the algorithms and auditing ex ante calculation models used by the program to estimate energy savings. The engineering audit of program calculations determines if the inputs that feed the program calculations are reasonable and acceptable or need revision based on evaluation findings. Additionally, telephone interviews with the site contact(s) will be conducted in support of these desk reviews and information obtained from the interviews will be used to verify savings. Also, site contact(s) will be requested to provide production data electronically for measure(s) installation detail. The savings will be adjusted as needed based on all the available information.

[9] The evaluation team may choose to perform additional onsite visits if there is uncertainty associated with the savings or if enough documentation was not provided for the desk review sites.

In addition to the data collection methods highlighted above, monthly calls will be held between the evaluation team and ComEd to discuss program status, evaluation updates, and project-specific issues. This will allow for early discussion and feedback on project findings, as well as provide a setting for early feedback and real-time evaluation discussions. ComEd will also have an opportunity to review and comment on the M&V plans as they are drafted, prior to conducting a site visit. Any comments provided by ComEd will be reviewed and addressed accordingly within a five-day review period before finalizing the M&V plans for a project.

A site-specific engineering analysis will be performed for the sampled CY2020 projects. The engineering analysis methods will vary from project to project, depending on the complexity of the measures installed, the size of the associated savings and the availability and reliability of existing data. Gross impact calculation methodologies are generally based on IPMVP protocols, options A through D. We will communicate the evaluation M&V approach to the implementation team before conducting the site visit. The measure-level engineering review will verify documentation and installed measure inventory and characteristics, hours of operation, modes of operation, and characteristics of replaced equipment. Any measured values obtained during on-site M&V audits will also be used to revise algorithm assumptions as appropriate.

The gross realization rate will be calculated for each site, and for the sample. For each site in the sample, a site-specific report detailing evaluation findings will be prepared. ComEd will have an opportunity to review and comment on the site-specific reports prior to each being finalized. Site-level gross impact realization rates from the sample will then be extrapolated based on kWh savings to the program population using a ratio estimation approach to calculate CY2020 program level gross impact estimates

The measure type will dictate the savings verification approach. We will also make a research estimate of gross savings based entirely on site-collected data and evaluation engineering analysis of savings. The two methods are described below:

1. Savings Verification

    - Measures with fully custom or partially-deemed[10] ex ante savings will be subject to retrospective evaluation adjustments to gross savings on custom variables. For fully custom measures, Navigant will subject the algorithm and parameter values to evaluation adjustment, where necessary. For partially-deemed measures, TRM algorithms and deemed parameter values will be used where specified by the TRM, and evaluation research will be used to verify custom variables.

2. Evaluation Research Savings Estimate

    - The evaluation will also include an analysis of on-site collected verification data for a subset of projects. The engineering analysis methods and degree of monitoring will vary from project to project, depending on whether the measure has deemed savings or not, the complexity of the measures, the size of the associated savings, the potential to revise input assumptions, and the availability and reliability of existing data. The evaluators will contact the implementers prior to conducting site visits to ensure that the evaluation team has all correct and relevant information.

[10] Fully custom savings refer to savings which take an entirely custom approach specific for that project, to calculating savings. These should be based on site-specific metering or billing data. Partially-deemed savings are those which rely on TRM calculations or input variables which are not specific to the site, but are deemed based on research.

The measure-level realization rates will be extrapolated to the program population based on the ex-ante kWh using a ratio estimation method to yield ex post evaluation-adjusted gross energy savings. Any therm savings identified will be converted to kWh savings. Gross realization rates will be developed for energy and demand savings. The sample design will provide 90/10 statistical validity for the overall program. The sample of approximately fifteen on-site audits and five desk reviews for the custom sample, and five on-site audits and three desk reviews for the data center sample is expected to achieve a 90/10 confidence/relative precision level (one-tailed test) to comply with the PJM verification requirements outlined in Manual 18B.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value [kWh]	CY2020 Deemed NTG Value [kW]
Custom (Public & Private Sector)	0.70	0.63
Custom Public Sector - DCEO	0.24	0.23
Data Centers (New Construction) – Co-Location	0.44	0.34
Data Centers (Retrofit) – Co-Location	0.78	0.82
Data Centers (New Construction) – Non-Co-Location	0.67	0.67

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

PM and IC Interviews

In CY2021, we might conduct in-depth interviews with program managers and implementation contractors. Interviews will focus on progress to goals, identifying program successes and challenges, identifying drivers of those successes and challenges, and retailer education and marketing tactics.

Program Management and Implementer Interviews

The evaluation team might interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Participant Surveys

Participant survey questions will address both free ridership and participant spillover; see the next section for a discussion of the free ridership and spillover approach.

We will attempt to survey a sample of CY2020 customers to achieve one-tailed 90/10 confidence and precision level at the program level and will ensure that the sample points are representative of the program population.

All telephone sample points selected will be submitted to ComEd to obtain project overview documents that provide information on the primary decision maker (name, phone, email address), program staff's role in project implementation and any additional data related to program influence. The evaluation team will review the project overview documents before conducting the surveys.

Research NTG Impact Evaluation

Previous NTG evaluations have performed an NTG analysis for each program year. The evaluation team plans to conduct NTG interviews in CY2020 and CY2021. To reduce the budget, the evaluation team will skip the NTG analysis for CY2020 and perform combined analysis for CY2020 and CY2021. The research plan NTG ratios are based on primary data collected as described below. Note that the method described is fully compliant with the framework for Custom programs that have been adopted by the SAG and is part of the most recent Illinois statewide TRM.

Data Collection Methods

1. Telephone surveys with participant decision makers.
2. Trade ally interviews – with participating equipment vendors (suppliers and/or installers).

Content

NTG ratio: The telephone surveys will provide all inputs needed for the calculation of the program's net-to-gross ratio. We will use the self-report method which assigns sampled projects to one of three levels of rigor, based on the size and complexity of the project:

- Basic – small or medium sized projects
- Standard – larger projects and smaller projects representing those measure categories that comprise the highest percentage of program savings impacts
- Enhanced – approximately 10-20% of the largest projects - this generally includes those with rebates of $100,000 or greater

Navigant will field two waves of free ridership and spillover surveys with participating customers. NTG survey questions will address both free ridership and participant spillover. Free-ridership questions will determine the value of energy savings coming from customers who would have installed the measures offered by the program in the absence of the program offering. Spillover questions will determine energy savings from measures installed outside of the program as a direct result of the program's influence. Together, the free-ridership and spillover survey answers will be used to calculate NTG ratios for the program.

Participating customers will be interviewed in all cases. Standard and enhanced cases will also include interviews with program representatives and participating equipment vendors or influential o facility assessment representatives. The vendor interviews will be conducted before the customer interviews. Enhanced cases may also include secondary research on standard industry practices.

For enhanced cases, NTG summaries detailing all the findings from the interview performed by a senior consultant will be provided.

Analysis

The telephone surveys will provide the inputs needed for the calculation of the program's NTG ratio. Free ridership will be assessed using an algorithm approach that relies on survey self-report measure level data. Where there are multiple data sources, a result will be determined using triangulation between participant surveys, service provider surveys, implementation staff, and program staff interviews. Enhanced cases will include input from any relevant secondary research.

The existence of spillover will be examined using participant survey self-report data. We will quantify spillover where (1) significant program influence is indicated[11] and (2) significant spillover is revealed by the customer.

Our goal is to measure and report NTG findings for categories of interest to ComEd, and corresponding to segments that exhibit high degrees of difference in NTG results. Examples of these are Public versus Private Sector for Custom, and Co-location (New Construction, Retrofit) versus Non-Co-location (Retrofit only) for Data Centers.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Randomized Control Trial or Quasi-Experimental Design

The evaluation team will not use the Randomized Control Trial (RCT) or Quasi-Experimental Design for process evaluation because:

- There are not enough participants in this program to achieve statistically significant savings estimates using this method
- It is not possible to create a valid matched control group for the customers in this program
- This method estimates average savings across all program participants which is not the desired savings estimate for this program

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

[11] Corresponding to a score of 8, 9 or 10 for the importance of the program on their decision to do the spillover.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 2, 2020
CY2020 program tracking data for QA/QC	ComEd	April 3, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	June 1, 2020
CY2020 participating customer survey design	Evaluation	June 26, 2020
Wave 1 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	July 31, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	July 31, 2020
CY2020 program tracking data for sampling Wave 2	ComEd	August 28, 2020
Wave 1 participating customer NTG survey fielding	Evaluation	September 25, 2020
Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	November 25, 2020
CY2020 Program tracking data for sampling Wave 3	ComEd	January 29, 2021
Wave 2 participating customer NTG survey fielding	Evaluation	February 26, 2010
Wave 3 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	February 26, 2021
Internal Report Draft by Navigant	Evaluation	March 5, 2021
Draft Report to ComEd and SAG	Evaluation	March 10, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 31, 2021
Revised Draft by Navigant	Evaluation	April 8, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 15, 2021
Final Report to ComEd and SAG	Evaluation	April 24, 2021

ComEd Grocery Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Grocery Program aims to achieve cost-effective electricity savings for grocery and retail customers with refrigeration systems with peak demand between 100 and 400 kW. The program provides an account manager working with the customer through an initial energy assessment, equipment selection and installation, incentive application and approval, and re-engagement to identify additional energy savings opportunities. The program engages with manufacturers, distributors, and installers of refrigeration and lighting equipment to offer the measures listed in Table 1 below.

To participate in the program, the ComEd customer must first undergo a no-cost energy assessment and interview completed by the program implementer, CLEAResult. CLEAResult prepares a savings report based on the findings of the assessment, and a CLEAResult account manager discusses the report with the customer. The savings report is generated using an energy savings model and measure analysis tool developed by CLEAResult. Each customer report presents possible efficiency measures for the customer to consider. Once the customer selects the measures to install, the account manager helps the customer select installers, complete incentive processing paperwork, and manage the projects to completion. Account managers will re-engage with customers after project completion to identify additional opportunities, providing the same level of management and assistance for subsequent projects the customer decides to undertake.

Table 1. Grocery Program Measures by Type

Deemed Refrigeration	Kitchen Measure	Custom Refrigeration	Lighting
Strip Curtains	ES Electric Steam Cooker	Adding Doors to Open Cases	Case Lighting
Anti-Sweat Heat Controls	ES Electric Combination Oven	High Efficiency Cases	Indoor Lighting
Night Covers	ES Electric Convection Oven	Floating Head Pressure Controls	Outdoor Lighting
Automatic Door Closer	ES Hot Food Holding	Floating Suction Pressure Controls	Lighting Controls
EC Motors	ES Electric Griddle		Case Lighting Controls
Evaporator Fan Controls	ES Electric Vat Fryer		Photocells
Q-Sync Motors	ES Ice Maker		Timeclocks
VFD for Condenser Fans	ES Freezer and Cooler		
Special Doors with Low/No ASH	Kitchen Ventilation Controls		
Open Case to Reach-In Case – Medium Temperature			
Open Case to Reach-In Case – Low Temperature			
Demand Defrost Controls			
Vending Machine Controls			
Advanced Rooftop Unit Controls			
HVAC early replacement			
Door Gaskets			

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 2. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Savings Review	X	X
Impact – Detailed Project-Level Desk Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Process Evaluation		X

Coordination

ComEd administers this program and other Illinois utilities do not offer similar programs. Therefore, no cross-utility coordination is required for the evaluation of this program.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. Did the program meet its energy and demand savings targets? If not, why?
4. What updates (if any) are recommended for the Illinois Technical Reference Manual (TRM)?
5. How well does the GrocerSmart tool reflect the performance of grocery stores in ComEd territory?
6. How accurate are the GrocerSmart savings estimates, and what changes (if any) to the assessment process would improve accuracy?
7. Are interactions between measures which are analyzed using different approaches (e.g., deemed vs. custom) properly determined?

Process Evaluation and Other Research Topics

There will be no Process research in CY2020. The Evaluation team will conduct a complete process evaluation in CY2021

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 3. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Wave 1† and Final data	
Measure-Level Savings Review	Deemed measures Custom measures	NA	Wave 1† and Final data	Deemed – TRM review Custom – Methodology review
Project-Level Savings Review	Participating projects	33	Aug 2020 – Feb 2021	90/20, 0.5 C.V
In-Depth Interviews	Program Management and Implementers	~2	July – Sept 2020	
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2021	

Note: FR = Free Ridership; SO = Spillover
† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects.

Gross Impact Evaluation

The Grocery Program includes savings derived from a collection of different sources. Deemed and standard refrigeration, HVAC and Kitchen Equipment measure savings are based on the Illinois Technical Reference Manual (TRM) and the ComEd Standard workpaper. Custom refrigeration savings are based on the GrocerSmart energy model, a building simulation package developed by CLEAResult. Lighting measure savings are calculated using a lighting calculator based on the IL TRM methodology. Given the diversity of savings sources, the evaluation team will take multiple approaches to determine verified gross impacts, performing both measure-level and project-level reviews.

The evaluation team will perform measure-level reviews to assess the validity of the various tools and approaches the program uses to quantify savings. For deemed and standard refrigeration measures, the evaluation team will ensure savings follow the methodology outlined in for the appropriate measure in the IL TRM. For custom refrigeration measures, the evaluation team will review the GrocerSmart energy model template to validate the model is consistent with engineering fundamentals. For lighting measures, the evaluation team will review the program's lighting calculator to ensure that it properly follows the IL TRM methodology.

The evaluation team will also perform project-level desk reviews for a sample of completed projects. For projects selected for review, the evaluation team will review all savings calculations and compare analysis inputs to project-specific conditions, such as building weather location, hours of operation, and baseline conditions. The evaluation team will adjust as appropriate to tailor the analyses to site-specific conditions. The evaluation team will also investigate if any changes to the models are appropriate based on non-standard conditions such as large changes in refrigeration loads and will make these changes using available store energy trend data. Additionally, the evaluation team will examine interactive effects between measures to ensure they are properly quantified.

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level NTG ratio of 0.92, aligning with the value for the Small Business Offering Program deemed through a consensus process by the IL SAG. Navigant believes that the Grocery Program participants are similar to Small Business Offering participants. Additionally, both programs offer direct customer support, including an onsite audit report and assistance choosing which efficient measures to pursue.

Navigant may conduct program specific NTG research in subsequent years if program participation or delivery factors deviate significantly from the Small Business Offering Program.

Table 4. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Grocery	0.92

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program. This will be done to understand the program and to make recommendations for potential program enhancements for future programs of a similar design.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 5 below provides the schedule for key deliverables and data transfer activities. (See Table 3 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 15, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	July 3, 2020
Wave 1 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	September 25, 2020
CY2020 program tracking data for sampling Wave 2	ComEd	January 30, 2021
Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	February 26, 2021
Illinois TRM Update Research Findings	Evaluation	March 1, 2021
Internal Report Draft by Navigant	Evaluation	March 5, 2021
Draft Report to ComEd and SAG	Evaluation	March 12, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 2, 2021
Revised Draft by Navigant	Evaluation	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Evaluation	April 24, 2021

ComEd Industrial Systems Program CY2020 to CY2021 Evaluation Plan

Introduction

The Industrial Systems Program offers a combination of technical assistance and financial incentives:

- **Technical assistance** offered includes an industrial systems study which assesses the performance of the facility's industrial compressed air system, process cooling system, refrigeration system, or waste-water treatment plant to ensure efficient, economical operation. This service examines the system's operating characteristics to help identify energy saving measures, using a combination of capital investments and low or no cost measures.
- ComEd offers a one-time **incentive** payment of $0.12 per annual kWh saved after proper implementation of recommendations identified through the Industrial Systems Program. The exception to this is waste-water treatment aeration blowers with controls projects where the customer receives $0.21 per annual kWh saved. Recommendations from the study that are implemented and incentivized by the program are not eligible for any other ComEd incentive. Eligible annual kWh and kW savings are determined through measurement and verification activities. The total incentive cannot exceed 100% of the total implementation costs or 100% of the total incremental costs for improvements recommended in the study.

The objective of the evaluation is to quantify CY2020 net savings impacts for the Industrial Systems Program. Key evaluation activities for CY2020 will take place from January 2020 through March 2021. Evaluation activities for CY2020 will be like CY2019. For the CY2020 evaluation, the evaluation team will work towards earlier engineering review and M&V work, to help ensure that critical impact issues are resolved early. Since large projects are likely to be selected in the sample, the evaluation team will review them in early stages of the project and provide feedback to ComEd as needed. This is to help ensure that the evaluation and implementation teams reach agreement on the calculation methodology and M&V plans before the project is finalized and documented in the tracking system. Due to reduced budget, evaluation will not conduct process evaluation in 2020 and impact sample sizes will be reduced during the 2020 impact evaluation.

The CY2020 gross impact evaluation will not vary from previous years, but adjustments will be made to reflect specific measure and project characterizations. The evaluation will include a participating customer free ridership and spillover study. The findings from the study will inform recommended net-to-gross (NTG) values for Illinois Stakeholder Advisory Group (SAG) approval and future program application.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Modeling (as needed)	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys	X	X
Net-to-Gross – EE Service Provider	X	X
Net-to-Gross – Technical Service Provider Interviews	X	X
Process Analysis		X

The evaluation team determined the evaluation approach for the 2020-2021 period based upon the needs of the program and program's prior history. Like CY2019, the evaluation will continue to evaluate any potential gas savings that may occur because of the program. The team will evaluate both first-year savings and savings over the lifetime of the equipment. Real-time evaluation will also be conducted for the largest projects when requested by ComEd, and early feedback provided for complex projects. Open communication between the evaluation team and the ComEd Industrial Systems team will continue to be key in successfully meeting evaluation requirements. The two-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Monthly review of completed and pipeline projects
- Multiple waves of participant sample availability throughout the year, based on completion rates of projects
- Site-specific M&V (SSMVP) plans provided to the ComEd team for all sampled points receiving an on-site survey
- Final Site Reports (FSRs) and detailed calculations for every sampled site
- Real-time evaluation for the largest sampled points or early feedback provided, upon request
- Optimized timing on when to conduct NTG research
- NTG analysis and reporting each year until NTG results are consistent over time
- NTG analysis each year when markets or program designs are changing
- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of Future Energy Jobs Act (FEJA)

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Note that coordination with other utilities has not typically been needed for this program; if issues arise, the evaluation team will coordinate needed discussion and evaluation.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the program's annual total lifetime verified gross savings?
2. What is the research estimate of gross savings (energy, peak demand, and total demand) for the program?
3. What is the program's lifetime verified net savings? What is ComEd's program influence versus other factors in installing energy efficient equipment?
4. What are the gas savings from the program?
5. What is the estimated free-ridership and spillover for participating customers? What is the research estimate for participant spillover for this program?
6. What are the opportunities for improvement for program impact calculations?
7. Are the effective useful life (EUL) assumptions of typical measures to report lifetime savings in the CY2020 program valid and up to date?

Process Evaluation and Other Research Topics

There will be no process evaluation in CY2020.

Process evaluation effort for CY2021 will assess the effectiveness of various program elements, such as incentive levels, marketing procedures, application processes, participation procedures, and determine customer satisfaction with the program and various program elements as needed.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Three waves	Three Waves and Early Feedback for Large Projects
PM and IC Interviews	Program Management and Implementers	TBD	Fall/Winter 2020	Augment with monthly calls
Gross Impact	Early Feedback File Review	TBD	April 2020 – Sept 2020	Early Feedback for Large Projects, Engineering File Review and On-site M&V
Gross Impact	Engineering File Review	TBD	April 2020 – February 2021	Three Waves†
Gross Impact	On-site M&V	TBD	April 2020 – February 2021	
Verified Net Impact	Calculation using deemed NTG ratio	NA	June 2020 – May 2021	Deemed Value
Surveys: NTG	Telephone Survey with Participating Customers	TBD	June 2020 – May 2021	FR & SO, Process. Two Waves
Interviews: NTG ‡	Telephone Interviews with Influential Trade Allies Triggered by Customer Responses	TBD	Fall/Winter 2020 – May 2021	FR & SO, Process. Two Waves

Note: FR = Free Ridership; SO = Spillover
† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
‡ Trade ally surveys are triggered by high importance ratings by participating customers to the trade ally or vendor. Therefore, the number of trade ally or vendor surveys is dependent on the results of the participating customer surveys.

Tracking System Review

In line with program changes and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform tracking system review and M&V project sampling in waves in 2020. Navigant will perform tracking system review and M&V project sampling in three waves in CY2020. The first wave of M&V sampling is expected to cover about one-third of projects completed in CY2020. Proposed gross impact sampling timelines are shown below.

d) First wave sample drawn in April 2020 and completed in July 2020
e) Second wave sample drawn in August 2020 and completed November 2020
f) Final wave starts February 2021 (or projects completion date)

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK. This latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

PM and IC Interviews

We will conduct in-depth interviews with program managers and implementation contractors. The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Gross Impact Evaluation

The gross impact evaluation is a combination of desk reviews and on-site audits:

- **On-site audits** On-site metering (full M&V) activity is expected to be performed for two-thirds of the selected sample (approximately seven sites). Note that the evaluation team will not perform metering if facility owned meters are already installed for data collection.
- **Desk reviews** will be performed for the rest of the sample (estimated to be three sites). The ex-ante data, including metering data, will be the primary data source for ex post analysis. This desk review approach is like the RCx program's desk review approach-auditing ex ante calculations and adjusting, if needed, based on any additional customer provided data, such as production data.

These evaluation approaches will provide the evaluation team sufficient detail and information to verify program achievements and provide recommendations to improve program performance. Also, these activities will allow the evaluation team to adjust the CY2020 evaluation approach (by reducing or increasing on-site activity). Since the program involves industrial facilities, where conditions may vary more than commercial facilities, the evaluation team believes the proposed approach will help verify the conditions and allow for informed adjustments to savings estimates for such sites. This will also help the evaluation team provide actionable recommendations to improve program M&V guidelines.

The evaluation will analyze program-level savings data by project size for this population of heterogeneous measures. Using the tracking data extract provided by ComEd, we will sort the projects from largest to smallest ex ante kWh claim and place them into one of three strata such that each stratum contains about one-third of the program total kWh claim.

The sample size will be calculated using the following equation:

$$n = \frac{ER^2}{\left(\frac{RP^2}{1.282^2} + \frac{ER^2}{N}\right)}$$

Where:

n	= Sample Size
ER	= Error Ratio (based on CY2018 results)
RP	= Relative Precision (10%)
N	= Estimated PY9 Project Population
1.282	= One-tailed Z-Value for 90% Confidence

The error ratio will be calculated from a combination of prior program results. Given the projected CY2020 project population, the sample size will be determined to achieve 90/10 confidence and precision levels. The sample size for CY2020 is estimated to be approximately 10 projects, like the CY2019 program evaluation.

Core data collection activities will include the following:

- We will collect pre-metering and post-installation interval data from the program implementers for all sampled projects. The evaluators will also request all available production data and other pertinent records and files from the implementers for all projects selected in the sample.
- We will perform on-site M&V audits for approximately seven projects.[12] Evaluators will select these projects for metering from stratum one and stratum two sample points based on the verified conditions and available ex ante project documentation so that evaluation metering efforts can contribute significantly to developing ex post analysis. On-site audits will also include collecting information from dedicated facility meters for the system power usage or load profile (e.g., air-flow profile), when available. Production data and spot measurements will be collected to support ex post savings calculations.
- We will perform engineering desk reviews for approximately three projects to complete ex post analysis. Desk reviews do not incorporate on-site audits. Desk reviews involve review of project documentation provided by the program, an engineering review of the algorithms and auditing ex ante calculation models used by the program to estimate energy savings. The engineering audit of program calculations determines if the inputs that feed the program calculations are reasonable and acceptable or need revision based on evaluation findings. Additionally, telephone interviews with the site contact(s) will be conducted in support of these desk reviews and information obtained from the interviews will be used to verify savings. Also, site contact(s) will be requested to provide production data electronically for measure(s) installation detail. The savings will be adjusted as needed based on all the available information.

In addition to the data collection methods highlighted above, monthly calls will be held between the evaluation team and ComEd to discuss program status, evaluation updates, and project-specific issues. This will allow for early discussion and feedback on project findings, as well as provide a setting for early feedback and concurrent evaluation discussions. ComEd will also have five business days to review and comment on the M&V plans as they are drafted, prior to conducting a site visit. Any comments provided by ComEd will be reviewed and addressed accordingly before finalizing the M&V plans for a project.

The gross savings impact approach will review the ex-ante measure type to determine whether it is covered by the Illinois TRM or whether it is a non-deemed measure that is subject to retrospective per unit savings adjustment of custom variables. The measure type, deemed or non-deemed, will dictate the savings verification approach. We will also make a research estimate of gross savings based entirely on site-collected data and evaluation engineering analysis of savings. The two methods are described below:

- A site-specific engineering analysis will be performed for the sampled CY2020 projects. The engineering analysis methods will vary from project to project, depending on the complexity of the measures installed, the size of the associated savings and the availability and reliability of existing data.
- Engineering calculations will be performed to derive gross kWh and kW savings. These calculations will start with an engineering audit of the algorithms used by the program to calculate energy savings and the inputs used for the algorithms. The engineering review will also include preliminary judgment to identify the assumptions with higher uncertainty or potential to influence the program savings estimate. The focus of the data collection will be to verify or update the assumptions that are used in the engineering algorithms for measure level savings. Data obtained for the sampled sites will serve to verify measure installation, determine installed measure characteristics, assess operating hours and relevant modes of operation, identify the characteristics of the replaced equipment and support the selection of baseline conditions and to

[12] The evaluation team may choose to perform additional onsite visits if there is uncertainty associated with the savings or if enough documentation was not provided for the desk review sites.

perform ex post savings calculations. If needed, the evaluation team will use the data obtained from the sampled sites to model calculations using AIRMaster+ [13] for compressed air projects, when the evaluators determine that the facility conditions have changed significantly, and the ex-ante data or calculation model is no longer representative for estimating savings. The evaluation team will notify the implementation team when AIRMaster+ is being used for ex post analysis and the evaluation team will communicate any issues identified in the ex-ante calculation models to the implementation team. The peak kW savings calculation methodology will be consistent with PJM requirements for each project.

A gross realization rate will be calculated for each site. Site-level gross impact realization rates from the sample will then be extrapolated to the program population using a ratio estimation approach. ComEd will have an opportunity to review and comment on the site-specific reports prior to each being finalized.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Industrial Systems kWh	0.77
Industrial Systems kW	0.78

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Participant Surveys

Participant survey questions will address both free ridership and participant spillover; see the next section for a discussion of the free ridership and spillover approach. We will attempt to survey a sample of CY2020 customers to achieve one-tailed 90/10 confidence and precision level at the program level and will ensure that the sample points are representative of the program population.

All telephone sample points selected will be submitted to ComEd to obtain project overview documents that provide information on the primary decision maker (name, phone, email address), program staff's role in project implementation and any additional data related to program influence. The evaluation team will review the project overview documents before conducting the surveys.

Research NTG Impact Evaluation

Due to the relatively stable results year to year, beginning in PY8, the evaluation team elected to conduct NTG surveys every year but perform the analysis every other year. The evaluation has produced NTG recommendations from PY8-PY9 sample and is underway on CY2018-CY2019 sample. The CY2020-CY2021 years will follow the same pattern with interviews in both years and the analysis in CY2021. Although findings are delayed considerably, which is an issue if the NTGRs have fluctuated significantly

[13] AIRMaster+ is a Windows-based software tool used to analyze industrial compressed air systems. It is intended to enable users to model existing and future improved system operation and evaluate savings from energy efficiency measures with relatively short payback periods.

from year to year, the evaluation team has found that Industrial Program results have been relatively stable year after year.

The research plan net-to-gross ratios are based on primary data collected as described below. Note that the method described is fully compliant with the framework for Custom programs that have been adopted by the SAG and is part of the most recent Illinois statewide TRM.

Data Collection Methods

1. Telephone surveys with participant decision makers
2. Service provider interviews with participating compressed air, process cooling and refrigeration service providers who completed projects in CY2020.

Content

Our NTG approach is consistent with the TRM and will address both free ridership and participant spillover. The telephone surveys will provide all inputs needed for the calculation of the program's net-to-gross ratio. We will use the self-report method which assigns sampled projects to one of three levels of rigor, based on the size and complexity of the project:

- Basic – small or medium sized projects.
- Standard – larger projects and smaller projects representing those measure categories that comprise the highest percentage of program savings impacts.
- Enhanced – approximately 10-20% of the largest projects - this generally includes those with rebates of $100,000 or greater.

We will survey participating customers regardless of rigor. Standard and enhanced cases will also include interviews with program representatives and participating equipment vendors or influential opportunity assessment or facility assessment representatives. Further, for those projects that received a program-sponsored study, an interview with the service provider will be completed. Enhanced cases may also include secondary research on standard industry practices. For enhanced cases, NTG summaries detailing all the findings from the interview will be provided.

Analysis

The telephone surveys will provide the inputs needed for the calculation of the program's NTG ratio. Free ridership will be assessed using an algorithm approach that relies on survey self-report measure level data. Where there are multiple data sources, a result will be determined using triangulation between participant surveys, service provider surveys, implementation staff, and program staff interviews. Enhanced cases will include input from any relevant secondary research.

The existence of spillover will be examined using participant survey self-report data. We will quantify spillover where (1) significant program influence is indicated [14]
and (2) significant spillover is revealed by the customer.

Our goal is to analyze and report NTG findings at the measure level. The measure level information will be collected for the three largest measures to keep the participant survey to a reasonable length. However, this is only possible if there are enough findings differentiated by measure type. The self-

[14] Corresponding to a score of 8, 9 or 10 for the importance of the program on their decision to do the spillover.

reported data is based on the level of program influence as reported by the customer and service provider. This could be at either the whole project level or at the individual measure level if enough sample is available and depending on the project.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Randomized Control Trial or Quasi-Experimental Design

The evaluation team will not use the Randomized Control Trial (RCT) or Quasi-Experimental Design for process evaluation because:

- There are not enough participants in this program to achieve statistically significant savings estimates using this method
- It is not possible to create a valid matched control group for the customers in this program
- This method estimates average savings across all program participants which is not the desired savings estimate for this program

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 2, 2020
CY2020 program tracking data for QA/QC	ComEd	April 3, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	June 1, 2020
CY2020 participating customer survey design	Evaluation	June 26, 2020
Wave 1 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	July 31, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	July 31, 2020
CY2020 program tracking data for sampling Wave 2	ComEd	August 28, 2020
Wave 1 participating customer NTG survey fielding	Evaluation	September 25, 2020
Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	November 25, 2020
CY2020 Program tracking data for sampling Wave 3	ComEd	January 29, 2021
Wave 2 participating customer NTG survey fielding	Evaluation	February 26, 2010
Wave 3 project documentation, engineering reviews, schedule, conduct on-site M&V, feedback	Evaluation	February 26, 2021
Internal Report Draft by Navigant	Evaluation	March 2, 2021
Draft Report to ComEd and SAG	Evaluation	March 6, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 27, 2021
Revised Draft by Navigant	Evaluation	April 6, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 13, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021
NTG Research Memo – draft	Evaluation	July 30, 2021
NTG Research Memo – Final	Evaluation	Sept 30, 2021

ComEd Instant Discounts Program CY2020 to CY2021 Evaluation Plan

Introduction

The non-residential Instant Discounts Program (formerly Business Instant Lighting Discounts, or BILD) is designed to provide an expedited, simple solution to business customers interested in purchasing high efficiency products by providing instant discounts at the point of sale. The Instant Discounts Program provides incentives for energy efficient LED lamps (screw based, pin based, and tubular), trim kits, exit signs, and wall packs as well as reduced wattage Linear Fluorescent (LF) lamps. Three-phase, high-frequency battery chargers are also offered through the Instant Discounts Program.

The CY2020 program will not change significantly from CY2019, in terms of measure mix and end-uses. Notable program changes made from CY2019 to CY2020 includes the introduction of HVAC measures and the removal of Omni-directional lamps as of June 30, 2019.

The primary objectives of the evaluation of the Instant Discounts Program are to: (1) quantify gross and net program impacts and (2) identify ways in which the program can be improved. The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

The CY2020 gross impact evaluation approach will not vary from the previous years, but adjustments will be made to reflect specific measure and project characterizations. Free ridership and spillover research will occur in CY2021.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1. Due to reduced budget, evaluation will not conduct process evaluation in 2020, impact sample sizes will be reduced, and there will be no NTG evaluation in 2020.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys	X	X
Data Collection – Program Manager and Implementer Meetings / Interviews	X	X
Data Collection – Trade Ally Interviews / Roundtables		X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Participant Surveys		X
Net-to-Gross – Trade Ally Interviews		X
Process Analysis		X

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. The Instant Discounts team is in close coordination with Ameren, which has an "Instant Incentives" program that also provides discounts at the point of sale through commercial lighting distributors. In CY2020, the ComEd and Ameren lighting program evaluations will continue to be closely aligned with respect to data collection activities and analysis methods.

Evaluation Research Topics

There are three primary areas of evaluation activity: 1) a savings verification analysis that utilizes program tracking data, deemed parameters from the Illinois Technical Reference Manual (TRM), and recommended net-to-gross (NTG) values from the Illinois Energy Efficiency Stakeholder Advisory Group (SAG); 2) evaluation research, which consists of online surveys with program EESPs and program participants to gather data on key evaluation parameters such as installation rate, residential and non-residential split, and net-to-gross; and 3) process research in CY2021.

The evaluation team determined the evaluation approach for 2020-2021 based upon the needs of the program and program history. Evaluation research serves two functions. First, it allows a comparison of the verified program savings estimates (using deemed values) to evaluation research program savings estimates. Second, it provides key parameter values for deeming in future updates to the IL TRM as well as SAG recommended NTG. Key evaluation approaches include:

- In CY2021, we will implement participant surveys to support installation rate, and residential and non-residential split parameter estimate updates.
- The evaluators, program implementers, and ComEd will have regular check-in calls to keep the evaluation team informed of any changes to program design or product availability. These calls will also include discussions of data needs, errors, omissions, etc., as well as updates on evaluation activities.

- Cumulative Persisting Annual Savings (CPAS), calculated based upon the requirements of the Future Energy Jobs Act (FEJA).

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

- What is the level of gross annual energy (kWh) and gross peak demand (kW) savings induced by the program?
- Did the program meet its energy and demand savings goals?

Process Evaluation and Other Research Topics

There will be no process evaluation in CY2020.

Evaluation Approach

Evaluation tasks will be conducted in 2020 through early 2021 and evaluation reporting will be concluded by April 30, 2021. Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	April – December 2020	Three Waves†
Program Management and Implementer Interviews	Program Management and Implementers	TBD	April – June 2020	Augmented with monthly calls
Participant Surveys	2020 Program Participants	Census	June 2020 – Feb 2021	Three Waves†
Gross Impact	Engineering File Review	TBD	June 2020 – Feb 2021	Three Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	Nov 2020 – March 2021	Deemed Value

Note: FR = Free Ridership; SO = Spillover
† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

At regular intervals throughout the program cycle (every three to four months), the evaluation team will review the program tracking data for application of IL TRM v8 parameters. The evaluation team will provide a memorandum of findings to ComEd at each interval. Proposed gross impact sampling timelines are shown below.

The Program Tracking Data collected for the CY2020 gross impact analysis will allow us to verify rebated measure sales and understand the characteristics of the installed measures that drive savings (such as bulb type and wattage).

Gross Impact Evaluation

The CY2020 gross impact evaluation approach will not vary from the previous years, but adjustments will be made to reflect specific measures. The evaluation will utilize the results of the PY9 NTG research and recommendations from the Illinois Stakeholder Advisory Group (SAG) for assessing net program impacts. Additional free ridership and spillover research will occur in CY2021.

CY2020 Gross Impact Sampling Waves

a) First wave sample drawn in April 2020 and completed June 2020
b) Second wave sample drawn in August 2020 and completed October 2020

c) Final wave drawn after January 30, 2021

After the conclusion of the program year, the evaluation will conduct a thorough review of savings calculations and calculate gross kWh, kW and Peak kW savings across all program bulbs using the following equations:

Annual kWh Savings =	Program bulbs * Delta Watts/1000 * Annual HOU * Installation Rate * (1-Leakage Rate) * Interactive Effects
Annual kW Savings =	Program bulbs * Delta Watts/1,000 * Installation Rate * (1-Leakage Rate) * Interactive Effects
Annual Coincident Peak =	Annual kW Savings * Peak Load Coincidence Factor[15] * kW Savings

For the verification analysis in CY2020, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2020 Instant Discounts tracking database.
- **Program Bulb Installation Rates** (both current program year and delayed program year installations) will come from the IL TRM v8.0.
- **Delta Watts** will be calculated using the lumen-equivalence mapping in the IL TRM v8.0.
- **Non-Residential HOU and Summer Peak CF** estimates will come from the IL TRM v8.0.
- **Residential/Non-Residential Bulb Installation** estimates will come from the IL TRM v8.0. [16]
- **Energy and Demand Interactive Effects** will be estimated using the algorithms presented in the IL TRM v8.0.

The calculation of carryover savings will be broken out by measure and based on the following parameter estimates:

- **Delta Watts** – Verified savings estimate from the year of installation (source: IL TRM v8.0).
- **Residential and Non-Res Split** - Evaluation research from the year of purchase (CY2019/CY2020 Report and IL TRM v6.0/v7.0).[17]
- **HOU and Peak CF** – Verified savings estimate from the year of installation (source: IL TRM v8.0).
- **Energy and Demand IE** – Verified savings estimate from the year of installation (source: IL TRM v8.0)
- **Installation Rate** - Verified savings estimate from the year of purchase (source: CY2019/CY2020 report and IL TRM v6.0/v7.0).
- **NTG** – Evaluation research from the year of purchase (source: CY2020/CY2019 report and SAG recommended NTG).

[15] Summer Peak is calculated as the percentage of lighting turned on in each room during peak hours of the summer months (hour ending 15:00 – 18:00 EPT, June 1 through August 32). http://www.pjm.com/~/media/documents/manuals/m18.ashx (pg. 67).
[16] Bulbs installed in residential locations will be assigned residential HOU and Peak CF estimates from the IL TRM v6.0.
[17] Bulbs installed in residential locations will be assigned residential HOU and Peak CF estimates from the IL TRM v6.0.

In 2020, we will conduct participant surveys[18] to verify measure receipt and installation of program bulbs, collect data on the characteristics of the facility (such as business type and room location where program bulbs are being installed, which are related to hours-of-use [HOU] and Peak Coincidence Factor [CF] estimates), and gather other information that will help inform other key lighting parameter estimates (Delta Watts, Installation Rate) for the gross impact analysis. Additionally, as part of this research we will quantify the leakage of program bulbs outside of ComEd service territory and the proportion of program bulbs that is installed in residential locations.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the NTG ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
LED Lamp and Fixture	0.83
Linear Fluorescent	0.67
LED Exit Sign	0.80
Battery Charger	0.80
Linear LED	0.80

Source: https://s3.amazonaws.com/ilsag/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Process Evaluation – Distributor, Program Manager and Implementer Interviews

No process research will occur in CY2020. Navigant will conduct process research in CY2021.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Evaluation conference calls and face-to-face meetings will be conducted with the ComEd program manager and program implementation team. These calls will be focused on the status of the Instant Discounts Program, recent updates to the program, and changes likely to occur to the program in CY2020 and beyond.

Telephone and Web Surveys

Participant surveys in 2020 will service impact research. Impact-related questions will affect the evaluated part-use factor. Participants will be asked how their units would have been disposed of if the program had not picked them up.

[18] Distributors collect email addresses at the time of purchase.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 21, 2020
CY2020 program tracking data for QA/QC	ComEd	February 28, 2020
CY2020 Wave 1 program tracking data for verification and sampling	ComEd	April 30, 2020
CY2020 Wave 1 early impact verification memo	Evaluation	May 31, 2020
CY2020 Wave 1 participating customer survey	Evaluation	July 26, 2020
CY2020 Wave 2 program tracking data for verification and sampling	ComEd	August 30, 2020
CY2020 Wave 2 early impact verification memo	Evaluation	September 30, 2020
CY2020 Wave 2 participating customer survey	Evaluation	October 30, 2020
CY2020 Program tracking data for sampling Wave 3	ComEd	January 15, 2021
CY2020 Final program tracking data for verification	Evaluation	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 6, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 27, 2021
Revised Draft by Navigant	Evaluation	April 3, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 10, 2021
Final Report to ComEd and SAG	Evaluation	April 20, 2021

ComEd LED Street Lighting Program CY2020 to CY2021 Evaluation Plan

Introduction

The LED Street Lighting Program seeks to secure energy savings by replacing mercury vapor (MV) and high-pressure sodium (HPS) fixtures with light-emitting diode (LED) fixtures. The program assists municipalities with replacement upgrades to high-intensity discharge (HID) street lights, with participation open to equipment independent of ownership, municipally-owned or ComEd-owned.

