Guidehouse

ComEd CY2021 Evaluation Plan

Presented to

ComEd®
Energy Efficiency Program

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ComEd CY2021 Evaluation Plan

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1. INTRODUCTION

This compendium of evaluation plans provides an overview of evaluation activities for the Calendar Year (CY) 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 2021 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. Guidehouse 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.

- **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.

Several elements of the FEJA drive the specifics of our evaluation research, as described below.

Focus on CPAS

Under FEJA, 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 Illinois Technical Reference Manual (TRM) in conjunction with the Illinois 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

[1] ComEd 2020-2021 Evaluation Plan: https://ilsag.s3.amazonaws.com/ComEd-CY2020-CY2021-Evaluation-Plan-2020-02-27.pdf

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.

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

Guidehouse is researching participant, utility, economic and societal non-energy impacts (NEIs) for ComEd. To date, Guidehouse completed the economic, societal and utility NEI analyses. The completed reports are posted on the SAG NEI Working Group website (https://www.ilsag.info/nei-working-group/). The initial focus for NEIs research has been quantifying NEIs associated with income eligible programs, since previous research has shown significant NEIs associated with 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. Total Resource Cost (TRC) test results will be shown with and without non-TRM NEIs in the TRC report. This is consistent with the position ICC Staff provided during the summer of 2020.

Guidehouse completed research to determine:

- Economic NEIs including job creation (direct, indirect, and induced)
- Utility NEIs including reduced collections, arrearages, and disconnect and reconnect costs
- Societal NEIs from reduced emissions due to reductions in fossil-fuel based electricity generation

In CY2021, Guidehouse is conducting research to determine:

- Participant NEIs associated with several income eligible programs including improved health and reduced missed work and school days. In addition, we are conducting interviews with building owners and operators to quantify NEIs associated with operations and maintenance.
- NEIs associated with non-income eligible 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

Guidehouse will develop a detailed CY2021 NEI research plan and post it to the Illinois Stakeholder Advisory Group website in Q1 2021.

Summary Report

Guidehouse 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, 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

Guidehouse 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.

Four-Year Summary Report

Guidehouse will also provide a report that summarizes savings across the four years of the Plan. It will provide a summary of portfolio-level results for verified cumulative persisting annual savings, peak demand reduction, and weighted average measure life. It will also present a summary of the Total Resource Cost (TRC) results from each year. The final TRC report will include summary level TRCs as well as sector and program level TRCs. The annual summary report will also include the summary level TRCs.

Schedule

Guidehouse will deliver the first draft within two weeks of the first draft of the CY2021 Summary Report.

ComEd 4-Year Plan Savings

Guidehouse 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.

Table 1. ComEd 4-Year Plan Savings

Savings/Budget	2018	2019	2020	2021
Statutory CPAS (MWh)	6,130,858	7,152,667	8,174,477	9,274,887
Legal 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 (Million)	$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 in the Appendices and also shown in Appendix A. “Program-Specific Four-Year Tasks.” Guidehouse also develops evaluation plans for Pilot programs with energy savings. Guidehouse will approach the evaluation of each program with an approach tailored for the specifics of the program. Below we give an overview of our approach for each sector, plus the pilots.

Business Sector

Our evaluation strategy for the business sector programs includes (1) impact analysis in each of the four years leveraging the TRM, when appropriate (e.g., Standard, Small Business and Instant Discounts) and custom evaluation for other business programs (e.g., Custom, Industrial, 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) screening questions in program participant surveys looking for evidence of non-energy impacts associated with these programs, (6) 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 (7) 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

Guidehouse’s evaluation of income eligible programs will focus on (1) impact analyses, (2) identifying gaps in participation or underserved regions, (3) identifying potential updates to the TRM or NTG ratios, and (4) coordination with stakeholders, including the Income Qualified Energy Efficiency Advisory Committee.

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

We will conduct impact research that will result in updates to the NTG Lighting recommendations for the future use in the TRM. The data collection activity will consist of Customer Self Report Surveys, specifically In-Store Intercepts. The evaluation team plans to complete 350 in-store intercept surveys at Big Box and DIY locations.

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 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.

Pilots and Market Transformation Programs

ComEd's plan includes pilots to test feasibility for inclusion in ComEd's portfolio as well as adding new measures to the TRM. In addition, ComEd's plan includes market transformation programs. For the pilots and market transformation program with evaluation support, Guidehouse conducts impact and process evaluations in a similar manner to the programs in the portfolio includes: (1) determining the data needed to conduct impact evaluations, (2) tracking system review, (3) engineering file review, (4) impact analyses, (5) assessing feasibility of measure added to a future TRM using primary and secondary research as needed including draft Work Paper reviews, (6) research on behavioral measure savings and custom measure savings and evaluation approaches, (7) process evaluations (including trade ally, participant and non-participant interviews), and (8) TRM draft Work Paper review.

CY2021 Pilots and Market Transformation Programs include:

- Commercial Food Service Equipment (Joint Market Transformation Program)
- Electric Homes New Construction (Pilot)
- Efficient Choice (Pilot)
- ENERGYSTAR Retail Products Platform (Market Transformation Program)
- Normalized Meter Energy Consumption - Power TakeOff (Pilot)
- Normalized Meter Energy Consumption - Recurve (Pilot)
- SEM Water Savings (Pilot)
- Very High Efficiency HVAC (Pilot)
- Water Infrastructure Leak Reduction (Pilot)

Since Pilots and Market Transformation programs are launched throughout the program year, our evaluation plans for these ComEd offerings will be posted to the Illinois Stakeholder Advisory Group website when our understanding of the design and implementation has advanced far enough for evaluation plans to be developed.

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 Guidehouse'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. The final TRCs are used for validation of the statutory requirement and use in the related ICC proceeding to show that ComEd's portfolio has adhered to state law and regulations. As part of Guidehouse'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 Peoples Gas and 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. Modeling of the TRCs and cost analysis will be done with Guidehouse's Analytica model which will include inputs discussed with ComEd and the ICC. For CY2021, Guidehouse will calculate program and portfolio TRCs which will include monetized non-energy impacts (NEIs). In addition, Guidehouse will develop a four-year TRC report to summarize the four-year cycle and provide an overview of CY2018 – CY2021 including final four-year TRCs for each program and the portfolio. The four-year report will also include findings for each calendar year by program,

We anticipate 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 Guidehouse team will work with ComEd to ensure that the appropriate 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 North Shore Gas), only the electric portion of the program savings and cost-benefit calculations are included. The combined joint calculations for the joint programs will be included in a separate memo attached as an appendix to the report.

Guidehouse will comply with the Illinois Energy Efficiency Policy Manual v2.0, 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 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

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

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

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

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
RCt = Replacement costs of incandescent equivalents in year t
SNEIt = Societal NEI in year t

Guidehouse 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:

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 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 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. Note that the societal discount rate will be used to calculate the UCT consistent with policy manual v2.0.

Using the equation terms previously defined for the 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 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 Guidehouse's evaluation activities. Guidehouse 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	Guidehouse 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: Guidehouse 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*
	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. CY2021 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.
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	Guidehouse 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, Guidehouse 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, Guidehouse 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	Guidehouse 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. Guidehouse makes the assumption that the implementation contractor and marketing costs are the only costs associated with this program and there is no measure cost.

Activity/Deliverables	Responsible Party	Date Delivered
Public Housing Authority	ComEd (Multi-Family Market Rate Program) and TRM	Measure costs weren't tracked by ComEd. Guidehouse 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
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. Guidehouse 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.
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. Guidehouse 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. Guidehouse 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 Guidehouse 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. Guidehouse 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. Guidehouse 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. Guidehouse 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.
Public Housing Energy Savings		ComEd Invoices aren't setup to track the measure level costs for this program. Guidehouse had to make the assumption that the total cost was twice the ComEd incentive since ComEd only covers half the cost of each installation.

* 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 does not 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. Guidehouse 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. Guidehouse 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), Guidehouse 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.

CY2021 cost analysis will run into 2022 and conclude per the relevant stipulation on or before June 29th, 2022. Guidehouse 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 Guidehouse.

[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, 2021 *
Guidehouse Develops Initial Cost Model (Analytica)	Guidehouse	Jan 20, 2022
Iterative Cost and Assumptions Discussions w/ComEd	ComEd / Guidehouse	Jan-May 2022
Finalize Cost Model	Guidehouse	Feb 1, 2022
Guidehouse Develops Initial TRCs	Guidehouse	Feb 30, 2022
Discussion of Initial TRCs	ComEd / Guidehouse	Feb-April 2022
Guidehouse Draft TRC Report – Delivered	ComEd/ICC	May 21, 2022
Comments on Draft TRC Report due from Parties	ComEd / Guidehouse	June 11, 2022
Guidehouse Re-Draft TRC Report – Delivered	ComEd/ICC	June 18, 2022
Final TRC Report to ComEd and SAG	Guidehouse	June 29, 2022
Guidehouse Draft Joint TRCs**	Guidehouse	August 5, 2022
Comments on Guidehouse Draft of Joint TRC Report**	ComEd / Guidehouse	August 26, 2022
Guidehouse Re-Draft of Joint TRC Report**	ComEd	August 26, 2022
Final Joint TRC Report**	Guidehouse	September 9, 2022

*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.
** Draft and final joint CY2021 TRCs are dependent on the gas companies finalizing their CY2021 TRCs.

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 SAG and the TRM administrator to update the 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 the appendices.

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
   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 TRM evaluation research is to improve TRM input parameter assumptions and formulas. All evaluators in Illinois, including Guidehouse, are part of the Illinois SAG Technical Advisory Committee (TAC) and are charged with providing materials to continually update and improve the TRM to provide the most accurate input parameter assumptions and impact evaluation methodology. Guidehouse will continue to produce TRM measure workpapers including primary and secondary research. Each year, Guidehouse reviews current 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 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 SAG releases new updates on TRM research priorities and the ComEd portfolio measure mix shifts over time. This ongoing review will ensure Guidehouse's research will focus on the most important topics for ComEd and SAG stakeholders.

As new measures are proposed to the TRM, Guidehouse will conduct secondary research in coordination with the 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.

Non-Energy Impact Research

In CY2021, Guidehouse 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 participant NEI research associated with several income eligible programs. In addition, we will provide updates via SAG NEI Working Group meetings. We will also continue the process of including the monetized NEIs in the TRM or policy manual.

Net-to-Gross Evaluation Research

In CY2021, Guidehouse will continue to lead the NTG working group as it seeks to improve the 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 on these proposals 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 TRM methodologies) that were articulated in Illinois SAG NTG Working Group meetings
- Conducting sensitivity analyses of Guidehouse'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

Table 5 below summarizes the NTG research we plan to conduct this year. Results from these studies will inform our September 1, 2021 NTG recommendations, which will be applied in CY2022 (except two programs[9]). Detailed information about each study is in each program's evaluation plan.

Table 5. CY2021 NTG Research and Draft NTG Memo Delivery Date

Sector	Program	Survey Respondent	NTG Component	Draft NTG Memo
Business	Business Instant Discounts	Participant and Distributor	Free Ridership and Spillover	July 16, 2021
Business	Incentives - Custom	Participant and EESP	Free Ridership and Spillover	June 28, 2021
Business	Incentives - Standard	EESP	Spillover	May 27, 2021
Business	Industrial Systems	Participant and EESP	Free Ridership and Spillover	June 28, 2021
Business	Non-residential New Construction	Participant	Free Ridership	July 26, 2021
Business	RetroCommissioning	Participant and EESP	Free Ridership and Spillover	June 25, 2021
Business	Small Business Kits	Participant	Free Ridership and Spillover	July 12, 2021

[9] Due to COVID-19 limitations, research for Residential Lighting Discounts and Income Eligible Products will be conducted in Fall 2021, and results will inform our NTG recommendations September 1, 2022.

Sector	Program	Survey Respondent	NTG Component	Draft NTG Memo
Business	Virtual Commissioning (VCX)	Participant	Free Ridership and Spillover	June 25, 2021
Residential	Single-Family Assessments	Participant	Free Ridership and Spillover	July 16, 2021
Residential	Lighting Discounts	Participant	Free Ridership and Spillover	March 2, 2022
Income Eligible	Product Discounts	Participant	Free Ridership and Spillover	March 2, 2022

Research Tasks

Tables 6 and 7 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 SAG releases new updates on TRM research priorities and the ComEd portfolio measure mix shifts over time. This ongoing review will ensure Guidehouse's research will focus on the most important topics for ComEd's evaluation and 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. Guidehouse has included existing research plans in Appendix G and other plans will be created as information is available.

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

Table 6. Evaluation Research Tasks: TRM Measure Research*

Research Task	Description	2017	2018	2019	2020	2021
TRM 5.2.1: 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	✓	✓	✓	✓	
TRM 5.3.16 Advanced Thermostats - Cooling Savings Factor	Billing analysis to estimate cooling savings factors for advanced thermostats	✓	✓	✓	✓	
TRM 5.6.1-5.6.5: Shell Measures - Savings Verification	Engineering and billing analysis to update de-rating factors for air sealing and insulation	✓	✓			
TRM 6.1.1: Weather Normalization for Behavior Measures	Billing analysis to determine whether weather normalization is required for evaluating behavior measure savings	✓				
TRM 6.1.1: Adjustments to Behavior Savings to Account for Persistence	Billing analysis to estimate decay rates for behavior measure savings	✓	✓	✓	✓	

Research Task	Description	2017	2018	2019	2020	2021
TRM 4.5.16: 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	✓	✓			
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	✓	✓			
TRM 4.4.19: Demand Controlled Ventilation - Savings Factors	Secondary research to update savings factors for demand-controlled ventilation	✓	✓			
TRM 4.5.4, 5.5.6, 5.5.8, and 5.5.9: 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	✓	✓			
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		✓	✓		
TRM 4.5.16: LED Streetlighting Impacts	Secondary research and metering study to update savings estimates for LED Streetlighting measures		✓	✓		
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		✓	✓		
TRM 4.4.48: 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		✓	✓		
TRM 5.1.8: Refrigerator and Freezer Recycling – Secondary Review	Secondary research to update incremental cost estimates for VSDs			✓		

Research Task	Description	2017	2018	2019	2020	2021
TRM 4.4.48: Small Commercial Programmable Thermostat – Fan Energy (F_e) Assumption	Review the fan energy assumption (Fe) for relevance to commercial sector as the current assumption was pulled from the residential measure.					✓
TRM 4.8.22: Smart Sockets – ISR research	Research ISR and determine end uses (i.e., what's plugged in) using Small Business Kits Program surveys. Will also consider updates to TRM values for hours of operation.					✓
TRM 4.5.10: Lighting Controls – Savings Verification	Primary research into savings. A research plan will be forthcoming.					✓
TRM 4.5.4, 5.5.6, 5.5.8, and 5.5.9: LED Bulbs and Fixtures - Inputs	Secondary research to determine updates to LED product wattage and lumen values					✓
TRM Measures	Additional measures added each year, to be determined			✓	✓	✓

* Measure numbers refer to TRM version 9.0.

Table 7. 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		✓	✓	✓	✓
Compressed Air Measure Prioritization	Tabulating and characterizing the available historical data from Industrial Systems investigation and verification reports					✓
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.	✓	✓	✓	✓	✓

* EUL persistence research for CY2021 is expected to focus on Compressed Air and Virtual Commissioning. Research plans will be forthcoming.

APPENDIX A. PROGRAM-SPECIFIC FOUR-YEAR TASKS

Table 1. Business Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Agriculture Offering	Program Tracking Data Review			X	X
Agriculture Offering	ComEd Staff Interviews			X	X
Agriculture Offerings	Implementer Interview	X	X	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
Business Telecomm (a/k/a Telecommunications Optimization)	Program Tracking Data Review			X	X
Business Telecomm (p/k/a Telecommunications Optimization)	ComEd Staff Interviews			X	X
Business Telecomm (p/k/a Telecommunication Optimization)	Implementer Interview	X	X	X	X
Business Telecomm (p/k/a Telecommunications Optimization)	Impact – Measure-Level Deemed Savings Review			X	X
Business Telecomm (p/k/a Telecommunications Optimization)	Impact – Project Level Desk Reviews			X	X
Business Telecomm (p/k/a Telecommunications Optimization)	Impact – Project Level Site Visits & Metering				X
Business Telecomm (p/k/a Telecommunications Optimization)	Impact – Verification & Gross Realization Rate			X	X
Business Telecomm (p/k/a Telecommunications Optimization)	Impact – Net-to-Gross Research				
Coordinated Utility Retro-Commissioning	Program Tracking Data Review	X	X	X	X
Coordinated Utility Retro-Commissioning	Program Manager Interviews	X	X		X
Coordinated Utility Retro-Commissioning	Implementer Interviews	X	X	X	X
Coordinated Utility Retro-Commissioning	Impact – Project-specific Billing Analysis	X	X	X	X
Coordinated Utility Retro-Commissioning	Impact – Engineering Review	X	X	X	X
Coordinated Utility Retro-Commissioning	Impact – Verification & Gross Realization Rate	X	X	X	X
Coordinated Utility Retro-Commissioning	NTG Research Customer Self-Report Surveys				X
Coordinated Utility Retro-Commissioning	NTG Research Service Provider Interviews				X
Coordinated Utility Retro-Commissioning	Process Analysis	X	X		
Facility Assessments (a/k/a Operational Efficiency)	Implementer Interview	X	X	X	X
Facility Assessments (a/k/a Operational Efficiency)	Program Manager Interview	X	X	X	X
Facility Assessments (a/k/a Operational Efficiency)	Gross Impact	X	X	X	X
Facility Assessments (a/k/a Operational Efficiency)	Gross Sampling Frequency	X	X	X	

Program	Task	2018	2019	2020	2021
Facility Assessments (a/k/a Operational Efficiency)	Verified Net Impact Approach	X	X	X	X
Facility Assessments (a/k/a Operational Efficiency)	Researched NTG Approach		X		
Facility Assessments (a/k/a Operational Efficiency)	Program Manager and Implementer Interviews/Review Materials	X	X	X	
Facility Assessments (a/k/a Operational Efficiency)	Participant Interviews	X	X		
Facility Assessments (a/k/a Operational Efficiency)	Effective Useful Life Determination	X	X	X	
Facility Assessments (a/k/a Operational Efficiency)	Process Evaluation	X	X		
Grocery	Program Tracking Data Review			X	X
Grocery	Implementer Interviews	X	X	X	X
Grocery	Program Manager 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				
Incentives – Custom	Program Tracking Data Review	X	X	X	X
Incentives – Custom	Data Collection – Participant Surveys	X	X	X	X
Incentives – Custom	Program Manager Interviews	X	X	X	X
Incentives – Custom	Implementer Interviews	X	X	X	X
Incentives – Custom	Impact – Engineering Review	X	X	X	X
Incentives - Custom	Impact – Modeling (as needed)	X	X	X	X
Incentives - Custom	Impact – Verification & Gross Realization Rate	X	X	X	X
Incentives - Custom	Net-to-Gross – Customer Self-Report Surveys		X	X	X
Incentives - Custom	Net-to-Gross – EE Service Provider Interviews		X	X	X
Incentives - Custom	Process Analysis	X	X		TBD
Incentives – Standard	Program Tracking Data Review				X
Incentives - Standard	Data Collection – Participant Surveys	X	X		
Incentives - Standard	Program Manager Interviews	X	X	X	X
Incentives – Standard	Implementer Interviews	X	X	X	X
Incentives - Standard	Literature Review				X
Incentives - Standard	Impact – Billing Analysis	X		X	X
Incentives - Standard	Impact – Engineering Review	X	X	X	X
Incentives - Standard	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Incentives - Standard	Impact – Verification & Realization Rate	X		X	X
Incentives - Standard	Net-to-Gross – Customer Self-Report Surveys		X		X

Program	Task	2018	2019	2020	2021
Incentives - Standard	Net-to-Gross – EESP Free Ridership and Spillover Research		X		X
Incentives - Standard	Process Analysis	X	X		
Incentives – Standard	Program Delivery – Benchmarking, Influences				
Industrial Systems Optimization	Program Tracking Data Review	X	X	X	X
Industrial Systems Optimization	Data Collection – Participant Surveys	X	X	X	X
Industrial Systems Optimization	Program Manager Interviews	X	X	X	X
Industrial Systems Optimization	Implementer Interviews	X	X	X	X
Industrial Systems Optimization	Impact – Engineering Review	X	X	X	X
Industrial Systems Optimization	Impact – Measure-Level Deemed Savings Review				X
Industrial Systems Optimization	Impact – Modeling (as needed)	X	X	X	X
Industrial Systems Optimization	Impact – Verification & Gross 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 – EE Service Providers Interviews		X	X	X
Industrial Systems Optimization	Net-to-Gross – Technical Service Provider Interviews			X	X
Industrial Systems Optimization	Process Analysis	X	X		X
Industrial Energy Management	Program Manager Interviews				X
Industrial Energy Management	Implementer Interviews				X
Industrial Energy Management	Program Tracking Data Review				X
Industrial Energy Management	Impact – Billing Analysis				X
Industrial Energy Management	Impact – Engineering Review				X
Industrial Energy Management	Impact – Verification & Gross Realization Rate				X
Instant Discounts	Program Tracking Data Review	X	X	X	X
Instant Discounts	Participant Surveys	X	X	X	X
Instant Discounts	Purchaser Surveys				X
Instant Discounts	Program Manager Interviews	X	X	X	X
Instant Discounts	Implementer Interviews				X
Instant Discounts	Distributor Interviews				X
Instant Discounts	Data Collection – EESPs Interviews/Roundtables	X	X		
Instant Discounts	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Instant Discounts	Impact – Verification & Gross Realization Rate	X	X	X	X
Instant Discounts	Net-to-Gross – Participant Self-Report Surveys	X			X
Instant Discounts	Net-to-Gross – Distributor Interviews				X
Instant Discounts	Net-to-Gross – EESPs Interviews	X			
Instant Discounts	Process Analysis	X	X		X

Program	Task	2018	2019	2020	2021
LED Street Lighting	Program Tracking Data Review	X	X	X	X
LED Street Lighting	Program Manager Interviews	X	X	X	X
LED Street Lighting	Implementer Interviews				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	Impact – Verification and Gross Realization Rate				X
LED Street Lighting	Net-to-Gross – Customer Self-Report Surveys		X		
LED Street Lighting	Process Analysis	X			
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Tracking System and Data Flow Review			X	X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Program Manager Interviews			X	X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Implementer Interviews				X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Impact – Project Level Desk Reviews including Deemed Savings Review			X	X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Impact – Project Level Site Visits and Installation Verification			X	X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Impact – Verification and Gross Realization Rate			X	X
Nonprofit Retrofits (p/k/a Nonprofit Organizations)	Impact – Gross and Net Savings Verification			X	X
Non-Residential New Construction	Program Tracking Data Review	X	X	X	X
Non-Residential New Construction	Data Collection – Materials Review			X	X
Non-Residential New Construction	Participant Interviews	X	X	X	X
Non-Residential New Construction	Program Manager Interviews	X	X	X	X
Non-Residential New Construction	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		
Non-Residential New Construction	Process Research	X	X		
Public Buildings in Distressed Communities	Program Tracking Data Review			X	X
Public Buildings in Distressed Communities	Program Manager Interviews	X	X	X	X

Program	Task	2018	2019	2020	2021
Public Buildings in Distressed Communities	Implementer Interviews				X
Public Buildings in Distressed Communities	Process – Participant surveys and implementer interviews	X	X	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	Program Tracking Data Review			X	X
Public Small Facilities	Data Collection – Program Manager and Implementer Interviews	X	X	X	
Public Small Facilities	Impact – Engineering Review			X	
Public Small Facilities	Impact – Measure-Level Deemed Savings Review			X	
Public Small Facilities	Impact – Verification & Gross Realization Rate			X	
Public Small Facilities	Net-to-Gross – Customer Self-Report Surveys				
Public Small Facilities	Net-to-Gross – EESP Interviews				
Public Small Facilities	Process Research		X		
Small Business Kits	Program Tracking Data Review			X	X
Small Business Kits	Program Manager Interviews			X	X
Small Business Kits	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				
Small Business	Program Tracking Data Review	X	X	X	X
Small Business	Program Manager Interviews	X	X	X	X
Small Business	Implementer Interviews	X	X	X	X
Small Business	Impact – Billing Analysis	X	X	X	
Small Business	Impact – Engineering Review	X	X	X	X
Small Business	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Small Business	Impact – Modeling (as needed)	X		X	
Small Business	Impact – Verification & Realization Rate	X	X	X	X
Small Business	Net-to-Gross – Customer Self-Report Surveys	X		X	
Small Business	Net-to-Gross – EESP Interviews	X		X	
Small Business	Process Research	X	X		
Strategic Energy Management	Program Tracking Data Review	X	X	X	X

Program	Task	2018	2019	2020	2021
Strategic Energy Management	Program Manager Interviews	X	X	X	X
Strategic Energy Management	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
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		
Virtual Commissioning	Program Tracking Data Review	X	X	X	X
Virtual Commissioning	Program Manager Interviews	X	X	X	X
Virtual Commissioning	Implementer Interviews				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	X

Table 2. Residential Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Appliance Rebates	Program Tracking Data Review	X	X	X	X
Appliance Rebates	Data Collection – Participant Surveys	X			
Appliance Rebates	Data Collection – Program Manager and Implementer Interviews	X	X	X	
Appliance Rebates	ComEd Staff Interview				X
Appliance Rebates	Implementer Interview	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		
Elementary Education Kits	Program Tracking Data Review	X	X	X	X
Elementary Education Kits	Program Manager Interview	X	X	X	X
Elementary Education Kits	Implementer Interview	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	NTG Research – Secondary				X
Elementary Education Kits	Process Analysis	X	X		
Lighting Discounts	Program Tracking Data Review	X	X	X	X
Lighting Discounts	Data Collection – In-store Intercept Participant Surveys	X			X
Lighting Discounts	Data Collection – In-store Shelf Surveys	X			
Lighting Discounts	Program Manager Interview	X	X	X	X
Lighting Discounts	Implementer Interview	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	Impact – Net Program Savings Estimate				X
Lighting Discounts	NTG Research – Customer Self-Report Surveys	X			X
Lighting Discounts	Process Analysis	X			
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Program Tracking Data Review	X	X	X	X
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Data Collection – Building Owner and Property Manager Surveys	X			
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Program Manager Interview	X	X	X	X

Program	Task	2018	2019	2020	2021
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Implementer Interview	X	X	X	X
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Data Collection – EESP Interviews	X			
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Impact – Engineering Review	X	X	X	X
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Impact – Verification & Realization Rate	X	X	X	X
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Net-to-Gross	X			
Multi-Family Assessments (p/k/a Multi-Family Market Rate)	Process Analysis	X			
Residential Behavior	Program Tracking Data Review	X	X	X	X
Residential Behavior	Data Collection – Program Manager and Implementer Interviews	X	X	X	X
Residential Behavior	ComEd Staff Interviews				X
Residential Behavior	Implementer Interviews	X	X	X	X
Residential Behavior	Impact – Regression Analysis	X	X	X	X
Residential HVAC (p/k/a Heating and Cooling Rebates)	Program Tracking Data Review	X	X	X	X
Residential HVAC (p/k/a Heating and Cooling Rebates)	Data Collection – Participant Surveys	X	X		
Residential HVAC (p/k/a Heating and Cooling Rebates)	Program Manager Interview	X	X	X	X
Residential HVAC (p/k/a Heating and Cooling Rebates)	Implementer Interview	X	XX		X
Residential HVAC (p/k/a Heating and Cooling Rebates)	Data Collection – EESP Interviews	X			
Residential HVAC (p/k/a Heating and Cooling Rebates)	Impact – Measure-Level Deemed Savings Review	X	X	X	X

Program	Task	2018	2019	2020	2021
Residential HVAC (p/k/a Heating and Cooling Rebates)	Impact – Verification & Realization Rate	X	X	X	X
Residential HVAC (p/k/a Heating and Cooling Rebates)	Net-to-Gross – Customer Self-Report Surveys	X			
Residential HVAC (p/k/a Heating and Cooling Rebates)	Net-to-Gross – EESP Interviews	X			
Residential HVAC (p/k/a Heating and Cooling Rebates)	Process Analysis	X			
Single Family Assessment (p/k/a HEA - Single Family)	Program Tracking Data Review	X	X	X	X
Single Family Assessment (p/k/a HEA - Single Family)	Program Manager Interview	X	X	X	X
Single Family Assessment (p/k/a HEA - Single Family)	Implementer Interview	X	X	X	X
Single Family Assessment (p/k/a HEA - Single Family)	Data Collection – Participant Survey				X
Single Family Assessment (p/k/a HEA - Single Family)	Impact – Measure-Level Deemed Savings Review	X	X	X	X
Single Family Assessment (p/k/a HEA - Single Family)	Impact – Verification & Gross Realization Rate	X	X	X	X
Single Family Assessment (p/k/a HEA - Single Family)	NTG Research				X
Single Family Assessment (p/k/a HEA - Single Family)	Process Analysis	X			

Table 3. Income Eligible Programs Four-Year Plan

Program	Task	2018	2019	2020	2021
Affordable Housing New Construction	Program Tracking Data Review	X	X	X	X
Affordable Housing New Construction	Data Collection – Program Manager and Implementer Interviews	X	X	X	
Affordable Housing New Construction	Data Collection – Stakeholder Interviews	X	X		
Affordable Housing New Construction	Data Collection – Program Materials Review				
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			
Food Bank Distribution	Program Tracking Data Review	X		X	X
Food Bank Distribution	ComEd Staff Interview				X
Food Bank Distribution	Implementer Interview				X
Food Bank Distribution	Data Collection – Participant Surveys	X			
Food Bank Distribution	Ex ante Calculation Review				X
Food Bank Distribution	Data Collection – Program Manager and Implementer Interviews	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			
Income Eligible Energy Savings Kit	Program Tracking Data Review	X		X	X
Income Eligible Energy Savings Kit	Data Collection – Program Manager and Implementer Interviews	X		X	
Income Eligible Energy Savings Kit	ComEd Staff Interview				X
Income Eligible Energy Savings Kit	Implementer Interview				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

Program	Task	2018	2019	2020	2021
Income Eligible Energy Savings Kit	Impact – Verification & Realization Rate	X		X	X
Income Eligible Energy Savings Kit	Process Analysis	X			
Income Eligible Energy Savings Kit	Ex ante Calculation Review				X
Income Eligible Multi-Family Energy Efficiency	Data Collection – Program Manager and Implementer Interviews	X	X	X	
Income Eligible Multi-Family Energy Efficiency	ComEd Staff Interviews				X
Income Eligible Multi-Family Energy Efficiency	Implementer Interviews				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	Program Tracking Data Review				X
Income Eligible Multi-Family Energy Efficiency	Impact – Engineering Review	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 (Elevate component)			X	X
Income Eligible Multi-Family Energy Efficiency	Impact – Custom Analysis to Confirm TRM Savings Estimates				X
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	
Income Eligible Multi-Family Energy Efficiency	Other Research Topics – Interviews and Focus Groups				X
Income Eligible Product Discounts	Program Tracking Data Review	X	X	X	X
Income Eligible Product Discounts	Impact – Measure-Level Deemed Savings Review				X
Income Eligible Product Discounts	Impact – Verification & Gross Realization Rate	X	X	X	X
Income Eligible Product Discounts	ComEd Staff Interview				X
Income Eligible Product Discounts	Implementer Interview				X

Program	Task	2018	2019	2020	2021
Income Eligible Product Discounts	Impact – Net Program Savings Estimate				X
Income Eligible Product Discounts	Net-to-Gross – Lighting Customer Self Report Survey				X
Income Eligible Product Discounts	Data Collection – In-store Intercepts Participant Surveys	X	X	X	
Income Eligible Product Discounts	Data Collection – Program Manager and Implementer Interviews	X	X	X	
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	Process Analysis	X	X		
Income Eligible Product Discounts	Program Tracking Data Review	X	X	X	X
Income Eligible Single-Family Retrofit	ComEd Staff Interviews				X
Income Eligible Single-Family Retrofit	Implementer Interviews				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	
Income Eligible Single-Family Retrofit	Data Collection – EESP Interviews	X			
Income Eligible Single-Family Retrofit	Impact – Billing Analysis		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	
Income Eligible Single-Family Retrofit	Impact – Verification & Realization Rate	X	X	X	X
Income Eligible Single Family Retrofit	Other Research Topics – Surveys, Interviews and Focus Groups				X
Income Eligible Single-Family Retrofit	Impact – Field Work	X			
Income Eligible Single-Family Retrofit	Process Analysis	X	X		
Public Housing Retrofits Program	Program Tracking Data Review			X	X
Public Housing Retrofits Program	ComEd Staff Interview				X
Public Housing Retrofits Program	Implementer Interview				X

Program	Task	2018	2019	2020	2021
Public Housing Retrofits Program	Data Collection – Program Manager and Implementer Interviews			X	
Public Housing Retrofits Program	Data Collection – Resident Interviews				
Public Housing Retrofits Program	Data Collection – EESP and Stakeholder Interviews				
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				

Table 4. Voltage Optimization Four-Year Plan

Program	Task	2018	2019	2020	2021
Voltage Optimization	Program Tracking Data Review			X	X
Voltage Optimization	ComEd Staff Interviews	X	X	X	X
Voltage Optimization	Implementer Interviews				X
Voltage Optimization	Data Collection – 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	

APPENDIX B. BUSINESS PROGRAMS EVALUATION PLANS

Agriculture Program CY2021 Evaluation Plan

Introduction

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

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

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Verification and Gross Realization Rate	X
Impact – Net Verification and Evaluation Report	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 TRM, and sound savings assumptions.