The evaluation of this program will review ComEd's LED Street Lighting tracking data for consistency and accuracy of use of all values and proper application of Illinois Technical Resource Manual (TRM) LED savings values. The hours of use agreed to by ComEd and the Illinois Commerce Commission for LED Street Lights are outlined in the 2019 Illinois Statewide TRM version 8.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		X

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the LED Street Lighting programs are closely coordinated in that the evaluation of both is led by the same person so as to ensure consistency and knowledge sharing as possible. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. The one exception is the approaches being used to compute net-to-gross ratios, which differ somewhat. The ComEd team calculates a hybrid participating customer and Retailer-Based NTG ratio as its main method, which is consistent with the Enhanced method in the TRM. The Ameren team, with a more limited budget, calculates a Participating Customer-based NTG ratio

Evaluation Research Topics

The primary objectives of the evaluation of the LED Street Lighting Program are to: (1) quantify gross and net savings impacts from the program, and (2) as the program evolves, make recommendations to enhance the program.

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. Did the program meet its energy savings targets? If not, why?
4. What updates are recommended for the Illinois Technical Reference Manual, including hours of operation?

Process Evaluation and Other Research Topics

The evaluation team updated the NTG value for this program in CY2019. No further process or NTG evaluation is needed in CY2020.

Evaluation Approach

The evaluation team recommends the evaluation priorities outlined in Table 1 based upon our understanding of the needs of the program and the program's prior evaluation history. Navigant realizes that the program is relatively new and will likely change as it matures over the next two years. Navigant also notes that the current approach may change over the next two years as the program grows, but expects the following aspects of the evaluation approach will remain consistent:

- Gross and net impact analyses will be conducted each year.
- Annual program management and implementor interviews are recommended so that the evaluation team can track and respond to changes to the program design and delivery.
- NTG values for the program were assessed in 2019, and do not need further review until 2021.
- Cumulative Persistence Annual Savings (CPAS) will be calculated annually based upon the requirements of the Future Energy Jobs Act (FEJA). The CPAS calculated in any given year will remain the same once reported.
    - An updated EUL for this measure has been proposed and is under review. If adopted, the lifetime applied to the CPAS tables will reflect this update starting in the program year immediately after the update is adopted.

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	April 2020 – January 2021	Three waves†
In Depth Interviews	Program Management and Implementers	2	June – July 2020	Augment with monthly calls
Gross Impact	Engineering File Review	Census	May 2020 – February 2021	Three Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	June 2020 – March 2021	

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

ComEd will upload program data on an on-going basis to the eTrack system for Navigant's review. Navigant will review project documentation and conduct an engineering review of the initial data provided by ComEd of both municipality-owned and ComEd-owned fixtures approximately halfway through the calendar year. Navigant will then provide a memo outlining the initial program findings. The analysis will be revised with an updated data extract and Fall review. A final analysis update will occur in early 2021, once the CY2020 program data is finalized. Navigant will provide impact findings to ComEd in a memo and work with ComEd and the Illinois Stakeholder Advisory Group (SAG) to refine the memo until it has been finalized.

Program Manager and Implementer Interviews

In CY2020, Navigant will interview both the program manager and the program implementer. Both interviews will include similar questions and shared objective to identify opportunities for program improvement. These interviews are not a formal process evaluation, but a combination of structured time and open-ended discussion about the program objectives, successes, lessons learned, and strategy. These deep dive interviews will be further supported by bi-monthly team check-in calls that focus on annual progress to date, near-term planning, and team coordination.

Gross Impact Evaluation

The program key gross impact evaluation activities for CY2020 will be based on:

- Reviewing the tracking system to determine whether all fields are appropriately populated,
- Reviewing project supporting information for consistency with tracking data,
- Verifying measure totals and savings as recorded in the tracking database.

Verified Net Impact Evaluation

Navigant conducted NTG research for this program in 2019, with a focus on the municipally owned fixtures. This update was approved by the SAG in October of 2019 and will be applied in CY2020. For ComEd-owned fixtures, a NTG of 1.0 was previously approved by the SAG and remains applicable for CY2020.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
ComEd-owned fixtures	1.0
Municipality-owned fixtures	0.81

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by FEJA, Navigant will report ex post gross and ex post net savings for the program as well as the CPAS generated by the program in CY2020. Additionally, Navigant will estimate average measure life for each of the unique LED fixtures in the program and generate a weighted (based on measure counts and energy savings) measure life at the program level.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Navigant is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Deliverable	Responsible Party	Date Delivered
Update Program Operations Manual and Workpapers	ComEd	January 2, 2020
Upload CY2020 program tracking data to eTrack	ComEd	Ongoing
Review initial project documentation, engineering review and memo	Evaluation	August 31, 2020
ComEd to indicate when all CY2020 program tracking data has been uploaded to eTrack	ComEd	January 29, 2021
Review final program savings and complete engineering review	Evaluation	February 26, 2021
Internal Report Draft by Navigant	Evaluation	March 2, 2021
Draft Report to ComEd and SAG	Evaluation	March 9, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 30, 2021
Revised Draft by Navigant	Evaluation	April 6, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 13, 2021
Final Report to ComEd and SAG	Evaluation	April 20, 2021

ComEd Nonprofit Organizations Program CY2020 – CY2021 Evaluation Plan

Introduction Introduction

The ComEd Nonprofit Organizations (NPO) Program aims to cost-effectively generate and capture savings from energy efficiency projects undertaken by ComEd's nonprofit customers. The NPO Program aims to provide a single point of contact for

- Energy assessments
- Energy efficiency measure installation
- Construction oversight
- 'Handholding' and long term relationship building.

The measures included in the NPO Program (Table 1) are prescriptive measures. The program approach to incentive levels and customer outreach closely mirrors the Small Business (SBO) program. The target population for the program includes churches, child care centers, transitional housing, community-based organizations, and healthcare clinics.

To participate in the program, the ComEd customer must be a 501(c)3, located within ComEd's service territory, whose mission involves providing direct services to at-risk populations. Eligible projects are identified by Energy Efficiency Service Providers (EESPs) and Elevate Energy (Elevate), which is responsible for implementation of the program. Elevate engineers complete a free assessment of the customer facility and identify savings opportunities from the program measure list. Elevate then helps the participant identify installers and provides construction management oversight and inspection to ensure the measures are installed and generating savings as expected.

Table 1. NPO Program Measures by Type*

Retrofit	Early Replacement	Direct Install
HVAC (VSD, advanced controls, thermostats, tune-up)	Chillers, AC units, Heat Pumps	
Refrigeration (automatic door closers)		Vending machine controls
Lighting Measures (LED fixtures, DE lamping of fluorescent fixtures)		Screw based LEDs

* The measures noted in program documentation received to date from Elevate Energy. The program measures may change.

The CY2020 gross impact evaluation will include a variety of data collection and analysis activities, including those indicated in Table 2.

Table 2. Evaluation Approaches

Tasks	CY2020	CY2021
Tracking System and Data Flow Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Project Level Desk Reviews including Deemed Savings Review	X	X
Impact – Project Level Site Visits and Installation Verification	X	X
Impact – Verification & Gross Realization Rate	X	X
Impact – Gross and Net Savings Verification	X	X

Coordination

The NPO Program is not offered jointly with the gas companies, and there is no similar offering for Ameren Illinois. The evaluation team does not anticipate cross utility coordination for the NPO Program Evaluation.

Evaluation Research Topics

The evaluation in CY2020 will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings based on the deemed NTG value for NPO?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are project baselines properly determined? If not, why not and what guidance can the evaluation team provide for future project?
5. What changes (if any) to the assessment process would improve accuracy of savings estimates?
6. Are interactions between measures properly determined per the TRM?
7. What updates (if any) are recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no process research in CY2020. Process research and NTG may be conducted in CY2021.

Evaluation Approach

This evaluation plan identifies tasks on a preliminary basis for CY2020 – CY2021 (Table 3). Activities are subject to change as program circumstances are better known.

For CY2020 – CY2021, the primary method to determine gross savings will be detailed project reviews of a random sample of completed projects. A program-level net-to-gross (NTG) ratio, deemed through

consensus by the Illinois Stakeholder Advisory Group (IL SAG), will be applied to the program's verified gross savings to determine net savings.

The table below summarizes the evaluation tasks for CY2020 – CY2021.

Table 3. Evaluation Plan Summary

Activity	CY2020	CY2021
Gross Impact Approach	Tracking System Review Project-Level Desk Reviews including Measure-Level Savings Review Project-Level Installation Verification Site Visits	Tracking System Review Project-Level Desk Reviews including Measure-Level Savings Review Project-Level Installation Verification Site Visits
Verified Net Impact Approach	Deemed Value	Deemed Value
Program Manager and Implementer Interviews/ Review Materials	Yes	Yes

Table 4 summarizes the proposed data collection activities for CY2020, including the sample sizes and timing of each activity. During CY2020, Navigant will develop a sample design upon receipt of the first wave of project tracking data. Navigant will modify the CY2020 sample size targets in late CY2020 and after the final data wave in early CY2021, as warranted by program participation.

Table 4. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System and Data Flow Review	Tracking system	Census	Wave 1 (by June 1, 2020) and Final data	Two Waves
Project-Level Desk Reviews including Measure-Level Savings Review	Tracking System and Project Files	Census	Wave 1 (by June 1, 2020) and Final data	Two Waves
Project-Level Installation Verification Site Visits – random sub-sample	Customer Facilities	TBD after receipt of Wave 1 extract	August 2020 – February 2021	Installation verification site visits will only be the largest, highest uncertainty projects as needed to satisfy the requirements of the IPMVP†
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2021	

† IPMVP = International Performance Measurement and Verification Protocol

In line with program changes and an accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform a tracking system review in two waves during 2020.

Gross Impact Evaluation

The NPO program includes savings from standard lighting, HVAC, and refrigeration measures in the Illinois Technical Reference Manual (TRM). A majority of pipeline savings for CY2020 is expected to be

lighting. Therefore, the evaluation team will initially adopt a prescriptive impact evaluation approach that includes installation verification site visits for a sub-sample of projects to reduce uncertainty in the projects with the largest contribution to program savings, as required by the IPMVP.

The evaluation team will:

- Perform measure-level reviews to assess the validity of the various tools and approaches the program uses to quantify savings.
- Ensure savings follow the methodology outlined for the appropriate measure in the IL TRM.

The specific gross impact evaluation activities are as follows:

1. Develop a stratified random sample of completed projects
2. For each project the evaluation team will:
    a. Review all savings calculations and compare analysis inputs to project-specific conditions,[19] such as building weather location, hours of operation, project type and associated baseline determination[20] project-specific baseline conditions.
    b. Adjust analyses to site-specific conditions as appropriate.
    c. Examine interactive effects between measures to ensure they are properly quantified.
    d. For projects receiving a site visit, the evaluation team may additionally collect operational information from the customer's energy management system.

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level NTG ratio of 0.97 deemed through consensus by the IL SAG.

Table 5. Deemed NTG Values for CY2020

Program Measure	CY2019 Deemed NTG Value
Nonprofit Organization	0.97

Source: IL SAG ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of CPAS and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated, if possible. The evaluation team will also add the savings converted from gas savings to the electric savings so that it's documented in the report. Navigant will follow reporting rules for the Nonprofit Organizations program based on the measure types implemented for CY2020.

[19] The evaluation team will use a variety of methods to determine project-specific inputs even for projects not selected for a site visit. Methods may include reviewing posted building schedules online, telephone verification with the participant, and reviewing billing data.
[20] For example, a project could have multiple baselines for a retrofit project—additional added electric load would have an 'industry best practices / code' baseline whereas a more efficient servicing of the pre-existing load may have an 'existing equipment' baseline.

Program Manager and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This research will be conducted so that the evaluation team can evaluate the program with a solid understanding of the program. The interviews will include similar questions and a shared objective to identify opportunities for program status, operations and improvement.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 6 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress.

Table 6. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual	ComEd	May 29, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	June 1, 2020
Tracking System Wave 1 Ex Ante Preliminary Review Findings and Recommendations	Evaluation	September 30, 2020
Fieldwork (installation verification only, no metering)	Evaluation	October 2020
CY2020 final program tracking data	ComEd	February 1, 2021
Internal Impact Report Draft by Navigant	Evaluation	February 15, 2021
Draft Report to ComEd and SAG	Evaluation	March 8, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 29, 2021
Revised Draft by Navigant	Evaluation	April 5, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 12, 2021
Final Report to ComEd and SAG	Evaluation	April 21, 2021

ComEd Non-Residential New Construction Program CY2020 to CY2021 Evaluation Plan

Introduction

This plan covers CY2020 to CY2021 for the Non-Residential New Construction Program. CY2020 (January 1, 2020 to December 31, 2020) is the 12th program year of ComEd's energy efficiency savings portfolio and the ninth program year for energy efficiency gas savings. The Non-Residential New Construction Program is coordinated between ComEd, Nicor Gas, Peoples Gas and North Shore Gas Companies. Slipstream implements the program for ComEd, Nicor Gas, Peoples Gas, and North Shore Gas.

The CY2020 program will not change significantly from CY2019. The program has continued to develop and offer different program tracks to tailor program support to specific business segments. In the Best Practices track, program administrators will offer participants a set incentive per square foot for incorporating pre-selected packages of measures. The measures and incentives offered are tailored by business segment to meet the needs of those customers.

This evaluation plan reflects evaluation approaches designed for the unique characteristics of this program. The evaluation approaches have been developed through discussions between the implementation and evaluation teams as well as ComEd over the course of the past several years. The primary objectives of this evaluation are as follows:

- Provide adjusted gross impacts for all completed projects using a researched realization rate.
- Provide verified net savings for all electric and gas projects completed in CY2020.

The CY2020 gross impact evaluation will not vary substantially from the previous years and will be based on engineering desk reviews. The evaluation team will use the same general evaluation approach for all tracks of the program, including the public sector projects, but will account for the variations in the tracks (e.g., Expedited Assistance, Best Practices) and program offerings as needed. To the extent there are a sufficient number of projects to be meaningful, we will present results for each track as well as overall results for the program.

Given that net-to-gross (NTG) research was conducted in CY2019 and is planned for CY2021 the Navigant team will not be conducting NTG research in CY2020.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Materials Review	X	X
Data Collection – Participant Interviews	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Building Energy Simulation Modeling	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Free Ridership Self-Report Surveys		X
Process Research		X

Given that the program includes very large custom projects and that the program plans to roll out several new initiatives to better serve specific customer groups, we plan to conduct impact research activities - annually. This approach will ensure that any year-to-year variations due to individual projects will not affect future years.

Coordination

In this plan, Navigant outlines the evaluation objectives and activities for the program and how results pertain to each utility. The impact evaluation work will be fuel-specific: the electric impact evaluation will focus on a sample of projects with electric savings, while the gas impact evaluation will focus on a sample of projects claiming gas savings.

The evaluation activities and timing for each utility evaluation are the same, as this is one evaluation for all utilities. Participant interviews are done without respect to the associated gas utility. The team will work with the program implementer to determine if the differences in measures and buildings by gas service territory warrant updating the sampling strategy to support utility-specific realization rates. If not, sampling for desk reviews will be done without respect to the associated gas utility. NTG ratios are deemed prospectively with separate NTG values for electric and for gas. Beyond these points, the ComEd evaluation team will coordinate with the gas utilities on any relevant evaluation issues as needed.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Internal Tracking System	Entire System	Completed by January 30th each year
In-Depth Interviews	Program Management and Implementers	2	Augment with monthly calls
Material Review	Literature review, secondary research, program materials	n/a	Inform primary data collection activities
Gross Impact Evaluation	Early Feedback File Review	5	Early Feedback for Large Projects, As Needed
Gross Impact Evaluation	Engineering Desk Review	30†	Two Waves†
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	n/a	

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects, depending on the expected distribution of CY2020 completed projects over the year.

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK. This latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

Navigant will perform tracking system review and M&V project sampling in waves in 2020. The first wave of M&V sampling is expected to cover about one-half of the projects.

Proposed gross impact sampling timelines are shown below.

CY2020 Gross Impact Sampling Waves

- First wave sample drawn in June 2020 and completed September 2020
- Final (second) wave by January 30, 2021 or upon the completion of all CY2020 projects

Gross Impact Evaluation

The evaluation team will conduct gross savings research using building energy simulation models on a sample of approximately 30 projects to determine CY2020 savings and calculate realization rates. This research will include an engineering desk review of each project in our sample. The evaluation team will also develop a summary sheet for each project reviewed that outlines the evaluation activities completed, any resulting changes to the building energy simulation model because of ex post review, and the net effect on the electric and therm savings relative to ex ante claimed savings.

Per the program design, the baseline for all projects typically will be based on the applicable Illinois Energy Conservation Code for Commercial Buildings. Determination of the applicable code version will be subject to requirements, if any, of the ICC approved version of the *Illinois Energy Efficiency Policy Manual* in place at the time of a project's application to the program. At the time of drafting this plan, the policy will likely be for evaluation to estimate savings using the code in effect at the time of the issuance of the construction permit.

All projects accepted under the guidance of *Illinois Energy Efficiency Policy Manual Version 1.1* (or earlier versions), will continue the practice of using a project's application date to determine which version of the Illinois Energy Conservation Code is the most appropriate to use as baseline. The Illinois Energy Conservation Code for Commercial Buildings references the *International Energy Conservation Code* (IECC), which also allows for use of *ASHRAE Standard 90.1* as an alternate compliance method.

The evaluation team will also calculate interactive effects associated with projects for each utility to be used within the cost-effectiveness analysis by each fuel type. We include all interactive effects for projects within participating gas companies' service territories (e.g., the project receives natural gas service from Nicor Gas and electric service from ComEd but may or may not have received a gas incentive). We will also present researched savings without interactive effects for comparison to utility goals.

Some new construction projects have high uncertainty surrounding the baseline selection (e.g., major renovations with HVAC reconfiguration), resulting in higher risk for downward evaluation savings adjustment if the evaluation determines that the appropriate baseline is more efficient than what was assumed in the ex-ante savings calculations. To anticipate and reduce the incidence of such cases, a review of the baseline by the evaluation team prior to incentive commitment may be appropriate. As a part of monthly evaluation update calls, there will be an opportunity for the program staff to identify projects where they perceive higher uncertainty. After discussion, the program staff and evaluation team may agree to have the evaluation team follow up with a brief but deeper review of project details and provide feedback on baseline selection within 10 days. The evaluation follow-up review will be optional, advisory and non-binding from the standpoint of updating ex ante savings claims but may serve to reduce downward savings adjustments in the ex post evaluation.

Sampling Approach

The evaluation team plans to create two sample frames, one focused on electric projects and the other focused on gas projects. The electric sample frame will be composed only of projects with electric savings. These projects may or may not have gas savings and may or may not be in any of the participating gas utilities' service territories. The gas sample frame will consist of all gas projects with positive therm savings before interactive effects from electric measures, regardless of whether the project has electric savings or received a gas incentive. [21] Within each of the sample frames, we plan to use a

[21] Similarly, when estimating verified savings, the evaluation will include all therm savings in the gas utilities' service territories with the interactive effects removed, whether the project received a gas incentive.

stratified random sample design. Each sample will be designed to reach 90% confidence and 10% precision two tailed for MWh and therms, respectively. The overall sample will include 30 projects, approximately 12 of which will have received gas incentives. [22]

Table 3. Estimated Number of Projects in Sample

Fuel-Type	Estimate of Projects in Sample (Approximate)
Electric	18
Gas	12
Total	**30**

Navigant will perform tracking system review and M&V project sampling in two waves in CY2020. The first wave of M&V sampling is expected to cover about one-half of projects completed in CY2020.

Verified Net Impact Evaluation

The evaluation team will apply the NTG ratio(s) approved by the SAG to the estimate of evaluation-verified gross savings to compute verified net savings. Separate estimates will be made for electric and gas savings.

Table 4. Deemed NTG Values for CY2018

Utility	CY2020 Deemed NTG Value
ComEd (MW and MWh)	0.59
Gas Utilities (therms)	0.58

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/Nicor_Gas_NTG_History_and_2020_Values_2019-10-01_Final.xlsx

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Calculation of Cumulative Persisting Annual Savings (CPAs) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be provided.

[22] The number of projects in the sample may change based on the final list of projects and their savings. Additional gas projects may be sampled if utility-specific realization rates are warranted.

Use of Randomized Controlled Trial and Quasi-Experimental Design

The evaluation team will not use the Randomized Control Trials (RCT) or Quasi-Experimental Design for process evaluation because:

- There are not enough participants in this program to achieve statistically significant savings estimates using this method.
- It would not be possible to create a valid matched control group for the customers in this program.
- This method would estimate average savings across all program participants which is not the desired savings estimate for this program

Evaluation Schedule

Table 5 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 program tracking data for sampling Wave 1	ComEd	June 3, 2020
Wave 1 engineering desk reviews	Evaluation	September 30, 2020
CY2020 program tracking data for sampling Wave 2	ComEd	January 30, 2021
Wave 2 engineering desk reviews	Evaluation	February 28, 2021
Internal Report Draft by Navigant	Evaluation	March 6, 2021
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 13, 2021
Comments on draft (15 Business Days)	ComEd, Gas Utilities, and SAG	April 3, 2021
Revised Draft by Navigant	Evaluation	April 10, 2021
Comments on redraft (5 Business Days)	ComEd, Gas Utilities, and SAG	April 17, 2021
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 27, 2021

ComEd Operational Efficiency Program CY2020 to CY2021 Evaluation Plan

Introduction

Navigant anticipates the following evaluation activities will occur over the CY2020-2021 period:

- Gross savings will be calculated through a detailed desk review of the sampled projects.
- The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program – the program CY2020 NTG ratio is 0.94.
- Any resulting changes to savings will be rolled up to the sample and a program level realization rate will be calculated.
- We tentatively plan to conduct NTG research in 2021.
- Assist the ComEd OEP team as it revises and implements improved program calculators.

Due to the wide range of measures included in the program, it is difficult to calculate a program measure life. Instead, the program should consider calculating measure life for each of its individual measures and apply this measure life on a site-by-site basis. If requested, Navigant will provide input on individual measure life based upon secondary research in CY2020.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table. Due to reduced budget, evaluation will have reduced impact sample sizes, no NTG research and there will be no participant interviews during the 2020 evaluation.

Table1. CY2020-2021 Evaluation Plan Summary

Activity	CY2020	CY2021
Gross Impact Approach	X	X
Gross Sampling Frequency	X	X
Verified Net Impact Approach	X	X
Researched NTG Approach		X
Program Manager and Implementer Interviews/ Review Materials	X	X
Participant Interviews		X
Effective Useful Life Determination	X	X
Process Evaluation		X

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. The one exception is the approaches being used to compute net-to-gross ratios, which differ somewhat. The ComEd team calculates a hybrid participating customer NTG ratio as its main

method, which is consistent with the Enhanced method in the TRM. The Ameren team, with a more limited budget, calculates a Participating Customer-based NTG ratio as its main method for an NTG ratio as a sensitivity case. The two teams then compare and discuss results at the end of the evaluation process.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the actual achieved ex post energy savings in this program?
2. How did the achieved savings compare to the ex-ante estimates?

Process Evaluation and Other Research Topics

Process evaluation will not be conducted in 2020

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline
Tracking System Review	Tracking system	Census	Jan-Feb 2021
In Depth Interviews	Program Management, Implementers and Participant	2	Feb-April 2021
Gross Impact	Engineering File Review	*	April 2018 – Sept 2018

*The size of the sample will be determined later once full program data is available.

For CY2020, Navigant will complete several site-specific calculation reviews. The sampling plan for this review will target overall 10 percent precision at 90 percent confidence using the stratified ratio estimation technique to optimize sample size and control evaluation costs. The strata will be defined by project size and offering type. Depending on the needs of the program, Navigant may review a sample of projects in 2020, but the size of this sample will be determined later.

Tracking System Review

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK.

Gross Impact Evaluation

The impact evaluation will be grounded in site-specific desk reviews. Navigant will collect individual site calculation data, review all calculation assumptions and follow up with sites as needed to update any inputs within the calculations.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program. For CY2018 that ratio was 0.94.[23] Over the course of 2018 we examined the program theory and evaluation approach to inform discussions in the fall Illinois Stakeholder Advisory Group (SAG) net-to-gross (NTG) deliberations about the need for doing free ridership surveys with OEP participants in future years.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
OEP Program	0.94

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Program Management and Implementer Interviews

Process analysis will be conducted in conjunction with the impact analysis. Program structure comments will be provided, as has been done in each of the previous evaluation years, by the impact team and documented in the report. The CY2020 process evaluation research will include a synthesis of both qualitative and quantitative data collected during the program staff interviews. Interviews will focus on progress to goals, identifying program successes and challenges, identifying drivers of those successes and challenges.

Research NTG Impact Evaluation

Navigant does not plan to conduct NTG research in CY2020 or CY2021.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated for each measure, along with the total CPAS for all measures. Additionally, the weighted average measure life will be estimated. Evaluation will also add the savings converted from gas savings to the electric savings so that it is documented in the report.

[23] http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2019_Recommendations_2018-10-01.xlsx

Use of Randomized Controlled Trial and Quasi-Experimental Design

The evaluation team will not evaluate this program via a randomized controlled trial (RCT) because the program was not designed with randomly assigned treatment and control groups.

The evaluation will not use quasi-experimental design (QED) because there are not enough participants for individual measures in this program to achieve statistically significant savings estimates.

Evaluation Schedule

Table 3 below provides the schedule for key deliverables and data transfer activities for 2020. Process analysis will be completed after the April 30th impact date and will be reported in a timely manner by the 4th quarter.

Table 4. Schedule – Key Deadlines

Activity/Deliverables	Responsible Party	Date Delivered
CY2019 Site Calculations are available to Navigant	ComEd	Q4/Q1 2020/2021
Sample of sites determined and approved	Evaluation	Q4/Q1 2020/2021
Project review	Evaluation	Q4/Q1 2020/2021
Program manager interview	Evaluation	Q1 2021
Internal Navigant Draft Report Review	Evaluation	March 5, 2021
Draft Report to ComEd and SAG	Evaluation	March 14, 2021
Comments on Draft (15 Business Days)	ComEd	April 6, 2021
Navigant Redraft of Report	Evaluation	April 13, 2021
Comments on Redraft (5 Business Days)	ComEd	April 20, 2021
Final Report to ComEd and SAG	Evaluation	April 27, 2021

ComEd Public Buildings in Distressed Communities Program CY2020 to CY2021 Evaluation Plan

Introduction

The Public Buildings in Distressed Communities Program seeks to secure energy savings through support of HVAC and lighting retrofits in public sector buildings in distressed communities. Distressed communities are defined based on information provided by the Illinois Department of Commerce and Economic Opportunity (DCEO), Economic Innovation Group, and Elevate Energy.. This eligibility extends throughout the ComEd territory, with admissibility determined though qualifying municipalities, zip codes, and census tracts.

Examples of market segments expected to participate in this program include:

- Schools
- Police Departments
- Fire Departments
- City & County offices
- State & federal buildings located within the distressed community

Measures offered will primarily target lighting and HVAC end-uses, with the program covering a portion of the retrofit and installation cost. Responsibility for installation activities is dependent on the measure type. Lighting projects are managed by the participant; with equipment installed using internal staff, or with the support of a contractor. HVAC measures can be customer installed or with all work completed by contractor. If self-installed, HVAC projects require the program implementer to conduct a preliminary evaluation and post-install verification.

The evaluation will assess ComEd's Public Buildings in Distressed Communities Program tracking data to ensure:

- Sufficient data is collected to enable reporting and evaluation
- Savings and inputs are applied correctly
- The impacts are calculated correctly according to the Illinois Technical Resource Manual (IL TRM)

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1: Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Process – Participant surveys and Implementer interviews		X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Verification of Gross and Net Impacts	X	X
Impact – Verification and Gross Realization Rate	X	X

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. The program team is in close coordination with Ameren, which has an "Instant Incentives" program that also provides discounts at the point of sale through commercial lighting distributors. In CY2020, the ComEd and Ameren lighting program evaluations will continue to be closely aligned with respect to data collection activities and analysis methods.

Evaluation Research Topics

The primary objectives of the evaluation of the Public Buildings in Distressed Communities Program are to: (1) quantify gross and net savings impacts from the program, and (2) make recommendations to enhance the program.

The evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings?

Process Evaluation and Other Research Topics

There will be no Process research in CY2020. The evaluation team will conduct a process evaluation for the program in CY2021.

Evaluation Approach

The evaluation approach for the 2020-2021 period is outlined in Table 1. The evaluation team realizes that the program is young and will likely change as it matures over the next two years and will adjust the plan as needed as time goes along. The current evaluation approach includes:

- Gross and net impact analyses will be conducted each year

- Cumulative Persistence Annual Savings (CPAS) will be calculated annually based upon the requirements of Future Energy Jobs Act (FEJA)

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. NTG will not be researched in CY2020.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Two waves†	
PM and IC Interviews	Program Management and Implementers	2	May-June 2020	Augment with quarterly status meetings
Program Status Meetings	Program Management and Implementers	4	2020	Quarterly calls to facilitate awareness of program progress
Gross Impact	Engineering File Review‡	Census	Sept 2020 – Feb 2021	Two Waves†
Verified Net Impact	Net Savings Calculation	NA	March 2021	NTG ratio provided in Table 3

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Gross Impact Evaluation

The program key gross impact evaluation activities for CY2020 will be based on (1) reviewing the tracking system to determine whether all fields are appropriately populated, (2) ensuring that TRM inputs are correctly applied, (3) cross-checking measure totals and savings recorded in the tracking database, and (4) checking for outliers.

Verified Net Impact Evaluation

The evaluation team will not research NTG in CY2020. Evaluation will apply the net-to-gross (NTG) ratios approved by the Stakeholder Advisory Group (SAG) on October 1, 2019 to the estimate of evaluation-verified gross savings to compute verified net savings. These NTG values are provided in Table 3.

Table 3. NTG Values for CY2020

Program Measure	CY2020 NTG Value
All measures	0.97

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	November 2019 – January 24, 2020
CY2020 Program Tracking Data for Tracking System Review	ComEd	June 1, 2020
CY2020 Wave 1 program tracking data and supporting documentation for individual projects	ComEd	July 1, 2020
Wave 1 project documentation, engineering review and memo	Evaluation	August 31, 2020
CY2020 program tracking data	ComEd	January 29, 2021
Internal Report Draft by Navigant	Evaluation	March 1, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 26, 2021
Revised Draft by Navigant	Evaluation	April 2, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 9, 2021
Final Report to ComEd and SAG	Evaluation	April 16, 2021
Draft Process Memo	Evaluation	July 15, 2021
Final Process Memo	Evaluation	August 30, 2021

ComEd Public Small Facilities Program CY2020 Evaluation Plan

Introduction

The Public Small Facilities (PSF) Program is designed to assist qualified ComEd public sector non-residential customers[24] to achieve electric energy savings by educating them about energy efficiency opportunities through no-cost on-site energy assessments conducted by preapproved, specially-trained Energy Efficiency Service Providers (EESPs). [25] EESPs are the primary means of promoting the Public Small Facilities Program and obtaining participants.

Willdan Energy Solutions is the implementation contractor for the Public Small Facilities Program.

The PSF CY2020 measure mix will include lighting, compressed air and HVAC end-use measures. The HVAC measures are new to the PSF program. [26]

The primary objectives of the CY2020 evaluation of the PSF Program will be to: (1) quantify the gross and net savings impacts of the program; and (2) investigate potential gas savings counted as kWh (therms conversion).

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 5.

Table 5. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys	X	X
Net-to-Gross – EESP Interviews	X	X

The evaluation team determined the evaluation approach for the CY2020-2021 period based upon the needs of the program and the program's history. The two-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Optimized timing on when to conduct net-to-gross (NTG) research

[24] To qualify, participants must be ComEd public sector non-residential customers with monthly peak demand levels up to 100 KW.
[25] No-cost direct-install measures include low-flow showerheads and faucet aerators, pre-rinse spray valves, smart power strips, and controls for novelty coolers, beverage machines, and snack machines.
[26] These measures began to be added midyear CY2019, and include package terminal air conditioners (PTAC), package terminal heat pump (PTHP), single-package and split system unitary air conditioners, small commercial programmable and advanced thermostats, small commercial programmable and advanced thermostat adjustments, notched v-belts, and advanced rooftop controls.

- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of the Future Energy Jobs Act (FEJA) [27]

Coordination

Ameren Illinois does not currently have a program analogous to ComEd's PSF Program, and instead will serve small public-sector customers through their existing Small Business Program. Navigant will coordinate with the Ameren Illinois Small Business Program evaluation team on data collection, analytical methods, and survey instrument design to ensure consistency in our evaluation approaches for small public-sector facilities.

Evaluation Research Topics

The evaluation will seek to answer the following key researchable questions:

Impact Evaluation

- What are the program's verified gross savings?
- What are the program's verified net savings?
- What are the program's demand savings?
- What updates are recommended for the Illinois Technical Reference Manual (TRM)?
- What are the effective useful lives (EUL) of measures within the program?

Process Evaluation

There will be no process evaluation in 2020.

Evaluation Approach

Table 6 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

[27] Illinois Public Act 099-0906 (http://www.ilga.gov/legislation/publicacts/99/099-0906.htm).

Table 6. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020 (approx.)	Notes
Tracking System Review	Tracking system	Census	
Gross Impact	Early Feedback File Review	Census	Two to Three Waves*
Gross Impact	Engineering File Review	10	Early Feedback for Sampled Projects (One Wave)
Verified Net Impact	Calculation using deemed NTG ratio	Census	
NTG Research	Participants Surveys and EESP Interviews		Free ridership and Spillover research

* Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
† Navigant will complete an appropriate number of surveys with participants and interviews with EESPs to achieve statistically significant NTG results.

Navigant will perform tracking system review and engineering file reviews on a sample of participant projects in two to three waves in CY2020. Navigant will use the SAG approved net-to-gross ratios for CY2020 to calculate program net savings in CY2020.

Gross Impact Evaluation

Since most PSF Program savings are derived from deemed values contained in the TRM, gross savings will be evaluated primarily by (1) reviewing the tracking system data and savings workbook to ensure that all fields are appropriately populated and savings are consistent with the implementation contractor's workpapers and savings calculators that feed into the tracking system; (2) reviewing new measures' algorithms and values in the tracking system and savings workbook to assure that they are appropriately applied; and (3) cross-checking totals. This approach will be supplemented where possible with a review of project documentation on a random sample of projects to verify participation, installed measure quantities, and associated savings. Findings from the impact analysis will be reviewed to provide an opportunity for improving the tracking system and data collection.

Proposed CY2020 gross impact and sampling timelines are shown below Core data collection activities will include the following:

1. Engineering examination of ComEd workpapers, tracking system and measure workbook calculations of claimed savings.
2. Engineering review of project documentation at the measure-level for a sample of projects to verify participation and tracking system entries, check documentation of invoiced quantities and installed measure characteristics, confirm compliance with eligibility, and deemed input values.
3. Computer assisted telephone interviews (CATI) with a sample of PSF Program project to quantify participating customer free-ridership and spillover, and trade ally free ridership and spillover.
4. Attend regular monthly meetings by telephone with ComEd program staff and the IC staff to discuss specific impact issues that need to be addressed during program evaluation.
5. The evaluation team will collect PJM demand savings estimates and program and measure-specific cost detail to further ComEd's PJM auction and TRC analysis.

6. Investigate potential gas measures with kWh savings and review the parameters ComEd used to estimate potential kWh savings (therms conversion).

Verified Net Impact Evaluation

The verified net impact evaluation will apply the NTG ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program (Table 3).

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Small Public Facilities (all public-sector measures)	0.97

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_2019-10-01.pdf

Research NTG Impact Evaluation

Navigant will conduct NTG research in CY2021.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Calculation of CPAS and Annual Savings

As required by FEJA, Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. Evaluation will also calculate gas savings from the program.

Use of Randomized Control Trial and Quasi-Experimental Design

Navigant is not evaluating the PSF Program via a randomized controlled trial (RCT) because the program was not designed with randomly assigned treatment and control groups. Navigant is not using quasi-experimental consumption data (QED) for the following reasons.

- It would not be possible to create a valid matched control group for the customers in this program.
- This method would estimate average savings across all program participants which is not the desired savings estimate for this program.
- This program delivers a unique mix of program measures to each participating customer. At best, a quasi-experimental consumption data analysis would produce savings estimates for bundles of

commonly-installed measures, rather than for each measure individually, which is not the desired output for all analysis.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities (see Table 2 for other schedule details.) The April 30th deadline in is for the impact report. The NTG findings will be delivered in different documents and on a different schedule. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Impact Deadlines

Activity/Deliverables	Responsible Party	Date Delivered*
Monthly Evaluation Calls	ComEd/Navigant & IC Staff	Every six weeks as needed
Program Operations Manual and Workpapers/Workbook Review	ComEd/Nexant	October – December 2019
CY2019 Wave 1 Tracking Data	ComEd	July 30, 2020
Early impacts findings memo	Evaluation Team	August 30, 2020
Sample Projects Documentation for Review	ComEd	September 30, 2020
Wave 2 and Final CY2019 Tracking Data to Navigant	ComEd	January 30, 2021
Internal Impact Report Draft by Navigant	Evaluation Team	March 5, 2021
Draft Impact Report to ComEd and SAG	Evaluation Team	March 12, 2021
Comments on draft (15 Bus. Days)	ComEd / SAG	April 2, 2021
Revised Impact Draft by Navigant	Evaluation Team	April 9, 2021
Comments on Impact Redraft (5 Bus. Days)	ComEd / SAG	April 16, 2021
Final Impact Report to ComEd and SAG	Evaluation Team	April 23, 2021

ComEd Coordinated Utility Retro-Commissioning Program CY2020 to CY2021 Evaluation Plan

Introduction

The Coordinated Utility Retro-Commissioning (RCx) Program seeks to realize energy savings by restoring building HVAC systems and optimizing controls to meet the needs of the current building occupants. RCx is a study-based process that generates savings through improved understanding and operation of the existing equipment, rather than capital outlays to install new equipment.

The RCx Program is managed by ComEd. ComEd coordinates with Nicor Gas, Peoples Gas and North Shore Gas to account for gas savings generated through the program. The RCx Program continues to evolve to serve more diverse customer segments. To reach smaller customers and market segments, the utilities began expanding the program to support additional offerings in the fifth electric and second gas program years (PY5/GPY2) and in the seventh electric and fourth gas program years (PY7/GPY4). Beginning in CY2018 public sector customers could participate in any of the RCx offerings from the utilities.

There are four RCx Program options to optimize energy performance:

- Traditional RCx represents the original offering for large commercial buildings and completes a four-phase RCx process (Planning, Investigation, Implementation, and Verification). Projects are unique, and savings are determined using program standard and custom calculations developed by service providers and implementation contractors with input from the evaluators.
- Monitoring-Based Commissioning (MBCx) is a long-term engagement between the Energy Efficiency service provider (EESP) and customer to identify, implement, and monitor measures over time. MBCx features the integration of monitoring software into the building automation system to assist in the identification and documentation of deeper energy saving opportunities than those found in traditional RCx. It can also be used as a process to continue and augment prior projects that will help ensure measure persistence and improve building operations over time.
- Retro-Commissioning Express (RCxpress) is an offering targeted to mid-sized commercial buildings or buildings interested in a shorter project timeline. RCxpress uses program-standard calculators in addition to custom calculations for savings estimates.
- RCx Building Tune-Up (Tune-Up) is for customers less than about 150,000 ft^2 but with more than 100 kW of peak demand. This offering offers an implementation incentive in addition to the RCx study incentive provided in the other offerings.

Navigant anticipates that the evaluation will pursue the following research areas for CY2020 to CY2021. Due to reduced budget, evaluation will not conduct process evaluation and impact sample sizes will be reduced in 2020.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews		X
Impact – Project-specific Billing Analysis	X	X
Impact – Engineering Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – CY2019 Customer Self-Report Surveys		X
Net-to-Gross – CY2019 Service Provider Interviews		X
Process Analysis		X

The evaluation team determined the evaluation approach for the CY2020-2021 period based upon the needs of the program and program's prior history. The two-year evaluation approach for this program is based on the following:

- RCx measures are custom to respective applications and often use custom calculation tools to estimate savings. As a result, we will continue to review and estimate gross and net impacts each year over CY2020-2021.
- Cumulative Persistent Annual Savings (CPAS) will be calculated based upon the requirements of the Future Energy Jobs Act (FEJA).
- Following the pattern from past evaluations, Navigant will conduct Net-to-Gross (NTG) research in alternate years. NTG research with participants and EESPs will conform to statewide NTG methodologies described in the Illinois Technical Reference Manual.

The primary objectives of the CY2020 RCx evaluation is: (1) to quantify net savings impacts in therms, kWh, and kW from the program during CY2020 and identify any systemic problems with calculators; (2) to update net-to-gross for program offerings for both gas and electric savings; and (3) in CY2021 to determine key process-related program strengths and weaknesses and identify ways in which the program offering(s) can be improved. The process evaluation will include input from program management and the experiences of active EESPs and participants.