Coordination

Guidehouse 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 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 CY2021 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. Are there any updates recommended for the TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the Agriculture Program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as an interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Guidehouse determined the evaluation approach for CY2021 (see Table 2) based upon the current and expected near-term needs of the program. Therefore, the evaluation team notes that the proposed approach needs to be dynamic and is prepared to respond as needed to program updates and growth. Regardless of future shifts in evaluation needs, the evaluation approach will include the following:

- Gross and Net impact analyses
- ComEd staff interviews

Table 2 summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Net-to-gross (NTG) will not be researched in CY2021; values will remain as they are currently assigned.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	July 2021 – Feb. 2022*	Tracking review will occur in waves starting in 2021
In Depth Interviews	ComEd Staff and Implementers	2	May/June & December 2021	To minimize burden for PM and IC, process interviews will displace regularly scheduled team check-in.
Gross Impact	Engineering File Review and Telephone Interviews	TBD†	June 2021 – March 2022	Three Wave Progression

* Program tracking data review will occur in Waves; starting preliminary review in July 2021, an updated review in Nov 2021, and a final review after end of year updates are available in early 2022.
† Impact evaluation sample size depends on program participation; Guidehouse will leverage results from CY2020 to inform sample design for CY2021 with objective to achieve 90/10 precision.

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual

savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

Program Management and Implementer Interviews

Regular program meetings will occur with the implementation and evaluation team and discussions of program activity and issues will be discussed. Guidehouse will interview the program manager and implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. To minimize burden on call participants, these calls will displace the team's regularly scheduled check-in calls for the month in which they occur.

Gross Impact Evaluation

The primary program gross impact evaluation activities for CY2021 are:

- Workpaper review
- Review tracking data to confirm that all fields are appropriately populated
- Develop a statistically valid sample of projects for in-depth review
- Conduct project file reviews for sampled projects and confirm savings
- As needed, conduct brief participant interviews to clarify project details
- Review savings methodology and, if necessary, provide recommendations for improvement

Verified Net Impact Evaluation

The evaluation team will apply the NTG ratios approved by the Illinois 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 CY2021

Measure	NTG Value
All Measures	0.80

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Research NTG Impact Evaluation

NTG values will not receive further research in CY2021.

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

As required by Future Energy Jobs Act (FEJA), the measure-specific and total ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Also, the evaluation team will focus on assessing the weighted average measure life for this program.

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
Program Tracking Data Review – Wave 1 Review of available data from ComEd	Evaluation	July 30, 2021
Wave 1 Findings Deliverable	Evaluation	Sept. 30, 2021
Program Tracking Data Review – Wave 2 Review of available data from ComEd	Evaluation	November 5, 2021
Wave 2 Findings Deliverable	Evaluation	December 15, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Review year-end program savings and complete engineering review	Evaluation	February 25, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Business Telecomm Program CY2021 Evaluation Plan

Introduction

The ComEd Business Telecomm (Telcomm) Program aims to cost-effectively generate and capture savings from energy efficiency projects undertaken by its telecommunications customers. The Telecomm 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 Telecomm 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. Telecomm Program Measures by Type*

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

* 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 year will include a variety of data collection and analysis activities, including those shown in the following table.

Table 2. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Project Level Desk Reviews	X
Impact – Project Level Site Visits and metering	X*
Impact – Verification & Gross Realization Rate	X

*Site visits will be conducted on an as-needed basis.

Coordination

The Telecomm 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 Telecomm Program evaluation.

Evaluation Research Topics

The CY2021 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. Are project baselines properly determined? If not, why not and what guidance can the evaluation team provide for future projects?
4. What changes (if any) to the assessment process would improve accuracy of savings estimates?
5. Are interactions between measures which are analyzed using different approaches (e.g., deemed versus custom) properly determined?
6. What updates (if any) are recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. During CY2021, Guidehouse is targeting approximately 20 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. Guidehouse will modify the CY2021 targets to include a stratified random sample of projects if warranted by higher program participation, to be revisited quarterly. Program manuals and workpaper review will be included in this approach.

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

Activity	Target	Target Completes CY2020	Timeline*	Notes
Program Tracking Data Review	Tracking System	Census	Wave 1 and Final data	Two Waves
Measure-Level Savings Review	Tracking System and Project Files	20 projects	Wave 1 and Final data	Two Waves
Project-Level Desk Reviews	Project Files	20 projects	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 2021 – February 2022	Largest projects with highest uncertainty (as-needed) measures per the IPMVP†
In Depth Interviews	ComEd Staff and Implementers	~2	July – August 2021	
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2022	

* Guidehouse will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
† IPMVP = International Performance Measurement and Verification Protocol

Program Tracking Data Review

. Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 5). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

The Telecomm Program includes savings derived from a collection of different sources. Standard lighting or switch peripheral consolidation measure savings are based on the Illinois TRM v.9. Retrocommissioning 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 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,[10] 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[11].

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 SAG.

Table 4. Deemed NTG Values for CY2020

Program Measure	CY2021 Applicable Deemed NTG Value
All but Thermostat	0.80
Thermostat	0.90

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Research NTG Impact Evaluation

Guidehouse will not conduct a NTG study in CY2021.

Program Management and Implementer Interviews

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

[10] 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.
[11] 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.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

The evaluation team will not use the Randomized Control Trial (RCT) or Quasi-Experimental Design 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 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
Calculators/Ops Manual/Workpapers	ComEd	January 30, 2021
Program Tracking Data Review for sampling Wave 1	ComEd	August 6, 2021
Program Tracking Data Review Feedback - Wave 1 project documentation, engineering reviews	Evaluation	October 1, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - Wave 2 program tracking data for sampling	ComEd	January 30, 2022
Program Tracking Data Review Feedback Wave 2 project documentation, engineering reviews	Evaluation	February 25, 2022
Illinois TRM Update Research Findings	Evaluation	March 4, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Coordinated Utility Retro-Commissioning Program 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.

Historically there have been four core RCx Program options to optimize energy performance. Virtual Commissioning (VCx) savings are reported by ComEd along with RCx savings but evaluated as a separate program. Starting in CY2021, these will be merged into two distinct options as follows:

- **Retro-Commissioning** includes the following historical program tracks:
  - 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.
  - 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.
- **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.

Guidehouse anticipates that the evaluation will pursue the following research areas for CY2021.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Project-specific Billing Analysis	X
Impact – Engineering Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Customer Self-Report Surveys	X
NTG Research: Service Provider Interviews	X

The evaluation team determined the evaluation approach for the CY2021 period based upon the needs of the program and program's prior history. The evaluation approach for this program is based on the following:

- RCx measures 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 CY2021.
- Cumulative Persistent Annual Savings (CPAS) will be calculated based upon the requirements of the Future Energy Jobs Act (FEJA).
- NTG research with participants and EESPs will conform to statewide NTG methodologies described in the Illinois Technical Reference Manual (TRM).

Coordination

Guidehouse 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 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 memorandum of understanding between ComEd and the gas utilities promotes estimating complementary gas savings at ComEd customer sites for all RCx offerings, up to an amount of approximately 600,000 therms for CY2021. The RCx Program evaluation plan parallels the planned work for the AIC RCx Program.

Evaluation Research Topics

The CY2021 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. Should the program design be modified to reduce free ridership, and if so, how?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Guidehouse will undertake NTG and EUL research in CY2021. NTG was last researched for RCx using participants from PY9 and Guidehouse believes it is time to re-estimate the value.

Evaluation Approach

Guidehouse 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, Guidehouse 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. Guidehouse will adjust ex post evaluated savings results where needed to represent a 'typical' year.

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, Guidehouse assumes CY2021 participation will be similar to CY2020 participation. Participation by gas utility customers is unknown at the time of this Plan.

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

Activity	Target	Target Completes CY2021	Notes
Tracking Data Review	Tracking System	Census	Oct 31, 2021 / Jan 30, 2022
Gross Impact Evaluation	Engineering File Review	50	March 31, June 30, Sept 30, Dec 31†
Gross Impact Evaluation	On-site M&V	TBD‡	
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	Census	
NTG Research: Service Provider NTG Interviews*	Active retro-commissioning service providers (EESP)	TBD	Census sample frame
NTG Research: Participant NTG Surveys	Program Participants	TBD	Census sample frame

* Service Provider surveys are triggered by high importance ratings by participating customers to the Service Provider or vendor. Therefore, the number of surveys is dependent on the results of the participating customer surveys.
† Guidehouse will draw an incremental sample each quarter based on completed projects at the time of the sample refresh.
‡ Guidehouse will limit on-site M&V to the extent we can and focus it on only the highest-impact projects. Guidehouse 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 it may limit the amount of site-specific feedback available to ComEd to explain the realization rates.

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess

the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

Gross Impact Evaluation

The CY2021 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. We will also accommodate secondary research objectives, as requested by ComEd, but with relaxed precision and confidence,[12] to fit research within budget constraints and as permitted by ComEd. The default strata will be defined by project size and offering type.

The impact research sample will be drawn quarterly based on the projects labeled 'Ready for Evaluation' 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 Guidehouse will adjust the sample to comply with sampling goals.

CY2021 Gross Impact Research Waves

Guidehouse will perform program data tracking review and M&V project review quarterly in CY2021.

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), 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) Guidehouse will communicate preliminary realization rates within four weeks of receiving all necessary information including permission to contact participant customers for confirmation and clarification of key inputs to the savings algorithms. Necessary information includes project folders, detailed measure summary, up-to-date customer contact information, and tracking data

[12] 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.

for projects sampled quarterly. This target assumes projects do not require a site visit to reduce uncertainty in key project variables such as equipment kW and operational hours. [13]

b) Guidehouse will communicate results for projects requiring a Guidehouse 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 2022 or sooner.

Retro-commissioning program measures are not covered by the TRM and are all non-deemed measures subject to retrospective per unit savings adjustment of custom variables. Guidehouse performs an engineering analysis of savings using document review, telephone interview with participating customers, and supplemental data requests. Where appropriate, Guidehouse will use site-collected data as inputs to the analysis. The approach is further described below:

- 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, Guidehouse 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.
- 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 coincident peak demand savings. The sample design will provide 90/10 statistical validity for program savings overall.

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.

[13] 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, Guidehouse 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, Guidehouse will request the additional information from the implementer and/or make initial contact with the participant within 45 days to schedule a site visit.

Table 3. Deemed NTG Values for CY2021

Component	CY2021 Deemed NTG Value
RCx	0.94
Legacy RCx Legacy Tune-Up Legacy RCxpress	0.94
MBCx	0.94
All-Natural Gas	0.94

Source:
https://www.ilsag.info/policy/net-to-gross-framework/

NTG Research: Customer Surveys

Guidehouse will conduct a participating customer NTG study in CY2021 to research free ridership and spillover. We will survey participants and interview active EESPs to research free ridership and spillover. We will triangulate their results to inform the final recommended NTG value, using methods defined in the Illinois TRM.

- **Net-to-gross research.** NTG research with participants and EESPs will conform to statewide NTG methodologies described in the Illinois Technical Reference Manual[14], and includes the following:
  - Target CY2020-2021 participant population for Free Ridership
  - Target CY2019-2020 participant population for Spillover
  - Online surveys
  - Report in Summer 2021

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.

NTG Research: 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.

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.

[14] The evaluation team will calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group. The participation population is small, and the free ridership battery for this program is long, therefore, using both the old free ridership questions and the new ones is not possible.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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 ComEd staff 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 new program structure.

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
Calculators/Ops Manual/Workpapers	ComEd	January 20, 2021
Program Tracking Data Review – tracking data for QA/QC	ComEd	April 1, July 1, Oct 1st of 2021
Program Tracking Data Review Feedback – Quarterly project documentation, engineering reviews	Evaluation	June 1, 2021, Oct. 1, 2021 Early feedback for on-site projects will be provide ongoing as results become available
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review – data for final end of year sampling	ComEd	January 30, 2022
Final Project Documentation Feedback - engineering reviews	Evaluation	February 25, 2022
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd	April 15, 2022
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 22, 2022
NTG Research Memo	Evaluation	June 25, 2021

Facility Assessments Program CY2021 Evaluation Plan

Introduction

The Facility Assessments Program was created to support the ComEd facility assessment audits. During these audits, ComEd noted that there were low-cost behavioral energy efficiency opportunities that could be completed but were not a part of any of their other programs. This program was created to complete these projects and claim the savings due to these opportunities.

The following evaluation activities will occur during the CY2021 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 CY2021 NTG ratio is 0.94.
- The resulting changes to savings will be rolled up to the sample and a program level realization rate will be calculated.
- Assist the ComEd Facility Assessments Program team as it revises and implements improved program calculators.

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

Table 1. Evaluation Approaches

Activity	CY2021
Implementer Interviews	X
ComEd Staff Interviews	X
Gross Impact	X
Verified Net Impact	X

Coordination

Guidehouse 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 majority of methods used in both evaluations are specified by the Illinois TRM and so the evaluation approaches are generally consistent. Some measures are partially custom projects that require sufficient documentation from the utility for proper evaluation. When the approaches differ, the ComEd and Ameren teams compare and discuss results at the end of the evaluation process to ensure overall consistency.

Evaluation Research Topics

The CY2021 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

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff that manage and implement the program ("the implementer") to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 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 CY2021	Timeline
Program Tracking Data Review	Tracking System	Census	Jan-Feb 2022
In Depth Interviews	ComEd Staff and, Implementers	2	Feb-April 2022
Gross Impact	Engineering File Review	*	April 2021 – Sept 2021

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

For CY2021, Guidehouse will complete several site-specific calculation reviews. Guidehouse may review a sample of projects in 2021, but the size of this sample will be determined later. 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.

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

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

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, Guidehouse will provide input on individual measure life based upon secondary research in CY2021.

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. In CY2021 the NTG ratio is 0.94.[15]

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2020 Deemed NTG Value
Facility Assessments Program	0.94

Source: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021

Program Management and Implementer Interviews

As noted, we will not be conducting process research in 2021. Guidehouse will conduct interviews with the ComEd's program management team that implement the program along with others that assist with the program during our regularly scheduled calls for regular program updates and to understand progress towards goals, identify program successes and challenges, identify drivers of those successes and challenges. Guidehouse has recommended high level changes to program structure in previous evaluations and will discuss these changes in order to assess what has been implemented and was is still in development.

Research NTG Impact Evaluation

Guidehouse does not plan to conduct NTG research in CY2021.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2021 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.

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 because there are not enough participants for individual measures in this program to achieve statistically significant savings estimates.

Evaluation Schedule

Table 4 below provides the schedule for key deliverables and data transfer activities for 2021.

[15] https://www.ilsag.info/evaluator-ntg-recommendations-for-2021

Table 4. Schedule – Key Deadlines

Activity/Deliverables	Responsible Party	Date Delivered
Program Tracking Data Review - tracking data for sampling Wave 1	ComEd	Sept. 2021
Program Tracking Data Review Feedback - Wave 1 documentation, engineering review, conduct on-site M&V	Evaluation	Sept 2021
Program Tracking Data Review - program tracking data for sampling Wave 2	ComEd	Nov. 15 2021
Wave 2 Feedback	Evaluation	Dec. 20, 2021
Sample of sites determined and approved	Evaluation	Dec 2021, Jan 2022
Project review	Evaluation	Dec 2021, Jan 2022
ComEd Staff Interview	Evaluation	December 15, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Grocery Program 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 200 and 400 kW. The program provides an account manager to work 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, HVAC, kitchen and lighting equipment to offer the measures listed in Table 1 below.

To participate in the program, the ComEd customer has the option to 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.

Table1. Grocery Program Measures by Type

Deemed Refrigeration	Kitchen Measure	Custom Refrigeration	Lighting	HVAC
Strip Curtains	ES Electric Steam Cooker		Case Lighting	Advanced Rooftop Unit Controls
Anti-Sweat Heat Controls	ES Electric Combination Oven	High Efficiency Cases	Indoor Lighting	HVAC early replacement
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		LED Open Signs	
Special Doors with Low/No ASH	Kitchen Ventilation Controls			
Open Case to Reach-In Case – Medium Temperature	On-Demand Package Sealers			
Open Case to Reach-In Case – Low Temperature				
Add Doors to Open Cases				
Vending Machine Controls				
Door Gaskets				

The evaluation of this program over the coming year will include a variety of data collection and analysis activities, including those indicated in Table 2.

Table 2. Evaluation Approaches – CY2021Plan

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Measure-Level Savings Review	X
Impact – Detailed Project-Level Desk Review	X
Impact – Verification & Gross Realization Rate	X

Coordination

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 CY2021 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. What updates (if any) are recommended for the Illinois Technical Reference Manual (TRM)?
4. How well does the GrocerSmart tool reflect the performance of grocery stores in ComEd's territory?
5. How accurate are the GrocerSmart savings estimates, and what changes (if any) to the assessment process would improve accuracy?
6. 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 formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 3 summarizes the evaluation tasks for CY2021 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 CY2021	Timeline	Notes
Program Tracking Data 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	*	Aug 2021 – Feb 2022	90/10, 0.5 C.V
In-Depth Interviews	ComEd Staff and Implementers	~2	Aug 2021 – Feb 2022	
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2022	

† Guidehouse will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
*Actual sample will depend on final number of participating customers

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 5). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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 workpapers. 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 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 for the appropriate measure in the 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 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/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.
A sample of projects will be taken to achieve a 90/10 precision and confidence. If program data is available early in waves, analysis will be completed on portions of each wave to achieve a 90/10 statistical significance overall.

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level NTG ratio of 0.97, the value deemed through the consensus process by the Illinois Stakeholder Advisory Group.

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

Table 4. Deemed NTG Values for CY201

Program Measure	CY2021 Deemed NTG Value
Grocery	0.97

Source: Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Program Management and Implementer Interviews

The evaluation team will interview ComEd Staff 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's current status. 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), Guidehouse will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2021 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
Calculators/Ops Manual/Workpapers	ComEd	January 29, 2021
Program Tracking Data Review - program tracking data for sampling Wave 1	ComEd	July 2, 2021
Program Tracking Data Review Feedback – Wave 1 documentation, engineering review, conduct on-site M&V	Evaluation	September 24, 2021
ComEd Staff/ Implementer Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - program tracking data for sampling Wave 2	ComEd	January 30, 2022
Program Tracking Data Review Feedback – Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	February 26, 2022
Illinois TRM Update Research Findings	Evaluation	March 1, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April ,8 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Incentives – Custom Program CY2021 Evaluation Plan

Introduction

The ComEd Incentives – Custom (Custom) Program provides a custom incentive to commercial, industrial and public sector customers 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. 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 from CY2020, Combined Heat & Power (CHP) was offered under the Custom Program.

The objective of the CY2021 evaluation is to quantify net savings impacts from the Custom Program. Evaluation activities for CY2021 will be similar to previous evaluations. The CY2021 gross impact evaluation will not vary from previous years, but adjustments will be made to reflect specific measure and project characterizations. For the CY2021 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. As the largest projects each year 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 and Service Provider 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 year will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Modeling (as needed)	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Customer Self-Report Surveys	X
NTG Research: EE Service Provider	X

The evaluation team determined the evaluation approach for 2021 based upon the needs of the program and the program's prior history. As we did in CY2020, the evaluation will continue to evaluate any potential gas savings or gas increase 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 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

Guidehouse 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 CY2021 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 overall gas impacts 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 program valid and up-to-date?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 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 CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	Three waves	Three Waves and Early Feedback for Large Projects
PM and IC Interviews	ComEd Staff and Implementers	2	2021	Augment with monthly calls
Gross Impact	Early Feedback File Review	TBD	April 2021 – Sept 2021	Early Feedback for Large Projects, Engineering File Review and On-site M&V
Gross Impact	Engineering File Review	TBD	April 2021 – February 2022	Three Waves†
Gross Impact	On-site M&V	TBD	April 2021 – February 2022	
Verified Net Impact	Calculation using deemed NTG ratio	NA	June 2021 – May 2022	Deemed Value
Surveys: NTG	Telephone Survey with Participating Customers	TBD	June 2021 – May 2022	FR & SO, Process. Two Waves
Interviews: NTG ‡	Telephone Interviews with Influential Service Providers Triggered by Customer Responses	TBD	Fall/Winter 2021 – May 2022	FR & SO, Process. Two Waves

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

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project

review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

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.[16]
- **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. The evaluation team will rely on ex-ante calculations, metered data or billing data, and data obtained from customer interviews to calculate ex-post savings.

These evaluation approaches will provide the evaluation team sufficient detail and information to verify program achievements and provide recommendations to improve program performance.

The Data Center Projects are currently part of the Custom Program but since the project scope, savings methodology and the implementation of the Data Center projects are different from the other Custom projects, the two program categories will be sampled separately.

Similar to CY2020, the evaluation team expects a sample size of approximately 20 custom projects and eight data centers projects but will increase the sample size up to a total of 33 projects if necessary. The final number will be determined when the final count of the CY2021 population is known. If the population variability in CY2021 remains close to that in CY2020, this cap will allow us to achieve the overall portfolio-level 90/10 requirements. Note that sample points which represent different phases of the same project within the program year, will be combined and treated as one sample point. Phases which occur in subsequent program year(s) will be treated separately since they follow the year in which the savings are claimed by the program.

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

We will perform sampling for both custom and data center categories in three phases during the CY2021 evaluation period. We will draw the sample for the first wave around May 2021. We will draw the sample for the second wave around October 2021. The final sample will be drawn after we receive final program data at the end of January 2022. 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

[16] Due to COVID-19, on-site visits and on-site metering may be limited. The evaluation team will make adjustments as needed and may take an approach more similar to the Desk Reviews if on-site visits are not possible.

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.[17] Evaluators will select these projects for metering from stratum one and stratum two sample points 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 include 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 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 CY2021 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 CY2021 program level gross impact estimates.

The gross realization rates for the sample 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 for the population. The sample design will provide 90/10 statistical validity for

[17] 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. Alternatively, if sufficient metering data and other documentation is provided, it is possible that the evaluation team will not perform as many on-site visits.

the overall program. The sample of approximately ten on-site audits and ten desk reviews for the custom sample, and four on-site audits and four 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 evaluation team will use the NTG ratio accepted by SAG consensus to estimate the verified net savings for the program.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value [kWh]
Custom - All but Street Lighting	0.51
Custom - Street Lighting	0.81
Data Centers - Co-Location New Construction	0.43
Data Centers – All Other Projects	0.72

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Program Management and Implementer Interviews

The evaluation team will have monthly calls with the ComEd Staff and the implementation team to discuss the current program status and the plan for the future. This will ensure the evaluation team is up to speed on the program changes and has a solid understanding of the program.

NTG Research: Participant Surveys and Interviews

The evaluation team plans to conduct NTG interviews in CY2021 as described below. Note that the method described is fully compliant with the Illinois NTG framework for Custom programs adopted by the IL SAG in version 9.0 of the Illinois statewide TRM.

- Telephone surveys with participant decision makers
- Service Provider interviews – with participating equipment vendors (suppliers and/or installers)

Participant survey questions will be deployed for NTG research and will address both free ridership and participant spillover. We will survey a sample of CY2021 customers with a goal of achieving 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. For NTG purposes, projects that are separate phases of the same project will be grouped together as one sampling unit and ranked by Stratum accordingly. We will exclude municipal Street Lighting projects from the sample since they will be assigned the NTG value from ComEd's Street Lighting program. All other Custom projects will be ranked by size and separated into three size strata consistent with the approach used for Gross sampling. The results will be reported by size stratum and for the entire program.

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.

The telephone surveys will provide all inputs needed for the calculation of the program's NTG 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 as well as potentially, the combination of phased projects for a given customer.

Guidehouse will field at least 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.[18]

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.

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[19] 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.

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

As required by the FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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 because:

[18] The evaluation team may calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group if indicated by a comparison of old algorithm and new algorithm results in our pilot of the new algorithm.
[19] Corresponding to a score of 8, 9 or 10 for the importance of the program on their decision to do the spillover.

- 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.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Calculators/Ops Manual/Workpapers	ComEd	January 4 2021
Program Tracking Data Review – program tracking data for sampling Wave 1	ComEd	June 1, 2021
Program Tracking Data Review Feedback – Wave 1 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	July 30, 2021
Wave 1 participating customer NTG survey fielding	Evaluation	August 15, 2021
Program Tracking Data Review – program tracking data for sampling Wave 2	ComEd	August 28, 2021
Program Tracking Data Review Feedback – Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	November 24, 2021
Wave 2 participating customer NTG survey fielding	Evaluation	November 24, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
CY2021 Program tracking data for sampling Wave 3	ComEd	January 28, 2022
Program Tracking Data Review Feedback – Wave 3 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	February 25, 2022
Wave 3 participating customer NTG survey fielding	Evaluation	February 25, 2022
Draft Report to ComEd and SAG	Evaluation	March 10, 2022
Comments on Draft	ComEd and SAG	March 31, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 25, 2022

Incentives – Standard Program CY2021 Evaluation Plan

Introduction

As part of the Business Incentives Program,[20] the ComEd Incentives – Standard Program (Standard Program) 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 CY2021 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);[21] and (3) investigate potential gas savings (therms conversion) counted as kWh, either using the Illinois Technical Reference Manual (TRM) deemed inputs or billing analysis from gas usage data which may be collected from the gas utilities that serve the project sites.

The notable program changes between CY2020 and CY2021 are listed below.

- The Small Business Offering (SBO) has changed the customer eligibility requirements from 100 kW to 200 kW for private sector customers and 400 kW for public sector customers. These customers will still be eligible to participate in the Standard Program, but some may pursue SBO incentives instead.
- The Standard Program will offer a Large Energy Efficiency Project (LEEP) promotion. This promotion will allow customers to earn up to 30% in additional incentives if it meets size and deadline requirements.
- Pre-application is no longer required for Standard Program projects with incentives less than $1,000.
- The Standard Program added measures for VSD and magnetic bearing chillers and removed the adsorbent air cleaner measure.
- The incentives for networked lighting controls (NLC) has increased from $0.25 to $0.40 per Watt controlled, while the M&V option incentive increased from $0.10 to $0.15 per Watt controlled.

The evaluation of this program for CY2021 will include a variety of data collection and analysis activities, including those indicated in the following table.

[20] 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.
[21] Illinois Public Act 099-0906 (http://www.ilga.gov/legislation/publicacts/99/099-0906.htm), passed in 2016.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Literature Review	X
Impact – Billing Analysis	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research: EESP Spillover Research	X
Program Delivery – Benchmarking, Influences	X

Coordination

Guidehouse 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 TRM and are generally consistent. The one exception is the approaches being used to compute net-to-gross (NTG) ratios, which differ somewhat.

Evaluation Research Topics

The CY2021 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 CPAS 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 TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

There will be EESP NTG research on spillover.

Research into program delivery will address topics requested by ComEd and the implementer, including:

1. What is typical spillover for comparable programs across the country?
2. What influences project decisions among public sector participants?
3. Do staff at participating facilities consider energy efficiency when designing sustainability plans? And, if so, does there tend to be a difference among businesses with on-site staff dedicated to energy efficiency and facility management compared to those without on-site staff?
4. Do sustainability plans with energy efficiency programs drive participating facilities to pursue additional energy efficiency?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Census	This is a preliminary review that occurs prior to impact analysis
Review Workpapers	Update Tracking System Default Inputs	~25	New and Updated Workpapers
NTG Survey (SO)	Survey of active EESPs in 2021	20	
Gross Impact Evaluation	Engineering File Review	100*	Two Waves† plus Early Feedback for Large Projects
Gross Impact Evaluation	On-site M&V	30	Site Visits will depend on COVID-19 conditions in 2021
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	NA	

* Guidehouse will coordinate with ComEd to determine appropriate dates to pull tracking data extracts for each wave.
† The target for engineering file reviews does not depend on whether site visits can be performed due to COVID.

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

Guidehouse will perform program tracking data review and M&V project sampling in two waves in CY2021. The first wave of M&V sampling is expected to cover about two-thirds of projects completed in CY2021. Proposed gross impact sampling timelines are shown below. The CY2021 gross impact evaluation will not vary significantly from CY2020, but adjustments will be made to reflect specific measure and project characterizations.

CY2021 Gross Impact Sampling Waves

a) First wave sample drawn in August 2021 and completed by November 2021
b) Final wave starts February 2022

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 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.[22]
- 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

[22] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0, available at: http://www.ilsag.info/technical-reference-manual.html

lighting savings, non-lighting savings, and the program overall (EMS will be sampled separately as was done in the past year). The sample of 30 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 30 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 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 NTG ratios accepted by Illinois Stakeholders Advisory Group (SAG) consensus to estimate the verified net savings for the program (Table). Therms savings will be subjected to the electric NTG adjustments.

Table 3. NTG Values for CY2021

Program Measure	CY2021 NTG Value
Lighting	0.80
Non-Lighting	0.70
Thermostat	0.86

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

NTG Research: Surveys

Guidehouse will undertake an EESP NTG study during CY2021. This will update spillover values that contribute to the NTG values that we will recommend in September of 2021. We will complete on-line surveys with a goal of 20 completed surveys for active EESPs to quantify participant spillover. The final analysis will be completed to calculate NTG for lighting and non-lighting categories.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2021 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
Calculators/Ops Manual/Workpapers Review	ComEd and Evaluation	October 1, 2020
Program Impact	ComEd/Guidehouse & IC Staff	Every six weeks
Program Tracking Data Review – Program Tracking Data for Tracking System Review	ComEd	June 4, 2021
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	June 12, 2021
Program Tracking Data Review – CY2021 Program Tracking Data for Sampling Wave 1	ComEd	August 6, 2021
NTG Research Memo	Evaluation	May 27, 2021
Program Tracking Data Review Feedback – Wave 1 Project Documentation, Engineering Reviews, Schedule, Conduct On-site M&V	Evaluation	October 29, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review – Program Tracking Data for Sampling Final Wave	ComEd	January 30, 2022
Program Tracking Data Review Feedback – Final Wave Project Documentation, Engineering Reviews, Schedule, Conduct On-site M&V	Evaluation	February 28, 2022
Draft Impact Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Impact Report to ComEd and SAG	Evaluation	April 22, 2022

Industrial Energy Management Program CY2021 Evaluation Plan

Introduction

The Industrial Energy Management (IEM) Program provides customers with resources to design and implement a customized energy management program. The program helps the customers in identifying no- and low-cost opportunities to reduce their usage and the program also provides recommendations and implements energy efficiency measures where capital cost is needed. The low-cost projects are referred as O&M projects and the savings for these projects will be closed out on an annual calendar year cycle. The minimum commitment is for one year and the customer will have options for renewal at the end of the year. This program started in CY2020 with limited projects and will be expanded in CY2021.