Coordination

Navigant will coordinate with the Ameren Illinois (AIC) evaluation team on any issues relevant to this program. The teams have worked in parallel over many years and the methods used in both evaluations are specified by the Illinois TRM and are generally consistent. Depending on the number of completed projects the AIC impact analysis may include a sample or census of participants.

Gas savings. A collaborative agreement between ComEd and the gas utilities promotes estimating complementary gas savings at ComEd customer sites for all RCx offerings. The RCx Program evaluation plan parallels the planned work for the AIC RCx Program.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Should the program design be modified to reduce free ridership, and if so, how?

Process Evaluation and Other Research Topics

Navigant will not conduct process research for the program in CY2020. NTG and EUL research will take place in CY2020.

Evaluation Approach

Due to the custom analysis for each RCx project, we anticipate continuing to conduct impact research each program year. Navigant will use impact methodologies from the International Performance Measurement and Verification Protocols (IPMVP), as appropriate for the market segment we are researching. In some cases, Navigant may opt to use regression methods with meter data (IPMVP – Option C) for Tune-Ups or select measures in other offerings which would be apparent on meter data seasonally or during select hours of the day.

Table 2 below summarizes data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions for each program offering. For planning purposes, Navigant assumes CY2020 participation will be similar to CY2019 participation. Participation by gas utility customers is unknown at the time of this Plan. The number of gas participants spread across three utilities may necessitate a near-census sampling of gas participants.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	Quarterly
Service Provider NTG Interviews*	Active retro-commissioning service providers (EESP)	TBD	Census sample frame
Participant NTG Interviews	2020 Program Participants	TBD	Census sample frame
Gross Impact Evaluation	Engineering File Review	50	Quarterly†
Gross Impact Evaluation	On-site M&V	TBD‡	
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	Census	

* Trade ally surveys are triggered by high importance ratings by participating customers to the trade ally or vendor. Therefore, the number of trade ally or vendor surveys is dependent on the results of the participating customer surveys.
† Trade ally surveys are triggered by high importance ratings by participating customers to the trade ally or vendor.

‡ Navigant will limit on-site M&V on a case by case basis to reduce uncertainty for only the highest-impact projects. Navigant expects most or all of the projects to be verified using a combination of electric and gas billing data, additional trend data requested from the customer, and telephone verification of key inputs by the customer. This approach is not expected to impact the final realization rates, however may limit the amount of site-specific feedback available to ComEd to explain the realization rates.

Tracking System Review

In line with changes to the RCx offerings and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform tracking system review and M&V project sampling approximately quarterly in 2020. Initial feedback on sampled project files will occur within 45 days of their posting as outlined in the "*CY2020 Gross Impact Research Waves"* section below. Navigant will report periodic preliminary evaluated impact findings.

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK. This latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

Gross Impact Evaluation

The CY2020 gross impact evaluation sampling plan may be adjusted to reflect ComEd's research goals.

Sampling Strategy

Our overarching goal is to research savings impacts sufficiently to report program-level savings at ±10% precision and 90% confidence for each utility. We will also accommodate secondary research objectives, such as analysis by offering and/or sector level (public vs. private) as requested by ComEd, but with relaxed precision and confidence, [28] to fit research within budget constraints and as permitted by ComEd. The default strata will be defined by project size, offering type, and fuel type.

The impact research sample will be drawn quarterly based on the projects labeled 'Final Wrap Up' or 'Complete' in the Ops Report provided by the implementation contractor. After program ex ante results are final, the progressive quarterly sample will be compared to the year-end program participation and savings, and Navigant will adjust the sample to comply with sampling goals.

CY2020 Gross Impact Research Waves

Navigant will perform tracking system review and M&V project review quarterly in CY2020.

All sampled projects will be subject to engineering file review.Gross impact estimates will mimic ex ante methods to the extent they are reasonable and accurate per data collected during verification steps. The evaluation team will modify calculations if methods are not reasonable or if verified operation differs from what was reported.

Wherever possible, ex post savings may be determined with regression analysis of trend or utility billing data and weather or other independent variables that affect energy use (for example, days of operation),

[28] Sampling in this manner for 85/15 confidence/precision is the approach used by Exelon-PECO for sub-program level research. When the subprograms are considered the overall research achieves 90/10 results for the program.

as appropriate. If implemented measures are not amenable to regression analysis, the engineering review will form the basis of evaluated savings using IPMVP Option A. This review process may point to special needs of this market segment.

Proposed gross impact timeline:

a) Navigant will communicate preliminary realization rates within four weeks of receiving all necessary project folders and tracking data for projects sampled quarterly that do not require a site visit. [29]
b) Navigant will communicate results for projects requiring a Navigant site visit as soon as the site visit is complete and all data has been collected and analyzed.
c) Final analyses will be posted in March of 2021.

Retro-commissioning program measures are not covered by the Illinois TRM, and are all non-deemed measures subject to retrospective per unit savings adjustment of custom variables. The non-deemed measure type dictates the savings verification approach. Navigant methods include (1) Savings Verification: an engineering analysis of savings using document review, telephone interview with participating customers, and supplemental data requests, and (2) Evaluation Research Savings Estimate: an independent research estimate of gross savings based entirely on site-collected data where necessary. The two methods are further described below:

Savings Verification

- Measures with fully custom or partially-deemed ex ante savings will be subject to retrospective evaluation adjustments to gross savings on custom variables. For fully custom measures, Navigant will subject the algorithm and parameter values to evaluation adjustment, where necessary. For partially-deemed measures, TRM algorithms and deemed parameter values will be used where specified by the TRM, and evaluation research will be used to verify custom variables.

Evaluation Research Savings Estimate

- The evaluation may include an analysis of on-site collected verification data for a subset of projects. The engineering analysis methods and degree of monitoring will vary from project to project, depending on the complexity of the measures, the size of the associated savings, the potential to revise input assumptions, and the availability and reliability of existing data. The evaluators will contact the implementers prior to conducting site visits to ensure that the evaluation team has all correct and relevant information.

The measure-level realization rates will be extrapolated to the program population using a ratio estimation method to yield ex post evaluation-adjusted gross energy savings. Gross realization rates will be developed for energy and demand savings. The sample design will provide 90/10 statistical validity for program savings overall.

[29] The data required to develop an ex post savings estimate depends on several factors including: measure seasonality; the size of the project savings; whether the project is selected for an on-site visit; whether there are both gas and electric savings; the availability of gas company billing data; and on the completeness of the data provided by the implementer. Where possible based on the data provided by the implementer, Navigant will provide a preliminary estimate of the ex post savings subject to final quality control checks. Where additional data or clarifications are needed, or a site visit is required, Navigant will request the additional information from the implementer and/or make initial contact with the participant within 45 days to schedule a site visit.

Verified Net Impact Evaluation

The evaluation team will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to the estimate of evaluation-verified gross savings to compute verified net savings.

Table 3. Deemed NTG Values for CY2020

Coordinated Energy Efficiency Program Offering	CY2020 Deemed NTG Value
RCx	0.94
MBCx	0.94
RCxTune-Up	0.94
RCxpress	0.94
All-Natural Gas	0.94

Source:
http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2019_Recommendations_2019-10-01.xlsx

Navigant will apply overall values to all RCx Program offerings.

Research NTG Impact Evaluation

Navigant will conduct a participating customer NTG study in CY2020 of CY2019-2020 participants to research free ridership and CY2018 participants to research spillover. We will interview active EESPs to research free ridership and spillover, triangulating their results to inform the final recommended NTG value.

For natural gas NTG research, we will attempt a census of all gas projects. Each gas participant data point will also constitute an electric participant data point.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

When gas savings is not attributed to a gas utility, the evaluation will also add the savings converted from gas savings to the electric savings so that it is documented in the report.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the RCx Program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental consumption data because there are not enough participants in this program to achieve statistically significant savings estimates using this method and it would not be possible to create a valid matched control group for the customers in this program.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Service Provider Interviews

The evaluation team will conduct interviews with EESPs to inform NTG recommendations for each program offering. Interviews will address free-ridership and participant spillover using protocols developed by the Illinois EM&V NTG Working Group and incorporated into the TRM.

We will sample a census of service providers participating in each offering.

Participant Interviews

We will interview a sample of participants to inform NTG recommendations for each program offering. Interviews will address free-ridership and participant spillover using protocols developed by the Illinois EM&V NTG Working Group and incorporated into the TRM.

We will target a 90/10 sample by program offering. For natural gas NTG research, we will attempt a census of all gas projects. Each gas participant data point will also constitute an electric participant data point.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress. We plan to conduct process evaluation activities early in the program year and report results to ComEd as valuable information becomes available.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 20, 2020
CY2020 program tracking data for QA/QC	ComEd	Quarterly, beginning April 15, 2020
Quarterly project documentation, engineering reviews, feedback	Evaluation	Quarterly, beginning June 1, 2020 Early feedback for on-site projects will be provide ongoing as results become available
CY2020 Program tracking data for final end of year sampling	ComEd	January 15, 2021
Final project documentation, engineering reviews, feedback	Evaluation	February 26, 2021
Internal Report Draft by Navigant	Evaluation	March 12, 2021
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 19, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 9, 2021
Revised Draft by Navigant	Evaluation	April 16, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 23, 2020
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 28, 2020
NTG Research Memo – draft	Evaluation	August 15, 2020
NTG Research Memo – final	Evaluation	Sept 30, 2020

ComEd Small Business Program CY2020 to CY2021 Evaluation Plan

Introduction

The Small Business Program is designed to assist qualified ComEd private-sector, non-residential customers[30] to achieve electric energy savings by educating them about energy efficiency opportunities through no-cost on-site energy assessments conducted by preapproved, specially-trained energy efficiency service providers (EESPs) and installation of no-cost direct-install (DI) measures. [31] Further savings are available to participating customers through incentives of 30-75 percent offered for select contractor-installed measures.[32] EESPs are the primary means of promoting the Small Business Program and recruiting participants. Changes in the 2020 Small Business Offering (SBO) Program include promotion of RTU optimization measures for customers under 100 KW. These measures include cogged v-belts, coil cleaning, economizers, advanced controls, RTU replacement, and sealing.

The primary objectives of the CY2020 evaluation of the Small Business Program will be to quantify the gross and net savings impacts of the program. The evaluation of this program over the remaining two years of the 2020-2021 cycle will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Modeling (as needed)	X	
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys	X	
Net-to-Gross – EESP Interviews	X	
Process Research		X

The 4-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Optimized timing on when to conduct net-to-gross (NTG) research
- Cumulative persisting annual savings (CPAS) will be calculated based upon the requirements of the Future Energy Jobs Act (FEJA)

[30] To qualify, participants must be ComEd private-sector commercial or industrial customers with monthly peak demand levels up to 100 KW.
[31] No-cost direct-install measures include low-flow showerheads and faucet aerators, pre-rinse spray valves, power strips, and controls for novelty coolers, beverage machines, and snack machines.
[32] Incented measures may include upgrades to T8/T5 lighting, LED retrofits and fixtures, high bay fluorescents, lighting controls, HVAC system components, electric water heaters, refrigeration system components, commercial kitchen equipment, compressed air system measures, smart thermostats, and building envelope measures.

Evaluation Research Topics

The evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total verified gross savings?
2. What are the program's annual verified net savings?
3. What are the program's demand savings?
4. What updates are recommended for the Illinois Technical Reference Manual (TRM)?
5. What are the effective useful lives (EULs) of program measures that currently lack them?
6. The evaluation team will calculate CPAS.

Process Evaluation and Other Research Topics

There will be no process evaluation research conducted in CY2020.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020 (approx.)	Notes
Tracking System Review	Tracking system	Census	Impacts. Three data waves
Gross Impact	Early Feedback File Review	Census	Wave 1 and Wave 2 data*
Verified Net Impact	Calculation using deemed NTG ratio		
In Depth Interviews	Program managers and implementers	4	Augment with periodic calls
Net-to-Gross Surveys	CY2020 (FR) and CY2019 (SO) participants	200	
Net-to-Gross Interviews	Active EESPs	30	

* Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
† Navigant will complete an appropriate number of surveys with participants and interviews with EESPs to achieve statistically significant results.

Navigant will perform tracking system review and engineering file reviews on a sample of participant projects in two waves in CY2020. Navigant will have interviews with program manager (PM) and the implementation contractor (IC) in CY2020 for understand the program operations and related issues.

Tracking System Review

Navigant's tracking system review will primarily ensure that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Also, our tracking system review helps ensure that the tracking data is consistent with the program's data in eTRACK. This

latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

Gross Impact Evaluation

Since most Small Business Program savings are derived from deemed values contained in the TRM, gross savings will continue to be evaluated primarily by (1) reviewing the tracking system data and savings workbooks to ensure that all fields are appropriately populated and savings are consistent with the implementation contractor workpapers and savings calculators that feed into the tracking system; (2) reviewing new measures' algorithms and values in the tracking system and savings workbook to assure that they are appropriately applied; and (3) cross-checking totals. This approach will be supplemented with a review of project documentation on a random sample of projects to verify participation, installed measure quantities, and associated savings. Findings from the impact files will be reviewed to provide an opportunity for improving the tracking system and data collection.

Proposed CY2020 gross impact and sampling timelines are shown below.

1. Mid-year early impact review of Wave 1 data in July 2020 and completed in August 2020. This will include developing a memorandum of findings from early impact review.
2. Wave 2 sample of project files and documentation drawn in September 2020 and completed November 2020.
3. Final and third wave of tracking data by January 30, 2021 and completed by March 6, 2021.

Core data collection activities will include the following:

1. Engineering examination of ComEd workpapers, tracking system and measure workbook calculations of claimed savings.
2. Engineering review of project documentation at the measure-level for a sample of projects to verify participation and tracking system entries, check documentation of invoiced quantities and installed measure characteristics, confirm compliance with eligibility, and deemed input values.
3. Hold regular meetings (every 6 weeks) by telephone with ComEd program staff and the IC staff to discuss specific impact issues that need to be addressed during program implementation.
4. The evaluation team will collect PJM demand savings estimates and program and measure-specific cost detail to further ComEd's PJM auction and TRC analysis.
5. Investigate measures that may produce gas savings and review the parameters ComEd used to estimate potential kWh savings.

Use of Randomized Control Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the Small Business Program via a randomized controlled trial (RCT) because the program was not designed with randomly-assigned treatment and control groups. Nor will we base the CY2020 impact analysis on a quasi-experimental design (QED), because the program targets a heterogeneous group of businesses and has many unique measures with significant cross-participation. While the evaluation will continue to be based primarily on deemed TRM values, Navigant will consider using a QED approach to prospectively update the TRM for certain measures or measure-business type combinations. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Small Business (all measures)	0.97

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_2019-10-01.pdf

Research NTG Impact Evaluation

Navigant last conducted NTG research on the CY2018 participant and EESP populations. We will conduct NTG research in CY2020 with the goal of reporting results in 2021.

We will complete computer assisted telephone interviews (CATI) with a goal of up to 200 completed surveys for program participants to quantify participant free-ridership and spillover. The samples will be of CY2020 participating customers for free ridership and CY2019 participants for spillover. [33]

We will research program influence on participating customers through interviews with EESPs active in CY2020. The sample design developed for gross impact research will be applied to the NTG interviews, with the aim of attaining 90/10 confidence/precision levels for the NTG estimate. EESP NTG recommendations will be triangulated with the participant self-report NTG as appropriate based on our findings.

Program Management and Implementer Interviews

The evaluation team will develop a thorough understanding of the program by interviewing program managers and implementers to understand current program design and status as well as the program's future plans.

Coordination

Ameren Illinois's Small Business Incentives program is like ComEd's Small Business Program. [34] The ComEd evaluation team will coordinate with the independent evaluator of the Ameren program to ensure that the two evaluations use similar approaches, and to identify and report on any substantive differences.[35]

Navigant will coordinate any NTG or process research with the Ameren Illinois Small Business Incentives program evaluation team on data collection and survey instrument design to ensure consistency and appropriate questions in the customer surveys.

[33] The purpose of dividing FR and SO cohorts in this fashion is to allow sufficient time to pass for spillover occur.
[34] See https://amerenillinoissavings.com/for-my-business/explore-incentives/small-business-incentives for more information.
[35] Opinion Dynamics is the lead evaluator for Ameren Illinois energy efficiency programs.

Calculation of CPAS and Annual Savings

As required by FEJA, Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. Evaluation will also add the savings converted from gas savings to the electric savings so that it is documented in the report.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Impact Deadlines

Activity/Deliverables	Responsible Party	Date Delivered*
Program Operations Manual and Workpapers/Workbook Review	ComEd/Nexant	September 2019 – January 30, 2020
Monthly Team Meetings	ComEd/Navigant & IC Staff	Every 6 weeks, as needed
CY2020 Wave 1 Tracking Data	ComEd	July 1, 2020
Early impacts findings memo	Evaluation Team	August 2020
Sample Projects Documentation for Review	ComEd	September 30, 2020
CY2020 Wave 2 Tracking Data	ComEd	September 30, 2020
Wave 3 and Final CY2020 Tracking Data to Navigant	ComEd	January 30, 2021
Internal Impact Report Draft by Navigant	Evaluation Team	March 6, 2021
Draft Impact Report to ComEd and SAG	Evaluation Team	March 13, 2021
Comments on draft (15 Bus. Days)	ComEd / SAG	April 3, 2021
Revised Draft Impact Report by Navigant	Evaluation Team	April 10, 2021
Comments on redraft (5 Bus. Days)	ComEd / SAG	April 17, 2021
Final Impact Report to ComEd and SAG	Evaluation Team	April 24, 2021
Draft NTG Recommendations to ComEd and SAG	Evaluation Team	July 24, 2021
Draft NTG Memo to ComEd and SAG	Evaluation Team	July 24, 2021
Revised NTG Recommendations to ComEd and SAG	Evaluation	August 14, 2021
Revised NTG Research Memo	Evaluation	August 14, 2021
Final NTG Research Memo	Evaluation	Sept 20, 2021

ComEd Small Business Kits Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Small Business Kits (Small Business Kits) Program aims to cost-effectively capture electric savings in small commercial facilities located in ComEd's service territory by targeting small businesses, restaurants, public offices and fire stations(the office kit was removed from the 2020 program and the fire station kit was added.). This is an opt-in program where customers must request to receive an energy efficiency kit that includes self-install measures. The measures included in the energy efficiency kit depend on the type of facility the customer ordering the kit operates, as seen in Table 1 below.

Table 1. Energy Efficiency Kit Measures for Each Customer Segment

General Private & Public	Restaurants	Fire Station
3 LEDs: BR30 8W	2 LEDs: PAR30 11W	2 LEDs: PAR30 11W
2 LED: PAR30	2 LEDs: Candelabra 5W	2 Bathroom Aerators
2 Bathroom Aerators	2 Bathroom Aerators	2 Kitchen Aerators
2 Smart Socket	2 Kitchen Aerators	1 Pre-Rinse Spray Valve
Installation Guide	1 Pre-Rinse Spray Valve	2 Showerhead Savers
Marketing Materials	Installation Guide	Installation Guide
	Marketing Materials	Marketing Materials

Since CY2018, the program has added additional BR, PAR, 5W clear candelabra LEDs, smart sockets, and showerhead savers, and removed exit signs, 9w LEDs, and power strips from the kits.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table. The CY2020 gross impact evaluation will not vary significantly from the previous years.

Beginning in CY2019, the Small Business Kits Program expanded the eligible customer base beyond rural small businesses to include all ComEd small business customers. To determine updated NTG values, Navigant will examine the program participation from CY2019 and CY2020 to determine if updated NTG research is needed in CY2021. If NTG research is warranted during CY2021, Navigant will use participant self-report surveys to determine updated free-ridership and spillover numbers.

Table 2. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		X
Process Analysis		X

Coordination

Although Ameren has an efficiency kits program, it is a residential sector program rather than a business sector program and the TRM parameters for kit programs are different for these two sectors.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

Process evaluation will not be done in CY2020 and will likely be undertaken in CY2021.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 3. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Two waves	
PM and IC Interviews	Program Management and Implementers	2	April – June 2020	Augment with monthly calls
Gross Impact	Engineering Review	Census	July – Aug 2020 Feb – March 2021	Two Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	Dec 2020 – March 2021	

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The Wave 1 of M&V sampling is expected to cover more than half of the projects.

Program Management and Implementer Interviews

The evaluation team will interview program managers and implementers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Gross Impact Evaluation

Since almost all the program's savings are based on the Illinois Technical Reference Manual (TRM), the evaluation team will conduct a limited gross impact evaluation in CY2020. For this impact evaluation, gross savings will be evaluated by (1) reviewing the tracking system to be assured that all fields are appropriately populated and (2) cross-checking calculations and totals. The evaluation team will use follow-up survey data collected by Franklin during 2020 to determine the CY2020 verified custom inputs for measure ISRs, and the hot water fuel type (%ElectricDHW and %FossilDHW).

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level NTG ratio of 0.97 from the SAG consensus process to estimate the verified net savings for the program in CY2020, as shown in the table below.

Table 4. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
SB Kits Program	0.97

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 5 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	March 30, 2020
CY2020 program tracking data for Wave 1	ComEd	June 5, 2020
Wave 1 project documentation, engineering reviews, feedback	Evaluation	July 17, 2020
Final CY2020 Program tracking and customer survey data	ComEd	January 30, 2021
Internal Report Draft by Navigant	Evaluation	February 14, 2021
Draft Report to ComEd and SAG	Evaluation	February 21, 2021
Illinois TRM Update Research Findings	Evaluation	March 1, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 13, 2021
Revised Draft by Navigant	Evaluation	March 20, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	March 27, 2021
Final Report to ComEd and SAG	Evaluation	April 8, 2021

ComEd Standard Program CY2020 and CY2021 Evaluation Plan

Introduction

As part of the Business Incentives Program[36] the ComEd Standard Incentives Program (Standard) offers prescriptive financial incentives and a streamlined application to facilitate the implementation of cost-effective energy efficiency improvements for non-residential (commercial and industrial) customers and market segments, with a program network of Energy Efficiency Service Providers (EESPs). Eligible measures include energy-efficient indoor and outdoor lighting, HVAC equipment, refrigeration, energy management systems (EMS), commercial kitchen equipment, variable speed drives, compressed air equipment and other qualifying products. The program also targets new system installation opportunities (e.g., lighting systems) by offering incentives that "bundle" equipment and controls technologies. ICF International, Inc. is the program implementation contractor for the Standard Program. ICF collaborates with DNV GL for the program day-to-day operations of both private sector and public-sector portions of the program.

The primary objectives of the CY2020 evaluation of the Standard Program are to: (1) quantify the gross and net savings impacts of the program; (2) conduct research to support the program's mandate under the Future Energy Jobs Act (FEJA); [37] and (3) investigate potential gas savings (therms conversion) counted as kWh, either using the TRM deemed inputs or billing analysis from gas usage data which may be collected from the gas utilities that serve the project sites.

Notable program changes in CY2019 to CY2020 may include:

- Continued the public sector offering for facilities over 100 kW. Maintained incentive cost cap for private and public sector projects at 75%.
- Launched online application mid-year 2019.
- Include promotion of new RTU optimization measures for customers (>100 KW). These measures may include cogged v-belts, coil cleaning, economizers, advanced controls, RTU replacement, and sealing.

Continuing from CY2019, ComEd's marketing strategy presents the overall portfolio to customers. Streamlined incentive application and verification and quality control processes are expected to facilitate customer participation ease and minimize the time required for incentive payment.

Also continuing from CY2019, prior to issuing certain standard energy efficiency incentives in CY2020, ComEd will verify that the contractor responsible is certified through the Illinois Commerce Commission (ICC) to install energy efficiency measures. [38]

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

[36] The Business Incentive Program is comprised of the non-residential Standard and Custom programs. Incentive structure is based either on a "standard," per-unit basis, as with most lighting measures, or "custom," with the incentive based on the calculated annual energy savings for the customer.
[37] Illinois Public Act 099-0906 (http://www.ilga.gov/legislation/publicacts/99/099-0906.htm), passed in 2016.
[38] Energy Efficiency Measure Installer certification is only required to seek certification pursuant to Code Part 462 if the entity performs, while installing energy efficiency measures, electrical connections other than connections of class 2 circuits as defined in the National Electric Code effective August 24, 2016 and the incentive for the measure is $300 or more. These rules do not apply if the customer self-installs the measure.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Data Collection – Literature Review	X	X
Impact – Billing Analysis	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		X
Net-to-Gross – EESP Spillover Research		X

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. The one exception is the approaches being used to compute net-to-gross ratios, which differ somewhat.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total lifetime verified gross savings? What are the verified gross savings from private and public lighting projects? What are the verified gross savings from private and public non-lighting projects?
2. What are the program's verified annual total lifetime net savings?
3. Secondary questions include:
    - Are the ex-ante per-unit gross impact savings correctly implemented by the tracking system and reasonable for this program?
    - What updates are recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no process evaluation for CY2020.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	Three waves
Review Workpapers	Update Tracking System Default Inputs	Census	Both New and Unchanged Workpapers
In-Depth Interviews	Program Management and Implementers	4	Augment with quarterly impact and process meetings
Net-to-Gross (FR and SO) and Process Surveys	Participant from July 2018-December 2019 and July 2017-June 2018	200	Commenced in August 2019 to collect T12 data, paused and scheduled to resume in February with final CY2019 data
Gross Impact Evaluation	Engineering File Review	85	Three Waves* plus Early Feedback for Large Projects
Gross Impact Evaluation	On-site M&V	40	
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	NA	
Literature review, secondary research	Impact Research on CY2020 Operations	Census	Impact

* Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

In line with program changes and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform a tracking system review prior to conducting sampled gross impact evaluation. The goal of this review is to provide the program implementer with early feedback on the deemed savings in the tracking system.

Gross Impact Evaluation

Navigant will perform tracking system review and M&V project sampling in three waves in CY2020. The first wave of M&V sampling is expected to cover about one-third of projects completed in CY2020. Proposed gross impact sampling timelines are shown below. The CY2020 gross impact evaluation will not vary significantly from CY2019, but adjustments will be made to reflect specific measure and project characterizations.

CY2020 Gross Impact Sampling Waves

a) First wave sample drawn in June 2020 and completed by November 2020
b) Second wave sample drawn in October 2020 and completed in December 2020

c) Final wave starts February 2020

Core data collection activities will include the following:

- Engineering examination of ComEd workpapers and tracking system calculations of claimed savings.
- Engineering review of project documentation at the measure-level for a sample of projects to verify participation and tracking system entries, check documentation of invoiced quantities and installed measure characteristics, confirm compliance with eligibility, and deemed input values.
- On-site M&V of measure-level savings on a subset of project sites selected from the engineering review sample to estimate site-specific savings. On-site measurement and verification include participant interviews, baseline assessment, installed equipment verification, and performance measurement. Measurement may include spot measurements, run-time hour data logging, review of participant energy management system trend data, and post-installation interval metering. Our approach to selecting M&V strategies follows the International Performance Measurement and Verification Protocol (IPMVP); Option A or Option B are typically selected.
- The evaluation team will collect PJM demand savings estimates and program and measure-specific cost detail to further ComEd's PJM auction and TRC analysis.

The gross savings impact approach will review the ex-ante measure type to determine whether it is covered by the Illinois TRM or whether it is a non-deemed measure that is subject to retrospective per unit savings adjustment of custom variables. The measure type, deemed or non-deemed, will dictate the savings verification approach.

Savings Verification

- Measures with per unit savings values deemed by the TRM, would have verified gross savings estimated by multiplying deemed per unit savings (kWh and kW) by the verified quantity of eligible measures installed. Eligible deemed measures must meet all physical, operational, and baseline characteristics required to be assigned to the deemed value as defined in the TRM. [39]
- Measures with custom or partially-deemed ex ante savings input will be subject to retrospective evaluation adjustments to gross savings on custom variables. TRM algorithms and deemed parameter values will be used where specified by the TRM, and evaluation research will be used to verify or adjust custom variables.

The measure-level realization rates will be extrapolated to the program population using a ratio estimation method to yield ex post evaluation-adjusted gross energy savings. Gross realization rates will be developed for energy and demand savings. The sample design will provide 90/10 statistical validity for lighting savings, non-lighting savings, and the program overall (EMS will be sampled separately as was done in the past year). The sample of 20 on-sites drawn is also expected to achieve a 90/10 confidence/relative precision level (two-tailed test) to comply with the PJM verification requirements outlined in Manual 18B.

The 20 on-site projects will be randomly selected based on the magnitude of the project savings in the stratified sample. The on-site sample design will consider both lighting and non-lighting technologies, including measures with high savings variations and certain new technologies with potential savings

[39] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, available at: http://www.ilsag.info/technical-reference-manual.html

impact (e.g., advanced lighting controls, EMS, etc.). Where the TRM allows retrospective adjustment of savings using site collected data (e.g., lighting quantities, VSD hours and controls), the savings are recalculated based on site-specific data but still using the approach set forth in the TRM. Parameters defined in the TRM are not adjusted even if the site findings suggest alternate values are more appropriate. For measures not covered in the TRM (such as EMS), the on-site data collection will be used to develop an independent assessment of project savings. For these projects, all available information is used to recalculate savings.

Verified Net Impact Evaluation

The evaluation team will apply the net-to-gross (NTG) ratios accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program (Table 3). Therms savings will be subjected to the electric NTG adjustments.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Lighting	0.83
Non-Lighting	0.78

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Research NTG Impact Evaluation

Navigant will finalize a participating customer NTG study as necessary to achieve 90/10 during CY2020 with end-of-year data from CY2019 to recommend NTG values for deeming September 2020. We will complete computer assisted telephone interviews (CATI) with a goal of up to 200 completed surveys for program participants to quantify participant free-ridership and spillover. The samples are from CY2018-2019 (July 2018 to December 2019) participating customers for free ridership and PY9-CY2018 (July 2017 to June 2018) participants for spillover. The final analysis will be completed to calculate participant NTG for lighting and non-lighting categories.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Calculation of Cumulative Persisting Annual Savings (CPAs) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

The table below provides the schedule for key deliverables and data transfer activities (See Table 2 for other schedule details). Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers Review	ComEd and Evaluation	September 2019 - January 24, 2020
Quarterly Impact/Process Meetings	ComEd/Navigant & IC Staff	Every three months
CY2020 Program Tracking Data for Tracking System Review	ComEd	June 1, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	June 26, 2020
CY2020 Program Tracking Data for Sampling Wave 1	ComEd	July 1, 2020
NTG Research Memo - Draft	Evaluation	August 14, 2021
NTG Recommendations (Participant) to ComEd and SAG	Evaluation	August 14, 2020
Wave 1 Project Documentation, Engineering Reviews, Schedule, Conduct On-site M&V, Feedback	Evaluation	August 31, 2020
NTG Research Memo – Final	Evaluation	Sept 30, 2020
CY2020 Program Tracking Data for Sampling Wave 2	ComEd	October 31, 2020
Wave 2 Project Documentation, Engineering Reviews, Schedule, Conduct On-site M&V, Feedback	Evaluation	December 31, 2020
CY2020 Program Tracking Data for Sampling Wave 3	ComEd	January 29, 2021
Wave 3 Project Documentation, Engineering Reviews, Schedule, Conduct On-site M&V, Feedback	Evaluation	February 26, 2021
Internal Impact Report Draft by Navigant	Evaluation	March 5, 2021
Draft Impact Report to ComEd and SAG	Evaluation	March 12, 2021
Comments on Draft (15 Business Days)	ComEd and SAG	April 4, 2021
Revised Impact Report Draft by Navigant	Evaluation	April 11, 2021
Comments on Redraft (5 Business Days)	ComEd and SAG	April 19, 2021
Final Impact Report to ComEd and SAG	Evaluation	April 27, 2021

ComEd Strategic Energy Management Program CY2020 to CY2021 Evaluation Plan

Introduction

Currently the Strategic Energy Management (SEM) Program has two types of participants: (1) the new cohort made up of new participants, and (2) the alumni cohort for customers that continue to participate after their first year. Navigant's focus in CY2020 will be on new cohorts as that detail becomes available for evaluation.

Notable program changes made from CY2019 to CY2020 include:

- Evaluation of new participants in the program as opposed to the alumni group that was reviewed in CY2019. Possible evaluation of alumni participants based on specific discussions with ComEd.
- As sites transition into the alumni cohort, the evaluation activities will change to meet the needs of the client and implementer without overburdening the site. Navigant will not complete onsite surveys with sites that have already been surveyed in the past or complete simpler surveys to not overburden participants. Impact evaluation may be reduced as well for sites that have already received impact evaluations in the past.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Billing Analysis	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Modeling	X	X
Impact – Verification & Gross Realization Rate	X	X
Process Analysis		X

The evaluation team determined the evaluation approach for the CY2020-2021 period based upon the needs of the program and program's prior history. The two-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Site specific process surveys will occur every other year. If the program participation changes greatly from one year to the next or the customer has interest in specific site surveys that work can be completed after discussion with ComEd.
- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of Future Energy Job Act (FEJA).

- The impact evaluation of the SEM Program will characterize and quantify:
    - Energy savings achieved through SEM improvements and behavior change beyond capital projects (prescriptive and custom)
    - The influence of the SEM Program on increasing the number of Standard and Custom projects and their associated savings
- Limited process evaluation will be completed with the alumni cohorts to focus on persistence.

Coordination

The SEM Program is independently and jointly managed with Nicor Gas, Peoples Gas Company and North Shore Gas Company. ComEd will coordinate with gas utilities on issues relevant to the program. The SEM evaluation report is developed as a combined ComEd and gas utilities evaluation report. Navigant leads the evaluation and will work with each gas utility to finalize the report. There are special data collection issues with the SEM Program and Navigant will manage those data issues with ComEd and gas utilities.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the actual achieved energy behavior savings in this program?
2. What were the realization rates of the projects? [Defined as evaluation-verified (ex post) savings divided by program-reported (ex-ante) savings].
3. Are there any major changes occurring during or after program implementation (production, size, hours, etc.) which may have affected the results?

Process Evaluation and Other Research Topics

There will be no process evaluation in CY2020. We plan on process evaluation research in CY2021.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020, including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Final activities will be determined as program circumstances are better understood.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Participating Customers	Census	Engineering Review – Cohort 3 Second Engineering Review – Alumni Cohort
Gross Impact Evaluation	Engineering File Review	Census	This is a multi-regression model based upon whole-building data, production data and other key variables.
Verified Net Impact Evaluation	Calculation Using Deemed NTG Ratio	*	Deemed Value Electric (1.00) Gas (1.00)
Interviews	Program Management and Implementers	~2	Augment with monthly calls
Effective Useful Life Determination			5 years

*Sample size will be determined to achieve 90/10

Tracking System Review

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK. This latter task will become increasingly important as eTRACK undergoes development and more closely reflects the tracking data Navigant receives.

Gross Impact Evaluation

The impact evaluation will be grounded in site-specific data using engineering models and analysis.

1. A site-specific analysis approach will be implemented. Because this program contains primarily behavioral-based changes, International Performance Measurement and Verification Protocol (IPMVP) option C – – billing/metered data regression, will be the main method of impact evaluation.

2. The data collection will focus on verifying or updating the assumptions that feed into the implementer's energy model for each site. This data may include: program tracking data and supporting documentation (project specifications, invoices, etc.), utility billing and interval data, Navigant-calibrated building automation system (BAS) trend logs, production data and telephone conversations with onsite staff.

Energy models have been provided for all the sites within the SEM Program. This data will be used with other collected information from the site to identify operating characteristics of the site both pre-and post these activities. If major changes have occurred at the site during or after the SEM activities, it is

expected the model will need to be adjusted to account for these changes. The changes that could affect the model savings include but are not limited to:

- Changes in hours of operation
- Changes in employees
- Changes in production
- Various factors that affect the model savings

Other measures installed at the site that were implemented through other Utility EE/DR programs or outside of the ComEd and Nicor Gas programs[40]

Due to the small number of participating sites, Navigant will perform the impact analysis on all participating customers which may include participating sites and new sites based on discussion with ComEd. Sampling will be considered as number of participants grow.

Verified Net Impact Evaluation

The CY2020 net impact evaluation will apply the net-to-gross (NTG) ratio deemed through the Illinois Stakeholders Advisory Group (SAG) consensus process. The deemed NTG ratios are provided in Table 3.

Navigant will sample projects from the sites and apply the sample realization rates to the entire population to calculate overall savings. Navigant will consider several ways to stratify the SEM projects to design a sample once initial program data is received. Navigant will use a stratified ratio estimation sampling design to develop an efficient sample achieving 90/10 confidence/precision on the program-level realization rate. Once all sampled sites are evaluated, the realization rate of each stratum will be calculated. This realization rate will be applied to the total claimed savings within each stratum to calculate the final program savings.

As participating sites complete their one year of activities within the SEM Program, Navigant will collect the information regarding these sites and begin the evaluation. Navigant expects that the timing of this information will be dependent on the timing of the cohort training.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
All-Electric	1.00
All-Natural Gas	1.00

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

[40] These measures are rebated separately from SEM program and savings for these measures are not counted in the SEM savings

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the latest program developments.

Telephone and Web Surveys

Participant interviews will focus on participant satisfaction, and any potential improvements to program processes such as the training and onsite visits. The site interviews will be coordinated with the impact evaluation team to address any major operational changes occurring at the site.

Navigant will complete the gross impact review before conducting the surveys to identify any site-specific issues that could be addressed in the interviews. Prior to the interviews, the gas utilities and ComEd will review the surveys to ensure they meet the needs of the program. Once the surveys are complete, Navigant will finalize the engineering review by making any additional changes identified by the surveys.

Evaluation Schedule

Research NTG Impact Evaluation

The CY2020 gross impact evaluation will not vary from the previous years. Over the course of 2019 we examined the program theory and evaluation approach to inform discussions in the fall Illinois Stakeholder Advisory Group (SAG) net-to-gross (NTG) deliberations about the need for doing free ridership surveys with SEM participants in future years. We plan to conduct NTG research in CY2020 and CY2021.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by FEJA, Navigant will report ex post gross and ex post net savings for the program and CPAS for the measures installed in CY2020. The measure life of five years will be used for the SEM Program. Evaluation will also add the savings converted from gas savings to the electric savings so that it is documented in the report.

Use of Randomized Controlled Trial and Quasi-Experimental Design

The evaluation team will not evaluate this program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. The evaluation will not use quasi-experimental design because there are not enough participants for individual measures in this program to achieve statistically significant savings estimates using this method. Table 4 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress. Process reporting will occur after April 30th in 2021 and substantive process reporting will be provided in a timely manner.

Table 4. Evaluation Schedule – Key Deadlines

Activity/Deliverables	Responsible Party	Date Delivered
CY2019 Site Reports and Models available to Navigant	ComEd	Q3/Q4 2020*
Sample of sites determined and approved	Evaluation	Q3/Q4 2020
Project review	Evaluation	Q3/Q4 2020
Program manager interview	Evaluation	Q2/Q3 2020
Internal Navigant Draft Report Review	Evaluation	March 6, 2021
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 13, 2021
Comments on draft (15 Business Days)	ComEd, Gas Utilities, and SAG	April 3, 2021
Redraft of Report	Evaluation	April 10, 2021
Comments on Redraft (5 Business Days)	ComEd, Gas Utilities, and SAG	April 17, 2021
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 24, 2021

* Timing of tasks depends on timing of data availability are to be determined later

ComEd Telecommunications Optimization Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Telecommunications Optimization (Telcom) Program aims to cost-effectively generate and capture savings from energy efficiency projects undertaken by its telecommunications customers. The Telecom Program provides specialized energy assessments, energy management planning to help customers increase reliability, improve efficiency and reduce energy consumption without adversely affecting facility operations. The measures included in the Telecom Program include standard, retro-commissioning, and custom measures, as seen in Table 1 below.

To participate in the program, the ComEd customer must be a telecommunication, internet service provider, or cable provider associated business located within ComEd's service territory. Franklin Energy (Franklin) is responsible for the implementation of the program. Customers are recruited into the program by Franklin, and all customer interactions are tracked in ComEd's Salesforce system. Franklin staff complete a free walkthrough assessment of the customer facility and deliver a report detailing the network and electrical equipment which could be updated and summarizing the electrical and thermal loads at the facility. Franklin assists the customer with prioritizing efficient measures and submitting a pre-approval application. Once the efficient measures are installed, Franklin assists in completing the final program application and completing a satisfaction survey.

Table 1. Telecom Program Measures by Type*

Standard	Retro-commissioning	Custom
Interior Lighting	Scheduling	Lighting
Exterior Lighting	Humidification controls	Network Equipment Upgrades
Lighting Controls	Equipment Sequencing	Uninterruptible Power Supplies
Variable Speed Drives	Airflow Management	Rectifiers
	Economizers	Efficient Transformers
	Controls Optimization	CRAC and CRAH Sizing
	Operation and Maintenance	Switch Card Consolidation ("Network Combing")

* The measures noted in program documentation received to date from Franklin. The program may include additional measures.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those shown in the following table.