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

Table 1. Evaluation Approaches

Tasks	CY2021
Implementer Interviews	X
ComEd Staff Interviews	X
Program Tracking Data Review	X
Impact – Billing Analysis	X
Impact – Engineering Review	X
Impact – Verification & Gross Realization Rate	X

The impact evaluation of this program focuses on the review of site level energy models and detailed site reports. The evaluation will also review the engineering calculations and savings methodology for the large capital projects. As needed, calls with customers may be completed to verify information included in both the report and whole building models. The evaluation approach for this program is based on the following principles:

- Gross and net impact analysis will be conducted
- Cumulative Persisting Annual Savings (CPAS) will be calculated based upon the requirements of Future Energy Job Act (FEJA).

Coordination

Guidehouse will coordinate with the evaluation teams for other utilities on any issues relevant to this program. If any issues arise, the evaluation team will coordinate needed discussion and evaluation.

Evaluation Research Topics

The CY2021 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the achieved energy savings in this program?
2. What were the realization rates of the projects?
3. Are there any major changes occurring during or after program implementation (production, size, hours, etc.) that may have affected the results?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021, 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. Program manual and workpaper review is included in this approach.

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

Activity	Target	Target Completes CY2021	Notes
Program Tracking Data Review	Tracking System	Census	Guidehouse will coordinate with ComEd to ensure this tracking data is complete and accurate.
Gross Impact Evaluation	Engineering File Review	TBD*	This is a review of multi-regression models based upon whole-building data, production data and other key variables. For large Capital projects, engineering calculations and simulations are reviewed.
Verified Net Impact Evaluation	Calculation Using Deemed NTG Ratio	TBD*	Since this is a new program, the evaluation team will propose a NTG ratio in a separate memo to give ComEd, ICC and SAG an opportunity to discuss NTG for this program.
Interviews	ComEd Staff and Implementers	NA	Guidehouse will discuss the project status, changes to the program and other details in regularly scheduled monthly calls.

*Sample size will be determined to achieve 90/10

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 3). The purpose of the Wave 1 review

is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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. International Performance Measurement and Verification Protocol (IPMVP) Option C (i.e., billing/metered data regression) will be the main method of impact evaluation. For capital projects or projects where regression analysis is not possible, savings are estimated using engineering calculations or simulations.

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, Guidehouse-calibrated building automation system (BAS) trend logs, production data and telephone conversations with onsite staff.

ComEd will provide energy models for the sites where there is a good correlation[23]. The evaluation will use this data with other information from the site to identify operating characteristics of the site both pre- and post-program activities. If major changes have occurred at the site during or after the IEM 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 energy efficiency or demand response programs or outside of the ComEd.

Guidehouse will sample projects from the sites and apply the sample realization rates to the entire population to calculate overall savings. Guidehouse will consider several ways to stratify the IEM projects to design a sample once initial program data is received. Guidehouse 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 IEM Program, Guidehouse will collect the information regarding these sites and begin the evaluation.

Verified Net Impact Evaluation

Since this is a new program, the evaluation team will propose a NTG ratio in a separate memo in the summer of 2022 to give ComEd, ICC and SAG an opportunity to discuss the NTG for this program.

[23] Estimating the savings with an energy model is the ideal approach but it might not be feasible when the correlation is poor. In those cases, savings are estimated with bottom-up calculations using engineering judgment, similar to the Capital projects.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and CPAS for the measures installed in CY2021. For the O&M measures, a measure life of five years will be used. The five-year effective useful life (EUL) is derived from Guidehouse program primary research that was completed for the AEP Ohio CEI (SEM) program. For the capital projects, EUL will vary based on the measure type, consistent with the EUL memo[24] submitted to ComEd previously.

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.

Evaluation Schedule

Table 3 provides the schedule for key deliverables and data transfer activities. Adjustments will be made, as needed, as evaluation activities progress.

Table 3. Evaluation Schedule – Key Deadlines

Activity/Deliverables	Responsible Party	Date Delivered
Memo summarizing NTG approach for CY2020 and CY2021 sent to ComEd	Evaluation	January 15, 2021
Calculators/Ops Manual/Workpapers Review	ComEd	January 29, 2021
CY2021 site reports and models available to Guidehouse	ComEd	November 20, 2021*
ComEd PM interview	Evaluation	December 17, 2021
Sample of sites determined and approved	Evaluation	December 3, 2021*
Project review	Evaluation	January 28, 2022*
Program Tracking Data Review - EOY program data due	ComEd	January 30, 2022
Program Tracking Data QA/QC	Evaluation	February 11, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022
NTG memo sent to ComEd and SAG	Evaluation	July 29, 2022

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

[24] CY2018 Effective Useful Life of Custom and Data Center Measures (August 30th, 2018)

Industrial Systems Program 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.
- ComEd Fix It Now offers eligible customers assistance to implement low-cost measures in their industrial systems to improve efficiency and reduce energy costs without adversely affecting facility or systems operation.

The objective of the evaluation is to quantify CY2021 net savings impacts for the Industrial Systems Program. Evaluation activities for CY2021 will be similar to CY2020. For the CY2021 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.

The CY2021 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 year will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Data Collection – Participant Surveys	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Modeling (as needed)	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Customer Self-Report Surveys	X
NTG Research: EE Service Provider	X
NTG Research: Technical Service Provider Interviews	X

The evaluation team determined the evaluation approach for the CY2021 period based upon the needs of the program and program's prior history. Like CY2020, the evaluation will continue to evaluate any potential gas impacts 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, or parallel review, 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 CY2021 evaluation approach for this program is based on the following:

- Gross and net impact analysis will be conducted
- 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 the Future Energy Jobs Act (FEJA)

Coordination

Guidehouse 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 CY2021 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

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

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 below summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Program manual and workpaper review is included in this approach.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	Three waves	Three Waves and Early Feedback for Large Projects
PM and IC Interviews	ComEd Staff and Implementers	TBD	Fall/Winter 2021	Augment with monthly calls
Gross Impact	Early Feedback Workpaper and File Review	TBD	April 2021 – Nov 2021	Early Feedback for Large Projects, Engineering File Review and On-site M&V
Gross Impact	Engineering File Review	TBD	April 2021 – February 2022	Three Waves*
Gross Impact	On-site M&V	TBD	April 2021 – February 2022	
Verified Net Impact	Calculation using deemed NTG ratio	NA		Deemed Value
NTG Research: Surveys	Telephone Survey with Participating Customers	TBD	June 2021 – March 2022	FR & SO, Process. Two Waves
NTG Research: Interviews †	Telephone Interviews with Influential Service Provider Triggered by Customer Responses	TBD	Fall/Winter 2021 – May 2022	FR & SO, Process. Two Waves

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

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

The program data tracking 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 Guidehouse receives.

Project Management and Implementation Contractor Interviews

We will conduct in-depth interviews with ComEd Staff and implementation contractors. The evaluation team will interview ComEd Staff 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's current status.

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 six 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 four 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 CY2021 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 error ratio will be calculated from a combination of prior program results. Given the projected CY2021 project population, the sample size will be determined to achieve 90/10 confidence and precision levels. The sample size for CY2021 is estimated to be approximately 10 projects, like the CY2020 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 six projects.[25] 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

[25] 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.

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 four 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. Typically, production data is provided along with the ex-ante documentation when available. In some cases, site contact(s) may be requested to provide additional recent production data. 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, before 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 CY2021 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 perform ex post savings calculations. 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 will then be used to calculate a strata-level GRR. This strata-level GRR will 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 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: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

NTG Research: Participant Surveys and Service Provider Interviews

Due to relatively stable results year-to-year, the evaluation team beginning in PY8 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 the CY2018-CY2020 sample. Evaluation plans to conduct NTG interviews in CY2021. 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 Illinois framework for Custom programs adopted by the Illinois SAG and is part of the most recent Illinois statewide TRM. Data will be collected through two routes:

- Telephone surveys with participant decision makers
- Interviews with participating compressed air, process cooling and refrigeration service providers who completed projects in CY2021

Participant survey questions will address both free ridership and participant spillover. We will attempt to survey a sample of CY2021 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, telephone number, 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.

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.

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.[26]

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.

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 [27] 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-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 FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

[26] The evaluation team may calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group if indicated by a comparison of old algorithm and new algorithm results in our pilot of the new algorithm.
[27] Corresponding to a score of 8, 9 or 10 for the importance of the program on their decision to do the spillover.

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
Calculators/Ops Manual/Workpapers Review	ComEd	January 4 2021
Program Tracking Data Review - program tracking data for sampling Wave 1	ComEd	June 1, 2021
NTG Research Memo	Evaluation	June 28, 2021
Program Tracking Data Review Feedback - Wave 1 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	July 30, 2021
Wave 1 participating customer NTG survey fielding	Evaluation	August 15, 2021
Program Tracking Data Review - program tracking data for sampling Wave 2	ComEd	August 28, 2021
Program Tracking Data Review Feedback - Wave 2 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	November 24, 2021
Wave 2 participating customer NTG survey fielding	Evaluation	November 24, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - EOY Program tracking data for sampling Wave 3	ComEd	January 28, 2022
Program Tracking Data Review - Program tracking data QA/QC	Evaluation	February 11, 2022
Program Tracking Data Review Feedback - Wave 3 project documentation, engineering reviews, schedule, conduct on-site M&V	Evaluation	February 25, 2022
Wave 3 participating customer NTG survey fielding	Evaluation	February 25, 2022
Draft Report to ComEd and SAG	Evaluation	March 10, 2022
Comments on Draft	ComEd and SAG	March 31, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 25, 2022

Instant Discounts Program 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), ES Fixtures (primarily trim kits), exit signs, and wall packs as well as reduced wattage Linear Fluorescent (LF) lamps. Three-phase, high-frequency battery chargers and commercial HVAC equipment are also offered through the Instant Discounts Program. The CY2021 program will not change significantly from CY2020, in terms of measure mix and end-uses.

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 year will include a variety of data collection and analysis activities, including those indicated in Table 1.

The CY2021 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 are being conducted in CY2020 and CY2021. The results will be finalized in mid-2021 for application starting in CY2022.

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

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Data Collection – Purchaser Surveys (Wave 3 of 2020/2021 NTG research)	X
Implementer Interviews	X
ComEd Staff Interviews	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Participant Surveys	X

Coordination

Guidehouse will coordinate with the evaluation teams for other utilities on any issues relevant to this program. The Instant Discounts evaluation team will coordinate with Ameren, which has an “Instant Incentives” program. In CY2021, the ComEd and Ameren lighting program evaluations will continue to ensure there is alignment with respect to data collection activities and analysis methods.

Evaluation Research Topics

There are two 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); and 2) evaluation research, which consists of online surveys with program Energy Efficiency Service Providers (EESPs) and program participants to gather data on key evaluation parameters such as installation rate, residential and non-residential split, and NTG.

The evaluation team determined the evaluation approach for 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 TRM as well as SAG recommended NTG. Key evaluation approaches include:

- In CY2021, we will implement a third wave of lighting purchaser surveys (the first two waves of this survey will be conducted in CY2020) to support installation rate, and residential and non-residential split parameter estimate updates. This research is a joint CY2020-CY2021 effort and will include participants who purchased lighting measures through the program in either of these two program years.
- 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 CY2021 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?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Evaluation tasks will be conducted in 2021 through early 2022 and evaluation reporting will be concluded by April 30, 2022. Table 2 summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Program manual and workpaper review is included in this approach.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	April – December 2021	Three Waves†
ComEd Staff and Implementer Interviews	ComEd Staff and Implementers	TBD	April – June 2021	Augmented with monthly calls
NTG Research: Participant Surveys	CY2020/CY2021 Program Participants	Census	October 2020 – April 2021	Two Waves in 2020 and one Wave in 2021†
Gross Impact	Engineering File Review	TBD	June 2021 – Feb 2022	Three Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	Nov 2021 – March 2022	Deemed Value

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

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling are each expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

Gross Impact Evaluation

The CY2021 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 NTG value deemed in the SAG consensus process.

CY2020/CY2021 Gross Impact Sampling Waves

a) First wave sample drawn in September 2020 (Wave 2 of CY2020 data but the first wave of the joint CY2020/CY2021 data collection effort)
b) Second wave sample drawn in January 2021 (Wave 3 of CY2020 data but the second wave of the joint CY2020/CY2021 data collection effort)
c) Final wave sample drawn in mid-April 2022 (Wave 1 of CY2021 data but the third wave of the joint CY2020/CY2021 data collection effort)

CY2021 Gross Savings Equations - Lighting

After the conclusion of the program year, the evaluation will conduct a thorough review of lighting measure savings calculations and calculate gross kWh, kW and Peak kW savings across all program bulbs and fixtures using the following lighting measure 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[28] * kW Savings

For the verification analysis in CY2021, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2021 Instant Discounts tracking database.
- **Program Bulb Installation Rates** (both current program year and delayed program year installations) will come from the TRM v9.0.
- **Delta Watts** will be calculated using the lumen-equivalence mapping in the TRM v9.0.
- **Non-Residential HOU and Summer Peak CF** estimates will come from the TRM v9.0.
- **Residential/Non-Residential Bulb Installation** estimates will come from the TRM v9.0.
- **Energy and Demand Interactive Effects** will be estimated using the algorithms presented in the TRM v9.0.

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: TRM v9.0).
- **Residential and Non-Res Split** - Evaluation research from the year of purchase (CY2019/CY2020 Report and TRM v7.0/v8.0).
- **HOU and Peak CF** – Verified savings estimate from the year of installation (source: TRM v9.0).
- **Energy and Demand IE** – Verified savings estimate from the year of installation (source: TRM v9.0)
- **Installation Rate** - Verified savings estimate from the year of purchase (source: CY2019/CY2020 report and TRM v7.0/v8.0).
- **NTG** – Recommended NTG (SAG approved) from the year of purchase (CY2019/CY2020).

CY2021 Gross Savings Equations – HVAC

Electric Energy Savings:

$$\Delta kWh_{total} = \Delta kWh_{cool} + \Delta kWh_{heat}$$

[28] 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 31). http://www.pjm.com/~/media/documents/manuals/m18.ashx (pg. 67).

ΔkWh_{cool} = $[Capacity_{cool} * EFLH_{Cool} * (1/EER_{base} – 1/EER_{EFF})]/1000$

ΔkWh_{heat} = $[Capacity_{heat}/3.412 * EFLH_{heat} * (1/COP_{base} – 1/COP_{ee})]/1000$

Electric Demand Savings:

$\Delta kW = (Capacity_{Cool} * (1/EER_{base} - 1/EER_{EFF}))/1000 * CF$

Where:

$Capacity_{cool}$ = Cooling capacity of HVAC unit (Btu/hr), actual installed

$Capacity_{heat}$ = Heating capacity of HVAC unit (Btu/hr), actual installed

$EFLH_{cool}$ = Cooling Equivalent Full Load Hours, facility dependent

EER_{base} = Integrated Energy Efficiency Ratio (IEER), Seasonal Energy Efficiency Ratio (SEER), or Energy Efficiency Ratio (EER) of baseline cooling system, use minimum standard efficiencies

EER_{EFF} = Integrated Energy Efficiency Ratio (IEER) , Seasonal Energy Efficiency Ratio (SEER), or Energy Efficiency Ratio (EER) of efficient equipment, actual installed

$HSPF_{base}$ = heating seasonal performance factor of baseline heating system, use minimum standard efficiencies

$HSPF_{ee}$ = Heating Seasonal Performance Factor of efficient equipment, actual installed

COP_{base} = Coefficient of Performance of baseline equipment, use minimum standard efficiencies (if rating in HSPF, COP = HSPF/3.413)

COP_{ee} = Coefficient of Performance of efficient equipment, actual installed (if rating in HSPF, COP = HSPF/3.413)

In the latter half of 2020 and the first half of 2021, we will conduct three waves of Purchaser surveys[29] to verify measure receipt and installation of program bulbs, collect data on the characteristics of the facility (such as business type and 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 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. The Purchaser surveys will also contain NTG question batteries so that a CY2020/CY2021 NTG estimate can be derived for application in CY2022.[30]

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

[30] With this program, the evaluation team will pilot the new free ridership algorithm that is currently under development by the SAG NTG Working Group. The evaluation team will compare the results of the new free ridership algorithm and the results of the old free ridership algorithm against verbatim responses to open-ended questions on program influence and likely counterfactual behavior. The evaluation team will calculate free ridership using the algorithm that is most congruent with the verbatim responses.