Table 2. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Project Level Desk Reviews	X	X
Impact – Project Level Site Visits and metering		X*
Impact – Verification & Gross Realization Rate	X	X
Impact – Net-to-Gross Research		X**
Process Evaluation – based initial on PM interviews	X	X

*Site visits will be conducted on an as needed basis.
**Optional, depending on feedback from ComEd during CY2020.

Coordination

The Telecom Program is not offered jointly with the gas companies, and there is no similar offering for Ameren Illinois. The evaluation team does not anticipate cross utility coordination for the Telecom Program evaluation.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are project baselines properly determined? If not, why not and what guidance can the evaluation team provide for future projects?
5. What changes (if any) to the assessment process would improve accuracy of savings estimates?
6. Are interactions between measures which are analyzed using different approaches (e.g., deemed versus custom) properly determined?
7. What updates (if any) are recommended for the Illinois Technical Reference Manual (TRM)?
8. Is a Telecom-specific equipment useful life (EUL)/cumulative persisting annual savings (CPAS) persistence life needed for any of the measures as they pertain to telecom?

Process Evaluation and Other Research Topics

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. During CY2020, Navigant is targeting approximately 10 projects based on a simple random sample of completed projects, and may additionally evaluate a census sample of the largest and highest uncertainty projects not captured in the random sample. Navigant will modify the CY2019 targets to include a stratified random sample of projects if warranted by higher program participation, to be revisited quarterly.

Table 3. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline†	Notes
Tracking System Review	Tracking system	Census	Wave 1 and Final data	Two Waves
Measure-Level Savings Review	Tracking System and Project Files	Census	Wave 1 and Final data	Two Waves
Project-Level Desk Reviews	Project Files	Census	Wave 1 and Final data	Two Waves
Project-Level Site Visits – only on an as needed basis	Customer Facilities	TBD after receipt of Wave 1 extract	August 2020 – February 2021	Largest projects with highest uncertainty (as-needed) measures per the IPMVP‡
In Depth Interviews	Program Management and Implementers	~2	July – August 2020	
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2021	

Note: FR = Free Ridership; SO = Spillover
† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
‡ IPMVP = International Performance Measurement and Verification Protocol

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data.

Gross Impact Evaluation

The Telecom Program includes savings derived from a collection of different sources. Standard lighting or variable speed drive (VSD) measure savings are based on the IL TRM. Retro-commissioning and custom measures utilize project-specific calculators. Given the diversity of savings sources, the evaluation team will take multiple approaches to determine verified gross impacts, performing both measure-level and project-level reviews. Based on discussions with program staff, a majority of the savings through the program are calculated using custom analyses. Therefore, the evaluation team will conduct detailed technical reviews of energy savings calculations and supporting documentation for all sampled custom measures

The evaluation team will perform measure-level reviews to assess the validity of the various tools and approaches the program uses to quantify savings. For standard measures, the evaluation team will

ensure savings follow the methodology outlined for the appropriate measure in the IL TRM. The evaluation team will also review any custom measure calculation tools or models used by the program.

For projects selected for review, the evaluation team will review all savings calculations and compare analysis inputs to project-specific conditions, such as building weather location, hours of operation, project type and associated baseline determination, [41] project-specific baseline conditions, and customer energy usage. The evaluation team will adjust the analyses to site-specific conditions, as appropriate. Additionally, the evaluation team will examine interactive effects between measures to ensure they are properly quantified.

The evaluation team may complete parallel evaluations for projects which exceed 1,000,000 kWh of annual energy savings. During a parallel evaluation, the evaluation team will accompany implementer staff during the initial visit to the customers site to gather baseline information and install baseline monitoring equipment if needed. The evaluation team will provide guidance for the implementers' consideration regarding baseline choice, analysis methodology, or specific parameters. Parallel evaluation projects still receive a detailed evaluation at the close of the program year[42].

Verified Net Impact Evaluation

The verified net impact evaluation will apply program-level net-to-gross (NTG) ratios shown below, aligning with the value for the Data Center Program deemed through a consensus process by the IL SAG.

Table 4. Deemed NTG Values for CY2020

Program Measure	CY2020 Applicable Deemed NTG Value
Co-Location: New Construction	Energy NTG: 0.44 Demand NTG: 0.34
Co-Location: Retrofit	Energy NTG: 0.78 Demand NTG: 0.82
Non-Co-Location	Energy NTG: 0.67 Demand NTG: 0.67
Lighting	0.83
Other Standard	0.78

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Research NTG Impact Evaluation

ComEd has expressed interest in examining the costs and benefits of additional NTG research for the Telecom program. Navigant will provide additional details regarding the potential costs of additional NTG research for the Telecom program, along with potential outcomes, and determine if NTG research is warranted as a part of the CY2021 evaluation.

[41] For example, a project could have multiple baselines for a retrofit project—additional added electric load would have an 'industry best practices / code' baseline whereas a more efficient servicing of the pre-existing load may have an 'existing equipment' baseline.
[42] More information on parallel evaluations can be found in the Memo "ComEd Parallel Impact Evaluation Process v3.docx" prepared by Erin Daughton of ComEd November 13, 2017.

Program Management and Implementer Interviews

The evaluation team will interview program managers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Given the small number of participants, Navigant does not plan to complete a randomized control trial (RCT) or quasi-experimental design (QED) approach to the process evaluation but rather, attempt to get a census of all participants.

Evaluation Schedule

Table 5 below provides the schedule for key deliverables and data transfer activities. (See Table 3 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 3, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	July 3, 2020
Wave 1 project documentation, engineering reviews, feedback	Evaluation	September 25, 2020
CY2020 program tracking data for sampling Wave 2	ComEd	January 30, 2021
Wave 2 project documentation, engineering reviews, feedback	Evaluation	February 26, 2021
Illinois TRM Update Research Findings	Evaluation	March 1, 2021
Internal Report Draft by Navigant	Evaluation	March 5, 2021
Draft Report to ComEd and SAG	Evaluation	March 12, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 2, 2021
Revised Draft by Navigant	Evaluation	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021

ComEd Virtual Commissioning Program CY2020 Evaluation Plan

Introduction

The ComEd Virtual Commissioning Program (VCx) [43] is an energy efficiency pathway within the Retrocommissioning Program (RCx) [44] designed and operated for ComEd by Power TakeOff (PTO) that provides qualified ComEd business customers[45] with energy management and information system services to better manage their energy usage, identify energy savings opportunities, and achieve energy savings through low- or no-cost energy-saving measures. The Virtual Commissioning Program follows a step-by-step process to identify customers with significant potential for low- or no-cost energy savings, work with them to understand their energy usage and identify savings opportunities, enroll them in the VCx Program, and monitor their progress throughout their participation in the program. Energy savings actions taken by each participant are documented as part of the program, and the resulting energy savings claimed for each action are estimated by PTO using a regression analysis of the participant's pre- and post-enrollment energy usage data.

Unlike behavioral energy efficiency (EE) programs that provide participating customers with generic energy savings recommendations, where little or nothing is known about the specific actions taken by individual participants, the VCx Program collects specific information about each participant, including a detailed log of each contact PTO had with the customer, the operational actions each participant agreed to undertake, and the date each action was undertaken.[46] Additionally, the program collects at least one year of pre-enrollment and three to six months of post-enrollment interval usage data from each meter.

The primary objectives of the CY2020 evaluation of the VCx Program are to: (1) quantify the gross and net savings impacts of the program; (2) conduct net-to-gross (NTG) research to ascertain the program's free-ridership and spillover effects; and (3) investigate potential gas savings available through the program.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Regression Analysis (Customer-Specific)	X	X
Net-to-Gross – Customer Self-Report Surveys	X	
Process Research – Customer Self-Report Surveys	X	

[43] Formerly known as Remote Commissioning, the name was changed to Virtual Commissioning in CY2019 when it was brought within the RCx Program to avoid confusion with similarly-named programs.
[44] Although VCx falls within the RCx Program it will be evaluated separately due to differences in implementation and the evaluation methodology.
[45] To qualify, a participant must be a ComEd business customer with at least one year of 30-minute interval smart-meter data available prior to engagement.
[46] Recommended actions are focused on operational adjustments to automated systems and may include, but are not limited to, adjusting HVAC schedules to match occupancy, installing smart timers to turn off unneeded equipment during off or light-duty hours, managing equipment start-up and shut-down schedules, and delamping.

Coordination

At present there are no equivalent programs at other Illinois utilities. We will continue to monitor that situation.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified annual total lifetime gross savings?
2. What are the program's verified annual total lifetime net savings?
3. What is the appropriate net-to-gross ratio (NTGR) for this program?

Net to Gross, Effective Useful Life, Process Evaluation and Other Research Topics

1. How do participants channel through the portfolio?
2. How can persistence of savings be increased?
3. What are the participants' satisfaction with and perceptions of the program?
4. What aspects of the program would participants like to see changed?

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Evaluation Plan Summary for Virtual Commissioning

Activity	CY2020
Gross Impacts Evaluation	Regression Analysis
Review of Apparent Uplift in Other EE Programs	Yes
Sampling Frequency	Annual
Program Manager and Implementer Interviews	Yes
Materials Review	Yes
Participant NTG	Yes
Participant Survey	Yes

Gross Impact Evaluation

Navigant will measure the VCx Program's CY2020 annualized energy savings by developing baseline hourly energy usage models for each CY2020 program participant, calibrated to their year of pre-enrollment daily usage data using regression analysis, of the form shown in Equation 1, and use the model to estimate each participant's gross energy savings attributable to the program. Net CY2020

program savings will be the product of the sum of the individual participants' gross annualized savings and the NTG ratio.

Equation 1. Virtual Commissioning Load Model[47]

$$E_{it} = \beta_{1,it} Weekday_t + \sum_{j=1}^{12} \beta_{2j} Month_{tj} + \beta_3 CDH_{it} + \beta_4 HDH_{it} + \sum_{j=1}^{J} \beta_{5j} Change_{tj} + \varepsilon_t$$

where:

E_{it}	is energy use in hour i of day t
$Weekday_t$	equals 1 when t is a weekday and 0 otherwise[48]
$Month_{tj}$	equals 1 when t falls within month j and 0 otherwise
CDH_{it}	is the cooling degree-hours during hour i of day t[49]
HDH_{it}	is the heating degree-hours during hour i of day t
$Change_{tj}$	is a binary indicator that equals 1 when day t falls after agreed-upon behavior change j and 0, otherwise
The β_k	are unknown model parameters to be estimated
ε_t	is a white-noise disturbance with zero mean and constant variance

In cases where the above model is used to assess the energy savings from changes pertaining to exterior lighting measures, the model may be adjusted to include an hours-of-daylight variable based on the customer's longitude and latitude. When this variable and the set of month dummies are both included the CDH and HDH variables may be dropped from the model if there is evidence of multicollinearity.[50]

Participant-specific parameter values will be obtained by fitting the above model to each participant's actual interval usage data and weather data using all available (pre- and post-enrollment) data. The parameter values will then be used, together with normal (TMY3) weather data[51], to forecast individual annualized usage profiles for the post-install period for all participating customers. Annualized savings will be calculated by forecasting each participant's predicted post-install usage twice: once with the change variable(s) set to zero (to simulate their baseline usage) and once with the change variable(s) set to one (to simulate their usage with the changes in place) and subtracting the post-change profile from the baseline profile.

[47] In CY2018 Navigant employed a daily regression model to estimate VCx Program savings applied to 30-minute interval AMI usage data aggregated to daily totals. Midway through CY2019 PTO proposed using an hourly model where feasible instead, using 30-minute interval usage data aggregated to hourly totals, to provide "insights into the impact of the program on peak hours" (June 13, 2019 memo, Power TakeOff, "RE: ComEd Virtual Commissioning Program – CY2019 Program Updates Review," p. 3).
[48] The day-type granularity can be changed to daily increments (i.e., a Monday dummy, a Tuesday dummy, etc., rather than just a weekday/weekend dummy) if warranted by the customer-specific demand pattern or type of behavioral actions the customer agrees to undertake.
[49] Navigant will use a grid search to solve for individual premise degree-day balance points.
[50] Past experience suggests that inclusion of the hours-of-daylight and month dummy variables in models for exterior lighting changes tends to annihilate the coefficients on the degree-day variables. Continuing to include them would not cause statistical bias to the coefficients of any included variables, but it might cause the regression standard errors to be larger than would be the case if the degree-day variables were dropped.
[51] See http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/ for more information.

Navigant will consider using modified models for certain types of changes, such as the exterior lighting example described above. All alternative models will be discussed and agreed to by Navigant and the program implementer. Due to the lack of a control group we will be unable to adjust the savings for any uplift it causes in participation in other EE programs. However, we will review participation in other ComEd programs before and after participation in the Energy Analyzer Program, and include questions in the NTG research survey instrument designed to identify uplift.

Verified Net Impact Evaluation

The Illinois Stakeholders Advisory Group (SAG) consensus process agreed to a net-to-gross (NTG) value of 1.0 for this program for CY2019 (Table 2). Navigant will apply that NTG ratio to the adjusted gross savings to estimate the verified net savings for the program in CY2019.

The regression analysis described in the previous section produces gross savings with respect to free ridership. [52]Therefore, Navigant will pursue net-to-gross research in CY2020 to measure free-ridership as well as spillover. This research will involve participant interviews using the study-based protocol as defined by the Illinois Technical Reference Manual (IL TRM).[53] We will use the results of this analysis to support a revised NTG proposal for CY2021.

Table 3. Deemed NTG Value for CY2020

Program Path/Measure	CY2019 Deemed NTG Value
Virtual Commissioning	1.00

Source: http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2019_Recommendations_2018-10-01.xlsx

Calculation of CPAS and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report measure-specific ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2019 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. Navigant will not have the gas usage data and so will not calculate gas savings for this program.

Program Manager and Implementer Interviews

Navigant will conduct interviews with the ComEd program manager and implementation contractor to understand the program design and goals. These interviews will focus on how Power Takeoff recruits and interacts with customers, the extent to which Power Takeoff informs customers about or promotes other ComEd program offerings, and any areas for program improvement. These interviews will be used to inform our evaluations, including the instruments that will be used for participant surveys.

[52] The evaluation does capture participant spillover, and the program is unlikely to generate significant non-participant spillover, but the evaluation does not remove free-ridership bias. Thus, research to identify free-ridership is warranted.
[53] See IL TRM version 8.0, volume 4, section 3.

Materials Review

Navigant will request and review program materials to ensure a thorough understanding of the program design and any materials that the program provides to the customer. This review may include documents such as marketing materials; materials provided to participants to explain the program, help them implement the recommended changes, or promote other ComEd program offerings; public and participant-only internet sites; or explanations of program design.

Participant Net-to-Gross and Process Survey

The participant surveys will be combined with the NTG research described above and will consist of 20- to 30-minute surveys. We will survey as many participants as can be reached to provide a 90/10 confidence/precision level of NTG ratios for program-level savings. The survey will follow the appropriate free ridership and spillover protocols as defined in the TRM, with an additional focus on effective useful live (EUL) research and the process research questions listed above (i.e., improving persistence, customer satisfaction, desired programmatic changes).

Research into channeling through the portfolio will be conducted using tracking data rather than customer self-report.

Use of Randomized Control Trial and Quasi-Experimental Design

The evaluation team uses a regression-based evaluation method for this program, but it is not a randomized controlled trail (RCT) or quasi-experimental design (QED). An RCT is not being utilized as the program was not designed with a random control group. A QED is not being used as we expect the program savings to be very different for each customer since they're getting a unique program experience; the method we are utilizing allows us to estimate customer-specific impacts, whereas QED would estimate average program impacts.

Data Requirements

Table 4 shows the data Navigant will need for the CY2020 evaluation.

Table 4. Data Requirements for CY2020 Virtual Commissioning Evaluation

Required Data	Relevant Information Requested
Tracking Data	**For all Virtual Commissioning participants:**
	• Account ID
	• Date participant was enrolled in Virtual Commissioning
	• Date participant began each agreed-upon Virtual Commissioning energy-saving action
	• Opt-out/move-out date (if relevant)
	• Type of Business or Segment
	• Customer contact information
	• Tracking data for other ComEd C&I EE programs (for evaluation of post-participation changes in program participation)
Customer Usage Data	**For all Virtual Commissioning participants:**
	• Account ID

Required Data	Relevant Information Requested
	• Hourly energy usage values for CY2020 (Jan 1, 2020 – Dec 31, 2020) and at least 1 year prior to enrollment

Evaluation Schedule

Table 5 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress. Process reporting will occur after the April 30th impact deadline.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Manager and Implementer Interviews	Navigant	December 3-21, 2019
Material Review and Participant Surveys	Navigant/Blackstone	February-March 2020
NTG Draft Memo to ComEd	Navigant	August 15, 2020
Recommended NTG to ComEd and SAG	Navigant	August 15, 2020
Final NTG Memo to ComEd and SAG	Navigant	September 30, 2020
Final evaluation data request sent to ComEd / PTO	Navigant	December 31, 2020
Final evaluation data delivered to Navigant	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Navigant	March 6, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 27, 2021
Revised Draft by Navigant	Navigant	April 3, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 10, 2021
Final Report to ComEd and SAG	Navigant	April 19, 2021

APPENDIX C. INCOME ELIGIBLE PROGRAMS EVALUATION PLANS

ComEd Affordable Housing New Construction CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Affordable Housing New Construction (AHNC) Program provides technical assistance and incentives for energy-efficient construction and major renovation of single-family and multi-family affordable housing. The program targets affordable housing developers and owners for the construction of housing for customers with incomes at or below 80% of the Area Median Income. An additional goal of the program is to educate housing developers on cost-effective energy efficient building practices. The program has two participation levels: major renovation, and new multi-family. The program is a coordinated program with Peoples Gas (PGL), North Shore Gas (NSG), and Nicor Gas.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementation Contractor Interviews	X	X
Data Collection - Program Materials Review		X
Data Collection - Developer Interviews		X
Impact - Engineering Review	X	X
Impact - Measure-Level Deemed Savings Review	X	X
Impact - Verification & Gross Realization Rate	X	X
Process Analysis		X

The evaluation team determined the evaluation approach for the CY2020-2021 period based on the needs of the program and the program's prior evaluation history. The two-year evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted each year
- Program manager and implementer interviews will be conducted each year
- Program materials review will be routinely conducted every other year, starting in CY2019. This is contingent on whether there are significant program changes.
- Interviews with affordable housing developers will be conducted in 2021
- Cumulative Persisting Annual Savings (CPAS) will be calculated based on the requirements of the Future Energy Jobs Act (FEJA)

Coordination

Navigant will coordinate with the evaluation teams from other utilities on any issues relevant to this program. Specifically, as this is a coordinated program with Nicor Gas and PGL and NSG, the evaluation team will coordinate closely with the gas utilities on issues common to this program. The evaluation

activities and timing for each utility evaluation are the same for all utilities. Additionally, Navigant will solicit feedback from and coordinate with the Income Qualified Energy Efficiency Advisory Committee. Ameren does not currently offer an income eligible new construction program; however, we will coordinate on any issues which are common to the evaluation where applicable.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the gross annual energy and demand savings induced by the program?
2. Did the program meet its energy and demand savings goals? If not, why not?
3. What are the net impacts from the program?

Process Evaluation and Other Research Topics

There will be no process research conducted in CY2020.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	
Gross Impact Evaluation	Early feedback review	As needed	Early feedback for large projects
Gross Impact Evaluation	Engineering review	All	Two waves*
Verified Net Impact Evaluation	Calculation using deemed net-to-gross (NTG) ratio	NA	

* Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Program Management and Implementer Interview

Navigant will conduct an in-depth telephone interview with program managers and implementation contractors to understand the current state of the program operations and to discuss any program changes which are relevant to the evaluation. This will be done so we can perform the evaluation with a solid understanding of the program.

Gross Impact Evaluation

Since the AHNC Program savings are derived from deemed values contained in the TRM[54], gross savings will be evaluated primarily by (1) reviewing the project savings calculators to ensure that all fields are appropriately populated; (2) reviewing measure algorithms and values in the project savings calculators to assure they are appropriately applied; and (3) cross-checking totals. This approach will be supplemented, where possible, with a review of project documentation in each program year to verify participation, installed measure quantities, and associated savings.

Navigant will perform a tracking system and project savings calculator review in two waves during the CY2020 evaluation period. Final program gross and net impact results will be based on the two waves combined. Proposed gross impact timelines for CY2020 are shown below:

a) First wave drawn in May 2020 and completed in August 2020
b) The final tracking data is provided by ComEd by January 30, 2021, with reporting finalized by April 30, 2021

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program	CY2020 Deemed NTG Value
Affordable Housing New Construction	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of CPAS and Annual Savings

As required by FEJA, Navigant will report measure-specific and total ex post gross and net savings for the program, and the CPAS in CY2020 will be calculated for each measure along with the total CPAS for all measures. Additionally, the weighted average measure life will be estimated at the portfolio level.

Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

[54] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0 for projects with application dates after January 1, 2020. The TRM version used for each project will be based on its application date.
available at: http://www.ilsag.info/technical-reference-manual.html

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress. We plan to conduct process evaluation activities early in the program year and report results to ComEd as valuable information becomes available.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Wave 1 tracking data request	Evaluation	April 15, 2020
CY2020 Wave 1 program tracking data, project savings calculators, and project documentation	ComEd	May 15, 2020
Wave 1 findings	Evaluation	August 28, 2020
CY2020 End of Year tracking data request	Evaluation	September 15, 2020
CY2020 End of Year program tracking data, project savings calculators, and project documentation	ComEd	January 30, 2021
Draft report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 business days)	ComEd and SAG	March 26, 2021
Revised draft by Navigant	Evaluation	April 2, 2021
Comments on redraft (5 business days)	ComEd and SAG	April 9, 2021
Final report to ComEd and SAG	Evaluation	April 23, 2021

ComEd Food Bank Distribution Program CY2020 to CY2021 Evaluation Plan

Introduction

The Food Bank Distribution Program provides packages of ENERGY STAR certified LEDs, Advanced Power Strips (APS), and Door Sweeps to select Feeding America food banks. The food banks use their network of local food pantries within ComEd's service territory to distribute the bulbs to utility customers. The LEDs, APSs, and Door Sweeps are distributed at no cost to the food banks, food pantries and their customers. CLEAResult Consulting Inc. (CLEAResult) implements the program and coordinates program activities, including engaging with the food banks and their participating food pantries.

In addition to the LED Omni 4-packs distributed in CY2019, ComEd is planning on the addition of the following measures to the program in CY2020:

- 11 W LED Recessed Fixture
- Specialty LED BR30 4-pack
- LED Night Light
- Tier 1 APS Unit, 7 Plug
- Door Sweep

Further research to determine an in-service rate (ISR) for these measures will be conducted in the CY2021 evaluation if they are found to be a significant source of savings in CY2020.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys		X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X

Coordination

Navigant will coordinate with the Illinois Income Qualified Advisory Committee to share results and lessons learned, as needed.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total verified gross energy savings?
2. What are the program's verified net energy savings?

Process Evaluation and Other Research Topics

Navigant will not conduct a process evaluation for this program in CY2020.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline
Tracking System Review	Tracking System	Census	Two waves†
Gross Impact Evaluation	Engineering Impact Review	Census	Two waves
Calculation of CPAS	Engineering Impact Review	Census	Two waves
In-Depth Interview	Program Management and Implementers	1	August 2020

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

Navigant will perform an early impact tracking system review in CY2020, and we will also review the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects.

Gross Impact Evaluation

The program key gross impact evaluation activities will be based on (1) reviewing the tracking system to determine whether all data required to verify program participation and distribution of LED products are appropriately collected, (2) reviewing measure algorithms and savings values in the tracking system to assure that they are appropriately applied, and (3) cross-checking measure totals and savings recorded in the tracking database. The evaluation team will conduct gross impact verification for program savings using the applicable Illinois Technical Reference Manual (TRM) (v8.0). Verified gross savings will be estimated by multiplying deemed per unit kWh savings by the verified quantity of eligible LEDs distributed at the food pantries.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
LED Lighting	1.0
Advanced Power Strip (Tier 1)	1.0
Door Sweep	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2020_Recs_2019-09-27_SAG_Notes.xlsx

Program Management and Implementer Interview

Navigant will conduct an in-depth telephone interview with program managers and implementation contractors to understand the current state of the program operations and to discuss any program changes which are relevant to the evaluation. This will be done so we can perform the evaluation with a solid understanding of the program.

Calculation of Cumulative Persisting Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Navigant is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Navigant is not using quasi-experimental

consumption data because the savings are likely not large enough to achieve statistically significant estimates using this method.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Data Request for Wave 1 CY2020 program tracking data	Evaluation	June 19,2020
CY2020 program tracking data for sampling Wave 1	ComEd	July 17, 2020
Program Manager and Implementer Interview	ComEd	August 14, 2020
Early impact findings memo	Evaluation	August 28, 2020
Final CY2020 Program tracking data to Navigant	ComEd	January 29, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 26, 2021
Revised Draft by Navigant	Evaluation	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021

ComEd Income Eligible Multi-Family Energy Efficiency CY2020 to CY 2021 Evaluation Plan

Introduction

The Income Eligible Multi-Family Energy Efficiency Program offers direct installation of energy efficiency measures and replacement of inefficient equipment, as well as educational information to further save money on energy bills. Eligible measures include LED and energy efficient lighting retrofits, programmable thermostats, advanced power strips, water efficiency devices, weatherization measures, pipe insulation, refrigerators, heating and cooling equipment and custom energy saving measures for eligible properties. The program also offers installation of health and safety measures, including installation of vents, electrical repairs, and asbestos and mold remediation.

There are two different components for this program. The Income Eligible Multi-Family Savings Program (IEMS) is administered by ComEd and Peoples Gas (PGL) and North Shore Gas (NSG) companies and is implemented by Elevate Energy. The Income Eligible Retrofits Multi-Family Program (IER-MF) is administered by ComEd, PGL and NSG, and Nicor Gas and implemented by Resource Innovations in partnership with the Illinois Home Weatherization Assistance Program (IHWAP).

Both the IEMS and IER-MF programs provide retrofits in common areas and tenant spaces to eligible multi-family properties in the ComEd service territory and serve as a “one stop shop” to multi-family building owners and managers whose buildings are targeted to income eligible residents. [55]

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Building Owner and Property Manager Surveys (Lead Lifecycle Analysis)	X	
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact - Custom Analysis to confirm TRM savings estimates		X
Impact – Verification & Gross Realization Rate	X	X
Impact - Field Work	X	

Coordination

These are joint programs with the gas utilities and Navigant will coordinate closely with the gas utilities on issues common to the programs. We will ensure that the program tracking data provided by ComEd aligns with that provided by the gas utilities and will pull our samples for field work and surveys with the aim of creating efficiencies between the programs and utilities. There will be separate impact reports for

[55] Multi-family properties served by the IHWAP, nonprofits that manage HUD 811 and HUD 202 housing, other federal or state subsidized housing, other building owners/managers and tenants in qualified geographic areas (e.g., Census tracts).

the gas utilities. Ameren Illinois has a suite of energy efficiency programs for income eligible customers and we will coordinate with Ameren on as-need basis. Additionally, Navigant will solicit feedback from and coordinate with the Income Qualified Energy Efficiency Advisory Committee.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. Did the program meet its energy savings targets?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

Navigant will consult with ComEd and PGL/NSG program leads and plan to conclude the partially completed CY2019 program delivery focused process research in CY2020. The research was planned to address the following research questions for both program components:

1. What are property managers' and building owners' perspectives and overall satisfaction with the program?
2. What are the barriers to participation for building owners and property managers?
3. What are conversion rates between marketing and outreach and customer participation? How long does project participation take?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 7. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking system	Census	Two waves	
Lead Lifecycle Analysis	Property Manager/Owner	Sample	Jan 2020 – March 2020	Only for the Elevate component.
Program Manager and Implementer Interviews	Program Management and Implementers	4	May 2020	Both components
Gross Impact	Early Impact Review	Wave 1 Projects	June 2020 – Oct 2020	Early Impact review for Wave 1 Projects
Gross Impact	On-site M&V	Sample	Sept 2020 – Dec 2020	Only for the Elevate component
Gross Impact	Measure-Level Deemed Savings Review	EOY data	Feb 2021 – March 2021	Both components
Gross Impact	Custom Analysis for non-TRM projects	All custom projects	Feb 2021 – March 2021	Both components
Gross Impact	Verification & Gross Realization Rate	EOY data	Feb 2021 – March 2021	Both components

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The tracking data will be reviewed for completeness and Navigant will identify any missing inputs needed for conducting the evaluation.

Gross Impact Evaluation

The IEMS and IER-MF savings verification will be based on using the applicable TRM v8.0, or secondary research for any measure with custom savings input. Gross savings will be evaluated primarily by: (1) reviewing the tracking system data to ensure that all fields are appropriately populated; (2) reviewing measure algorithms and values in the tracking system to assure that they are appropriately applied; and (3) cross-checking totals. The impact evaluation will quantify gas measures eligible for kWh conversion and review the parameters ComEd used to estimate eligible gas savings.

This approach will be supplemented in CY2020 with a field work effort which will be focused on verifying measure quantities and installation. Additionally, Navigant will perform a custom analysis for measures which are not included in the TRM.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Air Sealing	1.0
Attic Insulation	1.0
Central Air Conditioner	1.0
CFL Lighting	1.0
Furnace	1.0
High Performance T8	1.0
LED Exit Sign	1.0
LED Lighting	1.0
Occupancy Sensor	1.0
Packaged Terminal Heat Pump	1.0
Programmable Thermostat	1.0
Refrigerator	1.0
Room Air Conditioner	1.0
Advanced Power Strip	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Lead Lifecycle Analysis

Navigant will conclude the lead lifecycle analysis research started in CY2019 in early CY2020. The analysis will focus on the CY2019 program year. The lead lifecycle analysis provides insight into the customer's decision-making process as they decide whether to participate in the program. This analysis examines a customer's interactions with program marketing and outreach touchpoints to determine whether the program is being promoted at critical decision-making points, such as when equipment fails or when renovations are being planned. In addition, the analysis will examine whether the program is following up with interested customers to encourage participation. The evaluation team will also quantify the conversion ratio between customers reached though marketing and outreach and those who ultimately participate in the program. The lead lifecycle analysis can be used to make targeted improvements to program marketing and outreach, allowing the program to convert more interested customers to participants.

The data collection for the lead lifecycle analysis is comprised of the implementation contractor interview completed in CY2019 and an estimated one to three additional discussions with program stakeholders to finalize details of the analysis. In addition, the evaluation team will interview a small sample of building owners and property managers in CY2020 (estimated five to 10 interviews) to understand their experience.

Program Manager and Implementation Contractor Interviews

The evaluation team will conduct program manager and implementation contractor interviews to:

1. Discuss the program findings from CY2019 impact evaluations.
2. Identify tracking data issues and discuss potential ways of resolving them in CY2020.

3. Identify issues with the ex ante calculators and discuss potential ways of resolving them in CY2020.
4. Review the CY2020 evaluation timeline to avoid any delays.
5. Talk about any changes in the program structure or measure mix being offered.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 8. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Operations Manual and Workpapers	ComEd	January 2, 2020
Lead Lifecycle Analysis findings	Evaluation	March 31, 2020
Program Manager and Implementation Contractor Interviews	Evaluation	May 2020
Wave 1 Data Request to ComEd	Evaluation	May 04, 2020
CY2020 program tracking data for Wave 1	ComEd/Gas Utilities	June 15, 2020
Early Impact Memo	Evaluation	September 15, 2020
CY2020 data extract for on-site sampling	ComEd/Gas Utilities	September 15, 2020
On-site Verification	Evaluation	December 30, 2020
CY2020 EOY tracking data	ComEd/Gas Utilities	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 12, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 2, 2021
Revised Draft by Navigant	Evaluation	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021

ComEd Income Eligible Product Discounts Program CY2020 to CY2021 Evaluation Plan

Introduction

The Income Eligible Product Discounts Program provides incentives to increase the market share of ENERGY STAR® certified LED bulbs and fixtures and efficient products such as window air conditioning units, air purifiers, and Tier 1 Advanced Power Strips (Tier 1 APS) sold through retail sales channels. The program includes instant discounts (at the time of sale) to decrease customer costs, and provides educational materials aimed at increasing customer awareness and acceptance of energy-efficient technologies. The incentives offered through this program for light bulbs and fixtures are larger than the incentives offered through the market rate Lighting Discounts Program. Currently, ComEd does not offer in-store discounts for the other non-lighting products through the market rate program. The Income Eligible Product Discounts Program is available through retail stores that are likely to serve a high percentage of ComEd residential customers with incomes at or below 60% of the Area Median Income.

The primary objective of the evaluation of the Income Eligible Product Discounts Program is to quantify net savings impacts from the program. The evaluation of this program over the next two years will include a review of the tracking databases, deemed savings reviews, verification of savings and measure-level and program-level realization rates, and estimation of net program impacts. These activities are highlighted in the table below.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Impact – Net Program Savings Estimate	X	X

Coordination

Navigant will coordinate with the ComEd Residential Lighting Discounts Program on any LED bulb and fixture related issues relevant to this program. Ameren Illinois has a residential energy-efficient lighting program offering the Time of Sale discounts to residential electric customers but does not have a similar program targeting income eligible participants and Navigant will coordinate as needed. Navigant will also collaborate with the Income Qualified Energy Efficiency Advisory Committee.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total verified gross and net energy savings (kWh) and peak demand (kW) savings?
2. Did the program meet savings goals, and if not, why?

3. What are the net impacts from the program? What is the level of free ridership associated with this program in stores where intercepts can feasibly be conducted

Process Evaluation and Other Research Topics

Navigant will not conduct process research for the program in CY2020 or CY2021. The data collection activities required for the process evaluation (Shelf Surveys and Trade Ally Interviews) will not be conducted. As a result, there will be no process related results for this program.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline
Tracking System Review	All Program Sales	Census	Ongoing

Tracking System Review

The CY2020 program tracking data review will allow for the verification of rebated measure sales and characteristics of the rebated measures. The program tracking data review will verify that all necessary information is included for the evaluation team to successfully conduct the CY2020 gross impact analysis.

Gross Impact Evaluation

The evaluation team will perform an engineering review of savings calculations. For all lighting measures, Navigant will calculate gross kWh, kW and summer and winter peak kW savings across all program bulbs based on the following equations:

Annual kWh Savings = Program bulbs * Delta Watts/1000 * Annual HOU * Realization Rate

Annual kW Savings = Program bulbs * Delta Watts/1000 * Realization Rate

Annual Summer Coincident Peak kW Savings = Annual kW Savings * Summer Peak Load CF Factor[56]

Annual Winter Coincident Peak kW Savings = Annual kW Savings * Winter Peak Load CF[57]

Where Realization Rate = Installation Rate * (1-Leakage Rate) * Interactive Effects

For the verification analysis in CY2020, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2020 EM&V tracking database analysis.

[56] Summer Peak CF is calculated as the percentage of lighting turned on in each room during peak hours of the summer months (1-6 pm on summer weekdays).
[57] Winter Peak CF is calculated as the percentage of lighting turned on in each room during peak hours of the winter months (6-8 am and 5-7pm, between January 1 and February 28).

- **Program Bulb Installation Rates** will be obtained from the IL TRM v8.0.
- **Delta Watts** will be calculated using the bulb type lumen-equivalence mapping in the IL TRM v8.0.
- **HOU and Summer Peak CF** will be obtained from both the residential and non-residential sections of the IL TRM v8.0. The non-residential HOU and Peak CF will be determined based upon the business activities conducted in the non-residential locations where program bulbs are reportedly installed.
- **Winter Peak CF** will be determined based upon analysis done by the evaluation team.
- **Residential Bulb Installation Rate** will be obtained from the IL TRM v8.0.
- **Interactive Effects** will be obtained from the IL TRM v8.0.
- **Leakage** will be obtained from the IL TRM v8.0.

Navigant will also calculate gross kWh, kW, and summer and winter peak kW savings for all non-lighting measures (dehumidifiers, air purifiers and Tier 1 APS) based on values deemed in the IL TRM v8.0. Navigant will (1) review the tracking system data to ensure that all fields are appropriately populated and savings are consistent with the implementation contractor's workpapers and savings calculators that feed into the tracking system; (2) review new measures' algorithms and values in the tracking system and the implementation contractor's workpapers to ensure that they are appropriately applied; and (3) cross-check Navigant's calculated savings with the implementation contractor's calculated savings.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the (NTG ratio accepted by Illinois Stakeholders Advisory Group (IL SAG) consensus to estimate the verified net savings for the program in CY2020
The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Lighting – DIY, Big Box, and Warehouse Locations	0.62
Lighting – Non-DIY, Big Box, and Warehouse Locations	1.00
Non-Lighting	1.00

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/ Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Research NTG Impact Evaluation

The evaluation team will not conduct NTG research in CY2020 or CY2021. The required data collection activity (in-store intercepts) will not be conducted for these program years. As a result, no updated NTG recommendations will be made for this program.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design

We are not evaluating the Income Eligible Product Discounts Program via an RCT or quasi-experimental design because the program is delivered upstream and it is not possible to select treatment and control groups for programs where the participants are unknown.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Wave 1 CY2020 Data Request	Evaluation	May 29, 2020
Wave 1 CY2020 Data Available for Ex Ante Review and Analysis	ComEd	June 15, 2020
Wave 1 CY2020 Ex Ante Review Assessment Memo	Evaluation	July 26, 2020
CY2020 Program tracking data is final	ComEd	January 30, 2021
Draft Impact Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft Impact Report (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Impact Report Draft by Navigant	Evaluation	April 5, 2021
Comments on Impact Report redraft (5 Business Days)	ComEd and SAG	April 12, 2021
Final Impact Report to ComEd and SAG	Evaluation	April 26, 202

ComEd Income Eligible Single Family Retrofit Program CY2020 to CY2021 Evaluation Plan

Introduction

The Income-Eligible Single-Family Retrofit (SFR) Program provides retrofits to single-family households in ComEd service areas with incomes at or below 80% of the Area Median Income. The program offers assessments, direct installation of energy efficiency measures, replacement of inefficient equipment, technical assistance, and educational information to further save money on energy bills through two program components. One program component is delivered with the Chicago Bungalow Association (CBA) and is offered jointly with Peoples Gas. The portion of the program offered outside the City of Chicago is delivered by the Chicagoland Vintage Home Association (which is an extension of CBA) and is solely offered by ComEd. The other component is delivered leveraging the State of Illinois' Home Weatherization Assistance Program (IHWAP). The IHWAP portion is offered jointly with Peoples Gas, North Shore Gas, and Nicor Gas.

Eligible program measures include, but are not limited to:

- LED lighting
- Smart and programmable thermostats
- HVAC equipment such as boilers, furnaces, central and room air conditioners and ductless heat pumps
- Water heaters
- Low-flow faucet aerators and showerheads
- Attic and wall insulation
- Air sealing
- Health and safety measures, such as installation of vents and electrical repairs

The following table shows the data collection and analysis activities over the coming two years.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Impact – Engineering Review	X	X
Impact – Verification & Gross Realization Rate	X	X

The evaluation team created the evaluation approach for the CY2020-CY2021 period based on the needs of the program and program's history. In CY2018, our impact evaluation efforts focused on conducting field work and verification of tracking data against the Illinois Technical Reference Manual (TRM) [58] and our process evaluation efforts focused on questions related to gaps in participation and the program transition. In CY2019, we applied the results from CY2018 field work and continued process evaluation efforts to identify additional research for upcoming years. Looking forward, the two-year evaluation approach for this program includes:

[58] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 6.0, http://www.ilsag.info/technical-reference-manual.html

- Tracking system review and analysis each year to calculate gross and net impact and Cumulative Persisting Annual Savings (CPAS)
- Process evaluation conducted each year based upon client request, program performance, and any existing program barriers

Coordination

The ComEd evaluation team will coordinate closely with the Peoples Gas evaluation team on issues common to the CBA component and with the Peoples Gas, North Shore Gas, and Nicor Gas evaluation teams on issues common to the IHWAP component. To the best of our ability, we will prepare joint impact reports for ComEd and the gas utilities for each of this program's delivery channels. The evaluation team will also coordinate with the Illinois Income Eligible Stakeholder Advisory Group and as needed, with Ameren Illinois, who administers the Residential Income Qualified Initiative. Similar to SFR, this initiative has two channels: a Moderate Income Implementation Contractor Channel and an Income Qualified Community Action Agency Channel.

Evaluation Research Questions

The CY2020 evaluation will seek to answer the following key research questions:

Impact Evaluation

1. What are the program's annual total verified gross savings for lighting and non-lighting measures?
2. What are the program's verified net savings?

Evaluation Approach

The team will conduct the evaluation tasks in Table 2 for both components to answer the above evaluation questions.

Table 2. CY2019 Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes	Notes
Gross Impact Evaluation	Engineering Impact Review	NA	Two waves* for each program component
Calculation of CPAS and Annual Savings	Engineering Impact Review	NA	Two waves* for each program component

*Navigant will coordinate with ComEd and the gas utilities to determine appropriate dates to pull tracking data extracts for each wave.

Gross Impact Evaluation

Since the SFR Program derives savings from deemed values contained in the TRM[59], the team will continue to evaluate savings by reviewing:

[59] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, http://www.ilsag.info/technical-reference-manual.html

- Tracking system data to ensure the accurate population of fields
- Measure algorithms and values in the tracking system to ensure accurate calculation of savings
- Totals to ensure accurate summation of savings

Calculation of CPAS and Annual Savings

As required by the Future Energy Jobs Act (FEJA), we will calculate measure-specific and total CPAS in addition to gross and net savings for the program. We will also include electric savings converted from gas savings and estimate the weighted average measure life at the portfolio level.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Advanced Thermostat	1.0
Air Sealing	1.0
Air Source Heat Pump	1.0
Attic Insulation	1.0
Basement/Sidewall Insulation	1.0
Bathroom Faucet Aerator SF (DI)	1.0
Bathroom Exhaust Fan	1.0
Central Air Conditioner	1.0
Duct Insulation and Sealing	1.0
ECM Motor Retrofit	1.0
Floor Insulation Above Crawlspace	1.0
Freezer	1.0
HW Pipe Insulation (1 ft.) (DI)	1.0
Kitchen Faucet Aerator SF (DI)	1.0
LED Indoor Specialty	1.0
LED Indoor Standard	1.0
LED Outdoor Specialty	1.0
LED Outdoor Standard	1.0
Programmable Thermostat	1.0
Refrigerator	1.0
Room Air Conditioner	1.0
Showerhead	1.0

Program Measure	CY2020 Deemed NTG Value
Advanced Power Strip (Tier 2)	1.0
Wall Insulation	1.0
Heat Pump Water Heater	1.0
Water Heater Wrap	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. If needed, we will adjust the schedule as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Wave 1 Data Request	Evaluation	May 4, 2020
CY2020 Program Tracking Data for Wave 1	ComEd, Gas Utilities	July 3, 2020
Wave 1 Tracking System Ex Ante Review Findings and Recommendations to ComEd and Gas Utilities	Evaluation	September 11, 2020
CY2020 Final Tracking Data Request	Evaluation	November 1, 2020
CY2020 Final Wave Data	ComEd, Gas Utilities	January 30, 2021
Draft Reports to ComEd, Gas Utilities, and SAG	Evaluation	March 8, 2021
Comments on Drafts (15 Business Days)	ComEd, Gas Utilities, and SAG	March 29, 2021
Revised Drafts by Navigant	Evaluation	April 5, 2021
Comments on Redrafts (5 Business Days)	ComEd, Gas Utilities, and SAG	April 12, 2021
Final Impact Reports to ComEd, Gas Utilities, and SAG	Evaluation	April 23, 2021

ComEd Income Eligible Energy Savings Kit Program CY2020 to CY2021 Evaluation Plan

Introduction

The University of Illinois at Chicago Energy Resources Center (UIC-ERC) implements the Income Eligible Energy Savings Kit (IE Kits) Program and jointly delivers the program with the Illinois Association of Community Action Agencies (IACAA). The program provides qualified customers with a kit containing energy-saving devices such as advanced power strip, LEDs, low flow faucet aerators for bathroom and kitchen, and low flow showerhead. The kits also include educational information on additional energy-saving actions customers can do to reduce their energy bills. The target population is income eligible customers living in single-family and small multi-family housing (two to four units) that are currently underserved by existing energy efficiency programs. Eligibility will be limited to customers whose incomes are at 80% AMI or below 250% of the federal poverty line for their household size.

Table 1 lists the measures provided in the IE Energy Savings kits.

Table 1. IE Energy Savings Kit Measures

Measures
7-Plug Advanced Power Strip (1)
9W LED bulb (2)
15W LED bulb (1)
5W LED 60W replacement Candelabra (1)
5W LED 60W replacement Globe (1)
3-Way 15W LED bulb (1)
BR30 8W LED bulb (1)
LED night light (1)
Low flow faucet aerator for bathroom (1)
Low flow faucet aerator for kitchen (1)
Low flow showerhead (1)

UIC-ERC is responsible for the program implementation, including purchasing the kit materials, assembling the kits, delivering the kits to Community Action Agencies for distribution, and collecting the data required for proper evaluation, measurement and verification. IACAA through the 15 participating Community Action Agencies will be responsible for hand delivering the kits to eligible participants.

IACAA is responsible for customer recruitment which takes place in the (15) Community Action Agencies facilities. Customers go to these facilities to receive assistance from several programs available to them and among those programs is the Low-Income Home Energy Assistance Program (LIHEAP). The LIHEAP has the same income-qualification requirements as the IE Kits Program (need to be at 80% AMI or below 250% of the federal poverty line). After a customer provides proof they are eligible to participate in the LIHEAP (proof of income eligibility AND receives electricity from ComEd), a Community Action Agency staff member will ask them if they would like to participate in the IE Kits Program and receive a free energy efficiency kit. The customer will then fill out a form to receive the kit, receive a brochure explaining the kit contents, and have the kit hand-delivered to them on site.

The primary objectives of the evaluation of the IE Kits Program are to: (1) quantify gross and net savings impacts from the program, and (2) make recommendations to enhance the program focused on the current priorities as determined by the program manager. The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 2. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interview	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Engineering Review	X	X

This evaluation plan details the evaluation approach for CY2020. The evaluation team will determine the evaluation approach for CY2021 based upon the needs of the program.

Coordination

As needed, Navigant will coordinate with the other Illinois utility evaluation teams on any issues relevant to this program. The evaluation team will coordinate with the Illinois Income Qualified Advisory Committee as needed.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total verified gross savings?
2. What is the research estimate of gross savings (energy, peak demand, and total demand) for the Program?
3. What are the program's verified net savings?

Process Evaluation and Other Research Topics

Navigant will not conduct a process evaluation for this program in CY2020.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 3. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Tracking System Review	Tracking System	Census	Two waves†	
Gross Impact	Tracking System	Census	Two waves	
Calculation of CPAS	Engineering Impact Review	Census	Two waves	
In-Depth Interview	Program Management and Implementers	1	August 2020	

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

Navigant will perform an early impact tracking system review in CY2020 and we will review the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects.

Gross Impact Evaluation

The IE Kits Program's savings are derived from the Illinois Technical Reference Manual (TRM). For the impact evaluation, gross savings will be evaluated by (1) reviewing the tracking system to ensure that all fields are appropriately populated, and (2) validate the program used the correct assumptions from the IL TRM v.8.0.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 4. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
LED	1.0
Showerhead	1.0
Aerator	1.0
Advanced Power Strip	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Program Management and Implementer Interviews

Navigant will conduct an in-depth telephone interview with program managers and implementation contractors to understand the current state of the program operations and to discuss any program changes which are relevant to the evaluation. This will be done so we can perform the evaluation with a solid understanding of the program.

Calculation of Cumulative Persisting Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Navigant is not evaluating the IE Kits Program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Navigant is not using quasi-experimental consumption data because the savings are likely not large enough to achieve statistically significant estimates using this method.

Evaluation Schedule

Table 5 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Data Request for Wave 1 CY2020 program tracking data	Evaluation	May 15, 2020
CY2020 program tracking data for sampling Wave 1	ComEd	June 12, 2020
Early impact findings memo	Evaluation	August 14, 2020
Final CY2020 Program tracking data to Navigant	ComEd	January 31, 2021
Draft Report to ComEd and SAG	Evaluation	March 12, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 2, 2021
Revised Draft by Navigant	Evaluation	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021

ComEd Manufactured Homes Energy Efficiency Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Manufactured Homes Energy Efficiency Program offering provides energy efficient products and services to existing manufactured homes in the ComEd service territory to customers with income levels at or below 80% of the Area Median Income. The program is implemented by Slipstream. The program offers an evaluation of the mechanical system and envelope of the home, ductwork and air leak sealing, educational information, and direct installation of energy efficient measures. Slipstream plans to initially target manufactured homes in DeKalb, Grundy, Kankakee, and LaSalle Counties. CY2020 will be the second year this program is offered to ComEd customers.

Eligible program measures include, but are not limited to:

- LED lighting
- Smart and programmable thermostats
- Low-flow faucet aerators and showerheads
- Advanced power strips
- Refrigerators
- Belly insulation
- Ductwork and air leak sealing
- Furnace Blower Motor Replacement
- High Efficiency Bathroom Exhaust Fan
- Health and Safety Measures

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Impact – Field Work		X
Impact – Program Manager and Implementation Contractor Interviews	X	X

The evaluation team created the evaluation approach for the CY2020 to CY2021 period based on the needs of the program. Looking forward, the two-year evaluation approach for this program includes:

- Tracking system review and analysis each year to calculate gross and net impact and cumulative persisting annual savings (CPAS)

- Field work in CY2021 that includes on-site visual verification to confirm measure installation and to identify any missed energy savings opportunities, dependent on participation

Coordination

The evaluation team will coordinate with the Illinois Income Qualified Advisory Committee as needed.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross and net savings?
2. Did the program meet its energy and summer peak demand savings targets? If not, why?

Process Evaluation and Other Research Topics

Navigant will not conduct process research for the program in CY2020.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline
Program Manager/Implementation Contractor Interviews	Engineering Impact Review	1	May 2020
Early Impact Review	Engineering Impact Review	NA	August – October 2020
Gross Impact Evaluation	Engineering Impact Review	NA	January – April 2021
Calculation of CPAS and Annual Savings	Engineering Impact Review	NA	January – April 2021

Gross Impact Evaluation

Since the Manufactured Homes Energy Efficiency Program derives savings from deemed values contained in the TRM[60], the team will evaluate savings by reviewing:

- Tracking system data to ensure the accurate population of fields
- Measure algorithms and values in the tracking system to ensure accurate calculation of savings

[60] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 8.0, http://www.ilsag.info/technical-reference-manual.html

- Totals to ensure accurate summation of savings

Where possible, we may also supplement the above approach by reviewing:

- Project documentation to verify participation, installed measure quantities, and associated savings

These activities will also serve to assess program comprehensiveness and missed opportunities.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html

Table 3. Deemed NTG Values for CY2020

Program	CY2020 Deemed NTG Value
Manufactured Homes Energy Efficiency	1.00

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01

Research NTG Impact Evaluation

No NTG research is planned for this income eligible program.

Ad Hoc Program Management and Implementer Meetings

The evaluation team will meet with the program manager and implementer on an ad hoc basis to support program evaluation. The purpose of these meetings will be information sharing and collaboration to resolve evaluation inconsistencies and ensure accurate and timely program evaluation. These meetings will provide program design and implementation context for the evaluation team to cater evaluation to the program. Possible topics include changes to program design and implementation, and expected program changes going forward. This is also an opportunity for the program manager and implementer to ask the evaluation team for preliminary research findings.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings

estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Manager and Implementer Interviews	Evaluation	May 15, 2020
CY2020 Wave 1 Data Request	Evaluation	May 22,2020
CY2020 program tracking data for Wave 1	ComEd	August 31, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	October 19, 2020
CY2020 Final Tracking Data Request	Evaluation	October 19, 2020
CY2020 Final Wave Data	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 11, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 1, 2021
Revised Draft by Navigant	Evaluation	April 6, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 13, 2021
Final Impact Report to ComEd and SAG	Evaluation	April 20, 2021

ComEd Public Housing Retrofits Program CY2020 to CY2021 Evaluation Plan

Introduction

The Public Housing Retrofits Program provides standard and custom incentives for federally assisted low-income and public housing, residential and common areas.

The purpose of this program is to work with 21 Illinois Public Housing Authorities (PHAs) and their portfolios of 51,693 housing units and other buildings to achieve energy savings. This market segment is considered underserved and is comprised of the extremely low to very low-income groups, including seniors, disabled, and households on federal assistance. The residents are renters with incomes at or below 30% to 80% of the area median income poverty levels. The program provides outreach, education, and incentives to management of eligible buildings to upgrade old, inefficient energy equipment in residential units, common areas, maintenance and community buildings, and any other buildings they own and manage in ComEd's territory.

Elevate Energy is the program implementation contractor for this program. Prior to CY2018, the program was operated under the Illinois Department of Commerce and Economic Opportunity (DCEO). CY2020 will be an impact-focused year for the evaluation, with the primary objective of quantifying the gross savings impacts of the program. In CY2021, the evaluation will conduct interviews with the growing number of Energy Efficiency Service Providers (EESP) delivering the program.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Data Collection – Resident Interviews		
Data Collection – EESP and Stakeholder Interviews		X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Process Analysis		X

Coordination

Navigant will coordinate with the evaluation teams for Nicor Gas and Peoples Gason any issues relevant to this program. Specifically, Navigant will coordinate impact and process research with the Ameren Illinois Public Housing Initiative evaluation team. Navigant will coordinate with the Ameren IL team on data collection and interview design to ensure consistency where appropriate.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

- What are the program's annual verified gross savings (energy, peak demand, and total demand)?
- What are the program's annual verified net savings?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline
Early Impact Review	Tracking system	Census	August – September 2020
Gross Impact Evaluation	Engineering File Review	Sample	August – September 2020
Gross Impact Evaluation	Engineering Impact Review	NA	January – April 2021
Calculation of CPAS and Annual Savings	Engineering Impact Review	NA	January – April 2021
In Depth Interview	Program Management and Implementers	1	April – June 2020

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. The Wave 1 of M&V sampling is expected to cover about half of the projects.

Gross Impact Evaluation

The measure type, deemed or non-deemed, will dictate the savings verification approach. For measures with per unit savings values deemed by the TRM, Navigant will calculate verified gross savings estimated by multiplying deemed per unit savings (kWh and kW) by the database-verified quantity of eligible measures installed. Eligible deemed measures must meet all physical, operational, and baseline characteristics required to be assigned to the deemed value as defined in the TRM. Measures with fully custom or partially-deemed ex ante savings will be subject to retrospective evaluation adjustments to gross savings on custom variables. For fully custom measures, Navigant will subject the algorithm and parameter values to evaluation adjustment, where necessary. For partially-deemed measures, TRM algorithms and deemed parameter values will be used where specified by the TRM, and evaluation research will be used to verify custom variables.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2020

Program	CY2020 Deemed NTG Value
Public Housing Authority	1.0

Source: http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Program Management and Implementer Interview

The evaluation team will interview the program manager about the goals of the program, implementation, and perceived effectiveness as relevant to the impact evaluation. The program implementer interview will focus on details of program implementation. Both interviews will focus on changes made in CY2020 in comparison to the prior program year. This will be done so we can perform the evaluation with a solid understanding of the program.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities (see Table 2 for other schedule details). Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Manager and Implementer Interview	Evaluation	June 15, 2020
CY2020 Wave 1 Data Request	Evaluation	June 30, 2020
CY2020 program tracking data for Wave 1	ComEd	July 30, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	September 10, 2020
CY2020 Final Wave Data	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 8, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 29, 2021
Revised Draft by Navigant	Evaluation	April 8, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 15, 2021
Final Report to ComEd and SAG	Evaluation	April 23, 2021

APPENDIX D. RESIDENTIAL PROGRAMS EVALUATION PLANS

ComEd Appliance Rebates Program CY2020 to CY2021 Evaluation Plan

Introduction

The Appliance Rebates Program is designed to increase the market share of ENERGY STAR® appliances sold through retail (in-store or online) sales channels by providing rebates to decrease customer costs as well as information and education to increase customer awareness and acceptance of energy efficient appliances. The program targets residential customers who purchase new or replacement ENERGY STAR® appliances including advanced power strips, advanced thermostats, air purifiers, electric clothes dryers, electric clothes washers, dehumidifiers, freezers, refrigerators, and pool pumps.

The primary objectives of the evaluation of the ComEd Appliance Rebates Program are to: (1) determine gross and net program savings and (2) examine the effectiveness of program processes in achieving savings.

The CY2020 gross impact evaluation will be conducted similarly to previous years, with adjustments to accommodate changes to the measure mix.

Table 1 summarizes the data collection and analysis activities scheduled for the next three years.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Process Analysis		X

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Additionally, Navigant will coordinate with the evaluation team for Ameren's Retail Products program as they begin to offer rebates on appliances in 2020.

Evaluation Research Topics

The CY2020 evaluation team will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross kWh, peak demand kW savings, and therm savings?
2. What are the program's verified net kWh, peak demand kW, and therm savings?
3. What are the program's Cumulative Persisting Annual Savings (CPAS)?

4. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sampling, and Analyses

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	Concurrent with gross impact analyses.
In-Depth Interviews	Program Management and Implementers	2	Augment with monthly calls
Gross Impact Evaluation	TRM Review	Census	Wave one and final data†
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	Census	

* SO refers to Spillover
† Navigant will coordinate with ComEd to determine appropriate date to pull the "wave 1" tracking data extract.

Tracking System Review

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures.

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Researched NTG Analysis

The evaluation will not include NTG research in CY2020.

Gross Impact Evaluation

Appliance Rebates Program measure savings are derived from deemed values contained in the TRM. Subsequently, gross savings will continue to be evaluated by (1) reviewing the tracking system data to ensure that all fields are appropriately populated and savings are consistent with the implementation contractor workpapers and savings calculators that feed into the tracking system; (2) reviewing new measures' algorithms and values in the tracking system and implementation contractor workpapers to

ensure that they are appropriately applied; and (3) cross-checking Navigant's calculated savings with the implementation contractor's calculated savings.

Navigant will complete this process two times, once during the Wave 1 impact analysis and again during the final analysis in March 2021. The Wave 1 impact analysis provides an opportunity for Navigant to give early feedback to the implementation contractor and ComEd with ample time to discuss potential discrepancies and make adjustments prior to the end of the program year. Concurrently with the Wave 1 and final impact analyses, the evaluation team will review program data in ComEd's eTRACK system to ensure data is consistent. In addition to calculating electric savings, the evaluation team will also calculate gas savings for eligible measures.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program. Table 3 provides the recommended NTG ratios for use in CY2020.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Advanced Power Strip – Tier 1	0.76
Advanced Thermostat	NA*
Air Purifier	0.79
Clothes Dryer	0.67
Clothes Washer	0.63
Dehumidifier	0.67
Freezer	0.63
Pool Pump	0.80
Refrigerator – Time of Sale (TOS)**	0.65

* TRM-deemed savings represent net savings for this measure.
**TOS = Time of Sale
Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of CPAS and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report electric, gas, and total CPAS for CY2020. For measures that achieve gas savings, Navigant will convert gas savings to electric savings for inclusion in total CPAS. Additionally, the weighted average measure life will be estimated, and Navigant will calculate the weighted average measure life for the program.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the Appliance Rebates Program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because the savings from the Appliance Rebates Program

represent a small percentage of the total household's savings and there are not enough participants in this program to achieve statistically significant savings estimates using this method.

Evaluation Schedule

Table 4 provides scheduling details for key impact and process evaluation deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress. We plan to conduct process evaluation activities early in the program year and report results to ComEd as valuable information becomes available.

Table 4. Schedule – Key Evaluation Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Calculators and Workpapers	ComEd	October/November 2019
CY2020 Wave 1 Data Request	Evaluation	May 12, 2020
CY2020 Program Tracking Data for Wave 1 Data Review and Analysis	ComEd	June 12, 2020
Program Manager and Implementation Contractor Interviews	Evaluation	TBD
Tracking System Wave 1 Ex Ante Review Findings and Recommendations	Evaluation	August 14, 2020
CY2020 Final Program tracking data	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 8, 2021
Comments on Draft (15 Business Days)	ComEd and SAG	March 22, 2021
Revised Draft by Navigant	Evaluation	March 29, 2021
Comments on Redraft (5 Business Days)	ComEd and SAG	April 2, 2021
Final Report to ComEd and SAG	Evaluation	April 16, 2021

ComEd Elementary Energy Education Program CY2020 to CY2021 Evaluation Plan

Introduction

The Elementary Energy Education (EEE) Program's primary focus is to produce electricity and natural gas savings in the residential sector by motivating students and their families to take steps through reducing energy consumption for water heating and lighting in their home. The program is offered in service areas for ComEd, Nicor Gas, Peoples Gas, and North Shore Gas.

The primary objectives of the CY2020 evaluation of the EEE Program are to: (1) quantify net and gross electric savings impacts (as well as natural gas savings from ComEd-only kits) from the program and (2) identify enhancements to the program. The CY2020 gross impact evaluation will not vary significantly from the previous years. Table 1 lists the different surveys associated with this program.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		TBD
Process Analysis – Analyze Teacher Surveys (collected by Franklin Energy)	X	

Coordination

Navigant will coordinate with the evaluation teams from other utilities on any issues relevant to this program, since the EEE Program is jointly offered by ComEd, Nicor Gas, Peoples Gas and North Shore Gas Companies, with Franklin Energy as the implementation contractor. In addition, Navigant will coordinate with the evaluation team for Ameren's Direct Distribution Efficient Products program which has a similar program design to the EEE Program.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?

4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation

The implementer conducts teacher and participant surveys throughout the year to measure satisfaction with the program. Because the program has doubled in size and quite a few new schools have been added to ComEd's service territory since the NTC Middle School Kits program ended in 2018, Navigant proposes analyzing and summarizing the results from Franklin Energy teacher evaluation survey to ensure teachers that used to participate in NTC's program are satisfied with the EEE program implementation.

Teaching the program material for the EEE program compared to the NTC program is very different. Teachers are responsible for teaching the program material to students over a certain amount of days for the EEE program. Navigant plans to analyze the results from the teacher evaluation surveys from those teachers that used to participate in the NTC program to understand the effectiveness of EEE's program materials including the products in the kits focusing on opportunities for improvement.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Gross Impact Approach	Tracking system Review	All	Two Waves†
Gross Impact Approach	Student Survey Analysis	All	Two Waves†
In Depth Interviews	Program Management and Implementers	2	
Verified Net Impact	Calculation using deemed NTG ratio	NA	

† Navigant will coordinate with ComEd to determine appropriate dates to pull Wave 1 tracking data extract.

Gross Impact Approach

Since all of the EEE Program's savings are based on the Illinois Technical Resources Manual (IL TRM) estimates, the evaluation team will conduct a limited gross impact evaluation in CY2020. The gross impact evaluation's foundation will be a review of program tracking data that substantiates the type and quantity of measures installed. Navigant will perform independent verification of the program tracking database and determine the level of input completeness, outliers, missing values, and potentially missing variables. If necessary, the Navigant team will include recommendations for additional fields to be added to the tracking system for use in the impact evaluation effort as well as program process monitoring.

Verified gross savings for all the measures included in the kits will be calculated for each participant using appropriate IL TRM algorithms and customer-specific data collected in the tracking system. For custom input variables, the evaluation analysis will be supplemented by additional research, and then summed across participants to calculate program totals. To be eligible, a measure must meet the physical, operational, and baseline characteristics as defined in the applicable version of the IL TRM. The evaluation team will convert therm savings to kWh savings for water saving measures in the ComEd-only kits.

Program Manager and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level NTG ratio deemed through a consensus process by the IL SAG to estimate the verified net savings for the EEE Program. The NTG values for CY2020 are shown in the table below.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
LEDs	0.84
Other EEE Measures	1.0

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the EEE Program via an RCT because the program was not designed with randomly assigned treatment and control groups. Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other evaluation details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Calculators and Workpapers Review	Evaluation	October/November 2019
CY2020 Wave 1 Data Request	Evaluation	June 10, 2020
CY2020 program tracking data for Wave 1	ComEd	July 10, 2020
Wave 1 project documentation, engineering reviews, feedback	Evaluation	September 15, 2020
Final CY2021 Program tracking and customer survey data	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Draft by Navigant	Evaluation	April 1, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 7, 2021
Final Report to ComEd and SAG	Evaluation	April 16, 2021

ComEd Fridge Freezer Recycling Program CY2020 to CY2021 Evaluation Plan

Introduction

The Fridge and Freezer Recycling (FFR) Program offers free pickup and recycling services for older, working refrigerators, freezers and room air conditioners that households no longer want. Program savings are based on the accelerated removal, dismantling and recycling of these older, inefficient units. To meet a reduced level of participation during CY2020, the program is reducing the incentive to $35 from the previous $50 per unit level. This incentive is provided for up to two recycled refrigerators or freezers during all months of the year. Operational room air conditioner (AC) units are also eligible for pick up and recycling but can only be picked up from sites where the program implementer plans to collect a refrigerator or freezer (so the room AC unit can “ride for free”). Note that the program has discontinued eligibility for dehumidifiers in 2020. Participants contributing working room AC units receive a $10 program incentive. Additionally, smaller refrigerators (capacity less than 9 cubic feet) are eligible for recycling through special recycling turn-in events, where the program is providing $25/unit incentive for these smaller units. Finally, a few older units, that look large outside but are undersized (less than 10 cubic feet) interior measurements (called “small units” or “SUs”) are collected only if the customer is elderly or disabled and needs to have it removed and agrees to not receive an incentive.

During CY2020, impact related activities will be completed, including net-to-gross (NTG) related activities (data collection and analysis). The evaluation team will not be conducting a full process evaluation for CY2020, due to similar findings in past program cycles. However, a limited scope process evaluation will be done to examine the effect of the reduced incentive on customer participation and satisfaction levels. A full process evaluation is recommended for the CY2021 evaluation, given the three-year hiatus since the PY9 one was completed.

The objectives of the CY2020 evaluation are to quantify net energy and peak demand savings impacts from the program, , assess free ridership associated with recycled units and determine customer acceptance of the reduced incentive. CY2020 impact evaluation activities such as surveying participating customers and interviewing the largest and most active retailers reported to have sold new replacement units to participants will be completed and survey findings will be used to update the NTG ratio for future use.

The evaluation activities for this program over the coming two years are indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Data Collection – Retailer Interviews		X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys	X	X
Net-to-Gross – Analysis	X	X
Process Evaluation and Analysis (limited)		X

The evaluation team determined the evaluation approach for the CY2020-2021 period based upon the needs of the program and the program's history. The two-year evaluation approach for this program is based on the following:

- Annual gross and net impact analysis
- Optimized timing on when to conduct part-use, unit location and NTG research
- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of the Future Energy Job Act (FEJA)

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the FFR programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. Due to the nature of participant responses and retailer prominence, the ComEd NTG scores are a hybrid of participating customer and retailer-based NTG, which is consistent with the Enhanced method in the TRM. The Ameren NTG scores, however, have less weight on retailer-based NTG scores. The two teams then compare and discuss results at the end of the evaluation process.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Does spillover exist in the program? If so, how much spillover is occurring?

5. Should the program design be modified to reduce free ridership, and if so, how?
6. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	
In Depth Interviews	Program Management and Implementers	2	
Telephone and Web Surveys	Participating Customers	425	Focus on verification and net-to-gross assessment
In-Depth Interviews	Retailers Associated with Unit Replacements	5	
Gross Impact Evaluation			Bottom-up regression-based estimation. Part-use factor from surveys.
Verified Net Impact Evaluation			Deemed NTG Value

Tracking System Review

Navigant will perform tracking system review in waves in CY2020, as well as reviewing the final tracking data. Wave 1 is expected to cover about half of the projects.

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Telephone and Web Surveys

A multi-modal approach will be used to conduct participant surveys, relying on both telephone and web surveys. This approach reflects the transition to a changing industry survey research environment and improved survey data quality and coverage. The participant survey will ask questions that will affect the

evaluated part-use factor and NTG ratio. Participants will be asked how their units would have been disposed of if the program had not picked them up. The survey will also ask a few questions to gauge participant's awareness of program features.

Gross Impact Evaluation

The CY2020 ex ante and evaluation-verified gross energy savings will be calculated directly using procedures specified in the Illinois Technical Reference Manual (TRM) version 8.0 (CY2020). The program tracking database and TRM v8.0 provide inputs needed to calculate verified gross savings. In addition to program tracking data, a telephone and web survey of program participants determines: (1) the unit's location (when used) prior to the customer's decision to participate in the program; and (2) a verification factor. The first term, the unit's prior location, is used directly in the regression-based calculation of unit energy savings. The second term, the verification factor, calculates the percentage of units that were verified as being recycled through the program. A mixed mode approach is being used, to achieve efficiencies in web-based survey data collection, while still obtaining results that mirror the characteristics of the population. Historically, telephone surveys have attracted older respondents, while web surveys attract younger respondents. Therefore, a mixed mode approach (50% web-based and 50% telephone-based) is planned to provide approximately the same balance between these two groups as is present in the program population.

The TRM v8.0 states that the most recent part-use-factor participant survey results available at the start of the program year shall be used in refrigerator and freezer recycling energy savings calculations. In CY2020, the source of the part-use factor is the CY2018 evaluation. Savings estimates will be developed for the full population of units collected in CY2020 to estimate CY2020 Unit Energy Consumption (UECs). The ex-post savings estimates of energy (kWh) savings will rely on regression equations as specified in the TRM v8.0. Gross energy savings are expressed in terms of full-year UECs. UEC estimates will be made using a regression-based approach that models full-year energy savings as a function of unit characteristics (i.e., age, size, configuration, defrost mode, and unit location prior to being recycled).

Gross peak demand (kW) savings will also be calculated according to the algorithm specified in the TRM v8.0. The coincidence factors in the TRM v8.0 were calculated using the regression equations to predict consumption on summer peak days. These values are based on the same peak period definitions as used by PJM.

Both energy (kWh) and peak demand (kW) savings estimates will be made based on the characteristics of the population of units collected by the program during CY2020. In addition, gross energy savings estimates will be adjusted for part-use, by applying part-use factors from the CY2018 evaluation.

Verified Net Impact Evaluation

The evaluation team will apply the NTG ratio(s) approved by the Stakeholder Advisory Group (SAG) to the estimate of evaluation-verified gross savings to compute verified net savings. Separate estimates will be made for each appliance type – refrigerators and freezers.

In addition, telephone and web surveys of customers and retailers will be conducted to update the research-based NTG ratio for future years. Under this approach, the existing participant survey is used to guide the analytical approach for the retailer associated units, as well as the non-replaced units picked up by Recleim at customers' homes. Specifically, for those participating customers surveyed that indicate they would otherwise have their appliance retailer remove the old unit after a new one is acquired, the NTG ratio is based on the results of the survey of the retailer that they bought the replacement unit from. This survey reflects the retailers' self-reported disposal practices absent the program.

Research NTG Impact Evaluation

The following data sources will be used:

1. *Telephone and web surveys with participating customers.* As in previous years, we will rely heavily on findings from telephone and web-based surveys participating customer surveys to understand how participants would have disposed of their units if the program had not picked them up. For participants that replaced their old units, surveys will include a question to determine who they bought the new unit from. We will include new response categories and related consistency checking questions to ensure the responses given to the question used to determine free ridership includes the disposal options available to them via the retailer they bought it from.
2. *In-depth interviews with retailers associated with unit replacements.* We will conduct interviews with a sample of the most active retailers who sold FFR participants a new unit to replace the old one that was picked up by the program. These interviews will focus on their disposal practices absent the program during the past three years to provide information regarding trends and to characterize the robustness of utilized factors. These findings will be used to determine the disposition of used appliances absent the program for those that purchase a new unit from these non-participating retailers. We will obtain the names of these retailers from the participating customer telephone surveys, wherein participants that replaced their unit will choose who they purchased it from.

Free Ridership – The NTG ratio will be computed using an algorithm approach which utilizes a blend of nonparticipating retailer and participating customer survey self-report data. The initial NTG ratio is adjusted for the fraction of units that would have been kept but not used and those that would have been discarded through a method in which the unit was destroyed absent the program.

Spillover – Based on our understanding of the program design, we do not see a program theory that supports an expectation of significant spillover. However, we will include questions in the participating customer survey to assess whether spillover has occurred because of their experience with FFR Program participation. Any spillover reported that is associated with a high degree of program influence will be incorporated into the NTG ratio calculation.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by FEJA, Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the FFR Program via an RCT because the program was not designed with randomly assigned treatment and control groups. Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 3 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 3. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Calculators Review	Evaluation	October/November 2019
Program management and implementer in-depth-interviews	Evaluation	April/May 2020
CY2020 Wave 1 Data Request	Evaluation	June 1, 2020
CY2020 program tracking data for Wave 1	ComEd	June 30, 2020
NTG Draft Report to ComEd and SAG	Evaluation	July 15, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	July 31, 2020
Participant telephone and web surveys	Evaluation	October/November 2020
CY2020 program tracking data	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Draft by Navigant	Evaluation	April 1, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 7, 2021
Final Report to ComEd and SAG	Evaluation	April 16, 2021

ComEd Heating and Cooling Rebates Program CY2020 to CY2021 Evaluation Plan

Introduction

The Heating and Cooling (HVAC) Rebates Program offers incentives for the installation of qualifying, high efficiency heating and cooling equipment. The measures incentivized through the HVAC Rebates Program are air source heat pumps (ASHP), central air conditioners (CAC), ductless mini-split heat pumps (DMSHP), furnace blower motors (ECM[61]), ground source heat pumps (GSHP), ENERGY STAR® thermostats, duct sealing and AC/ASHP tune ups . The program is implemented as a "closed network" Energy Efficiency Service Provider (EESP) program, meaning that only installations completed by a contractor in the ComEd Residential EESP Network qualify for a rebate. ComEd Residential EESPs must be Illinois Commerce Commission (ICC) Energy Efficiency Installer certified and meet the program eligibility requirements.

Notable program changes made from transitioning from CY2019 to CY2020 include:

- CACs will now be offered through a midstream rather than downstream channel. Due to this change, all rebates will be under $300 and will allow any contractor to receive a rebate for CACs, not just the "closed network" EESPs. Navigant will work with the implementer to evaluate these projects now that measure is being incentivized to distributors rather than customers.
- Duct sealing and ASHP/AC Tune up are now being incentivized through the program.

The primary objective of the evaluation of the HVAC Rebates Program is to determine gross and net program savings.

The CY2020 gross impact evaluation will not vary significantly from the previous years, but adjustments will be made to reflect specific measure and project characterizations.

The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys		X
Data Collection – Program Manager and Implementer Interviews	X	X
Data Collection – EESP Interviews		X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		X
Process Analysis		X

[61] Electronically commutated motors

The evaluation team determined the evaluation approach for the CY2020-CY2021 period based upon the needs of the program and program's history. The two-year evaluation approach for this program is based on the following:

- Annual gross and net impact analysis.
- Interviews with the program manager and implementer will be conducted in CY2020 to inform the Navigant team of any substantial changes to the program for the upcoming year.
- Budget permitting, we will conduct participant spillover in CY2021 with CY2020 participants.
- Budget permitting, interviews with participating EESPs will be conducted in CY2021 to inform program spillover.

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. The one exception is the approaches being used to compute net-to-gross ratios, which differ somewhat. The ComEd team calculates a hybrid participating customer and Retailer-Based NTG ratio as its main method, which is consistent with the Enhanced method in the TRM. The Ameren team, with a more limited budget, calculates a Participating Customer-based NTG ratio as its main method and computes a Retailer-Based NTG ratio as a sensitivity case. The two teams then compare and discuss results at the end of the evaluation process.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

Navigant will not conduct process research for the Heating and Cooling Rebates Program in CY2020. Navigant will consult with ComEd program leads on focused, key process questions to be answered to help improve and inform the program in 2021.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	One interim and one final
In Depth Interviews	Program Management and Implementers	2	
Gross Impact Evaluation	TRM Review	Census	One interim and on final
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	NA	Deemed Value

Tracking System Review

Navigant will perform an interim tracking system review in the summer of 2020 in line with program changes and an accelerated evaluation schedule for delivering tracking data to the evaluation team. Navigant will perform final tracking system review in February 2021 once Navigant receives the end of year tracking data from ComEd in preparation for the final CY2020 report.

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementers to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from wave analyses to help ComEd and the implementation contractor plan for final reporting.

Gross Impact Evaluation

The gross impact analysis will include a review of deemed savings estimates for all measures in the program, in compliance with the Illinois TRM. Navigant will document how the deemed measures differ from ComEd's existing planning or ex ante tracking estimates and provide guidance as to how these differences will impact ComEd's programs. If new measures are included in CY2020, Navigant will perform a desk review of program calculations and compare savings to the Illinois TRM. The evaluation team will also calculate gas savings achieved by the program and convert it to electric savings.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the NTG ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Central AC	TBD
Advanced Thermostat	NA
Air Source Heat Pump	0.57
Ductless Mini-Split	0.63
ECM Furnace Motor – with Furnace Upgrade	0.78
ECM Furnace Motor – without Furnace Upgrade	0.78
Geothermal Heat Pump	0.59

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this program contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Calculators and Workpapers	ComEd	October/November 2019
Program Management and Implementers Interviews	Evaluation	TBD
CY2020 Wave 1 program tracking data request	Evaluation	June 1, 2020
CY2020 Wave 1 program tracking data for Interim Review	ComEd	June 30, 2020
Tracking System Wave 1 Ex Ante Review Findings and Recommendations	Evaluation	August 30, 2020
CY2020 EOY program tracking data for Final Review	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Draft by Navigant	Evaluation	April 1, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 7, 2021
Final Report to ComEd and SAG	Evaluation	April 14, 2019

ComEd Home Energy Assessment Program CY2020 to CY2021 Evaluation Plan

Introduction

The Home Energy Assessment (HEA) Program seeks to: (1) secure energy savings through direct installation of low-cost efficiency measures such as water efficient showerheads and faucet aerators, pipe insulation, programmable thermostats, LEDs and smart thermostats (with co-pays), and free and co-pay leave behind advanced power strips (at eligible single family residences) and (2) perform a brief assessment of additional energy-efficiency opportunities (e.g., furnace, boiler, air conditioning, insulation, and air sealing) from the respective utility portfolios.

For CY2020, the program is being offered jointly between ComEd, Peoples Gas (PGL) and North Shore Gas (NSG) and Nicor Gas. The program is marketed as the HEA Program for ComEd, Home Energy Jumpstart Program for PGL and NSG, and Home Energy Savings Program for Nicor Gas. Franklin Energy Services LLC (Franklin Energy) is the implementation contractor for all the programs.

The ComEd CY2020 net savings forecast is 20,754 MWh per the ComEd 2018-2021 Energy Efficiency Demand Response Plan.

The primary objectives of the evaluation of the HEA Program are to: (1) quantify gross and net savings impacts from the program, and (2) as the program continues to evolve, make recommendations to enhance the program focused on the current priorities as determined by the program. Our evaluation report will capture the electric savings for ComEd, and the gas savings will be captured in separate reports for PGL and NSG and Nicor Gas. The CY2020 gross impact evaluation will not vary significantly from the previous years, but adjustments will be made to reflect specific measure and project characterizations. The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Participant Surveys		X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross – Customer Self-Report Surveys		X
Process Analysis		X

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Specifically, the HEA Program is jointly offered by ComEd, Nicor Gas, PGL and NSG Companies with Franklin Energy as the implementation contractor. The evaluation tasks for this program over the next two years are similar for these utilities.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross savings?
2. What are the program's verified net savings (first year and lifetime)?
3. Did the program meet its energy and demand savings targets? If not, why?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

The evaluation team will not conduct any process research in CY2020.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	
In Depth Interviews	Program Management and Implementers	2	
Gross Impact	Engineering File Review	Census	Two Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

The tracking system review serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is accurately calculating savings defined by the TRM.

In line with program changes and accelerated evaluation schedule for delivering tracking data to the evaluation team, Navigant will perform tracking system review in waves in 2020. Wave 1 is expected to cover about half of the projects.

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Gross Impact Evaluation

The key gross impact evaluation activities for the program in CY2020 will be based on (1) reviewing the tracking system to determine whether all fields are appropriately populated, (2) reviewing measure algorithms and savings values in the tracking system to assure that the TRM is appropriately applied, and (3) cross-checking measure totals and savings recorded in the tracking database.

Verified Net Impact Evaluation

For CY2020, the primary method to determine net and gross savings will be a program tracking system review and applying measure-level net-to-gross (NTG) ratios that are deemed through a consensus process by the Illinois Stakeholder Advisory Group (IL SAG).

The verified net impact evaluation will apply the NTG ratios accepted by IL SAG consensus to estimate the verified net savings for the program. Those NTG values are shown in the following table.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Lighting	0.84
Bath Aerators	1.04
Kitchen Aerators	1.04
Showerheads	1.04
Programmable Thermostats	0.90
Pipe Wrap	0.80
Tier 1 Advanced Power Strips	0.85
Co-Pay Tier 2 Advanced Power Strips	0.85
Co-Pay Smart Thermostats	NA

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. The evaluation will also add the savings converted from gas savings to the electric savings so that it is documented in the report.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the Home Energy Assessment Program via an RCT because the program was not designed with randomly assigned treatment and control groups. Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Calculators and Workpapers Review	Evaluation	October/November 2019
CY2020 Wave 1 Data Request	Evaluation	May 12, 2020
CY2020 Program Tracking Data for Sampling Wave 1	ComEd	June 30, 2020
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	August 14, 2020
CY2020 Final Program Tracking Data	Evaluation	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on Draft (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Draft by Navigant	Evaluation	April 1, 2021
Comments on Redraft (5 Business Days)	ComEd and SAG	April 7, 2021
Final Report to ComEd and SAG	Evaluation	April 14, 2021

ComEd Home Energy Report Program CY2020 to CY2021 Evaluation Plan

Introduction

The Home Energy Report (HER) Program is a behavioral-based energy efficiency program implemented by Oracle. In CY2020, ComEd's HER program will consist of 12 waves of varying sizes.