Verified Net Impact Evaluation

The verified net impact evaluation will apply the NTG ratio accepted by SAG consensus to estimate the verified net savings for the program

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
LED Screw-in Lamps	0.72
LED Fixtures	0.80
Linear LED	0.76
Linear Fluorescent	0.67
LED Exit Sign	0.80
Battery Charger	0.80

Source: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021/

Program Management and Implementer Interviews

The evaluation team will interview ComEd staff 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 staff 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 CY2021 and beyond.

NTG Research; Participant Surveys

The evaluation team plans to conduct NTG interviews in CY2021 as described below. Participant surveys in CY2021 will be combined with participant surveys conducted in CY2020 to support gross and net impact parameter research for application in future program years. Note that the method described is fully compliant with the Illinois NTG framework for non-residential programs adopted by the IL SAG in version 9.0 of the Illinois statewide TRM.

Participant survey questions will be deployed for NTG research and 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.

We will survey a sample of CY2021 program participants early in 2021 (at the beginning of Q2 2021) and these responses will be combined with responses collected during the first two waves of surveys conducted with CY2020 participants. The goal across the three waves of surveys will be to achieve one-tailed 90/10 confidence and precision level at the program level. Conducting multiple waves of surveys help to ensure that the surveyed population is representative of the program population over time.

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

As required by the FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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
Calculators/Ops Manual/Workpapers Review	ComEd	January 4, 2021
Program Tracking Data Review - Wave 1 program tracking data for verification and sampling	ComEd	April 15, 2021
CY2021 Wave 1 Participant survey (Wave 3 of CY2020/CY2021 research)	Evaluation	May 1, 2021
CY2021 Wave 1 early impact verification memo	Evaluation	May 31, 2021
Program Tracking Data Review Feedback	Evaluation	June 15, 2021
ComEd Staff and Program Implementer Interviews	Evaluation	July 1, 2021
CY2020/CY2021 Participant survey results memos (Gross and NTG Parameters)	Evaluation	July 16, 2021
Tracking Data Review - Wave 2 program tracking data for verification	ComEd	August 30, 2021
Program Tracking Data Review - Wave 2 early impact verification memo	Evaluation	September 30, 2021
Program Tracking Data Review - Final program tracking data for verification	Evaluation	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 6, 2022
Comments on Draft	ComEd and SAG	March 27, 2022
Revised Draft	Evaluation	April 3, 2022
Comments on Revised Draft	ComEd and SAG	April 10, 2022
Final Report to ComEd and SAG	Evaluation	April 20, 2022

LED Street Lighting Program CY2021 Evaluation Plan

Introduction

The LED Street Lighting Program seeks to secure energy savings by replacing high-intensity discharge (HID) fixtures (including mercury vapor, metal halide, and high-pressure sodium) with light-emitting diode (LED) fixtures. The program assists municipalities with replacement upgrades to streetlights, with participation open to equipment independent of ownership, municipally owned or ComEd owned. In addition, ComEd will be expanding this program to offer a direct install track for economically distressed communities.

Evaluation of this program includes review of the tracking data for completeness and consistency; project files are reviewed to validate accuracy of database data entry; and savings are confirmed to ensure proper application of standards set by the Illinois Technical Resource Manual (TRM). The evaluation team also conducts interviews with the program manager and implementer to help identify opportunities for process improvement.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

Coordination

Guidehouse will coordinate with other utility evaluation teams on any issues relevant to this program, to include closely coordinating the LED Streetlighting evaluation teams between ComEd and Ameren Illinois. To this end, both the ComEd and Ameren evaluation teams are led by the same manager and both share some of the same engineering staff. This is done intentionally in order to ensure consistency in methodology and facilitate knowledge sharing across the two, similar programs.

Evaluation Research Topics

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

The CY2021 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. Are there any analysis mistakes or data entry errors reoccurring across multiple projects?
4. Do the findings justify recommendations to improve the TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Guidehouse expects the following aspects of the evaluation will remain consistent with the preceding years:

- Gross and net impact analyses is 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.
- 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 effective useful life (EUL) was approved and is effective as of January 2021; this new, increased lifetime will be reflected in the CPAS for CY2021.

Table 2 summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Program manual and workpaper review is included in this approach.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	April 2021 – February 2022	Three wave analysis*
Interviews	ComEd Staff and Key Implementer Staff	2	June – Dec. 2021	Will replace regular team check-in calls for the given Month
Gross Impact	Engineering File and Workpaper Review	12	May 2021 – February 2022	Three Waves†
Verified Net Impact	Calculation using deemed NTG ratio	NA	June 2021 – March 2022	

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

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling are each expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

Program Manager and Implementer Interviews

In CY2021, Guidehouse will interview both the program manager and the program implementer. These 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. Interviews will be scheduled to take the place of other, regularly scheduled team check-in calls. Observations about the program and process-oriented insights 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

Gross impact evaluation activities for CY2021 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
- Checking measure specifications and quantities recorded in the tracking database
- Verifying the program's savings estimates through independent engineering analysis
- Confirming that measure incentives are correctly calculated and recorded

Verified Net Impact Evaluation

The stakeholder consensus process produced the NTG values shown in the following table. The evaluation team will apply these values in the CY2021 evaluation.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
ComEd-owned fixtures	1.0
Municipality-owned fixtures	0.81
Distressed Communities	* Outlined in separate memo

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx
* NTG for the new program delivery track will be addressed in a memo for review by ComEd, ICC and SAG with the final value adopted for the program.

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

As required by FEJA, Guidehouse will report ex post gross and ex post net savings for the program as well as the CPAS generated by the program in CY2021. Additionally, Guidehouse 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

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. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Deliverable	Responsible Party	Date Delivered
Calculators/Ops Manual/Workpapers Review	Evaluation	as needed
Program Tracking Data Review - Data Wave Review Memo – draft	Evaluation	October 1, 2021
Program Tracking Data Review Feedback	Evaluation	November 15, 2021
Program Tracking Data Review – Wave 2	Evaluation	December 1, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review – Wave 2 Feedback	Evaluation	December 15, 2021
Program Tracking Data Review - Final CY2021 program tracking provided and all available supporting documents uploaded to eTrack	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Nonprofit Retrofits Program CY2021 Evaluation Plan

Introduction

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

- Energy assessments
- Energy efficiency measure installation
- Construction oversight
- Ongoing support and long-term relationship building

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

To participate in the program, the ComEd customer must be a 501(c)3 organization, 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. Nonprofit Retrofits Program Measure by Type

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

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

The CY2021 gross impact evaluation will include a variety of data collection and analysis activities, including those indicated in Table 2.

Table 2. Evaluation Approaches

Tasks	CY2021
Implementer Interview	X
Program Tracking Data Review	X
ComEd Staff Interviews	X
Impact – Project Level Desk Reviews including Deemed Savings Review	X
Impact – Project Level Site Visits and Installation Verification (if needed)*	X
Impact – Verification & Gross Realization Rate	X
Impact – Gross and Net Savings Verification	X

Source: Guidehouse
* Telephone Survey Engineering Review may be conducted in lieu of site visits.

Coordination

The Nonprofit Retrofits 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 Nonprofit Retrofits Program evaluation.

Evaluation Research Topics

The evaluation in CY2021 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?
3. Are project baselines properly determined? If not, why not and what guidance can the evaluation team provide for future projects?
4. What changes (if any) to the assessment process would improve the accuracy of savings estimates?
5. Are interactions between measures properly determined per the Illinois Technical Reference Manual (TRM)?
6. What updates (if any) are recommended for the TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

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

For CY2021, the primary method to determine gross savings will be detailed project reviews of a random sample of completed projects. A program-level NTG ratio, deemed through consensus by the Illinois Stakeholder Advisory Group (SAG), will be applied to the program's verified gross savings to determine net savings.

The table below summarizes the evaluation tasks for CY2021.

Table 3. Evaluation Plan Summary

Activity	CY2021
Gross Impact Approach	Program Tracking Data Review Project-Level Desk Reviews including Measure-Level Savings Review Project-Level Installation Verification via Telephone Interview or Site Visits
Verified Net Impact Approach	Deemed Value
ComEd Staff and Implementer Interviews	Yes (part of regular check-in meetings)

Source: Guidehouse

Table 4 summarizes the proposed data collection activities for CY2021, including the sample sizes and timing of each activity. During CY2021, Guidehouse will develop a sample design upon receipt of the first wave of project tracking data. Guidehouse will modify the CY2021 sample size targets in late CY2021 and after the final data wave in early CY2022, as warranted by program participation.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data System Review	Tracking System	Census	Receive Wave 1 by June 1, 2021 and Final data by January 30, 2022, findings available by September 30, 2021	Two Waves
Project-Level Desk Reviews including Measure-Level Savings Review	Tracking System, Workpaper and Project Files	20*	Starts when Wave 1 and Final data is provided, findings available by September 30, 2021	Two Waves
Project-Level Installation Verification Site Visits† – random sub-sample	Customer Facilities	TBD after receipt of Wave 1 extract	August 2021 – February 2022	Installation verification site visits will only be the largest, highest uncertainty projects as needed to satisfy the requirements of the IPMVP‡
Calculator Review	Program calculator from Elevate Energy	NA	Starts when calculator provided by ComEd, findings available by January 3, 2022	
Verified Net Impact	Calculation using deemed NTG ratio	NA	March 2022	

* Subject to change based on actual project population.
† Telephone Survey Engineering Review may be conducted in leu of site visits.
‡ IPMVP = International Performance Measurement and Verification Protocol.
Source: Guidehouse

In line with program changes and an accelerated evaluation schedule for delivering tracking data to the evaluation team, Guidehouse will perform a program data tracking review in two waves during CY2021.

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 6. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

The Nonprofit Retrofits Program includes savings from standard lighting, HVAC, and refrigeration measures in the TRM. A majority of pipeline savings for CY2021 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. Program workpaper review is included in this approach.

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 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,[31] such as building weather location, hours of operation, project type and associated baseline determination[32] 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 NTG ratios deemed through consensus by the SAG.

Table 5. Deemed NTG Values for CY2021

Program Measure	Measure or Sub-Program	CY2021 Deemed NTG Value
Nonprofit Organization	All but Thermostat	0.97
Nonprofit Organization	Thermostat	1.00

Source: SAG ComEd-NTG-History-and-CY2021-Recs-2020-09-30-FInal.xlsx

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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 is documented in the report. Guidehouse will follow reporting rules for the Nonprofit Retrofits Program based on the measure types implemented for CY2021.

[31] 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.

[32] 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. The evaluation team will conduct the interviews during the regularly scheduled program meetings.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Guidehouse is not using RCT or QED consumption data because this program contains many unique measures with significant cross-participation. In this case, 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 28, 2021
Program Tracking Data Review - program tracking data for sampling Wave 1	ComEd	June 1, 2021
Program Tracking Data Review - Wave 1 Ex Ante Preliminary Review Findings and Recommendations	Evaluation	September 30, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Calculator Review Findings	Evaluation	January 3, 2022
CY2021 final program tracking data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 8, 2022
Comments on Draft	ComEd and SAG	March 29, 2022
Revised Draft	Evaluation	April 5, 2022
Comments on Revised Draft	ComEd and SAG	April 12, 2022
Final Report to ComEd and SAG	Evaluation	April 21, 2022

Non-Residential New Construction Program CY2021 Evaluation Plan

Introduction

This plan covers CY2021 for the Non-Residential New Construction Program, which includes the Commercial and Industrial (CI) and Public Sector (PS) New Construction (NC) programs. CY2021 (January 1, 2021 to December 31, 2021) is the 13th program year of ComEd's energy efficiency savings portfolio and the 10th 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 CY2021 program has seen a few changes from previous years. The program has continued to develop and offer different program tracks to tailor program support to different types of participants and specific business segments. Prior to CY2020, the program offered the following participation tracks: Comprehensive Track, Expedited Assistance Track, Design Replication Track, and Accelerate Performance Track. The tracks varied in the incentives and technical assistance offered by the program based on the type of project and the point at which the project enters the program. Beginning in CY2020, the program consolidated the participation tracks into a single Performance Path and introduced a new Best Practices Path.

1. **Performance Path** – offers a custom, hands-on technical approach to new construction projects and targets projects that are early in the design phase to maximize opportunities to influence the incorporation of high-performance design strategies. Technical staff use whole building energy simulations (including energy models and spreadsheet calculations) to optimize the building design for energy performance. Modeling results include incentive amounts and annual energy cost savings estimates. This allows the design team to identify design strategies and technologies that will take their building design further and have the greatest impact on the building's energy use.
2. **Best Practices Path** – offers a more prescriptive approach to new construction projects. This pathway was designed for fast-moving, developer-led, projects or small projects. This includes pre-determined lists of measures and incentives that are available for specific building types along with resources and guidelines for how to best implement those measures. Provides an optimized and predictable incentive pathway with predefined, per-square-foot incentives for achieving specific energy efficiency best practices, as well as optional Advanced measures. The building types that are available through the Best Practices Path are listed below:
    - Warehouse and Industrial
    - Multi-Family and Assisted Living
    - Office
    - Retail and Grocery
    - Parking Garage – being added in 2021

Currently, the program is still serving projects that entered the program prior to CY2020 under one of the legacy participation tracks.

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 CY2021
- Use a rolling approach for the eventual derivation of net-to-gross (NTG), interviewing project representatives as they enter the reservation stage

The CY2021 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 paths of the program, including the public sector projects, but will account for the variations in the approach (e.g., Performance Path vs. Best Practices) and program offerings as needed. We will present results overall for the program by fuel type.

The CY2021 evaluation will include customer free ridership research. The findings from the research will inform recommended NTG values for the Illinois Stakeholder Advisory Group (SAG) approval and future program application. The CY2021 free ridership research will include in-depth interviews with participating customers to learn about how the program incentive and technical assistance may have influenced their project and to collect the data needed to calculate an NTG ratio.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Data Collection – Materials Review	X
Participant Interviews	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Building Energy Simulation Modeling	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Free Ridership Self-Report Interviews	X

Coordination

In this plan, Guidehouse 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. Guidehouse will also coordinate with Ameren evaluators on their evaluation approach. 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 CY2021 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. What are the free ridership values to be used prospectively in future program years?

Process Evaluation and Other Research Topics

The evaluation team is currently undertaking a preliminary process review of the Best Practices Path by conducting interviews with post-reservation phase Best Practices project representatives. This task was initiated in CY2020 as an ad hoc program evaluation support task but will be continued in early CY2021.

1. Are participants in the Best Practices Path satisfied with the program offerings and the participation process? If not, what recommendations do they have to improve the program path?
2. How did the Best Practices Path influence the level of energy efficiency incorporated in their project?
3. For repeat participants, how did their experience and satisfaction with the New Construction Program through the Best Practices Path compare to their previous experiences with the program?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Entire System	Completed by January 30, 2022
In-Depth Interviews	ComEd Staff 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	
NTG Research: Interviews	Telephone Interview with Participating Customers	~30	FR, Targeting Projects Currently in Reservation Phase

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

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 5). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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 CY2021 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 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.

Sampling Approach

The evaluation team plans to create two sample frames, one focused on electric projects and the other focused on gas projects. 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.[33] Within each of the sample frames, we plan to use a 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. [34]

Table 3. Estimated Number of Projects in Sample

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

Guidehouse will perform program tracking data review and M&V project sampling in two waves in CY2021. The first wave of M&V sampling is expected to cover about one-half of projects completed in CY2021.

New Measure Calculation Review

Program managers are currently in the process of developing new energy efficiency measures to add to program offerings and may seek the input of the evaluation team on preliminary savings calculations before the measures are offered to participants. The evaluation team is available to support program managers and staff in this process, as needed, and will review spreadsheets and other preliminary calculations to provide any insight on how the new measures may be evaluated in subsequent projects.

Verified Net Impact Evaluation

The evaluation team will apply the NTG ratios 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 CY2021

Utility	CY2021 Deemed NTG Value
ComEd (MW and MWh)	0.53
Gas Utilities (therms)	0.54

Source:
https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx
https://ilsag.s3.amazonaws.com/Nicor_Gas_NTG_History_and_2021_Values_Final-9-30-20.xlsx

[33] 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.
[34] 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.

Program Management and Implementer Interviews

The evaluation team will interview program managers during monthly calls, or separately if more time is needed, 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.

The implementation contractor will provide a draft agenda in advance of the monthly calls. Guidehouse will take meeting notes and distribute them.

NTG Research: Participant Interviews

The team will implement a rolling approach for deriving the NTG estimates, where program attribution will be estimated through attempting to evaluate all projects currently in the reservation stage, regardless of program year, to best capture the program's early influence. We will apply an augmented participant self-report approach (SRA), where in-depth interviews will collect the primary data necessary to implement the C&I New Construction free ridership protocol (3.4) from the Illinois Technical Reference Manual (TRM), Version 9.0 and results will be internally reviewed for consistency with project materials and documentation.[35] Further, for projects accounting for the top 20% of captured savings the NTG analysis will necessarily include a detailed project documentation and material review ("Enhanced Rigor"). This methodology will include the following for each sampled project:

1) **Initial Project Documentation Review.** This includes:
    a. Measure Incentive Reservation. The evaluation team will begin by reviewing the measure incentive reservation for each sampled project. This document will inform the evaluation team's characterization of the decision-making processes for specific components of each project. The measure incentive reservation documents contain:
        i. Project description
        ii. Estimated savings by energy efficiency measures (baseline compared to proposed equipment)
        iii. Estimated incentive, by energy efficiency measures
    b. Project Narrative/Influence Tab. The evaluation team will also review project narrative files developed by the implementation contractor and Project Influence tabs. This information will allow the team to determine potential points of influence of the program.

2) **Post-Reservation Interview.** The evaluation team will seek to speak with key decision makers for each project in reservation phase. In most cases, the primary project contact will be the key decision maker, but we will verify this as part of the interview and ask to be referred to the appropriate contact if necessary. If needed, the evaluation team will work with the implementer to identify alternate contacts. We will work with program managers and staff to update and refine the existing interview guide for use in these interviews. We will also incorporate customized questions for each project linked to the points of influence identified in the documentation review. All project-level results will also be reviewed for consistency with the findings of the initial project documentation review task. Because we will attempt to interview a census of projects in the reservation stage, no sampling of projects or differentiation between electric and gas savings is needed. We expect to complete about 30 interviews.

3) **Enhanced Rigor Project Documentation Review.** For projects accounting for the top 20% of electric savings from the pool of completed interviews, we will conduct a secondary

[35] The evaluation team may calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group if indicated by a comparison of old algorithm and new algorithm results in our pilot of the new algorithm.

documentation review of all relevant project materials, communications, email documentation of engagement history, and other project files to corroborate and support project-level NTG findings. We will develop a structured review protocol before conducting the analysis, rely on two qualified consultants working independently though all projects, and, if needed, adjust SRA results accordingly.

Best Practices Process Evaluation

The evaluation team is currently undertaking a preliminary process review of the Best Practices Path by conducting interviews with post-reservation phase Best Practices project representatives. This task was initiated in CY2020 as an ad hoc program evaluation support task but will be continued in early CY2021. The goal of the task is to assist program managers with program design decisions by providing early feedback on program processes and participation experiences. The evaluation team is conducting a census of Best Practices projects which at or beyond the program's reservation phase. Interviews focus on providing collecting feedback on program processes, incentive levels, comparison to prior program participation (for repeat participants), and a qualitative assessment of attribution.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be provided.

Use of Randomized Controlled Trial and Quasi-Experimental Design

The evaluation team will not use the Randomized Control Trials (RCT) or Quasi-Experimental Design 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
Best Practices Process Review Memo	Evaluation	February 19, 2021
Program Tracking Data for Participant Interviews	ComEd	April 1, 2021
Post-reservation phase participant interviews	Evaluation	April 1, 2021 through June 11, 2021
Program Tracking Data Review - program tracking data for sampling Wave 1	ComEd	June 3, 2021
Program Tracking Data Review – Wave 1 Feedback	Evaluation	September 1,2021
NTG Results Memo	Evaluation	July 26, 2021
Wave 1 Engineering Desk Reviews	Evaluation	September 30, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - program tracking data for sampling Wave 2	ComEd	January 30, 2022
Wave 2 Engineering Desk Reviews	Evaluation	February 28, 2022
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd, Gas Utilities, and SAG	March 18, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd, Gas Utilities, and SAG	April 15, 2022
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 22, 2022

Public Buildings in Distressed Communities Program CY2021 Evaluation Plan

Introduction

The Public Buildings in Distressed Communities Program (PBDC) 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 a contractor. If self-installed, HVAC projects require the program implementer to conduct a preliminary evaluation and post-installation verification.

The CY2021 evaluation of the PBDC program will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1: Evaluation Approaches

Tasks	CY2021
Implementer Interview	X
ComEd Staff Interview	X
Program Tracking Data Review	X
Impact – Engineering Review	X
Impact – Verification of Gross and Net Impacts	X
Impact – Determine Gross Realization Rate	X

Coordination

This evaluation team will continue to coordinate with our colleagues evaluating similar programs in order to facilitate a coherent approach to data collection and analysis methods. The PBDC evaluation team will coordinate with the Ameren Instant Incentives program evaluation team, which also provides discounts at the point of sale through commercial lighting distributors. Similarities between the ComEd and Ameren programs will be leveraged accordingly.

Evaluation Research Topics

The primary objectives of the evaluation of the Public Buildings in Distressed Communities Program are:

- Quantify gross and net savings impacts from the program

With those objectives in mind, the evaluation will seek to answer the following key researchable questions.

Impact Evaluation

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

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The evaluation approach for CY2021 is outlined in Table 1. The evaluation team realizes that the program is young and will continue to evolve as it matures over the next year; therefore, Guidehouse will adjust the plan as needed based on measure adoption trends, participant mix, and input from the program management team. Calculator and workpaper review is included in this approach. The initial evaluation approach will include:

- Gross and net impact analyses
- Cumulative Persistence Annual Savings (CPAS) will be calculated annually based upon the requirements of Future Energy Jobs Act (FEJA)
- As able, identification of areas for process improvement

Table 2 summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. NTG for this program will not be researched in CY2021; see the Verified Net Impact Evaluation section of this plan for further context.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	Three waves*	
ComEd Staff and Implementer Interviews	ComEd Staff and Implementers	2	June-Dec. 2021	Interviews will take the place of other, regularly scheduled team calls.
Program Status Meetings	ComEd Staff and Implementers	6	2021	Regularly scheduled calls to coordinate and facilitate program awareness within the broader team
Gross Impact	Engineering File Review	TBD	August 2021 – February 2022	May include limited participant outreach. Sample size dependent on participation.
Verified Net Impact	Net Savings Calculation	NA	March 2022	NTG ratio provided in Table 3

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

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

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 management team's goals and objectives; and also to inform a follow-up interview with the implementer. These interviews will take the place of two of the team's other, regularly scheduled check-in calls.

Gross Impact Evaluation

The primary program gross impact evaluation activities for CY2021 are:

- Review tracking data to confirm that all fields are appropriately populated
- Develop a statistically valid sample of projects for in-depth review
- Conduct project file reviews for sampled projects and confirm savings
- As needed, conduct brief participant interviews to clarify project detail

- Review ex ante analysis and ensure that TRM methods and inputs are correctly applied

Verified Net Impact Evaluation

The evaluation team will not research NTG for this program in CY2021. Instead, the evaluation will apply net-to-gross (NTG) ratios approved by the Illinois Stakeholder Advisory Group (SAG) on October 1, 2019 to evaluation-verified gross savings to compute verified net savings. The applicable NTG values are provided in Table 3, below.

Table 3. NTG Values for CY2021

Program Measure	CY2021 NTG Value
All measures except thermostat	0.97
Thermostat	1.00

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

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

As required by the FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

The evaluation team will not use the Randomized Control Trial (RCT) or Quasi-Experimental Design 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
Calculators/Workpapers	ComEd	October 2020 – January 29, 2021
Program Tracking Data Review	ComEd	June 1, 2021
Wave 1 supporting documentation for individual projects	ComEd	July 1, 2021
Wave 1 Review Draft Memo to ComEd	Evaluation	Sept 5, 2021
Wave 2 Tracking Data Review	Evaluation	October 15, 2021
Wave 2 Review Draft Memo to ComEd	Evaluation	November 20, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - final program tracking data provided to evaluation team and all available supporting documents uploaded to eTrack	ComEd	January 28, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Small Business Kits Program 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 eligible private sector small businesses, included restaurants and some small public sector customers including: park district and public works offices, libraries and fire stations. For 2021 the eligibility for private sector customers has increased from <100 up to <200 KW peak demand, and for public sector customers has increased from <100 up to 400 KW peak demand. 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 next year will include a variety of data collection and analysis activities, including those indicated in the following table. The CY2021 gross impact evaluation will not vary significantly from the previous years.

Table 2. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research: Customer Self-Report Surveys	X

Coordination

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

Evaluation Research Topics

The CY2021 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?
4. What is the free ridership for this program?
5. Is there any spillover attributed to this program?
6. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. Program manual and workpaper review is included in this approach.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	Two waves	
PM and IC Interviews	ComEd Staff and Implementers	2	April – June 2021	Augment with calls every six week with team
Gross Impact	Engineering Review	Census	July – Aug 2021 Feb – March 2022	Two Waves
Verified Net Impact	Calculation Using Deemed NTG Ratio	NA	Dec 2021 – March 2022	
NTG Research: Surveys	CY2020 and CY2021 Participants	TBD	Q1 2021	Will include in-service rate questions for smart sockets in the spillover survey

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 5). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Program Management and Implementer Interviews

No formal process evaluation will take place in 2021. 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 during our regular meeting with ComEd and the implementer that occurs every six weeks 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 CY2021. 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 2021 to determine the CY2021 verified custom inputs for measure ISRs, the hot water fuel type (%ElectricDHW and %FossilDHW), and space heating fuel type (%Electric and %FossilFuel).

Verified Net Impact Evaluation

The verified net impact evaluation will apply a program-level net-to-gross (NTG) ratio of 0.97 from the Illinois Stakeholder Advisory Group (SAG) consensus process to estimate the verified net savings for the program in CY2021, as shown in the table below.

Table 4. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
Small Business Kit	0.97

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

NTG Research: Participant Surveys

Using program tracking data with 2020 and 2021 participants' email addresses, we will conduct research on free ridership in spring 2021 through a participant survey via a website[36]. If not enough email addresses are available for 2020 and 2021 participants, then participants will be sampled for a telephone survey. Guidehouse will also conduct participant spillover research with 2020 participants through a telephone survey in spring 2021. In-service rate questions for smart sockets will also be included in the spillover survey and satisfaction questions will be included in both surveys.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the cumulative persisting annual savings (CPAS) in CY2021 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.

[36] The evaluation team may calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group if indicated by a comparison of old algorithm and new algorithm results in our pilot of the new algorithm.

Table 5. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Calculators/Ops Manual/Workpapers	ComEd	March 30, 2021
Program Tracking Data Review - program tracking data for Wave 1	ComEd	July 9, 2021
NTG Results Memo	Evaluation	July 12, 2021
Program Tracking Data Review Feedback - Wave 1 project documentation, engineering reviews	Evaluation	August 6, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - Final CY2021 Program tracking and customer survey data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 4, 2022
Illinois TRM Update Research Findings	Evaluation	March 4, 2022
Comments on Draft	ComEd and SAG	March 25, 2022
Revised Draft	Evaluation	April 1, 2022
Comments on Revised Draft	ComEd and SAG	April 8, 2022
Final Report to ComEd and SAG	Evaluation	April 15, 2022

Small Business Program CY2021 Evaluation Plan

Introduction

The Small Business (SB) Program is designed to assist qualified ComEd private- and public-sector non-residential customers[37] to achieve electric energy savings by educating them about energy efficiency opportunities through no-cost on-site energy assessments conducted by authorized, specially-trained energy efficiency service providers (EESPs) and installation of no-cost direct-install (DI) measures.[38] Further savings are available to participating customers through incentives of 30-75 percent offered for select contractor-installed measures.[39] EESPs are the primary means of promoting the SB Program and recruiting participants. Changes in the 2021 SB Program include opening up eligibility to public sector customers, and raising the eligibility cap from 100 kW maximum monthly demand to 200 kW (for private businesses) or 400 kW (for public sector). Nexant Inc. will be the implementation contractor for the day-to-day operations of both private and public sector portions of the Program,

The primary objectives of the CY2021 evaluation of the SB Program will be to quantify the gross and net savings impacts of the program. The evaluation of this program in 2021 will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

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

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

Evaluation Research Topics

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

[37] To qualify, participants must be ComEd commercial or industrial customers with monthly peak demand levels up to 200 kW for private businesses, or 400 kW for public sector.
[38] 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.
[39] Incented measures may include upgrades to T8/T5 lighting, LED retrofits and fixtures, high bay fluorescents, lighting controls, VSDs and HVAC system components, electric water heaters, refrigeration system components, commercial kitchen equipment, compressed air system measures, smart thermostats, and building envelope measures.

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 peak 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?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 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 CY2021 (approx.)	Notes
Program Tracking Data Review	Tracking System	Census	Impacts. Three data waves
Gross Impact	Early Feedback File Review	Census	Wave 1 and Wave 2
Verified Net Impact	Calculation using deemed NTG ratio		
In Depth Interviews	Program managers and implementers	4	Augment with periodic calls

Guidehouse will perform program tracking data review and engineering file reviews on a sample of participant projects in two waves in CY2021. Guidehouse will interview the program manager (PM) and implementation contractor (IC) in CY2021 to understand the program operations and related issues.

Program Tracking Data Review

Guidehouse will review program tracking data in three waves. The first and second waves of M&V sampling is expected to cover about one-third of projects completed in CY2021, the third wave will assess the remaining sampled projects. The final savings provided to Guidehouse by January 30th will be evaluated and matched against the prior evaluation waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft project review reports that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Wave 2 review will focus on the mid-year evaluation data during the summer and into the fall, findings documented in project review reports and inform annual

savings calculations for the impact analysis. Wave 3 will be based on the final end of year data delivered to Guidehouse by January 30th, 2022.

Gross Impact Evaluation

Since most SB 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 and workpapers 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. Program manual and workpaper review is included in this approach.

Proposed CY2021 gross impact and sampling timelines are shown below.

1. Mid-year early impact review of Wave 1 data in July 2021 and completed in August 2021. This will include developing a memorandum of findings from early impact review or a spreadsheet outlining issues to be addressed by ComEd if the findings are not numerous.
2. Wave 2 sample of project files and documentation drawn in September 2021 and completed November 2021. This will include developing a memorandum of findings from early impact review or a spreadsheet outlining issues to be addressed by ComEd if the findings are not numerous.
3. Final and third wave of tracking data by January 29, 2022 and completed by March 6, 2022.

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 water and gas savings and review the parameters ComEd used to estimate potential kWh savings, including
    a. kWh from gas savings conversion
    b. kWh converted from secondary water savings, and
    c. Electric heating penalties

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

Guidehouse is not evaluating the SB 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

CY2021 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,

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 CY2021

Program Measure	CY2021 Deemed NTG Value
Small Business (all measures except thermostat)	0.97
Thermostat	1.00

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Research NTG Impact Evaluation

Guidehouse conducted NTG research on CY2018 participant and EESP populations. We planned on conducting NTG research of CY2020 participants and EESPs with the goal of reporting results in 2021. However, given the extent of the program changes described above (i.e., changes to the size and composition of the target customer population), Guidehouse decided to put this research off until CY2022 to ensure that we will be able to obtain a sufficient representative sample.

Should the program complete a sufficient number of projects in early 2021 covering all the necessary bases[40], evaluation may revisit this decision based on discussion with the relevant stakeholders.

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 similar to ComEd's SB Program. [41] 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.[42]

Guidehouse 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.

[40] To meet the SAG's deadline for submitting NTG research results we would have to have multiple projects covering public and private sector customers, and all size categories, including the largest eligible ones.
[41] See https://amerenillinoissavings.com/for-my-business/explore-incentives/small-business-incentives for more information.
[42] Opinion Dynamics is the lead evaluator for Ameren Illinois energy efficiency programs.