The evaluation of this program over the coming two years will focus on estimating energy savings generated by regularly mailing customers reports that provide information about energy use and conservation. Table 1 lists tasks that we plan to complete as part of the evaluation. We plan to conduct the same type of analysis for the two years remaining in the evaluation cycle as we have in the past. We do not plan to conduct any process-related research at this time.

Table 1. Evaluation Approaches – Two-Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Regression Analysis	X	X

Coordination

Our ComEd evaluation team will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. These evaluations are also closely aligned with the gas utility HER program evaluations.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key impact researchable questions:

1. How much energy do customers in the program save during the program year?
    - What is the apparent long-run trend (flat, increasing, or falling) in program savings?
2. What is the uplift in other ComEd energy efficiency programs due to the reports?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
In Depth Interviews	Program Management and Implementers	1	June-July 2020	
Tracking System Review	Tracking system	Census	August, 2020	
Impact*	Regression analysis and uplift analysis	Census	February-April, 2021	

*Regression analysis produces impacts which are intrinsically net savings, aside from uplift.

Program Management and Implementer Interviews

The evaluation team will interview the program manager and implementation contractor about program marketing and processes to better understand the goals of the program, implementation, and perceived effectiveness. Both interviews will focus on changes made in CY2020 or expected in CY2021 in comparison to the prior program year. These interviews allow us to ensure that we know of program changes that could our impact evaluation.

Tracking System Review

Navigant will perform a tracking system review on wave 1 data part way through CY2020, as well as reviewing the final tracking data. The wave 1 review will allow us to identify and rectify any issues with the data before the final evaluation.

Impact Evaluation

For all waves, the evaluation team will measure CY2020 program impacts through billing analysis using a lagged dependent variable (LDV) model. Billing analysis implicitly estimates net impacts, so no net-to-gross adjustment is necessary.

The New Mover Wave evaluation will be slightly different from the other waves because this wave does not have full year pre-program customer data. The New Mover Wave is created by randomly assigning customers who just moved into their home in ComEd's service territory to participant (80% of customers) or non-participant (20% of customers) groups. Customers are placed into one of these two groups one month after they move into their home, meaning only one month of consumption data is available from before they were placed in the program. For this wave, pre-period data will come from the home's previous occupant, as identified by the service point identification, for one year before the new occupant was placed in the HER Program. Therefore, the twelve months of pre-program data will consist of eleven months of consumption data from the previous occupant and one month from the current occupant. Using data from the previous occupant as the pre-program data will act as a stand-in for the effects of fixed household characteristics on energy usage. Using this pre-program data, the evaluation team will run the same LDV model as for the other waves.

Enrollment uplift in other energy efficiency programs due to the HER Program will be estimated the same way as in previous evaluations. Uplift savings will be netted out of HER results to avoid double counting. The evaluation team will consider both uplift that occurs in CY2020 and legacy uplift from PY4 to CY2019. A key feature of the RCT design of the HER Program is that the analysis inherently estimates net savings because there are no participants who would have received the individualized reports in the absence of the program. While some customers receiving reports may have taken energy-conserving actions or

purchased high-efficiency equipment anyway, the random selection of program participants (as opposed to voluntary participation) implies that the control group of customers not receiving reports would be expected to exhibit the same degree of energy-conserving behavior and purchases. Therefore, this method estimates net savings and no further net-to-gross adjustment is necessary.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. Converted gas savings will not be calculated for this program.

Evaluation Schedule

Table 3 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 3. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Interviews with program manager and implementation contractor	Evaluation	Aug 31, 2020
Mid-year data request	Evaluation	Jul 13, 2020
Mid-year data delivery	ComEd	Aug 10, 2020
Early data characterization memo	Evaluation	Aug 31, 2020
Final data request	Evaluation	Dec 6, 2020
Final data delivery*	ComEd	Jan 30, 2021
Draft report to ComEd and SAG	Evaluation	Mar 13, 2021
Comments on draft (15 Business Days)	ComEd	Apr 3, 2021
Revised draft to ComEd and SAG	Evaluation	Apr 10, 2021
Comments on redraft (5 Business Days)	ComEd/SAG	Apr 17, 2021
Final report to ComEd and SAG	Evaluation	Apr 24, 2021

*Data will include approximately 70% of bills ending on or before December 31, 2020.

ComEd Lighting Discounts Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Residential Lighting Discounts Program provides incentives to increase the market share of qualified LED directional and specialty bulbs and fixtures sold through retail sales channels. The Lighting Discounts Program also provides educational materials to retailers to increase customer awareness and acceptance of energy-efficient lighting technologies and promote proper bulb disposal.

The primary objective of the evaluation of the Lighting Discounts Program is to quantify net savings impacts from the program. The evaluation of this program over the coming two years will include a review of the tracking databases, deemed savings reviews, verification of savings and measure-level and program-level realization rates, and estimating net program impacts. These activities are highlighted in the table below.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Impact – Net Program Savings Estimate	X	X

Coordination

Navigant will coordinate with the other utility evaluation teams on any issues relevant to this program. The approaches used by both the ComEd and Ameren Illinois evaluation teams to evaluate the programs are closely coordinated. The methods used in both evaluations are specified by the Illinois TRM and are generally consistent. Navigant will also coordinate with the Income Eligible Retail Discounts Program evaluation team on LED bulb and fixture related issues.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the level of gross annual energy (kWh) and peak demand (kW) savings induced by the program?
2. Did the program meet its energy and demand savings goals? If not, why not?
3. What are the net impacts from the program?

Process Evaluation and Other Research Topics

Navigant will not conduct process research for the program in CY2020 or CY2021. The data collection activities required for the process evaluation (Shelf Surveys and Trade Ally Interviews) will not be conducted. As a result, there will be no process related results for this program.

Evaluation Approach

The table below summarizes the evaluation task for CY2020.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking Data Review	All Program Sales	Census	Wave 1 and Final
In Depth Interviews	Program Management and Implementers	2	

Upstream Tracking System Review

The CY2020 program tracking data review will allow for the verification of rebated measure sales and analysis of the characteristics of the installed measures that drive savings (such as bulb type and wattage).

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Gross Impact Evaluation

The evaluation team will perform an engineering review of savings calculations. For all lighting measures, excluding connected LEDs, Navigant will calculate gross kWh, kW and summer and winter peak kW savings across all program bulbs based on the following equations:

Annual kWh Savings = Program bulbs * Delta Watts/1000 * Annual HOU * Realization Rate

Annual kW Savings = Program bulbs * Delta Watts/1,000 * Realization Rate

Annual Summer Coincident Peak kW Savings = Annual kW Savings * Summer Peak Load CF Factor[62]

[62] Summer Peak CF is calculated as the percentage of lighting turned on in each room during peak hours of the summer months (1-6 pm on summer weekdays).

Annual Winter Coincident Peak kW Savings = Annual kW Savings * Winter Peak Load CF[63]

Where Realization Rate = Installation Rate * (1-Leakage Rate) * Interactive Effects

For the verification analysis in CY2020, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2020 EM&V tracking database analysis.
- **Program Bulb Installation Rates** will be obtained from the IL TRM v8.0.
- **Delta Watts** will be calculated using the bulb type lumen-equivalence mapping in the IL TRM v8.0.
- **HOU and Summer Peak CF** will be obtained from both the residential and non-residential sections of the IL TRM v8.0. The non-residential HOU and Peak CF will be determined based upon the business activities conducted in the non-residential locations where program bulbs are reportedly installed.
- **Winter Peak CF** will be determined based upon analysis done by the evaluation team and presented to ComEd in a memorandum titled "Winter Peak Coincidence Factor Recommendation for Residential Lighting", dated February 2nd, 2015.
- **Residential and Non-Residential Bulb Installation** will be obtained from the IL TRM v8.0.
- **Interactive Effects** will be obtained from the IL TRM v8.0.
- **Leakage** will be obtained from the IL TRM v8.0.

Navigant will also calculate gross kWh, kW, and summer and winter peak kW savings for Connected LED measures based on values deemed in the IL TRM v8.0. Navigant will (1) review the tracking system data to ensure that all fields are appropriately populated and savings are consistent with the implementation contractor's workpapers and savings calculators that feed into the tracking system; (2) review new measures' algorithms and values in the tracking system and the implementation contractor's workpapers to ensure that they are appropriately applied; and (3) cross-check Navigant's calculated savings with the implementation contractor's calculated savings.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program in CY2020. The CY2020 EM&V NTG estimates are shown in the table below and available on the IL SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

[63] Winter Peak CF is calculated as the percentage of lighting turned on in each room during peak hours of the winter months (6-8 am and 5-7pm, between January 1 and February 28).

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Directional LED Bulbs and LED Fixtures	0.52
Specialty LED Bulbs	0.59
Connected LEDs and LED Nightlights*	0.80

*The NTG value for Connected LEDs and LED Nightlights is the default value for new measures that do not have a researched value

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Research NTG Impact Evaluation

The evaluation team will not conduct NTG research in CY2020 or CY2021. The required data collection activity (in-store intercepts) will not be conducted for these program years. As a result, no updated NTG recommendations will be made for this program.

Lifecycle Savings Estimation – Effective Useful Life Research

In addition to first year (annual) savings, ComEd will be reporting lifecycle savings in CY2020 and beyond. Lifecycle savings are calculated in the same manner as the gross and net impacts described above except that the annual savings value is then multiplied by the effective useful life (EUL) of the measure to account for savings that accrue over the lifetime of the product. In CY2020 and beyond, EULs will continue to be refined through a combination of primary or secondary research, as needed.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Federal Energy Job Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and CPAS in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the Residential Lighting Discounts Program via a RCT because the program was not designed with randomly assigned treatment and control groups. Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 provides the schedule for key deliverables and data transfer activities for the CY2020 evaluation. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. CY2020 Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Calculators/Workpapers Review	Evaluation	October/November 2019
Wave 1 CY2020 Data Request	Evaluation	May 29,2020
Wave 1 CY2020 Data Available for Ex Ante Review and Analysis	ComEd	June 30, 2020
Wave 1 CY2020 Ex Ante Review Assessment Memo	Evaluation	July 31, 2020
CY2020 Tracking system is final	ComEd	January 30, 2021
CY2020 Draft Report to ComEd and SAG	Evaluation	February 28, 2021
Comments on CY2020 Draft (15 Business Days)	ComEd	March 19, 2021
CY2020 Revised Draft Report to ComEd and SAG	Evaluation	March 26, 2021
Comments on Revised Draft (5 Business Days)	ComEd	April 1, 2021
CY2020 Final Report to ComEd and SAG	Evaluation	April 10, 2021

ComEd Multi-Family Market Rate Program CY2020 to CY2021 Evaluation Plan

Introduction

The Multi-Family Market Rate Program is jointly implemented by ComEd and Nicor Gas Company, and ComEd and Peoples Gas (PGL) and North Shore Gas (NSG) companies. Franklin Energy is the implementation contractor for the joint program. Franklin Energy staff install various energy-saving measures, which may include LEDs in tenant units, water-saving devices, programmable thermostats, pipe insulation, and LEDs in common area screw-in fixtures. The program further provides Energy Efficiency Service Provider (EESP) installs in common areas and exterior areas for lighting retrofits and gas measures, such as pipe wrap. Measures not covered by the Multi-Family Market Rate Program are transferred as leads to other programs.

The Multi-Family Market Rate Program serves as a "one stop shop" to multi-family building owners and managers to generate electricity and natural gas savings throughout the property. Program components include:

- Electric and gas energy assessments and provision of educational information.
- Information to building owners and managers as part of the assessment that explains how they can self-register for Business Energy Analyzer (BEA).
- Direct installation of electric and gas saving measures in tenant and common area spaces.
- EESP installation of electric and gas saving measures at no cost to customer, following agreed upon program pricing.

The primary objectives of the CY2020 evaluation are to quantify gross and net savings impacts from the program. The evaluation of this program over the coming two years will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2020	CY2021
Tracking System Review	X	X
Data Collection – Building Owner and Property Manager Surveys		X
Data Collection – Program Manager and Implementer Interviews	X	X
Impact – Engineering Review	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X
Net-to-Gross		X
Process Analysis		X

The evaluation team determined the evaluation approach for the 2020-2021 period based upon the needs of the program and program's history. The two-year evaluation approach for this program is based on the following:

- Annual gross and net impact analysis
- Calculating Cumulative Persisting Annual Savings (CPAS) based upon the requirements of Future Energy Jobs Act (FEJA)

Coordination

Navigant will coordinate with the evaluation teams for other utilities on any issues relevant to this joint program. Specifically, the ComEd NTG research activities and timeline will be coordinated with similar research to be conducted by the Peoples and North Shore Gas, and the Nicor Gas Multi-Family programs. The joint program evaluations and reporting timelines will be the same.

In addition, Navigant will coordinate with the evaluation team for Ameren regarding research topics in their Multifamily initiative, such as on-site verification for advanced power strip in-service rates.

Evaluation Research Topics

The CY2020 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual verified gross savings?
2. What are the program's annual verified net savings?
3. What are the program's CPAS?
4. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Notes
Tracking System Review	Tracking system	Census	
In Depth Interviews	Program Management and Implementers	2	
Gross Impact	Data Review and Analysis	Census	Wave 1 and Final Data†
Verified Net Impact	Calculation using deemed NTG ratio	Census	

† Navigant will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.

Tracking System Review

The tracking system review, concurrent with the start of the impact analysis cycle, serves two key purposes. Primarily, it ensures that the fields provided in the tracking data are sufficient for the evaluation team to calculate savings for the targeted measures. Additionally, this review helps guarantee that the tracking data is consistent with the program's data in eTRACK.

Program Management and Implementer Interviews

We will conduct in-depth interviews with program managers and implementation contractors to understand current program design and status as well as the program's plan for the future. This will be done so that the evaluation team can evaluate the program with a solid understanding of the program.

Key insights from in-depth interviews will inform impact analysis through a discussion of yearly program changes and will inform future process evaluation research topics. These interviews and meetings will also focus on findings and recommendations from Wave analyses to help ComEd and the implementation contractor plan for final reporting.

Gross Impact Evaluation

The Multi-Family Market Rate Program savings verification will be completed using the Illinois TRM (v8.0) or secondary research for any measure with custom savings inputs. Gross savings will be evaluated primarily by (1) reviewing the tracking system data to ensure that all fields are appropriately populated; (2) reviewing measure algorithms and values in the tracking system to assure that they are appropriately applied; and (3) cross-checking totals. This approach will be supplemented where possible with a review of project documentation in each program year to verify participation; installed measure quantities; and associated savings. Verified gross savings will be estimated by multiplying deemed per unit kWh savings by the verified quantity of eligible measures.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program. Table 3 provides the recommended NTG ratios for use in CY2020.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
LED Linear (CA)	0.96
LED Omnidirectional	0.67
LED Specialty	0.82
Controls (IU)	0.83
Fluorescent Delamping (CA)	0.83
Showerhead	1.03
Bathroom Faucet Aerator	1.03
Kitchen Faucet Aerator	1.03
Programmable Thermostat (Direct Install)	0.86
Programmable Thermostat (Comprehensive)	0.85
Reprogram Thermostat	0.86
Advanced Power Strip (Tier 1)	0.94
Advanced Power Strip (Tier 2)	0.83
DHW Pipe Insulation	0.83
Other, Direct Installed In-Unit	0.83
Occupancy Sensor Lighting Control	0.83
LED Exit Sign	0.83
Beverage and Snack Control	0.83
Other, Direct Installed in Common Area	0.83

Source:
http://ilsagfiles.org/SAG_files/NTG/2020_NTG_Meetings/Final_NTG_Ratios/ComEd_NTG_History_and_CY2020_Recs_Final_2019-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial (RCT) and Quasi-Experimental Design (QED)

Navigant is not evaluating the Multi-Family Market Rate Program via a RCT because the program was not designed with randomly assigned treatment and control groups. Navigant is not using QED consumption data because this program contains many unique measures with significant cross-participation. In this case, QED consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Table 4 provides scheduling details for key impact evaluation deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Program Calculators and Workbook Review	ComEd	October/November 2019
Program Manager, Implementer Interviews	Evaluation Team	TBD
CY2020 Wave 1 Tracking Data Request	Evaluation Team	June 1, 2020
CY2020 Wave 1 Tracking Data	ComEd	June 30, 2020
Wave 1 data review and analysis memo	Evaluation Team	August 31, 2020
Final CY2020 Tracking Data to Navigant	ComEd	January 30, 2021
Draft Report to ComEd and SAG	Evaluation	March 5, 2021
Comments on draft (15 Business Days)	ComEd and SAG	March 25, 2021
Revised Draft by Navigant	Evaluation Team	April 1, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 7, 2021
Final Report to ComEd and SAG	Evaluation Team	April 16, 2021

APPENDIX E. PILOTS

ComEd Adsorbent Air Cleaner Pilot CY2020 Evaluation Plan

Introduction

The Adsorbent Air Cleaner pilot saves energy through reducing energy use in conditioning outdoor air. The technology adsorbs gas-phase contaminants from ventilation air, allowing outside air intake to be reduced. Phase I of the pilot developed energy models for technology deployment, completed a Provisional Measure TRM workpaper, and performed outreach for a field study. Phase II of the pilot secured an agreement to participate with a commercial building customer and will evaluate energy usage as well as other non-energy benefits including indoor air quality.

The version 8 of the Illinois statewide Technical Reference Manual (TRM) includes deemed normalized electric savings factors for five climatic zones for different combinations of ventilation and air-conditioning systems such as conventional variable air volume systems and dedicated outdoor air systems.

This evaluation plan describes the proposed methods Navigant will use to evaluate the energy savings from the Adsorbent Air Cleaner Pilot. A secondary objective of this evaluation is to develop a robust and consistent methodology to evaluate energy savings from future installations of this measure. This pilot's evaluation includes several data collection and analysis activities for a single demonstration building. The evaluation includes an engineering analysis, and analysis of site data from the pilot implementer. Additionally, Navigant will provide recommendations on the applicability of the TRM measure to various building types.

The table below summarizes Navigant's evaluation activities for this pilot.

Table 1. Evaluation Activities

Tasks	CY2020
Engineering Review	X
Data Collection – Data Request from Implementers	X
Impact – Engineering Analysis	X
Impact – TRM Whole Building Energy Model Review	X

Evaluation Research Topics

The evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the pilot's total verifiable gross savings based on pilot activities extrapolated to the extent possible based on the data provided by Slipstream?
2. What are the pilot's verifiable net savings?
3. What are the deemed savings factors for the different climate zones and combinations of HVAC systems?
4. What is the appropriate baseline for the pilot project?

5. What is the applicability to the pilot building of the whole building energy models used to develop TRM savings?

Evaluation Approach

The table below summarizes the evaluation tasks including data collection methods, data sources, and timing that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities and Analysis

Activity	Target	Timeline	Notes
Baseline Determination	Information from the site including AC and ventilation equipment installed in the building and the building's pre-project ventilation airflow requirements	Summer 2019 – December 31, 2019	
Reviewing whole building energy models that informed TRM workpaper	Algorithms used to calculate measure savings.	October/November 2019	
Engineering Data Collection	Information from the site, e.g., previously installed HVAC systems, model information of adsorbent air cleaners to be installed and any pre-treatment and post-treatment measurement data, duct system modifications, and sequence of operation changes available from the implementers.	May 2019 – Feb 2020	To enable ComEd to claim summer and winter savings from this measure, the implementer should meter the post-treatment system during the winter through Feb 2020 to capture both cooling and heating seasons. The Navigant verified savings for the pilot will be based on available information, extrapolated to the extent possible within the bounds of building seasonal operation.

Gross Impact Evaluation

As discussed previously, Navigant plans to conduct the evaluation analysis of this pilot measure using an independent engineering analysis.

The engineering study is contingent on receipt of site and equipment-specific data, including any relevant engineering parameters recorded by the implementers while installing the equipment.

Engineering Analysis

As part of the engineering analysis, Navigant will request data on HVAC equipment installed in the building and the building's pre-project ventilation airflow requirements. Leveraging information gathered from implementers and pilot participant, Navigant will determine the operational aspects of the air adsorbent cleaner and calculate the estimated energy savings within the bounds of the available data, and industry standard impact evaluation methods which allow extrapolation appropriate to the building operating mode for which the data was collected.

In particular, Navigant expects that the operation of the adsorbent air cleaner system, and relevant HVAC system air temperature setpoints, will vary widely between summer and winter seasons.

Baseline Determination

Since this measure includes technology that affects indoor air quality, it is unlikely that the measure would be replicated by assembling purchased components. Therefore, using the pre-existing equipment is a viable baseline for this pilot. Navigant will consider whether using the impact baseline characterization of pre-existing equipment may require a sunset clause if this technology starts to become available using build up components.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio recommended by Navigant for the pilot.

Table 3. Deemed NTG Values for CY2020

Program Measure	CY2020 Deemed NTG Value
Adsorbent Air Cleaner	1.00

Source: Memo forthcoming in fall 2019.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Provide cooling interim report for review	ComEd	December 15, 2019
Review and comment on cooling interim report	Evaluation	January 10, 2020
Final project data provided by Slipstream	ComEd	March 31, 2020
Engineering Analysis	Evaluation	April 2020
Preliminary Results Findings Discussion and TRM Work Paper Review	Evaluation, ComEd, IC	May - June 2020
SubmitTRM Work Paper	IC	May 15, 2020
Internal Report Draft by Navigant	Evaluation	Fall, 2020
Draft Report to ComEd and SAG	Evaluation	December 11, 2020
Comments on draft (15 Business Days)	ComEd and SAG	January 4, 2021
Revised Draft by Navigant	Evaluation	February 5, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	February 12, 2021
Final Report to ComEd and SAG	Evaluation	February 26, 2021

ComEd Commercial Geothermal Advancement Pilot CY2020 Evaluation Plan

Introduction

The ComEd Commercial Geothermal Advancement (CGA) Pilot supports commercial and light industrial geothermal or ground-source heat pump installations in ComEd's service territory. AECOM, the Energy Resources Center at the University of Illinois at Chicago, and the Geothermal Alliance of Illinois are implementing the pilot. The CGA Pilot's goal is to increase the market penetration of commercial and light industrial geothermal systems, and to make these installations cost-effective and long-lasting energy efficiency upgrades.

Navigant understands the CGA Pilot targets specific types of commercial geothermal systems (e.g. closed ground loops) and does not include new construction projects. The CGA Pilot incentive is $1,000 per ton. The implementers estimated that the average commercial geothermal system participating in the pilot would be 5-20 tons though larger and smaller systems could apply. The CGA Pilot incentivized four building retrofit projects during CY2019.

The evaluation's objectives include: (1) determine customers satisfaction with the Pilot and the role of the incentive in their participation (2) determine barriers to participation by interviewing customers who started but did not complete the application process for the Pilot. This evaluation will not include estimating savings.

Impact Evaluation Objectives

Due to the limited number of projects in this Pilot, Navigant will not conduct an impact evaluation.

Process Evaluation Objectives and Approach

Process evaluation activities will seek reasons why potential participants decided not to continue their applications to the Pilot as well as reasons why participants did complete their applications and their overall satisfaction with the CGA Pilot. The process research will address the following questions:

1. What are the participants' perspectives and overall satisfaction with the CGA Pilot?
2. What are the barriers to participation in the CGA Pilot?

To collect information and feedback about the CGA Pilot, Navigant will conduct open-ended phone interviews with several different market actors. Separate interview guides will be developed for:

- Pilot participants
- Customers who expressed interest in the Pilot, but did not become participants
- Implementors
  - AECOM,
  - the Energy Resources Center at the University of Illinois at Chicago, and
  - Geothermal Alliance of Illinois
- ComEd Pilot manager

Navigant will provide these interview guides for review by ComEd prior to the first interview. Results will be compiled into a process evaluation report.

Evaluation Activities and Schedule

The table below summarizes the evaluation tasks including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes	Timeline
In Depth Interviews	Pilot Management and Implementers	2	Fall 2019
Researched Process	Telephone Survey with Participating Customers	Census	Fall 2019
Researched Process	Telephone Survey with Prospective Participants	Census	Fall 2019
Researched Process	Telephone Interviews with Trade Allies, Pilot managers, and implementers	Census	Fall 2019

The table below provides the schedule for key deliverables and data transfer activities. Adjustments will be made as needed as evaluation activities progress.

Table 3. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Interview guides ready for ComEd review	Evaluation	September 2019
Draft Process Evaluation Report to ComEd and SAG	Evaluation	Q1 2020

ComEd Upstream Commercial Food Service Equipment Pilot CY2020 Evaluation Plan

Introduction

In CY2019, ComEd, Nicor Gas and Peoples Gas and North Shore Gas launched an Upstream Food Service Equipment Pilot. These products have seen limited participation and savings within downstream programs. ComEd, Nicor Gas, Peoples Gas and North Shore Gas hope to increase participation and savings by moving up the supply chain and involving manufacturers and distributors as well as end users in the pilot. Purchasing decisions for food service equipment are largely influenced by first costs and by distributor stocking practices which make them good candidates for an upstream pilot.

The Upstream Commercial Food Service Equipment (CFSE) Pilot represents the first stage of a proposed multi-year pilot offering by ComEd, Nicor Gas, Peoples Gas and North Shore Gas (referred to as the "Utilities"). [This first stage was planned as an 18-month pilot beginning in February 2019 and concluding in July 2020. However, the pilot did not launch until September 2019 and currently the end data is unknown.] The goal of the pilot is to increase the uptake of energy efficient commercial food service (CFS) equipment among Chicagoland food service operators (referred to as "end users" or "utility customers") through the utilization of point-of-sale (POS) customer rebates, upstream incentives, and a simplified administrative process. The goal of the pilot is to ease barriers to efficient equipment uptake by end users, thereby reducing gas and electricity usage in the CFS sector; the goal of the pilot is to gauge the potential for this implementation approach and refine it for full program implementation. This pilot emphasizes the importance of an upstream incentive approach as well as streamlining administration to help ensure success[64].

The table below shows the activities related to this evaluation plan.

Table 1. Evaluation Approaches

Tasks	CY2020
Energy Savings Analysis	x
Net to Gross Secondary Research and Analysis	x
Review Baseline Projections	x

This evaluation plan pertains primarily to the quantitative verification of pilot savings for efficient CFS equipment. In addition to the pilot's short-term goal of generating savings through incenting efficient equipment, the pilot's long-term goal is to transform the market for energy efficient CFS equipment. In order to achieve this long-term objective, the pilot will be re-designed during its 18-month implementation to optimize market transformation impacts. Measurement of long-term market effects requires the establishment of a market baseline and a projection of this baseline looking forward. Navigant, in conjunction with the pilot administrator, implementer, and designer (ComEd, Gas Technology Institute (GTI), Frontier, Resource Innovations (RI) and Northwest Energy Efficiency Alliance (NEEA)) will establish a baseline by identifying market progress indicators that will serve to quantify changes to the structure and function of the market compared to if there were no pilot. Navigant will develop a market progress evaluation plan appropriate to the market transformation objectives at a later date.

[64] Excerpted from "CNP Upstream Commercial Food Service Pilot Program: Implementation Plan" December 2018. Prepared by Frontier Energy for Gas Technology Institute.

Evaluation Topics

This evaluation will seek to answer the following key researchable questions:

1. What are the gross and net energy and peak demand savings in CY2020 for this upstream pilot?
2. How can this pilot be optimized in order to transform the market for commercial food service equipment?

Evaluation Approach

The following subsections summarize the evaluation tasks that Navigant will complete to verify CY2020 pilot savings. The detailed plan outlines activities for this research in four tasks as summarized in Table 2.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes CY2020	Timeline	Notes
Impact analysis	Program data	Census	Jan – April 2021	Impact analysis using sales data and TRM savings algorithms
Net to gross development	Establish proxy for NTG or use default	Literature review	Q2, 2020	Secondary research on NTG for upstream programs
Review baseline development	Current market status	Approximately six market indicators	TBD when the planners and implementers are ready	Collaborative work to review pilot theory, logic model and market baseline Establish market progress indicators and associated data sources
In depth interviews	Pilot managers, implementers and distributors	20	Second half of 2020	At or near the pilot conclusion

Impact Evaluation

Gross Impact Evaluation

Navigant will use a sales data analysis of the pilot to determine savings. We will use pilot tracking data and sales data from the participating market actors (food service equipment distributors) which will include equipment and customer information. Customer demographic data is necessary to confirm that each unit is installed within the utility service area. We will utilize the savings values and algorithms from the Illinois Technical Reference Manual (IL TRM) to develop energy savings estimates for each equipment type.

Based on the report[65] prepared by GTI, food service equipment includes steam cookers, convection ovens, combination ovens, conveyor ovens, rack ovens, fryers, griddles, rotisserie ovens, broilers and

[65] CNP Upstream Commercial Food Service Pilot Program: Phase I.pdf, October 2018.

others. The IL TRM lists energy savings calculation equations for these and other food service equipment. The inputs to these equations are the primary equipment specifications, such as input energy rate of the efficient and baseline cases, annual operating hours, and duty cycle (If these key parameters are unknown, the TRM also provides default values). Navigant will request the necessary tracking/sales data that contains the key parameters of the equipment and customer information.

Net Impact Evaluation

As the pilot is new and small, and its success and longevity are yet unknown, Navigant will conduct secondary research on NTG for this pilot. We will perform a literature review for NTG values for upstream programs in similar regions to find a reasonable proxy. If none exist, we will use the default NTG of 0.8.

Pilot Management and Implementer Interviews

The evaluation team will interview the pilot manager about marketing and processes to better understand the goals of the pilot, implementation, and perceived effectiveness. The evaluation team will also interview participating distributors to better understand how the pilot met its goals.

Derivation of Market Transformation Impacts

To help develop a robust market transformation evaluation framework, Navigant will review the pilot's theory and logic model that is being revised by RI and NEEA. The logic model will be used to identify market transformation indicators that can be tracked and measured. Tracking market transformation indicators will allow ComEd to monitor where they are transforming the market and enacting change.

The following activities will be conducted to support the establishment of this market transformation evaluation framework.

Pilot's Theory and Logic Model

Navigant will review the pilot's theory and logic model (PTLM) currently being revised by NEEA and RI. Pilot logic model diagrams show the intended linkages between activities, outputs and outcomes, identify potential external influences and barriers as well as strategies to overcome them.

Methodology for Tracking Market Transformation Metrics

NEEA and RI will develop a model for establishing a market baseline projection. Navigant will review the model and inputs and assumptions and provide feedback.

The baseline will be used in future evaluation years to measure market transformation progress over time as a result of the pilot's activities.

Evaluation Schedule

Table 3 below provides the schedule for key deliverables and activities. Exact timing of evaluation activities is contingent on the Pilot implementation timing. Timing adjustments will be made, as needed, as implementation and evaluation activities progress.

Table 3. Schedule

Activity	Responsible Party	Date Delivered
In depth interviews with PM, implementers and distributers	Navigant	Q3 and Q4 of 2020
NTG secondary research	Navigant	With final impact report
Receive tracking data	ComEd	January 31, 2021
Impact analysis	Navigant	February 2021
Draft impact evaluation report to ComEd, Nicor Gas, Peoples Gas, North Shore Gas, and SAG	Navigant	March 5, 2021
Comments on draft	ComEd	March 26, 2021
Revised draft	Navigant	April 9, 2021
Comments on revised-draft	ComEd	April 16, 2021
Final impact evaluation report to ComEd, Nicor Gas, Peoples Gas, North Shore Gas, and SAG	Navigant	April 23, 2021
Review baseline projection and associated inputs and assumptions	Navigant	TBD, contingent on RI/NEEA timing
Identify Data Collection Needed for establishment of market baseline projection	Navigant	TBD, contingent on RI/NEEA timing

ComEd Income Eligible Program Design Pilot CY2019 and CY2020 Evaluation Plan

Introduction

ComEd launched the Income Eligible Program Design Pilot (Pilot) to determine if engaging new income eligible market providers and trade allies would catalyze greater program participation and reduce program delivery costs. The aim of this Pilot is to define a framework for scalable program delivery through dedicated market providers and trade allies to create deeper savings, improved delivery and lower delivery costs for the income eligible weatherization offering. The Pilot is implemented in two phases by Franklin Energy. Franklin Energy researched, designed and executed multiple implementation projects incorporating different combinations of housing stock, measures, market providers, and included services (audits, direct install, and weatherization). The first phase of the Pilot involves research and assessment of the housing stock and potential market providers within ComEd's service territory as well as the creation of an onboarding packet and an implementation plan for Pilot partners. In phase two, the Pilot team will select program design models to test out in three to four communities in ComEd territory . Franklin Energy will work with local trade allies and new market providers to identify up to 25 customer sites that meet the needs of each Pilot group, then complete the installations and monitor established metrics throughout the process. The Pilot will install measures in CY2019 and CY2020.

The Pilot seeks to answer this primary research question:

- Can engaging new income eligible market providers and trade allies catalyze greater program participation and reduce program delivery costs?

A sub-question asks:

- Are there modifications to the current program design of ComEd's Chicago Bungalow Association program that can be made that will result in deeper and/or more cost-effective savings for ComEd customers?
-

The evaluation of this Pilot will focus on the impact of the Pilot and will include data collection, data review, and analysis activities, including those in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2019	CY2020
Tracking System Review	X	X
Data Collection – Pilot Manager and Implementer Interviews	X	X
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X

Evaluation Research Topics

The CY2019 and CY2020 evaluations will seek to answer the following key researchable questions:

Impact Evaluation

5. What are the Pilot's verified gross savings?
6. What are the Pilot's verified net savings (first year and lifetime)?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2019 and CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes	Timeline	Notes
Tracking System Review	Tracking system	Census	February	2020 and 2021
In Depth Interviews	Pilot Management and Implementers	3	January - February 2020	
Verified Gross Impact	Calculation using deemed NTG ratio	NA	January - April	2020 and 2021

Tracking System Review

Navigant will review final tracking data for CY2019 and CY2020.

Verified Net Impact Evaluation

Since this Pilot is for income eligible customers the NTG ratio is 1.0 as approved by the Stakeholder Advisory Group (SAG).

Table 3. Deemed NTG Values for CY2019 and CY2020

Pilot Measure	CY2019 and CY2020 Deemed NTG Value
All measures	1.0

Source:
http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2019_Recommendations_2018-10-01.xlsx

Pilot Management and Implementer Interviews

The evaluation team will interview the Pilot manager to better understand the goals of the Pilot, implementation, and perceived effectiveness. The evaluation team will also interview the implementation team to better understand the Pilot's implementation.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the Pilot and the cumulative persisting annual savings (CPAS) in CY2019 and CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Use of Randomized Controlled Trial and Quasi-Experimental Design

We are not evaluating the Pilot via a randomized controlled trial because the Pilot was not designed with randomly assigned treatment and control groups. We are not using quasi-experimental design consumption data because this Pilot contains many unique measures with significant cross-participation. In this case, quasi-experimental consumption data analysis would produce savings estimates for bundles of commonly-installed measures, rather than for each measure individually, which is not the desired output for analysis.

Evaluation Schedule

Tables 4 and 5 below provide the schedules for CY2019 and CY2020 deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – CY2019 Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2019 Pilot tracking data	ComEd	January 30, 2020
Internal Report Draft by Navigant	Evaluation	February 24, 2020
Draft Report to ComEd and SAG	Evaluation	February 28, 2020
Comments on draft (15 Business Days)	ComEd and SAG	March 20, 2020
Revised Draft by Navigant	Evaluation	March 27, 2020
Comments on redraft (5 Business Days)	ComEd and SAG	April 3, 2020
Final Report to ComEd and SAG	Evaluation	April 10, 2020

Table 5. Schedule – CY2020 Deadlines*

Activity or Deliverable	Responsible Party	Date Delivered
CY2020 Pilot tracking data	ComEd	TBD
Internal Report Draft by Navigant	Evaluation	TBD
Draft Report to ComEd and SAG	Evaluation	TBD
Comments on draft (15 Business Days)	ComEd and SAG	TBD
Revised Draft by Navigant	Evaluation	TBD
Comments on redraft (5 Business Days)	ComEd and SAG	TBD
Final Report to ComEd and SAG	Evaluation	TBD

*Based on current information on the Pilot's implementation, Navigant anticipates receiving CY2020 final tracking data in Q2 of CY2020. We anticipate delivering the final report to ComEd and SAG in Q3 within 90 days of receiving final CY2020 final tracking data.

ComEd Savings for Income Eligible Seniors Pilot CY2019 and CY2020 Evaluation Plan

Introduction

ComEd launched the Saving for Income Eligible Seniors pilot (Pilot) to test an approach aimed at providing greater access to energy efficiency measures for income eligible senior customers. The Pilot is implemented by CLEAResult, Green Home Experts and AgeOptions (the Illinois Department on Aging). The implementors work with social services agencies to engage income eligible ComEd customers aged 60 and older (income eligible seniors) and describe the pilot and obtain permission to install energy efficiency measures in their homes. Technicians install a suite of measures, when possible, including weather stripping, door sweeps, caulking, smart thermostats, LED lamps, and LED nightlights.

The Pilot seeks to answer the following research questions:

- Does engaging caseworkers and member agencies working with income eligible senior customers increase access and remove barriers for these customers to accessing energy efficiency measures?
- How does the cost of acquisition and quantity of savings from senior income eligible customers compare to that of other income eligible programs?
- Can agencies implementing the ComEd Low Income Home Energy Assistance Program (LIHEAP) successfully direct customers who did not qualify for LIHEAP to other programs?

The evaluation of this Pilot will focus on the impact of the pilot and will include data collection, data review, and analysis activities, including those in the following table.

Table 1. Evaluation Approaches – Two Year Plan

Tasks	CY2019	CY2020
Tracking System Review	X	X
Data Collection – Pilot Manager and Implementer Interviews	X	
Impact – Measure-Level Deemed Savings Review	X	X
Impact – Verification & Gross Realization Rate	X	X

Evaluation Research Topics

The CY2019 and CY2020 evaluations will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the Pilot's verified gross savings?
2. What are the Pilot's verified net savings (first year and lifetime)?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2019 and CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Timeline

Activity	Target	Target Completes	Timeline
Tracking System Review	Tracking system	Census	February 2020 & 2021
In Depth Interviews	Pilot Management and Implementers	2	January 2020
Gross Impact	Measure-Level Deemed Savings Review	EOY Data	January – April 2020 & 2021
Verified Gross Impact	Verification & Gross Realization Rate	EOY Data	January – April 2020 & 2021

Tracking System Review

Navigant will review final tracking data for CY2019 and CY2020. This review will consist of verification that the tracking data includes all necessary measure parameters needed to accurately evaluate ex post savings. Any missing inputs needed for conduction the evaluation will be identified and flagged.

Gross Impact Evaluation

The pilot's savings verification will be based on using the TRM v8.0. Gross savings will be evaluated primarily by: (1) reviewing the tracking system data to ensure that all fields are appropriately populated; (2) reviewing measure algorithms and values in the tracking system to ensure that they are appropriately applied; and (3) cross-checking totals. The impact evaluation will quantify gas measures eligible for kWh conversion and review the parameters ComEd used to estimate eligible gas savings.

Verified Net Impact Evaluation

Since this Pilot is for income eligible customers, the NTG ratio is 1.0 as approved by the Stakeholder Advisory Group (SAG).

Table 3. Deemed NTG Values for CY2019 and CY2020

Pilot Measure	CY2019 and CY2020 Deemed NTG Value
All measures	1.0

Source:
http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Final_Values/ComEd_NTG_History_and_CY2019_Recommendations_2018-10-01.xlsx

Calculation of Cumulative Persisting Annual Savings (CPAs) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the Pilot and the cumulative persisting annual savings (CPAS) in CY2019 and CY2020 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

Pilot Management and Implementer Interviews

To better understand the goals of the Pilot, implementation, and perceived effectiveness, the evaluation team will interview the Pilot manager about the pilot's design and implementation, and any changes that have occurred. The evaluation team will also interview the implementation team to better understand how the Pilot is meeting its goals.

Evaluation Schedule

Table 4 below provide the schedules for CY2019 and CY2020 deliverables and data transfer activities. (See Table 2 for other schedule details.) Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – CY2019 Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2019 Pilot tracking data	ComEd	January 30, 2020
Internal Report Draft by Navigant	Evaluation	March 6, 2020
Draft Report to ComEd and SAG	Evaluation	March 12, 2020
Comments on draft (15 Business Days)	ComEd and SAG	April 4, 2020
Revised Draft by Navigant	Evaluation	April 10, 2020
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2020
Final Report to ComEd and SAG	Evaluation	April 24, 2020

Table 5. Schedule – CY2020 Deadlines

Activity or Deliverable	Responsible Party	Date Delivered *
CY2020 Pilot tracking data	ComEd	TBD
Internal Report Draft by Navigant	Evaluation	TBD
Draft Report to ComEd and SAG	Evaluation	TBD
Comments on draft (15 Business Days)	ComEd and SAG	TBD
Revised Draft by Navigant	Evaluation	TBD
Comments on redraft (5 Business Days)	ComEd and SAG	TBD
Final Report to ComEd and SAG	Evaluation	TBD

*Navigant anticipates completing the Final CY2020 Report to ComEd and SAG within 90 days of receiving final CY2020 final tracking data.

APPENDIX F. Cross-Cutting Research Evaluation Plans

ComEd Voltage Optimization Program CY2020 to CY2021 Evaluation Plan

Introduction

The ComEd Voltage Optimization (VO) Program comprises ComEd's plan to install hardware and software systems on a significant fraction of its electric power distribution grid to achieve voltage and reactive power optimization (volt-var optimization, or VVO) over the 2018-2025 time frame. VVO is a smart grid technology that uses distributed sensors, two-way communications infrastructure, remote controls on substation transformer load-tap changers (LTCs) and capacitor banks, and integrating and optimizing software to flatten voltage profiles and lower average voltage levels on an electric power distribution grid. ComEd is working with an automation-optimization hardware and software vendor[66] to implement the VO Program on selected parts of its distribution grid over the 2018-2025 period. This Evaluation Plan covers the third and fourth years (CY2020 and CY2021) of the planned VO Program roll-out and is based on the program description provided in ComEd's 2018-2021 Portfolio Plan[67] as well as ongoing discussions with ComEd's VO implementation team.

The primary objectives of the CY2020 evaluation of the VO Program will be to prepare a TRM work paper containing findings and recommendations for measuring VO savings to the Illinois Stakeholder Advisory Group (SAG) for inclusion in the next version of the Illinois Technical Reference Manual (IL-TRM V9.0) and then to quantify the net savings impacts of the program[68] using the same method as proposed for IL-TRM V9.0. The evaluation of this program will include a variety of data collection and analysis activities, including those shown in Table 1.

Table 1. Evaluation Approach – Two Year Plan

Tasks	CY2020	CY2021
Tracking system review	X	X
Data collection – program manager and implementer interviews*	X	X
Data collection – AMI and SCADA data from VO substations/feeders†	X	X
Impacts – measure net savings impact of VO in affected feeders	X	X
TRM research – develop method for measuring future VO impacts‡	X	

* These activities will be in the context of ongoing periodic meetings with the VO implementation team.
† SCADA and AMI data will be collected for feeders on which VO is installed during CY2020 and CY2021 and will be used (in combination with analytical models estimated using previously-received CY2018-19 data) to measure impacts.
‡ Navigant will submit findings and recommendations concerning VO EM&V to the IL SAG in a work paper for the IL TRM V9.0.

Coordination

Ameren Illinois is implementing a similar program and Navigant will coordinate with the Ameren evaluation, as well as with ICC staff, on issues relevant to measurement and verification of VO impacts. Navigant staff are involved in the evaluation of both utilities' programs and will identify and report on opportunities for collaboration, as well as any substantive differences in approach, when and as they arise.

[66] Open Systems International (OSI) of Medina, Minnesota.
[67] "Commonwealth Edison Company's 2018-2021 Energy Efficiency and Demand Response Plan," June 30, 2017, pp. 192-195.
[68] Since VO is not a customer-facing program and requires no actions by any affected ComEd customers, free-ridership and spillover are not relevant, implying that net and gross impacts are identical.

Evaluation Research Topics

The evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's incremental and cumulative persistent annual verified energy savings?
2. What are the program's incremental and cumulative peak demand reductions?
3. Other topics:
   a) What voltage reductions did the program achieve?
   b) What are the effects of season, time of day, day-type, and feeder characteristics on the program's energy and demand savings?

Process and Net-to-Gross Research

Navigant will not do a formal process evaluation of this program. To the extent that we identify opportunities for improvement through the normal course of our research, we will report them to ComEd. The VO Program requires no actions by any affected ComEd customers, so net and gross impacts are identical; thus, net-to-gross research is not required.

Evaluation Approach

ComEd, Ameren, Navigant, Opinion Dynamics, Illinois Commerce Commission (ICC) staff, and interested stakeholders have agreed to a proposed approach for IL-TRM V9.0 which would replace the single deemed CVR factor value approved for CY2019 (i.e., 0.8) with a set of multiple CVR factors, arranged in a set of lookup tables, that reflect variations based on a subset of feeder characteristics. Section II.8 of the Parties' Stipulation Agreement in ICC Docket No. 19-0580 states that the method used to evaluate CY2020 will be the same as that proposed for IL-TRM V9.0. As such the method to evaluate CY2020 will not be finalized until the IL-TRM V9.0 measure is. Therefore, this section presents our current approach with the understanding that it may be modified as we go through the IL-TRM update process.

Table 2 below summarizes the evaluation tasks for CY2020 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

Table 2. Evaluation Plan Summary for CY2020

Activity	CY2020
Target sample size (# of Test Feeders)	Census of VO-enabled feeders
Data collection (SCADA, AMI, tracking data, events log)	Census of VO-enabled feeders
Gross impacts evaluation	TBD
Program manager interviews / review materials	Yes

Gross Impact Evaluation

Navigant's proposed CVR factor approach for evaluation of the CY2020 VO energy impacts for ComEd and submission to the IL-TRM V9.0 generalizes the stipulated CVR factor EM&V methodology agreed to

by the Parties for CY2019 EM&V. Navigant proposes improving the accuracy of the currently-deemed single CVR factor by estimating multiple CVR factors to reflect how VO impacts vary empirically across feeder types depending on easily-measured feeder characteristics. Navigant's proposal consists of two basic steps:

1. Employing regression analysis to estimate feeder-specific VO energy savings and voltage reductions using feeder-level interval on/off test data from each feeder and using these results to develop a set of feeder-specific CVR factors
2. Employing a cross-sectional regression model to develop CVR factor lookup tables from the feeder-specific CVR factors

Each of these steps is described in the remainder of this section. Note that these descriptions reflect Navigant's current proposal but the details may change through the IL-TRM process.

Regression Analysis to Estimate Feeder-Specific VO Impacts and CVR Factors
The regression models used to estimate the feeder-specific VO impacts on energy usage and voltage would be of the forms shown in Equation 1 and Equation 2.

Equation 1. VO Load Model

$$MW_{it} = \alpha_{MW} VO_{it} + \sum_{h=1}^{24} \beta_h \overline{MW}_{WD,h} + \sum_{h=1}^{24} \gamma_h \overline{MW}_{WE,h} + \delta CDH_{it} + \theta CDH_{it}^2 + \rho HDH_{it} + \varphi HDH_{it}^2 + \varepsilon_{it}$$

Equation 2. VO Voltage Model

$$kV_{it} = \alpha_{kV} VO_{it} + \sum_{h=1}^{24} \beta_h \overline{kV}_{WD,h} + \sum_{h=1}^{24} \gamma_h \overline{kV}_{WE,h} + \delta CDH_{it} + \theta CDH_{it}^2 + \rho HDH_{it} + \varphi HDH_{it}^2 + \omega_{it}$$

where:

- i and t index the feeder and time interval, respectively, while h indexes each of the 24 hours of the day
- VO_{it} is an indicator equal to 1 when the VO system is engaged ("on") and 0 otherwise
- $\overline{MW}_{WD,h}$ and $\overline{MW}_{WE,h}$ are the average MW for feeder i in hour-of-day h prior to VO installation on weekdays and weekends, respectively
- $\overline{kV}_{WD,h}$ and $\overline{kV}_{WE,h}$ are the average measured voltage for feeder i in hour-of-day h prior to VO installation on weekdays and weekends, respectively
- CDH_{it} and CDH_{it}^2 are cooling degree-hours, base 65°F, and its square to capture (possibly nonlinear) impacts of temperature on cooling load
- HDH_{it} and HDH_{it}^2 are heating degree-hours, base 65°F, and its square to capture (possibly nonlinear) impacts of temperature on heating load
- ε_{it} and ω_{it} are the random error terms for the load and voltage models, respectively

Note that in both equations, fitting the model to on/off testing data for a given feeder will yield a value for the α coefficient on the VO_{it} indicator that will be an estimate of the average hourly load reduction (in Equation 1) or voltage reduction (in Equation 2) from VO being engaged on that feeder. These estimates can be used to determine the estimated average *percentage* energy and voltage reductions for each feeder, as shown in Equation 3 and Equation 4.

Equation 3. Feeder-Level Average VO Energy Savings Estimate

$$\%\Delta MWh = \frac{\alpha_{MW}}{\mu_{MW}^{Off}}$$

Equation 4. Feeder-Level Average VO Voltage Reduction

$$\%\Delta kV = \frac{\alpha_{kV}}{\mu_{kV}^{Off}}$$

where μ_{MW}^{Off} and μ_{kV}^{Off} represent the mean baseline MW and kV levels for the feeder. [69]

The percentage energy savings and voltage reductions are then used to generate a feeder-specific CVR factor for each feeder, as shown in Equation 5.

Equation 5. Calculation of Feeder-Level CVR Factors

$$CVRf = \frac{\%\Delta MWh}{\%\Delta kV}$$

Cross-Feeder Model to Develop CVR Factor Lookup Tables

With the set of feeder-specific CVR factors from the previous section in hand, Navigant's proposed approach next employs a cross-feeder model that relates the first-stage CVR factors to measurable feeder characteristics to identify the key factors determining how VO effects vary across feeders. The approach again relies on regression analysis to fit a model of the form shown in Equation 6.

Equation 6. Cross-Feeder Model for CVR Factor Lookup Table

$$CVRf_i = \alpha + \sum_{j=1}^{J} \beta_j Char_{ji} + \varepsilon_i$$

where $CVRf_i$ represents each feeder i's CVR factor, α is an intercept term, the $Char_{ji}$ terms comprise a vector of measurable feeder characteristics, and ε_i is an error term. The vector of feeder characteristics could consist both of those supplied by the utility[70] and others obtained by Navigant from summarizing the available pre-VO time-series data, [71] in addition to climate zone. [72] Our goal with this analysis would be to use it to screen for the subset of feeder characteristics that are best able to explain the observed variation in the CVR factor across feeders. Having selected a core subset of such characteristics, we will build out a separate lookup table for each climate zone.

Verified Net Impact Evaluation

Since the VO Program will require no actions by any affected ComEd customers, net and gross impacts are identical.

[69] Ideally, these baseline averages should be based on data from the year prior to VO being installed on the feeder.
[70] These include physical features like circuit length, number of customer connections, and rated peak load; geographic elements like urban vs. non-urban; and details regarding the proportions of each customer type served.
[71] These include characteristics culled from pre-VO data like min/median/max power and voltage, average load factor, spread or ratio of min to max power and voltage, average power factor, and phase imbalance (i.e., largest ratio between any two phases).
[72] The climate zone analysis would, at a minimum, divide the state of Illinois between the northern part represented by ComEd's territory and the southern part covered by Ameren's territory. We will also explore subdivisions within each utility's territory, to the extent that it is justified in the data.

Calculation of Cumulative Persisting Annual Savings (CPAS) and Annual Savings

As required by the Future Energy Jobs Act (FEJA), Navigant will report ex post gross and ex post net savings for the program and the CPAS in CY2020 will be calculated along with the total CPAS.

Data Requirements

Table 3 shows the data Navigant may need for the CY2020 evaluation. The final data needed will depend on the evaluation method agreed to for the IL-TRM. We will keep ComEd updated on expected data needs as the methodology becomes clearer throughout the year.

Table 3. Data Requirements for CY2020 VO Evaluation

Data Source	Information Required
AMI Meters of Customers on Each VO Feeder	• Feeder
	• Substation
	• Date / time stamp (30-minute intervals)
	• Load-weighted service voltage from all meters served by feeder
Substation SCADA System	• Feeder
	• Substation
	• Date / times stamp (30-minute intervals)
	• Voltage (at substation bus)
	• Real power (MW or MWh)
	• Reactive power (Mvar) / or power factor
	• Weather data (temperature, humidity, wind speed) *
Other	• VO control status
	• Log of substation / feeder status (outages, reconfigurations)
	• Static feeder characteristics

* Navigant will acquire required observed weather data from area NOAA weather stations.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities for the work leading to the IL-TRM work paper and to the CY2020 results. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Memo with ComEd feeder-specific CVR factors	Evaluation	Mar 6, 2020
Memo with CVR factor lookup tables	Evaluation	Apr 17, 2020
2021 IL-TRM Version 9.0 draft workpaper	Evaluation	May 1, 2020
Final CY2020 evaluation data delivered to Navigant	ComEd	January 29, 2021
Draft CY2020 report to ComEd and SAG	Navigant	March 12, 2021
Comments on draft (15 Business Days)	ComEd and SAG	April 2, 2021
Revised Draft by Navigant	Navigant	April 9, 2021
Comments on redraft (5 Business Days)	ComEd and SAG	April 16, 2021
Final Report to ComEd and SAG	Navigant	April 23, 2021

ComEd Effective Useful Life CY2020 Evaluation Research Plan

Introduction

This research work plan details the specific tasks, activities, deliverables, and schedule associated with CY2020 persistence and effective useful life (EUL) evaluation research for the ComEd Energy Efficiency Program. The work plan addresses measure persistence in a manner consistent with Illinois Future Energy Job Act (FEJA) legislation and the goals set out by this legislation for attaining cumulative persisting annual savings (CPAS) by electric utilities. The work outlined in this plan is designed to estimate EUL values that take into consideration the technical life, measure persistence, and savings persistence.

Navigant conducted an EUL value of information (VOI) analysis in CY2019 that is summarized in Table 1. The purpose of the VOI analysis was to define the measures which have uncertainty in the existing EUL with high value potential for additional EUL research. The VOI analysis consisted of interviews with Subject Matter Experts (SME) about the accuracy of the current Illinois Technical Reference Manual (TRM) EULs. Navigant is focusing additional EUL research on the areas classified as “Research Recommended” and “Preliminary Research Recommended”. For CY2019, Navigant is completing research for LED Fixtures (Commercial), LED streetlighting, and retrofit add-on equipment (advanced lighting control systems and HVAC controls). The CY2019 research did not include any field studies and provided insight as to consider if primary on-site data collection is merited.

Table 1. Phase I EUL Analysis Findings

EUL Uncertainty Assessment	Measure Name	TRM EUL	EUL +/- 20% Bounds	Probability EUL is Less than Lower Bound	Probability EUL is Greater than Upper Bound
Preliminary Research CY2019	LED Fixtures (Com)	15	12 - 18	87%	3%
	Advanced Lighting Control Systems	8	6.4 - 9.6	2%	77%
	HVAC Controls	15	12 - 18	81%	1%
	LED Streetlighting	ComEd Requested[73]			
Research Recommended CY2020	Compressed air - Leak Repair	3	2.4 - 3.6	17%	60%
	Retro-commissioning	New Recommendation[74]			
Accurate	AC Tune-up	3	2.4 - 3.6	48%	29%
	Energy Management System	15	12 - 18	45%	22%
	LED Lamps (Res)	10	8 - 12	43%	28%
	Lighting Controls	8	6.4 - 9.6	40%	32%
	Programmable Thermostats (Res)	8	6.4 - 9.6	29%	32%
No Research Recommended	Thermostat Adjustment*	2	1.6 - 2.4	20%	62%
	LED Lamps (Com)*	15	12 - 18	77%	4%
	Programmable Thermostats (Com)	10	8 - 12	63%	20%
	Smart Thermostats	11	8.8 - 13.2	62%	1%

*Previously addressed in the CY 2019 Research Plan regarding no research recommendation.
Source: Navigant Consulting, Inc.

In CY2020, Navigant is recommending research efforts for the following measures:

- **Compressed Air – Leak Repair.** Navigant will conduct field research for compressed air – leak repair**.** The VOI analysis found there was a 60% probability that the actual EUL is higher than the current TRM EUL. Additional field research may reveal that savings persist beyond the assumed value. Navigant proposes researching other compressed air measures simultaneously to cost-effectively understand the EUL of multiple measures. The initial draft plan was submitted mid-2019 for stakeholder input and a research plan is included below.
- **Retro-commissioning** Navigant does not recommend conducting retro-commissioning measure and program research. Instead for CY2020 we plan to develop a methodology for quantifying persistence for programs that have ongoing intervention, such as the virtual commissioning and monitoring-based commissioning program models. Data collection and analysis plans will be considered for subsequent years once there is a consensus on the approach.

Furthermore, there were two measures where we previously recommended research for CY2020. These have currently been added to the “no research recommended” category.[75] These are two thermostat measures:

[73] LED streetlighting was not included in the VOI analysis.
[74] Retro-commissioning was not included in the VOI analysis.
[75] The other two measures thermostat adjustment and commercial LED lamps were previously deemed as not necessary for research.

- **Programmable Thermostats (Commercial).** For CY2019, Navigant is conducting contractor interviews and customer surveys on HVAC controls and lighting controls. Early input from contractors indicate that the controls (at least the new installations) are mostly compatible with all host equipment. Navigant's preliminary findings for the CY2019 research indicate that most controls can last an indefinite amount of time prior to failure. Navigant did investigate other reasons for removal. However, for thermostats (in the same category as HVAC controls), Navigant should additionally explore the savings persistence of the thermostats.

  To do a savings persistence study, there are few options for the approach:
  (1) AMI-based: Commercial applications are not well suited for an AMI-based or billing analysis for persistence. The population sizes are not large enough and many installations are paired with other measures.
  (2) Field work: Data collection pre and post with multiple visits to each facility in the sample. This analysis will allow for checking thermostat settings and schedule, and noting any site-specific changes.
  (3) Assumptions-based: The unit energy savings for a deemed measure (which are intended to represent average savings across a population of measures) may already account for savings persistence as the use of the thermostat evolves for facilities, the sample average may not change. For example, a deemed unit energy savings is derived from metered data of a sample of installed equipment that are all operating at different stages of host equipment life with different operating patterns. The operational changes of this equipment over its lifetime may be captured by the average deemed unit energy savings calculated from the sample of metered equipment.

  Therefore, based on CY2019 findings and the assumptions outlined above, Navigant believes that the savings persistence analysis would either have large uncertainty bounds or result in insignificant results and we are not recommending further research.

- **Smart Thermostats.** Navigant is prioritizing research on the first-year savings value and methodology for this measure versus savings persistence research. The first-year savings value anchors the findings for any persistence research and the methodology also would most likely be adopted for savings persistence research. We will revisit the need to perform EUL research for this measure after the first-year savings value is established.

We recommend delaying further research for the commercial LED fixture. As indicated above, the CY2019 research was preliminary to help establish further research needs; Navigant believes that the commercial LED fixture EUL research is important, however, we recommend additional research on LED fixtures be performed in CY2021 or later years. Research to date has not been conclusive, thus, the remaining avenue for researching EUL of LED fixtures is field site visits to identify the failure rate of the installations to date. However, the earliest date of installation per program records is the 2014/2015 time frame, which provides about five to six years of operation which is insufficient to ascertain the survival curve for LED fixtures. Additionally, the technology and installation practices have improved and the survival analysis for installations a few years ago will be different than installations today.

For CY2021, Navigant recommends conducting a new prioritization analysis with high impact measure data after the CY2019 data is available to identify if new measures have emerged as priority.

Compressed Air Research

The following sections describe background and research approach for the compressed air research. Per subject matter interviews, bad (audible) leaks are repaired immediately or flagged for repair during the next opportunity at the facility. Differentiating between this repair and what happens or happened as a

result of a comprehensive survey[76] is important to tease out in this study. Eventually, the small and medium leaks sap the system of capacity and pressure stability or become larger and are subsequently fixed. The alternate option to leak repair is to add a new compressor. Given the amount of machine redundancy, this may happen more than leak repair. In many cases, the standard practice is adding capacity to address loss of pressure for the demand uses which can be attributed to leaks. [77]

Compressed Air Leak Repair EUL Background

Existing EUL for Compressed Air Leak Repair
Per the TRM, the compressed air leak repair has a two to five -year measure life. The reported value is dependent on implementer documentation that is subject to ex post verification.

There is no good number for the actual life of a specific leak repair, let alone the system as a whole. Generally, the main piping system lasts a long time, but most leaks occur on end use equipment. These leaks tend to return often due to the movement and vibration of the equipment. The weighted value based on size and life of each repair based on location and conditions is an unknown. The assumed leak rate increase per year is another unknown which will also vary significantly from site to site.

Defining Compressed Air Leak Repair Savings
As part of Navigant's research to date, there has been debate if the EUL for compressed air leak repair is based on compressor demand savings or system capacity needs. Navigant's approach is to understand what happens at the meter. Therefore, this study will draw a boundary around the air compressors and not the demand side, i.e. the repaired leaks. The compressors are the source of electricity energy use, whereas the demand side of the air compressors are the source of compressed air use. Navigant is defining the measure as not the repaired leak, but the savings at the compressor.

The challenge is that additional leaks spring up regularly. It is assumed that a compressed air system will leak more and more over time. The actual energy savings being achieved are higher than simply the year-over-year change in usage because the year-over-year change in usage reflects that additional leaks are occurring. There is a certain level of maintenance that is going to occur, but usage may be increasing every year without maintenance or without program intervention with a leak audit. Active leak repairs are still required to ensure that usage does not increase. This is different than Strategic Energy Management (SEM) and behavioral programs. For example, because the baseline is not that their energy use will get less and less efficient over time without intervention – it is that they have a fixed baseline, and meaningful improvements are made over that baseline that require active maintenance.

If a customer would have chosen to do leak repair in the absence of the program, **that is an attribution issue**, not an energy savings or measure life issue.

Compressed Air Leak Repair Persistence Factors

To cost-effectively research effective useful life (EUL) for compressed air leak repair, Navigant will explore a holistic approach. Since compressed air leak repair is frequently part of a larger project, we believe the EUL research can be conducted for a suite of compressed air measures in one study. Compressed air measures such as pressure reduction, flow controller, etc. will be included in any surveys

[76] The process of a comprehensive survey is rarely implemented without program intervention and typically finds 10% savings, but that does not mean that 10% appear every 2 years. More leaks appear, but the worst ones are fixed – possibly multiple times. The survey addresses the persistent medium and smaller leaks every 2 years in addition to the large leaks that happen to be active at the time of the survey.
[77] The proposed plan here does NOT address the specific leak repaired and addresses the system as a whole. This is different than the existing implementation approach that measures and targets individual leaks. This approach is similar to coil cleaning. For coil-cleaning, the savings value is not based on the individual fins cleaned, instead the savings are based on the change in conditions seen by the compressor.

or interviews as part of the leak repair study. These measures can be addressed via an implementer and retention survey, except for compressed air leak repair which will require site visits.

For the compressed air leak repair measure, we are proposing a customer survey, as well as site visits. Navigant will also conduct a desk review of the audits completed at sites that have had multiple audits over the program lifespan. The following table summarizes the approaches for this study and the desired outcome for the research. Navigant will first conduct small sample surveys to ensure the data collection plan will result in fruitful information.

Table 2. Compressed Air Research Approaches and Proposed Outcomes

Approach	Outcome

Conduct telephone surveys of program participants or review implementer or service provider audit report for the following: [78]
• Age of existing pieces of equipment[79]
• Description and schedule of existing O&M practices
  ○ Commissioning and maintenance of controls
  ○ Leak audit practices
• Decisions on adding capacity (new compressors)
<*This approach may be combined with the retention surveys.*>
	• Determine age of existing equipment
	• Understand effect of customer existing practices on decision making for compressed air maintenance and system improvements

Conduct retention surveys, this will include:
• Survey of previous participants 2 and 8 years post-retrofit to determine if equipment is still operating and at what level of performance (for control technology measures)
• Follow up with telephone surveys, as needed, and nested sample of on-sites to validate web surveys. These surveys will explore the following questions:
  ○ Have you conducted a leak audit and made repairs prior to the program? If yes, how often and when was the last time?
  ○ Do you conduct leak audits or have a leak repair program? On what schedule? If not, what is your process to detect leaks?
  ○ How do you decide what leaks to repair?
  ○ Have you installed additional compressor capacity recently? When and why?
  ○ Do you monitor your system pressure as a function of compressor demand?
  ○ Would you be able to shut off your compressed air system during downtime, to provide a measurement of leakage?
	• Determine retention of existing equipment
	• Determine age of existing equipment
	• Understand effect of customer existing practices on decision making for compressed air maintenance and system improvements

[78] The ComEd program implementers could support this data collection effort as part of their implementation work. For example, Navigant can supply the questions/data collection form to be part of the inspections and project work as they interact with the applicant. Navigant has requested this for the retrofit add-on EUL research for CY2019 and the implementer rejected the request.
[79] The industrial systems program in most projects collects equipment ages which can provide additional data points, especially if can be correlated to equipment replacement projects.

Approach	Outcome
Conduct field study (leak repair measure only): • Field study only for leak repair measure occurring 12, 18, or 24 months post-retrofit • Leverage existing impact evaluation on-site work by cross checking previous compressed air leak repair participation; leverage projects who have had multiple leak audits in multiple years • Focus only on leakage rate and the rate of leak formation. This will be based on the measurements as conducted in a leak audit.	• Understand the persistence of leak repair • Determining if savings are based on maintaining level of demand on compressor (assuming no change in operation) regardless if new leaks form or if repaired leaks leak again • Understand site practices

Compressed Air Leak Repair Persistence factors

The compressed air leak repair research approach will address multiple complex factors:

- New leaks formed continually
- Standard practice for facilities to fix leaks
- Alternate approaches to address leaks – i.e., increase supply
- Facility culture change

As part of this work and provided in Table 3, Navigant will investigate elements that may affect persistence. As part of the subject matter interviews, the following persistence topics were identified:

- Facility maintenance practices
  - Ongoing maintenance
  - Persist until become capacity constrained
- Barriers to leak repair
  - Need to shut down line
  - How important is energy savings compared to other competing interests
- Facility and operating conditions
  - Where is piping located (corrosive environment, clean room, other) and type of facility
  - System pressure
  - Piping sizing (undersized, then higher risks)

Measuring Compressed Air Leak Repair Savings

Navigant's study will identify the rate at which compressed air leakage is reestablished in the system.

The first-year savings are based on fixing leaks resulting in lower compressor demand. The savings persistence is reliant on the formation of new leaks negating the benefits of the repaired leaks or the degradation of the repaired leaks. Therefore, the key metrics would be the **leakage rate** and the **rate of leak formation.** This approach assumes that each project captures the leakage percentage both before and after leak repair. The basis for the EUL assessments is the time required for 50% of the difference of pre- and post-repair leakage percentage to reestablish.

Leaks are currently identified through compressed air audits. The audit provider completes an inspection of the compressed air system and tags any leaks identified and estimates a CFM leakage rate for each leak. Leaks are then repaired by the customer or the audit provider and an incentive is provided.

A simple approach to estimate the rate at which leaks redevelop is simply to redo the audit on a periodic basis and identify the current leak level. This study will reassess the leaks at one and two years after the original audit. The data points will be used to develop a curve to calculate the point where the savings are expected to be at 50% of the first-year savings.

The change of the leakage at each period will be used to determine EUL. This effort will also address the following site-specific question – how often do they repair leaks? It is important to understand if leak repair is done as maintenance or combined with retrofit solutions. Finally, to understand if the common practice is to add capacity, we will find out how close the existing system is to capacity.

In addition to the site audit approach, Navigant will also complete a review of audits completed at sites that have had multiple leak audits completed. For these sites, the rate at which leaks redevelop can be estimated as the difference between the leak CFM identified in the second audit at the site compared to the leak CFM (after repair) from the first audit, divided by the time between the second audit and the repair.

Compressed Air Research Timeline

Timeline assumptions include:

1. No data cleaning or barriers to getting a list of past participants
2. No implementer coordination
3. Only one time data collection (no need to re-visit a year later)

Table 3. Compressed Air Deliverable Schedule

Activity or Deliverable	Date Delivered
Coordination with implementer	January
Data collection template	January
Field web survey (population)	January-February
Telephone survey (small sample, up to 12)	March
On sites (small sample, up to 12)	February
Analyze preliminary results	March
Telephone survey (large sample)	April
On sites (large sample)	April
Draft Report for the TRM	June
Report for TRM Update	July

Commercial Program Persistence Framework

For any commercial program with ongoing interventions, Navigant recommends developing a methodology to assess the measure life for these program models. Current examples include the Virtual Commissioning (Power Take Off) and Monitoring-based Commissioning programs. There is no agreed-upon methodology for these program models. Currently, these programs use the retro commissioning program EUL. For this work, Navigant will engage stakeholders to develop a methodology to quantify savings persistence for both ongoing engagements and what happens to savings once those engagements end. If applicable, this methodological approach may be used for other program or

measures, such as, Business Energy Analyzer, Tune-ups, building operating certificate, and compressed air leak repair.

For this research effort, Navigant will:

- Draft a plan for initial review
- Present the plan for the stakeholder community
- Gather feedback
- Release a revised draft plan
- Finalize plan

ComEd Non-Energy Impacts CY2020 - CY2021 Evaluation Research Plan

Introduction

Navigant's CY2020-CY2021 research plan to quantify and monetize Non-Energy Impacts (NEI) contains research for both income eligible programs and non-income eligible programs. Our research activities are based on the Stipulation and Future Energy Jobs Act (FEJA) legislation. In CY2020, Navigant will continue to conduct the research quantifying and monetizing NEIs for ComEd's income eligible (IE) programs and begin to conduct the research in ComEd's non-IE programs, as well as complete the economic, utility and societal NEI research. In CY2021, Navigant will complete the research on the participant IE and non-IE NEIs. Navigant will revise the annual research plan accordingly.

This plan includes the specific tasks, activities, deliverables, and schedule associated with quantifying and monetizing NEIs for ComEd's IE energy efficiency programs as well as screening for non-IE energy efficiency programs.

This detailed evaluation plan also describes the proposed methods the Navigant team will use to quantify and monetize NEIs associated with IE and non-IE, residential, and business and public sector programs[80].ComEd and the stakeholder advisory group (SAG) are interested in first researching NEIs for ComEd's income eligible (IE) programs, since substantial NEIs are typically associated with these programs. This decision is based on the *Commonwealth Edison Company 2018 – 2021 Energy Efficiency and Demand Response Plan Settlement Stipulation*[81]:

> *"ComEd agrees to work in good faith to consult and reach consensus with the Income-Qualified Advisory Committee on issues of importance to the Committee, including but not limited to the following: Development of program information and practices for Income-Qualified programs, including the identification and reflection of non-energy benefits ("NEBs") such as comfort, health and safety, reduced tenant turnover, reduced shut-offs, reduction in revenue collection costs, and lower energy burden in Income-Qualified measures and programs."*

Future Energy Jobs Act (FEJA) legislation more broadly recognizes there may be NEIs associated with all energy efficiency programs, not only IE. FEJA states[82]:

> *"A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and 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 social benefits…"*

Overall Research Goals

This NEI research is relevant to ComEd's programs in varying amounts. This NEI research is distinct from annual program evaluation activities since most NEIs are currently not quantified nor monetized as part of evaluation activities. The Illinois Technical Reference Manual (IL TRM) currently includes only NEIs related to the avoided use of water and a deemed operations and maintenance (O&M) cost adjustment calculation. ComEd's total resource cost test (TRC) considers avoided water consumption and carbon dioxide emissions.

[80] Pilot programs do not typically have a long enough duration to screen for NEIs and conduct primary research. However, for IE pilot programs, Navigant will determine if NEIs can be quantified if not already quantified elsewhere.
[81] Page 7: http://ilsagfiles.org/SAG_files/Landing_Page/ComEd_EE_Plan_5_Stipulation_Final.pdf
[82] Page 33: http://www.ilga.gov/legislation/publicacts/99/PDF/099-0906.pdf

The key objectives of this research are to:

- **Quantify NEIs associated with IE and non-IE programs as proposed updates to the IL TRM**
  - Calculate NEIs at the program level, first for IE programs and followed by non-IE programs as determined by evidence of NEIs from screening questions and other research.
- **Monetize NEIs associated with IE and non-IE programs as proposed updates to the IL TRM**
  - Calculate dollar savings per NEI for inclusion in TRC calculations.

Research Questions

This research will seek to answer the following key researchable questions:

- What is the best way to quantify the NEI (i.e., at the measure, program, or portfolio level)?
- What are the economic NEIs? Specifically, how will the job market respond to decreased electricity generation? How many jobs will be created or lost? What observable changes in labor income and economic output will be associated with decreased electricity generation?
- What are the societal NEIs? How many deaths, hospital admissions, non-fatal heart attacks, cases of acute bronchitis, for example, will be avoided? How much work loss will be avoided? What is the dollar value of associated costs avoided by society?
- What are the avoided costs to ComEd and its customers?
- Do income-eligible ComEd program participants experience reductions in medical visits, missed days of school and/or work, instances of thermal stress, and instances heating assistance?

This research will provide value to ComEd and its customers by identifying, quantifying and monetizing NEIs. Currently, the TRC calculations exclude NEIs except for avoided water consumption and carbon dioxide emissions.

Summary of Evaluation Research Activities

This section provides an overview of the planned methodology to estimate NEIs. Table 9 presents a summary of the evaluation research plan.

This plan improves upon previous NEI research conducted by the IL SAG in 2015 to consider NEIs for the IL TRM by:

- Basing calculations on recent, reputable studies
- Ensuring reproducible research, quantification, and monetization processes
- Establishing logical connections between NEIs and energy efficiency measures
- Quantifying both negative and positive NEIs

Table 9. Evaluation Plan Summary

Activity	Rationale	Timing
Quantify Economic NEIs	Quantify job-creation and other economic NEIs related to energy efficiency programs at the portfolio level and present results at SAG NEI WG. Develop report with findings.	Q1 2020
Develop IE Participant and Non-participant Survey Instrument	In conjunction with ODC, Navigant is developing a survey instrument for single-family (SF) and multi-family (MF) program participants as well as a MF building owner and operator survey. Navigant is looking for feedback from ComEd and other IE stakeholders on the survey instruments once in draft form.	Q1 2020
Quantify Societal NEIs	Quantify societal NEIs using AVERT and COBRA associated with energy efficiency programs at the portfolio level and present results at SAG NEI WG. Develop report with findings.	Q2 2020
Quantify Utility NEIs	Quantify utility NEIs from IE energy efficiency programs and present results at SAG NEI WG. Develop report with findings.	Q4 2019 – Q2 2020
Field IE Participant and Non-participant Surveys and Analyze Results	Navigant will field surveys of single-family (SF) and multi-family (MF) program participants and pipe line participants as well as a MF building owner survey. Monetize health benefits via information from northern IL hospital system data.	Q1 2020 -Q1 2021 (control) Q1 2021 – Q1 2022 (treatment)
Develop Non-IE Participant and Non-participant Survey Instruments	In conjunction with ODC (where possible), Navigant will develop survey instruments for programs whose screening questions indicated a presence of NEIs. Navigant will look for feedback from ComEd and other stakeholders on the survey instruments once in draft form.	Q2 2020
Field Non-IE Participant and Non-participant Surveys	Navigant will field surveys with participants and non-participants of programs whose screening questions indicated a presence of NEIs.	Q3 2020 -Q3 2021 (control) Q3 2021 – Q3 2022 (treatment)
Draft IL TRM Workpapers	Document NEI quantification methodology for inclusion in IL TRMv10 and TRC for IE programs and present findings at SAG NEI WG meeting	Q2 2021
Draft IL TRM Workpapers	Document NEI quantification methodology for inclusion in IL TRMv11 and TRC for non-IE programs and present findings at SAG NEI WG meeting	Q4 2021

Source: Navigant

Methodology

This detailed plan outlines activities for this research into nine discrete tasks, as summarized in Table 10.

Table 10. Summary of Tasks, Deliverables, and Timeline

Tasks	Activities	Data Needed	Deliverables	Timeline
Task 1: Quantify Economic NEIs associated with IE and non-IE programs	IMPLAN modelling and SAG NEI WG webinar	IMPLAN economic data by county and ComEd program data	Presentation deck and report with findings	Q3 2019 – Q1 2020
Task 2: Develop IE Participant and Non-participant Survey Instruments	Develop harmonized surveys with ODC	IE program info	Draft and final survey instruments	Q1 2020
Task 3: Quantify Societal NEIs associated will IE and non-IE programs	Use AVERT and COBRA to quantify societal NEIs	ComEd program tracking data	Draft and final report and presentation to SAG NEI WG	Q3-2019-Q2 2020
Task 4: Quantify Utility NEIs associated with IE programs	Regression Analysis	• Payment transaction dates • Actual billed amounts by billing period • Source and amount of external assistance by billing period • Arrearage amount • Reconnections by billing period	Draft and final report and presentation to SAG NEI WG	Q4 2019 – Q2 2020
Task 5: Field IE Participant and Non-participant Surveys and Analyze Results	Telephone and online surveys	• Customer contact information • Specific healthcare values from ComEd's territory	• Memo summarizing early findings and presentation to SAG NEI WG (pre-treatment surveys) • Memo summarizing findings and presentation to SAG NEI WG (post-treatment surveys)	Q1 2020 -Q1 2021 (control) Q1 2021 – Q1 2022 (treatment)
Task 6: Develop Non-IE Participant and Non-participant Survey Instruments	Develop harmonized surveys with ODC	• Results from screening surveys • Non-IE program info	Draft and final survey instruments	Q2 2020
Task 7: Field Non-IE Participant and Non-participant Surveys and Analyze Results	Telephone and online surveys	• Customer contact information	• Memo summarizing early findings (pre) • Memo summarizing findings and presentation to SAG NEI WG (post)	Q3 2020 -Q3 2021 (control) Q3 2021 – Q3 2022 (treatment)

Tasks	Activities	Data Needed	Deliverables	Timeline
Task 8: Draft IL TRM Workpapers for NEIs associated with IE programs	Develop workpapers	Quantified and monetized NEIs	Workpapers for IL TRMv11	Q3 2021 – Q2 2022
Task 9: IL TRM Workpapers for NEIs associated with non-IE programs	Develop workpapers	Quantified and monetized NEIs	Workpapers for IL TRMv11	Q4 2021 – Q2 2022

Task 1: Quantify and Monetize Economic NEIs for the Portfolio (Jobs created and customers' savings on bills)

Navigant used Impact Analysis for Planning (IMPLAN) to analyze jobs impact related to energy efficiency goals. IMPLAN is widely used to conduct economic impact assessments and is a commonly used economic input-output (I-O) model.

The IMPLAN model is:

- Constructed based on the concept that all industries within an economy are linked together; the output of one industry becomes the input of another industry until all final goods and services are produced
- Used to both analyze the structure of the relevant area's economy and the economic impact of the construction and operational phase of projects

IMPLAN models the economic activity within a specified area through the spending and consumption among different economic sectors, such as businesses, households, government entities, and external economies. Economic sectors or industries conduct typical business operations, including hiring employees, using capital to maximize performance, and selling goods or services to final users. Navigant's energy efficiency IMPLAN analysis will:

- Input target spending data to IMPLAN economic sectors (i.e., industries) for use in the economic benefits model
- Rely upon IMPLAN's regional attribution percentages to quantify the spending that is expected in the area
- Quantify the direct, indirect, and induced economic benefits of the incremental energy efficiency spending

Specifically, our analysis will quantify:

- Jobs (FTE)
- Labor Income ($)
- Economic Output ($)

Task 2: Develop IE Participant and Non-participant Survey Instrument

Navigant, in conjunction with ODC, is developing a survey instrument to quantify NEIs associated with IE program participation.

Navigant will quantify the following NEIs based on feedback from participants:

- Reduced medical visits due to reduced asthma symptoms
- Reduced missed days of school
- Reduced missed days of work
- Reduced medical visits due to thermal stress
- Reduced need for heating assistance

Navigant will survey MF building owners to quantify:

- Reduced vacancy
- Reduced equipment maintenance
- Marketability
- Reduced tenant turnover
- Home improvements
- Durability of property
- Reduced tenant complaints

Navigant will not attempt to quantify carbon monoxide poisoning, home fires, lead exposure, cardiovascular disease, improved mental health, or cancer through participant surveys.

Task 3: Quantify Societal NEIs

Navigant will utilize the EPA's CO-Benefits Risk Assessment (COBRA) and AVoided Emissions and geneRation Tool (AVERT) models to quantify the avoided emissions and health benefits of ComEd's CY 2018 programs. Navigant will pull energy efficiency program evaluation MW and MWh savings results to use as inputs for AVERT. AVERT produces an estimate of PM2.5, SO2, NOx, and CO2 avoided emissions within a given region. For ComEd, that region is the Great Lakes / Mid Atlantic Region defined in the EPA's eGrid tool.

The avoided emissions estimates will be an input to the COBRA tool, which calculates the changes in ambient particulate matter in the region. Then, COBRA calculates the societal avoided cost of chronic and acute bronchitis, non-fatal heart attacks, respiratory or cardiovascular hospital admissions, work loss days, and other impacts associated with improved ambient particulate matter.

Navigant chose to utilize AVERT and COBRA for the following reasons:

- The tools were built by a trusted source
- Commonly used in state energy efficiency and renewable energy analyses
- Monetized impacts align with other impacts calculated at the participant level of this study

Navigant will use AVERT and COBRA to monetize health impacts from reduced emissions in the following categories:

- Avoided death
- Hospital admissions
- Non-fatal heart attacks

- Acute bronchitis
- Upper and lower respiratory symptoms
- Emergency room visits
- Minor restricted activities
- Work loss
- Asthma exacerbation

Task 4: Quantify Utility NEIs

Navigant will use a quasi-experimental method to quantify utility NEIs from ComEd's IE programs. This method analyzes one year of pre- and post-program payment data and administrative cost data for a treatment group and comparison group. The treatment group is customers who participated in IE weatherization programs in CY 2018. Navigant received data containing information on ComEd CARE CY 2018 program participants. To select the comparison group, Navigant pulled random samples with quotas from PIPP, Residential Hardship, and LIHEAP programs. The quotas were based on the proportions of customers who participated in both IE weatherization programs and ComEd CARE programs in CY 2018.

Navigant will analyze both customer payment and utility cost metrics using a difference-in-difference (DID) technique. We are using a simple DID approach because we expect there will not be a large enough sample size to use a regression analysis. If the sample is larger than expected, we could use a regression analysis. The DID technique looks at the change in any given metric for participants between the post- and pre-periods and subtract from that the same difference for the comparison customers. Dollar values will determine avoided utility costs.

Navigant received CY2017 ComEd data (and has requested CY2019 data when available in Q1 2020) that included:

- Payment transaction dates
- Actual billed amounts by billing period
- Source and amount of external payment assistance by billing period
- Deferred payment agreement amounts
- Reconnections by billing period

Using the above data, Navigant will quantify:

- **Customer payment metrics –** Portion of households receiving payment arrangements, total arrangements in dollars, and the percentage of bill paid by arrangements
- **Billing and payment metrics –** Average annual billed amount, on-time payments, late payments, and the portion of each payment covered by ComEd CARE or LIHEAP
- **Utility metrics –** Amount of disconnections and reconnections and average carried arrearage

Task 5: Field IE Participant and Non-participant Surveys and Analyze Results

Navigant will conduct online and telephone surveys for MF and SF IE customers as well as MF IE building owners. We will:

- Use a third-party contractor to implement the telephone surveys and will use Qualtrics for the online surveys
- Take precautions to not survey the same customers surveyed for the ThreeCubed / Seventhwave research effort (see later detail for more information)
- Sample from a separate pool from the standard process evaluation activities
- Survey three sample groups in 2020 and conduct follow up surveys with the same sample in 2021

The survey schedule is outlined in Table 11.
Navigant is planning to survey three groups pre- and post-weatherization[83].

- **Control (C)** – Surveys of households just after their unit has been assessed (March 2020–December 2020)
- **Treatment (T)** – Surveys of households 9–12 months after their unit has been weatherized

Table 11. Summary of Planned Surveys

Survey	Field Dates	Method
Single Family Income Eligible Customer Survey	Q1 2020 – Q1 2021 Q1 2021 – Q1 2022	Online and Telephone
Multifamily Income Eligible Customer Survey	Q1 2020 – Q1 2021 Q1 2021 – Q1 2022	Online and Telephone
Multifamily Income Eligible Building Owner Survey	2020 2021	Online and Telephone

This effort provides context for quantifying:

- **Occupant physical health impacts:** These questions will aim to understand impacts on occupant physical health because of ComEd's energy efficiency programs. Example questions for this objective include:
  - In the past 12 months, has anyone in the household needed medical attention because your home was too hot or cold?
  - Other than a routine visit, has anyone in your household had to see a doctor, visit an emergency room, or be admitted to a hospital in the past 12 months for symptoms related to asthma?
- **Occupant financial health impacts:** These questions will aim to understand impacts on occupant financial health because of ComEd's energy efficiency programs. An example questions for this objective includes:
  - In the past year, have you used any loans to assist with paying your energy bill?
- **Occupant comfort impacts:** These questions will aim to understand impacts on occupant comfort because of ComEd's energy efficiency programs. An example question for this objective is:

[83] Terminology adopted from ThreeCubed / Seventhwave JPB Foundation research effort.

  - Which of the following statements best describes the indoor temperature of your apartment during the winter or summer?

- **Building and home owner impacts:** These questions will aim to understand impacts on building and home owners because of ComEd's energy efficiency programs. Example questions for this objective include:
  - During the last 12 months, approximately how much was spent on preventative maintenance or maintenance cost due to equipment failure on this property?
  - During the last 12 months, approximately how much was spent on marketing[84]?

Navigant will develop the survey instrument questions primarily focusing on the objectives listed above. NEI equations are mapped to research questions at the end of this plan. Additional data points required to monetize NEIs are also outlined at the end of this plan.

Task 6: Develop Non-IE Participant and Non-participant Survey Instruments

Navigant, in conjunction with ODC (where possible), will develop survey instruments to quantify NEI associated with non-IE programs. Navigant will determine which non-IE programs to survey based on results from screening questions.

Task 7: Field Non-IE Participant and Non-participant Surveys and Analyze Results

Navigant will conduct online and telephone surveys for participants and non-participants of non-IE programs. We will:

- Use a third-party contractor to implement the telephone surveys and will use Qualtrics for the online surveys
- Sample from a separate pool from the standard process evaluation activities
- Survey groups in 2020 and conduct follow up surveys with the same sample in 2021

Task 8: Draft IL TRM Workpapers for NEIs associated with IE programs

Navigant recommends adding the NEIs to cross cutting volume 4 of the TRM, like the NTG methodology, with the NEIs presented at the program level. Navigant will present early findings to the Technical Advisory Committee to confirm how the results should be incorporated into the TRM for NEIs associated with IE programs.

Task 9: Draft IL TRM Workpapers for NEIs associated with non-IE programs

Navigant recommends adding the NEIs to cross cutting volume 4 of the TRM, like the NTG methodology, with the NEIs presented at the program level. Navigant will present early findings to the Technical Advisory Committee to confirm how the results should be incorporated into the TRM for NEIs associated with non-IE programs.

[84] Question for multifamily building owners only

NEI IE Equations

The following section outlines equations Navigant will use to quantify NEIs related to IE Wx programs.

Compare Sample Groups

Quantifying the Benefit

This equation will average the impact of treatment to compare a Wx group before and after treatment and a comparison group that had received treatment one year prior:

Reduction in instance = [(Pre-treatment – Post-treatment) + (Pre-treatment – Comparison group)] / 2

Reduced Thermal Stress on Occupants

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Percentage of hospitalizations, ED visits, and physician office visits for cold- and heat-related stress (state-specific where available)
- Average cost for each type of medical treatment including hospitalizations, ED visits, and physician office visits (state-specific where available and adjusted for inflation)
- Percentage of income-eligible with Medicare, Medicaid, Private/Other Insurance, or Uninsured (state-specific where available)

This equation quantifies the number of occurrences of (a) hospitalization, (b) ED visit, and (c) physician office visit avoided:

*N (a, b, c) = [(number of jobs completed in CY) * (decreased rate of seeking medical care) * (% of type of medical treatment sought for cold and heat-related thermal stress (for a, b, and c)*]

And the percent of annual medical costs for (a, b, and c) for those with (p1) Medicare, (p2) Medicaid, (p3) private/other, and (p4) uninsured or out-of-pocked payers:

% of annual medical costs— (for p1, p2, p3, p4)—for population (for a, b, and c) =
*[[(% of population by medical coverage type) * (% of medical costs—by payer—for Population (for a, b, and c)] / (% of population by medical coverage type)]]*

And finally, the benefit associated:

Total Program (without avoided deaths) =
*[(N (a, b, c) * % medical costs (for p1, p2, p3, p4)) *
Average cost for treatment (for a, b, and c)]*

Monetizing Avoided Death Benefit

To incorporate the benefit of avoided deaths, Navigant will need to find these additional inputs from reputable secondary sources:

- Number of deaths following hospitalization (state-specific where available)
- Percentage of hospitalizations resulting in deaths (state-specific where available)
- Current Value of Statistical Life

These equations are used by COBRA to monetize the number of avoided deaths:

*# of avoided deaths= [(% of hospitalizations resulting in deaths (U.S. population) * (# of hospitalizations prevented by program in CY)]*

*Total benefit of avoided deaths = [# of avoided deaths * VSL]*

Reduced Asthma Symptoms

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant had identified relevant inputs from the Illinois Department of Health Service Report (2017 data):

- Average cost for hospitalizations per adult and child and ED visit for all individuals (state-specific where available and adjusted for inflation)
- Percentage of income-eligible with Medicare, Medicaid, Private/Other Insurance, or Uninsured (state-specific where available)
- Frequency of re-admittance to hospital for adults and children and ED visits for all individuals
- Other direct medical costs and indirect costs associated with high-cost asthma patients adjusted for inflation
- Asthma prevalence rates in Illinois among both children and adults

These equations quantify the benefit associated for ED and hospitalizations:

*Benefit = (number of persons served by program in CY) * (asthma prevalence for adults and children) * (reduction in ED visits or hospitalizations) * (frequency of re-admittance (adults and children)) * (average hospital costs (adults and children))*

and other direct and indirect medical savings for high-cost patients:

*Benefit = (number of persons served by program in CY) * (asthma prevalence for adults and children) * (reduction in high-cost patients) * (difference in high and low-cost patients after extracting the ED visit and hospitalization costs already claimed))*

Reduced Need for Pay-Day Loans

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average loan amount
- Average interest payment

This equation quantifies the benefit:

*Total Benefit = (number of jobs completed in program year) * (percent reduction in households using short-term, high-interest loans) * (reduction in interest payments)*

Reduced Need for Heating Assistance

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average monthly per person heating assistance subsidy (state-specific where available and adjusted for inflation)

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent of reduction in households requiring heating assistance) * (average annual per person heating assistance subsidy) * (average program household size)*

Reduced Missed Days at Work

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average hourly wage (state-specific where available and adjusted for inflation)
- Percent of income-eligible worker without sick leave

This equation quantifies the benefit for missed days at work:

*Total Program Benefit = (number of jobs completed in CY) * (% of program households with an employed primary wage earner) * (reduction in missed days at work) * (average hourly wage) * (8 hours/day)*

Reduced Missed Days of School

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

We seek stakeholder feedback on three potential methods to monetize missed days of school:

Monetizing the Benefit

Navigant will need to find these additional inputs from reputable secondary databases:

- Average hourly wage (state-specific where available and adjusted for inflation)
- Percent of income-eligible worker without sick leave

To monetize the benefit of reduced missed days at school, Navigant will assume that the parent who is the primary wage earner will have to miss work to care for the sick child. This equation quantifies the benefit for missed days at school:

*Total Program Benefit = (number of jobs completed in CY) * (% of program households with an employed primary wage earner) * (reduction in missed days at school) * (average hourly wage for parent) * (8 hours/day)*

Monetizing the Benefit

Navigant will need to find these additional inputs from reputable secondary databases:

- Average hourly cost of childcare (state-specific where available and adjusted for inflation)

To monetize the benefit of reduced missed days at school, Navigant will assume that the parent will have to pay for childcare for that day. This equation quantifies the benefit for missed days at school:

*Total Program Benefit = (number of jobs completed in CY) * (reduction in missed days at school) * (average hourly cost for childcare) * (8 hours/day)*

Monetizing the Benefit

Navigant will need to find these additional inputs from reputable secondary databases:

- Value of K12 school day in lifetime labor market benefit

To monetize the benefit of reduced missed days at school, Navigant will assume reduced missed days at school result in added lifetime labor market benefits. This equation quantifies the benefit for missed days at school:

*Total Program Benefit = (number of jobs completed in CY) * (% reduction in missed days at school) * (lifetime labor market benefit per day per student)*

Reduced Need for Food Assistance

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.
Navigant will need to find these additional inputs from reputable secondary databases:

- Average monthly per person food assistance subsidy (state-specific where available and adjusted for inflation)

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent of reduction in households requiring food assistance) * (average annual per person food assistance subsidy) * (average program household size)*

Reduced Property and Equipment Maintenance Cost

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average annual cost for property maintenance
- Average annual cost for equipment maintenance

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent decrease in property and equipment maintenance cost) * (average annual cost for property and equipment maintenance)*

Improved Housing Stability

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average increase in value of extended lifetime of dwelling due to whole-house weatherization

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent of respondents observing increase in housing stability) * (average increase* in value of extended lifetime of dwelling due *to whole-house weatherization)*

Reduced Marketing Cost

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.
Navigant will need to find these additional inputs from reputable secondary databases:

- Average annual marketing cost for multifamily building owners

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent decrease in marketing cost) * (average annual marketing cost for multifamily building owners)*

Reduced Tenant Turnover and Unit Vacancy Cost

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Monetizing the Benefit

Navigant will need to find these additional inputs from reputable secondary databases:

- Average monthly rent (state specific and adjusted for inflation if needed)

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (percent reduction in vacant units in month-equivalent) * (average monthly rent)*

Reduced Tenant Complaints

Monetizing the Benefit

Although this research plan describes our current methodology for monetizing NEIs, we will revise our methodology as needed based on the data we are able to collect.

Navigant will need to find these additional inputs from reputable secondary databases:

- Average hourly wage for multifamily building maintenance and staff (state-specific where available and adjusted for inflation)

This equation quantifies the benefit:

*Total Program Benefit = (number of jobs completed in CY) * (reduction in time spent responding to tenant complaints in hours) * (average hourly wage for multifamily building maintenance and staff)*

ComEd Residential Advanced Thermostats CY2020 Evaluation Research Plan

Introduction

This evaluation research plan describes the research that the Navigant team will use to better understand the electric energy impacts from residential advanced thermostats incentivized through Illinois energy efficiency (EE) programs. This research builds on work completed in CY2019 and is being conducted at the request of Illinois Commerce Commission (ICC) staff, ComEd and regional stakeholders as a component of a consensus agreement for the Technical Reference Manual (TRM) version 7.0.

This research extends beyond previous Illinois advanced thermostat evaluation research studies by:

- Providing demand savings as well as annual electric savings
- Providing evidence to support or refute plausible explanations behind the savings results
- Incorporating advanced metering infrastructure (AMI) data and thermostat data
- Providing additional evidence beyond those provided in previous studies as to the representativeness of any comparison groups used in the study

The evaluation of this program over the coming year will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2020
Collect and Process AMI and Thermostat Data	X
Coordinate with Opinion Dynamics and Engage Advanced Thermostat Subcommittee	X
Gross Impact - Econometric Analysis	X
Gross Impact - Adjusted ENERGY STAR Analysis	X
Final Reporting and Minor Supplemental Analyses	X

Coordination

Navigant will conduct this research in coordination with Opinion Dynamics and the Advanced Thermostat Subcommittee, a subcommittee of the IL TRM Technical Advisory Commission (TAC). The Advanced Thermostat Subcommittee includes members of a variety of organizations, such as Navigant, Opinion Dynamics, ICC staff, Vermont Energy Investment Cooperative (VEIC), ComEd, Ameren, Google, Ecobee, and the Environmental Law and Policy Center (ELPC).

IL TRM v7.0 Stipulation

ICC staff, ComEd and regional stakeholders reached an agreement as part of the TRM update process for version 7.0, which will guide the current research effort for Advanced Thermostats. The stipulation is as follows:

> In an effort to resolve potential disputes regarding the cooling reduction value in the IL-TRM for advanced thermostats, the Stipulating Parties agree to retain the 8% cooling reduction value for the 2019 IL-TRM Version 7.0, subject to completion of a statewide advanced thermostat

evaluation utilizing AMI data. Specifically, the Stipulating Parties agree to work collaboratively with ComEd independent evaluator Navigant and Ameren Illinois independent evaluator Opinion Dynamics and other interested stakeholders to develop an Illinois-specific advanced thermostat evaluation method(s) that utilizes pre- and post-advanced thermostat participant AMI data and is developed with consideration of all proposed evaluation strategies, consistent with best industry practices, to be completed as soon as feasible for consideration in updating the IL-TRM. In developing the evaluation strategy, consideration will be given to adopting approaches that estimate cooling run time changes from the actual participants' pre-advanced thermostat AMI data, along with actual post-advanced thermostat run time data provided by both the thermostat manufacturers and AMI data, as well as performing an econometric analysis on the AMI data using total home electricity consumption rather than estimated run time to provide another estimate and a comparison between the two methods. The Stipulating Parties further agree that nothing in this agreement precludes consideration of other evaluation approaches.

Below is proposed language that would be included as a footnote next to an 8% cooling reduction value for advanced thermostats in the 2019 IL-TRM Version 7.0:

> In an effort to resolve potential disputes, without the need for litigation regarding the cooling reduction value in the IL-TRM for advanced thermostats, Stakeholders have reached through negotiation a separate stipulation that retains the 8% cooling reduction value in the 2019 IL-TRM Version 7.0, pending completion of a statewide advanced thermostat evaluation utilizing participant AMI data, and consistent with a Stipulation reached among stakeholders and the Program Administrators. Specifically, the parties have agreed to work collaboratively to develop an Illinois-specific advanced thermostat evaluation framework that utilizes AMI data, for consideration in updating the IL-TRM as soon as feasible, but no later than completing the evaluation in time for the 2021 IL-TRM Version 9.0, if practicable and, for Ameren Illinois, in a manner consistent with the timing of its AMI installation schedule.

Evaluation Research Topics

This research focuses on measure 5.3.16 Advanced Thermostats. [85] The goals of this study include:

- Evaluated estimate of annual cooling electric savings and coincident demand savings, which will be available to inform the IL TRM as a part of the IL TRM TAC process coordinated by VEIC
- Research to understand and contextualize findings, including understanding those that are unexpected, such as the effect of advanced thermostats on non-weather-related energy use

The CY2020 evaluation will seek to answer the following key researchable questions at a minimum. Additionally, some research questions may be added or edited as Navigant coordinates this research with the Advanced Thermostat Subcommittee.

- What is the impact of residential advanced thermostats on cooling season electric consumption?
- What adjustments could be made to the ENERGY STAR method for estimating field savings for advanced thermostats in order to improve estimates of cooling savings and what are the savings estimates for Illinois of an adjusted ENERGY STAR method?

[85] For more information on this measure, please review the IL TRM v8.0.

- What is the impact of residential advanced thermostats on electric demand at certain critical times?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2020 that will be used to answer the evaluation research questions.

Table 2. Core Data Collection Activities, Sample, and Analysis

Activity	Target(s)	Notes
Collect and Process AMI and Thermostat Data	• Request data from ComEd and thermostat manufacturers • Receive and process data • Address data issues	
Coordinate with Opinion Dynamics and Engage Advanced Thermostat Subcommittee	• ~7 Touchpoint Meeting(s) with Advanced Thermostat Subcommittee • 1-on-1 Meetings as necessary • Ongoing coordination meetings with Opinion Dynamics	Dependent on level of stakeholder feedback and data availability
Gross Impact - Econometric Analysis	• Analysis of AMI data	Dependent on data availability
Gross Impact - Adjusted ENERGY STAR Analysis	• Analysis of thermostat telemetry, survey, and HVAC metering data	Dependent on data availability
Final Reporting and Minor Supplemental Analyses	• Supplemental Analyses as Necessary • Final Report	Dependent on level of stakeholder feedback and data availability

Collect and Process AMI and Thermostat Data

Navigant sent data requests for ComEd advanced thermostat participants to ComEd, Nest and Ecobee in Summer 2018. Navigant expects to receive AMI interval data for ComEd customers for the period from at least March 2017 through March 2019. To date, Navigant has received data spanning the period from March 2018 through March 2019.

Navigant will work with parties from whom data has been requested to receive and validate AMI and thermostat data. This task will include processing and reviewing data, addressing any issues that arise, and ensuring data quality and completeness.

Coordinate with Opinion Dynamics and Engage Advanced Thermostat Subcommittee

At the request of the ICC Staff, Navigant has coordinated in CY2019 with Opinion Dynamics, evaluator for Ameren Illinois, to develop a unified set of methods for performing the current research, with the intent that the same methods would be conducted for both ComEd and Ameren Illinois advanced thermostat programs. For CY2020, Navigant will continue to coordinate with Opinion Dynamics in order to ensure that the two evaluators are aligned on the research to be conducted and methods to be employed.

For CY2020, Navigant will engage with stakeholders on the Advanced Thermostat Subcommittee through a series of Touchpoint meetings, as well as one-on-one meetings with individual subcommittee members as necessary. These meetings will serve two primary goals: (1) to reach consensus on methods and (2) to review and understand results. Delays in receiving data from ComEd or the thermostat vendors will impact how much Navigant is able to coordinate with stakeholders and still complete research by May 2020 for the IL TRM.

Reach Consensus on Methods

Navigant will coordinate with the Advanced Thermostat Subcommittee to the greatest extent possible in order to reach agreement on the methodology for this research. In CY2019, the subcommittee reached consensus to pursue two parallel pathways: (1) an econometric analysis of AMI data and (2) an analysis of adjustments to the Environmental Protection Agency's (EPA's) ENERGY STAR method for estimating energy savings due to advanced thermostats. The specific details of these methods will further need to be developed with stakeholder input.

Agreement on methods prior to seeing results serves several purposes: (1) to create a transparent record of the research to be conducted and questions to be answered (2) to make sure stakeholders understand the methods to be employed; (3) to create a framework with which to assess the validity of the research results, including understanding the assumptions and limitations of the agreed upon methods prior to seeing results; and (4) this framework enables Navigant (the independent evaluator) to be inclusive of input from financially vested parties without risking the objectivity of the research. While this process does not guarantee accuracy of the results, it will facilitate the interpretation and assessment of results in a consistent way among all stakeholders.

Importantly, reaching agreement on the methods does not mean that the results will be automatically adopted in the TRM. The purpose of this research is to provide Illinois-specific research and recommendations as appropriate. The decision of how to update the TRM will be the responsibility of stakeholders as part of a separate process coordinated by VEIC.

Review and Understand Results

Navigant will coordinate touchpoint meetings and 1-on-1 meetings as needed to discuss the study's findings. The purpose of these meetings will be to provide valuable context and/or plausible explanations for whatever savings estimates are found. This context has been a common request and a proactive discussion of results will mitigate concerns of key stakeholders and facilitate future discussions regarding updating the TRM.

Econometric Analysis

The econometric analysis of AMI data to estimate energy savings is one pathway that was agreed upon by stakeholders in CY2019. Econometric analysis would utilize AMI data to simulate an experiment, comparing the difference in cooling electric energy use before and after installation of the advanced thermostat, and will utilize a comparison group such as future participants or non-participants.

In CY2019, Navigant and Opinion Dynamics began the development of this method, incorporating the feedback of the Advanced Thermostat Subcommittee. Pending delivery of ComEd's AMI data, the details of this analysis will be further developed with the feedback of the Subcommittee. Navigant will then conduct the econometric analysis to produce an estimate of energy and peak demand savings. Depending on the final approach taken, Navigant will comment on whether the econometric analysis estimate should be considered an estimate net or gross savings. If the estimate is gross, this research does not encompass estimating a net-to-gross (NTG) ratio.

Adjusted ENERGY STAR Analysis

The EPA's ENERGY STAR program prescribes a method for demonstrating field savings for connected thermostats. [86] Stakeholders have expressed a strong desire to leverage this method for evaluation purposes. In CY2019, Navigant and Opinion Dynamics discussed this method with stakeholders, with two key outcomes:

- Many stakeholders agree with the evaluators that the unadjusted ENERGY STAR method is insufficient for evaluation purposes
- Many stakeholders believe that adjustments to the ENERGY STAR method could yield results that would be appropriate for evaluation

Navigant and Opinion Dynamics proposed a number of adjustments to the ENERGY STAR method that would improve the accuracy of the method, subject to the data available and the timeline prescribed by the IL TRM v7.0 Stipulation. Navigant will further develop the details of this analysis with the Subcommittee. The adjusted ENERGY STAR analysis produces an estimate of gross savings. This research does not encompass estimating an NTG ratio.

Final Reporting and Minor Supplemental Analyses

Based on stakeholder feedback, Navigant and Opinion Dynamics will consider additional, minor analyses proposed by the group that can inform the group's interpretation of the results of the research. Navigant will conduct any additional analyses as warranted and document the findings in a report. Separate from this study, VEIC will coordinate a process through IL TRM TAC for how best to update the IL TRM considering the findings from this study.

Evaluation Schedule

The timeline of this research is dependent on the availability of AMI and thermostat data. In order to meet the timeline of the IL TRM v7.0 Stipulation to inform IL TRM v9.0, this research needs to be completed by May 2020. In CY2019, since AMI data was expected by March 20, 2019, this data is required as soon as feasible for ComEd. Further delays of delivery of the AMI data will decrease the amount of time available for stakeholder engagement, which greatly increases the risk of negative stakeholder responses. This research may not be finished in time to inform IL TRM v9.0 at all if data is received after November 30, 2019.

Navigant will continue to coordinate meetings with the Advanced Thermostat Subcommittee prior to receiving AMI or thermostat data in an effort to expedite the study. Table below provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress.

[86] ENERGY STAR Connected Thermostat Products Method to Demonstrate Field Savings Version 1.0 (rev. Dec-2016). Available at: https://www.energystar.gov/sites/default/files/Version%201.0%20Method%20to%20Demonstrate%20Field%20Savings%20of%20ENERGY%20STAR%20Connected%20Thermostats.pdf

Table 3. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Approximate Date
Deliver AMI Data	ComEd	ASAP, no later than November 30, 2019
Collect Thermostat Data	Evaluation and Thermostat Manufacturers	ASAP, December 2019
Collect Available Survey and HVAC Metering Data	Evaluation	ASAP, December 2019
Touchpoint Meeting 11	Evaluation	December 2019
Touchpoint Meeting 12	Evaluation	January 2020
Touchpoint Meeting 13	Evaluation	February 2020
Touchpoint Meeting 14	Evaluation	March 2020
Draft Results – Econometric Analysis	Evaluation	March 2020
Draft Results – Adjusted ENERGY STAR Analysis	Evaluation	March 2020
Touchpoint Meeting 15	Evaluation	April 2020
Touchpoint Meeting 16	Evaluation	May 2020
Final Report Completed	Evaluation	May 2020
Additional Meetings / Engagement as Necessary	Evaluation	May – August 2020

Technical Reference Manual

Introduction

The purpose of the Illinois Technical Reference Manual (IL TRM) is to provide a transparent and consistent basis for calculating energy and demand savings in Illinois. [87] The overall goal of this evaluation research is to improve the IL TRM input parameter assumptions. All evaluators in Illinois, including Navigant, are part of the Illinois Stakeholder Advisory Group (SAG) Technical Advisory Committee (TAC) and are charged with providing materials to continually update and improve the IL TRM to provide the most accurate input parameter assumptions and impact evaluation methodology.

This evaluation research plan summarizes Navigant's approach for conducting evaluation research to update measures in the IL TRM. The purpose of this plan is to provide a summary of the prioritization framework and to outline the methodology for secondary and primary research efforts. We expect these activities to occur on a rolling basis each year during the two-year period.

Evaluation Research Topics

The objectives of IL TRM evaluation research are:

1. Develop a framework for ongoing evaluation research contributions to IL TRM updates, including scope and schedule for such activities.
2. Promote statewide coordinated evaluation research efforts through the TAC.
    a. Outline status update and communication processes to keep interested stakeholders apprised of this work and provide stakeholders meaningful opportunities to comment.
    b. Work with the TAC and IL TRM administrator to provide valuable input while avoiding duplication of efforts.
    c. Share results with ComEd, the Illinois gas utilities, Ameren IL and their evaluator, and other relevant stakeholders.
    d. Participate in annual prioritization for TRM evaluation research in conjunction with the TAC, including attending and providing feedback during research prioritization and TRM measure prioritization meetings.
3. Review current IL TRM measures and priority recommendations from the TAC to develop evaluation research based on energy savings, historical realization rates, variability and uncertainty in measure impacts, feasibility to update, relative contributions of measures and planned future use, among others.
4. Conduct secondary research to develop comparable industry benchmarks for selected measures and propose standardized deliverables for secondary research including inputs to IL TRM measure work papers.
5. Determine appropriate thresholds for determining when to conduct primary evaluation research. Upon selection, develop appropriate methods to conduct such research.

[87] Policy Document for the Illinois Statewide Technical Reference Manual for Energy Efficiency, https://s3.amazonaws.com/ilsag/IL-TRM_Policy_Document_Version_2.0_5-5-17_FINAL.pdf

Evaluation Approach

This evaluation plan segments activities for TRM research into four discrete activities, as summarized in Table 1 below. As stated above, we expect to conduct these activities on an ongoing basis, resulting in an updated list of measures for evaluation research each year.

Table 1. Summary of Activities, Tasks, and Deliverables

Activity	Tasks	Deliverables
Statewide Coordination	• Participate in Illinois SAG and TAC meetings • Participate in statewide coordination among utilities, evaluators and stakeholders	• TAC meeting to discuss planned secondary and primary research • Evaluation plans and activities reflect statewide coordination
TRM Research Prioritization	• Define framework for determining high impact measures for secondary and primary research • Determine gaps in current TRM research plan	• Annual list of secondary and primary research priorities
Secondary Research	• Conduct literature review • Conduct engineering review, including review of past measure participation	• Secondary Research Memo • TRM Work Paper
Primary Research	• Conduct primary research effort through metering, data collection, modeling, or other engineering method	• Primary Research Evaluation Plan • Primary Research Memo • TRM Work Paper

Statewide Coordination

Navigant coordinates evaluation research with relevant stakeholders to prioritize and conduct a coordinated research effort, including the following:

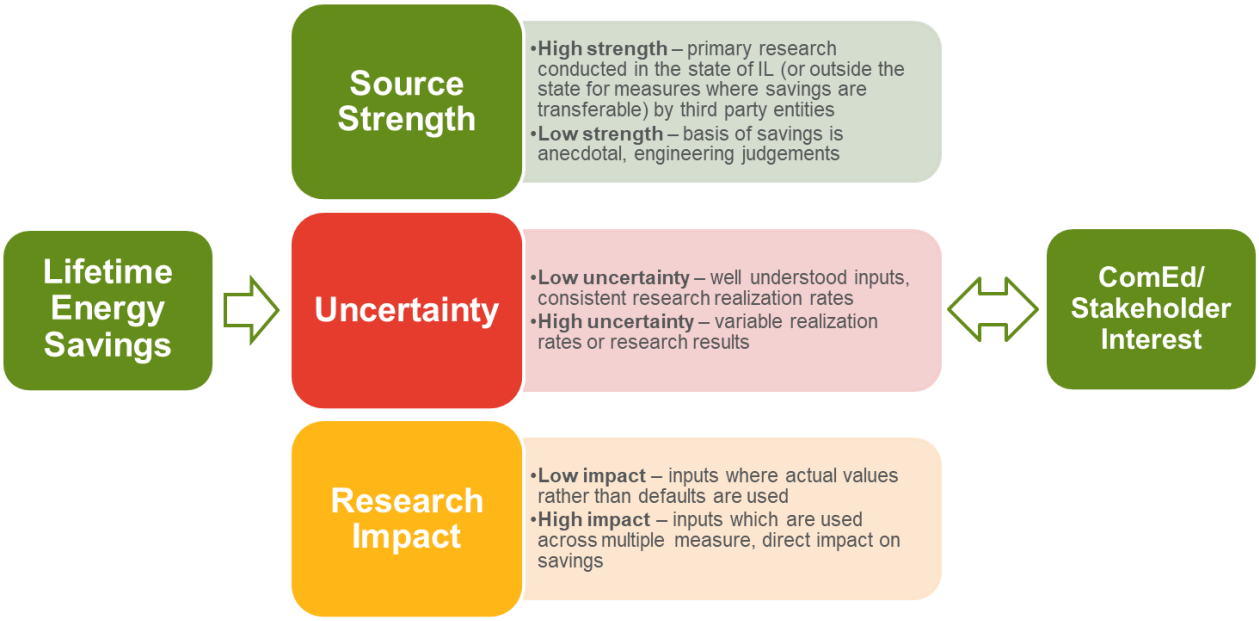
- **Ameren Illinois evaluation team.** Navigant holds monthly calls with the Ameren Illinois evaluation team and coordinates on statewide evaluation research.
- **Illinois Gas Utilities.** Navigant also evaluates Nicor Gas', Peoples Gas' and North Shore Gas' energy efficiency programs and will coordinate with our internal team on research items of interest to the gas utilities.
- **Continued IL SAG and TAC participation.** Navigant will continue to participate in IL SAG and TAC meetings to engage stakeholders at key stages of evaluation research plan development to ensure that objectives and methodology align with statewide and regional goals and other ongoing research. Additionally, Navigant will notify the TAC of the primary research planned during the TRM update process and will report out on research efforts during TAC calls.

Measure Prioritization

Navigant has developed a prioritization framework for IL TRM evaluation research tasks. The purpose of this framework is to aid the IL TRM Administrator and TAC in identifying current IL TRM measures that have the highest potential for updating current IL TRM algorithms or savings estimates. Figure 1 below provides a schematic of the prioritization framework. Navigant will update this framework as needed, based on new information about technologies, measures or programs. The framework considers the following:

- **Energy Savings.** Prioritize measures with significant planned Cumulative Persisting Annual Savings (CPAS) and/or high anticipated planned savings
- **Measure Research Criteria**. Rank each measure based on three criteria. Navigant uses a one to five ranking for the three below criteria, where a five represents a high need for research and a one represents a low need for research.
    - **Source strength** – Focus on measures which have not been well-studied recently. We will prioritize updates to measures with references noted by industry as "weak", e.g., values based on another state, values based on engineering simulations instead of primary data collection, or values which do not account for significant interactive effects.
    - **Uncertainty of measure savings** – Consider evaluated research realization rates over time, program changes, or measure mix changes
    - **Research impact** – Consider how likely the results from the research will develop into significant IL TRM updates.
- **Stakeholder and utility interest.** Consider interest from ComEd or other stakeholders in developing measure research priorities.

Figure 1. TRM Evaluation Research Prioritization Schematic



Source: Navigant

The framework will assist Navigant in (1) identifying gaps in our current TRM research plans and to (2) determine the appropriate level of rigor for each research effort. The following tables present results from the CY2018 high impact measures list by energy savings and whether there is a current or planned research initiative.

Table 2. Commercial & Industrial Measure Prioritization

End Use Type	Verified Gross First Year Savings (kWh)	Percent Impact on First Year Savings	Verified Gross Lifetime Savings (kWh)	Percent Impact on Lifetime Savings	Research?
LED Lighting (Lamps, Fixtures)	763,348,911	65%	8,444,289,666	63%	2019 EUL Research Effort
Other (Custom, RCx, etc.)	140,925,025	12%	1,701,853,347	13%	2019 EUL Research Effort
Voltage Optimization	66,014,049	6%	990,210,730	7%	
Other (HVAC)	34,661,587	3%	508,377,194	4%	
Compressor system	27,242,260	2%	250,862,979	2%	Demand-side compressed air TRM research considered for 2021
Networked Lighting & Controls	21,613,178	2%	247,191,435	2%	
Programmable Thermostat	17,893,833	2%	65,606,815	0%	
Occupancy Sensor & Other Controls	15,353,508	1%	121,696,725	1%	
Other (Refrigeration)	10,941,508	1%	122,417,083	1%	
Energy Management Systems	10,067,150	1%	151,007,253	1%	
Total*	**1,173,850,680**	**100%**	**13,361,864,886**	**100%**	

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Navigant Analysis

Table 3. Residential Measure Prioritization

End Use Type	Verified Gross First Year Savings (kWh)	Percent Impact on First Year Savings	Verified Gross Lifetime Savings (kWh)	Percent Impact on Lifetime Savings	Research?
LED Lighting (Lamps, Fixtures)	493,293,952	76%	4,761,729,360	79%	2019 EUL Research Effort
Refrigerator	38,320,158	6%	312,544,533	5%	
Advanced Thermostat	21,801,159	3%	218,011,591	4%	
Advanced Power Strips Tier 1	10,803,443	2%	75,624,098	1%	APS In-Service Rate Research
ECM Furnace Motor	7,415,736	1%	148,314,720	2%	
Air Purifier	5,482,708	1%	49,344,372	1%	
Freezer	4,779,903	1%	38,411,881	1%	
Room & Central Air Conditioner	3,317,542	1%	54,495,457	1%	
Low Flow Showerhead	2,964,787	0%	29,647,874	0%	
Heat Pumps (ASHP, Ductless HP, GSHP, Others)	1,613,844	0%	29,650,966	0%	
Total*	**648,191,485**	**100%**	**6,042,720,284**	**100%**	

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Navigant Analysis

Table 4. Income Eligible Measure Prioritization

End Use Type	Verified Gross First Year Savings (kWh)	Percent Impact on First Year Savings	Verified Gross Lifetime Savings (kWh)	Percent Impact on Lifetime Savings	Research?
LED Lighting (Lamps, Fixtures)	90,374,976	84%	876,174,674	85%	2019 EUL Research Effort
Advanced Power Strips Tier 1	3,369,629	3%	23,587,400	2%	APS In-Service Rate Research
Low Flow Showerhead	944,527	1%	9,445,273	1%	
Air Sealing	869,626	1%	13,044,385	1%	
Attic/Wall/Basement /Floor/Foundation Insulation	851,956	1%	21,298,907	2%	
Faucet Aerators	551,728	1%	4,965,555	0%	
PTAC/PTHP	483,305	0%	7,249,577	1%	
HVAC Control System & Maintenance	420,354	0%	7,566,364	1%	
Heat Pumps (ASHP, Ductless HP, GSHP, Others)	323,862	0%	5,808,380	1%	
Room & Central Air Conditioner	238,500	0%	4,086,024	0%	
Total*	**107,634,721**	**100%**	**1,036,172,473**	**100%**	

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Navigant Analysis

Secondary Evaluation Research

Secondary evaluation research efforts will (1) inform near-term updates to the TRM and (2) assess need for a primary research effort. Secondary evaluation research efforts may include reviewing applicable state TRMs, conference papers (e.g., IEPEC, ACEEE), consulting internal and external industry experts, reviewing previous measure-level evaluation findings, and reviewing available cost or technology data from stakeholders.

There are two deliverables typically associated with the secondary evaluation research effort; a research findings memo and TRM measure workpaper, outlined in the table below.

Table 5. Secondary Evaluation Research Deliverables

Deliverable	Description

Secondary Research Memo	The secondary research memo will typically include the following sections:
	• Background
	  ○ Measure prioritization, i.e., why Navigant conducted secondary research on this measure
	  ○ Description of measure technology and role in ComEd portfolio
	• Methodology
	  ○ Sources reviewed (research papers, TRMs, conference papers, industry experts)
	  ○ Type of engineering/econometric review performed
	• Findings
	  ○ Findings from literature review
	  ○ Findings from engineering/econometric review
	• Recommendations
	  ○ Changes recommended to the TRM in the short term
	  ○ Recommendations for additional primary or other type of research

TRM Work Paper	A TRM work paper will include TAC submittal procedure and deadlines to share this information with statewide stakeholders and to submit work papers to the TAC by May 15 of each year to be incorporated into future versions of the TRM. An example is embedded here:  Illinois_Statewide_TRM_Workpaper_Rev

Source: Navigant

Primary Evaluation Research

Once a need for primary evaluation research is identified, Navigant will work with ComEd, and relevant stakeholders as appropriate, to plan and deliver primary evaluation research. Primary evaluation research could include any ComEd territory specific data collection or analysis effort including:

- On-site metering
- Billing analysis
- Modeling
- Surveys/Interviews/Observations
- Collection of cost data

Evaluation Schedule

The table below includes a general schedule for IL TRM evaluation research that we expect to implement on a rolling basis, using the CY2020 timeframe as an example.

Table 6. TRM Evaluation Research Schedule by Task

Activity or Deliverable	Responsible Party	Date
2020 IL TRM research priorities established by stakeholders (complete)	Evaluation/ComEd/ Stakeholders	September 26, 2019
Evaluation review/prioritization (complete)	Evaluation	October 2019
Secondary research (in progress)	Evaluation	May 15, 2020
Develop TRM work papers (in progress)	Evaluation	May 15, 2020
2020-2021 primary research planning	Evaluation	June-July 2020
Feedback to inform next TRM prioritization	Evaluation	August 2020
2021 IL TRM research priorities established by stakeholders	Evaluation/ComEd/ Stakeholders	September 2020