Calculation of CPAS and Annual Savings

As required by FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. The evaluation team 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 Deadlines

Activity/Deliverables	Responsible Party	Date Delivered
Calculators/Ops Manual/Workpapers	ComEd/Nexant	September 2020 – January 30, 2021
Program Tracking Data Review - Wave 1 Tracking Data	ComEd	July 2, 2021
Program Tracking Data Review - Wave 1 Tracking Review Memo	Evaluation team	October 15, 2021
Early impacts findings memo	Evaluation Team	August 2021
Sample Wave 2 Projects Documentation for Review	ComEd	September 30, 2021
ComEd Staff Interviews	Evaluation	December 15, 2021
Program Tracking Data Review - Wave 3 and Final CY2021 Tracking Data to Guidehouse	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation Team	March 14, 2022
Comments on Draft	ComEd / SAG	April 4, 2022
Revised Draft Report by	Evaluation Team	April 11, 2022
Comments on Revised Draft	ComEd / SAG	April 18, 2022
Final Report to ComEd and SAG	Evaluation Team	April 25, 2022

Strategic Energy Management Program CY2021 Evaluation Plan

Introduction

The Strategic Energy Management (SEM) Program provides customers with high energy consumption training to holistically assess the energy use of their facilities and identify no/low cost opportunities to reduce their usage. Through the program, participants learn to apply principles and practices of continuous improvement to implement strategic energy management practices.

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. Guidehouse's focus in CY2021 will be on new cohorts as that detail becomes available for evaluation.

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

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Billing Analysis	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Modeling	X
Impact – Verification & Gross Realization Rate	X

The impact evaluation of this program focuses on the review of site-level energy models and detailed site reports. As needed, calls with customers may be completed to verify information included in both the report and whole building models. Notable evaluation changes made from CY2020 to CY2021 include:

- Due to timing of data availability, the gas and electric reports will likely be separate for this program and not a joint report.
- A sample will be taken from all participants. In CY2020, new participants were more focused on than alumni. This year all customers will be considered equally in order to ensure that alumni customers are continuing to show accurately claimed savings.
- Program coordination will occur during monthly meetings. Guidehouse has not planned for separate implementer and utility surveys this year.

The evaluation approach for this program is based on the following principles:

- Gross and net impact analyses 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)

Coordination

The SEM Program is jointly managed between ComEd, Nicor Gas, Peoples Gas Company and North Shore Gas Company. ComEd will coordinate with other Illinois utilities, as needed. The SEM evaluation report will be developed as a separate ComEd and gas utilities evaluation reports. Guidehouse 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 Guidehouse will manage those data issues with ComEd and gas utilities.

Evaluation Research Topics

The CY2021 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?
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 formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021, 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Census	Guidehouse will coordinate with both the electric and gas utilities to ensure this tracking data is complete and accurate.
Gross Impact Evaluation	Engineering File Review	*	This is a review of multi-regression models based upon whole-building data, production data and other key variables.
Verified Net Impact Evaluation	Calculation Using Deemed NTG Ratio	NA	Deemed Value Electric (1.00) Gas (1.00)
Interviews	ComEd Staff and Implementers	NA	Monthly calls as needed

*Sample size will be determined to achieve 90/10

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 4). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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 primarily contains behavioral-based changes, International Performance Measurement and Verification Protocol (IPMVP) Option C (i.e., 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, Guidehouse-calibrated building automation system (BAS) trend logs, production data and telephone conversations with onsite staff.

ComEd or the gas utilities will provide energy models for all the sites within the SEM Program. The evaluation will use this data with other information from the site to identify operating characteristics of the site both pre-and post-program 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 energy efficiency or demand response programs or outside of the ComEd and Nicor Gas programs[43]

Guidehouse will sample projects from the sites and apply the sample realization rates to the entire population to calculate overall savings. Guidehouse will consider several ways to stratify the SEM projects to design a sample once initial program data is received. Guidehouse 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, Guidehouse will collect the information regarding these sites and begin the evaluation. Guidehouse expects that the timing of this information will be dependent on the timing of the cohort training.

Verified Net Impact Evaluation

The CY2021 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.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All-Electric	1.00
All-Natural Gas	1.00

Source:
https://www.ilsag.info/evaluator-ntg-recommendations-for-2021/

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and CPAS for the measures installed in CY2021. The measure life of five years will be used for the SEM Program. The five-year EUL is derived from Guidehouse program primary research that was completed for the AEP Ohio CEI (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

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

quasi-experimental design because there are not enough participants for individual measures in this program to achieve statistically significant savings estimates using this method.

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

Activity/Deliverables	Responsible Party	Date Delivered
Workpapers and Models	ComEd	Oct. 15, 2021*
Sample of sites determined and approved	Evaluation	Nov. 5, 2021
Project review	Evaluation	Dec. 15, 2021
ComEd Staff Interviews	Evaluation	Dec. 20, 2021
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd, Gas Utilities, and SAG	April 1, 2022
Revised Draft Report	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd, Gas Utilities, and SAG	April 15, 2022
Final Report to ComEd, Gas Utilities, and SAG	Evaluation	April 22, 2022

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

Virtual Commissioning™ Program CY2021 Evaluation Plan

Introduction

The ComEd Virtual Commissioning™ Program (VCx™)[44] is an energy efficiency pathway within the Retrocommissioning Program (RCx)[45] designed and operated for ComEd by Power TakeOff (PTO) that provides qualified ComEd business customers[46] with energy management through the use of 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 saving 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.[47] 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 CY2021 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 – CY2021 Plan

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Regression Analysis (Customer-Specific)	X
NTG Research: Customer Self-Report Surveys	X
Process Research – Customer Self-Report Surveys	X

[44] Formerly known as Energy Advisor Monitoring Based Commissioning, the name was changed to Virtual Commissioning™ in CY2019 when it was brought within the RCx Program to avoid confusion with a similarly-named program.
[45] Although VCx™ falls within the RCx Program it will be evaluated separately due to differences in implementation and the evaluation methodology.
[46] 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.
[47] Recommended actions are focused on operational adjustments to automated systems and may include, but are not limited to, adjusting HVAC schedules to match occupancy, programming building automation systems to turn off unneeded equipment during off- or light-duty hours, and managing equipment start-up and shut-down schedules.

Coordination

Ameren Illinois began a Virtual Commissioning™ pilot program in the summer of 2020. Guidehouse will coordinate with the independent evaluator of the Ameren Illinois program to ensure that the two evaluation approaches are similar and to identify and report on any substantive differences.

Evaluation Research Topics

The CY2021 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the program's verified annual total lifetime gross savings?
2. What is the program's verified annual total lifetime net savings?

Process Evaluation and Other Research Topics

1. What is the appropriate net-to-gross (NTG) ratio for this program?
2. How do participants channel through the portfolio?
3. What is the participants' satisfaction with and perceptions of the program?
4. What aspects of the program would participants like to see changed?

Per Guidehouse's CY2020 VCx™ evaluation plan, we attempted to field a net-to-gross customer survey in 2020 to measure free ridership and spillover. Unfortunately, the response rate was unacceptably low due to the effects of the COVID-19 pandemic. We will attempt to field a net-to-gross customer survey in CY2021.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 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	CY2021
Gross Impacts Evaluation	Regression Analysis
Review of Apparent Uplift in Other EE Programs	Yes
Sampling Frequency	Annual
ComEd Staff and Implementer Interviews	Yes
Materials Review	Yes
Participant NTG	Yes
Participant Survey	Yes

Gross Impact Evaluation

Guidehouse will measure the VCx™ Program's CY2021 annualized energy savings by developing baseline hourly energy usage models (possibly adjusted for Covid-related issues) for each CY2021 program participant, calibrated to their year of pre-enrollment 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 CY2021 program savings will be the product of the sum of the individual participants' gross annualized savings and the NTG ratio deemed through the Illinois Stakeholder Advisory Group (SAG) consensus process.

Equation 1. Virtual Commissioning™ Load Model

$$E_{t,d} = \sum_{h=1}^{24} \alpha_h HOD_{h,t} + \sum_{h=1}^{24} \beta_h HOD_{h,t} * Weekend_d + \sum_{m=1}^{12} \sum_{h=1}^{24} \beta_{m,h} HOD_{h,t} * Month_{t,m} +$$

$$\gamma_L CDH_{t,d} + \gamma_Q CDH_{t,d}^2 \gamma_L + \delta_L HDH_{t,d} + \delta_Q HDH_{t,d}^2 + \theta Change_{t,d} + \varepsilon_{t,d}$$

where:

- t, d, m and h index time of day, day of week, month of year and hour, respectively
- $E_{t,d}$ is the customer's energy consumption at time t of day d
- The $HOD_{h,t}$ comprise a set of 24 binary hour-of-day indicators, which equal 1 if t falls in the hth hour of the day, and 0 otherwise
- $Weekend_d$ is a binary indicator that equals 1 if d is a weekend or holiday weekday, and 0 otherwise
- The $Month_{t,m}$ comprise a set of 12 month-of-year indicators, which equals 1 if t falls in month m, and 0 otherwise
- $CDH_{t,d}$ are the cooling degree-hours during hour t of day d
- $HDH_{t,d}$ are the heating degree-hours during hour t of day d
- $Change_{t,d}$ is a binary indicator that equals 1 if t falls after the date of the agreed-upon change(s), and 0 otherwise

- The α_h, β_h, $\beta_{m,h}$, γ_L, γ_Q, δ_L, δ_Q, and θ are unknown parameters to be estimated
- $\varepsilon_{t,d}$ is a mean-zero disturbance term

Guidehouse will employ a grid search technique to select the optimal base temperatures to use for calculating the HDD and CDD values on a site-specific basis.

When indicated by model fit, Guidehouse will instead employ a daily version of the above model, shown in Equation 7.

Equation 2. VCx™ Daily Load Model

$$E_d = Weekend_d + \sum_{m=1}^{12} \beta_{d,m} Month_{d,m} + \gamma_L CDH_d + \gamma_Q CDH_d^2 + \delta_L HDH_d + \delta_Q HDH_d^2 + \theta Change_d + \varepsilon_d$$

where:

- E_d is the customer's energy consumption during day d
- CDH_d are the cooling degree-hours during day d
- HDH_d are the heating degree-hours during day d
- ε_d is a mean-zero disturbance term

and all other definitions are the same in Equation 1.

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.[48]

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[49], 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.

Guidehouse 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 Guidehouse 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

[48] 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.

[49] See http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/ for more information.

ComEd programs before and after participation in the program and include questions in the NTG research survey instrument designed to identify uplift.

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in (Table 5). The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Verified Net Impact Evaluation

The SAG consensus process agreed to a net-to-gross (NTG) value of 1.0 for this program for CY2021 (Table 3). Guidehouse will apply that NTG ratio to the adjusted gross savings to estimate the verified net savings for the program in CY2021.

The regression analysis described in the previous section produces gross savings with respect to free ridership.[50] Therefore, Guidehouse will continue the NTG research begun in CY2020 to measure free ridership as well as spillover. This research will involve participant interviews, and we will u the results of this analysis to support a revised NTG proposal for future use[51].

Table 3 Deemed NTG Value for CY2021

Program Path/Measure	Deemed NTG Value
Virtual Commissioning™	1.00

Source: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report measure-specific ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated. Guidehouse will not have the gas usage data and so will not calculate gas savings for this program.

Program Manager and Implementer Interviews

We will not conduct any process research in 2021. Guidehouse will undertake interviews with the ComEd program managers 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

[50] The impact evaluation does capture participant spillover that occurs at the same time as program operational changes, but it does not capture spillover that may occur later. The program is unlikely to generate significant non-participant spillover, and the impact evaluation method does not remove free ridership. Thus, research to identify free ridership is warranted as is spillover that occurs at least one month after program operational changes..

[51] The evaluation team will calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group. The participation population is small, and the free ridership battery for this program is long, therefore, using both the old free ridership questions and the new ones is not possible.

program improvement. These interviews will be used to inform our evaluations, including the instruments that will be used for participant surveys.

Materials Review

Guidehouse 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 10- to 20-minute surveys suitable to address all research needs. 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 may address effective useful live (EUL) research and program operations and customer satisfaction research areas listed above.

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 are 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 Guidehouse will need for the CY2021 evaluation.

Table 4. Data Requirements for CY2021 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

Required Data	Relevant Information Requested
	• 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
	• Hourly energy usage values for CY2021 (Jan 1, 2021 – Dec 31, 2021) 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
ComEd Staff Interviews	Guidehouse	December 2020 – May 2021
Implementer Interviews	Guidehouse	June 30, 2021
Materials Review and Participant Surveys	Guidehouse	February March 2021
NTG Results Memo t	Guidehouse	June 25, 2021
Program Tracking Data Review - Final evaluation data request sent to ComEd / PTO	Guidehouse	December 31, 2021
Final Evaluation Data Delivered to Guidehouse	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Guidehouse	March 6, 2022
Comments on Draft	ComEd and SAG	March 27, 2022
Revised Draft	Guidehouse	April 4, 2022
Comments on Revised Draft	ComEd and SAG	April 11, 2022
Final Report to ComEd and SAG	Guidehouse	April 20, 2022

APPENDIX C. RESIDENTIAL PROGRAMS EVALUATION PLANS

Appliance Rebates Program 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, pool pumps, bathroom exhaust fans, and water coolers. The primary objectives of the evaluation of the ComEd Appliance Rebates Program are to determine gross and net program savings.

The CY2021 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 2021.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

Coordination

Guidehouse will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Additionally, Guidehouse will coordinate with the evaluation team for Ameren's Retail Products program as they began to offer rebates on appliances in 2020.

Evaluation Research Topics

The CY2021 evaluation team will seek to answer the following key researchable questions:

Impact Evaluation

1. What are the program's verified gross kWh, coincident peak demand kW savings, and therm savings?
2. What are the program's verified net kWh, coincident 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)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Census	Concurrent with gross impact analyses.
In-Depth Interviews	Program Manager and Implementer	2	
Gross Impact Evaluation	TRM Review	Census	Wave one and final data†

† Guidehouse will coordinate with ComEd to determine appropriate date to pull the "wave 1" tracking data extract.

Program Tracking Data Review

The program tracking data 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.

Guidehouse will review program tracking data twice for the program year. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The final program tracking data review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

ComEd Staff and Implementer Interviews

Guidehouse 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.

NTG Research

The evaluation will not include NTG research in CY2021.

Gross Impact Evaluation

Appliance Rebates Program measure savings are derived from deemed values contained in the TRM. Consequently, 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 Guidehouse's calculated savings with the implementation contractor's calculated savings.

Guidehouse will complete this process two times, once during the Wave 1 impact analysis and again during the final analysis in March 2022. The Wave 1 impact analysis provides an opportunity for Guidehouse 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 CY2021.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
Advanced Power Strip – Tier 1	0.76
Advanced Thermostat - Cooling	0.80
Advanced Thermostat - Heating	0.90
Air Purifier	0.79
Bathroom Exhaust Fan	0.66
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
Water Cooler	0.67

*TOS = Time of Sale
Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report electric savings, gas savings, and total CPAS for CY2021. For measures that achieve gas savings, Guidehouse will convert gas

savings to electric savings for inclusion in total CPAS. Additionally, the weighted average measure life will be estimated, and Guidehouse will calculate the weighted average measure life for the program.

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 Workpapers	ComEd	October 12, 2020
CY2021 Wave 1 Data Request	Evaluation	November 2020
Program Manager and Implementer Interviews	Evaluation	TBD
CY2021 Program Tracking Data for Wave 1 Data Review and Analysis	ComEd	July 2, 2021
Tracking System Wave 1 Ex Ante Review Findings and Recommendations	Evaluation	September 3, 2021
CY2021 Final Program tracking data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 7, 2022
Comments on Draft	ComEd and SAG	March 25, 2022
Revised Draft	Evaluation	April 1, 2022
Comments on Revised Draft	ComEd and SAG	April 8, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Elementary Energy Education Program 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. New to the program in CY2021 is the addition of one BR30 bulb as well as offering a coupon in the education kit for bulbs that the participant can purchase through an online website. These bulbs include a BR30, candelabra 5-watt, globe 6-watt, mini globe, and a three-way A19 LED.

The primary objectives of the CY2021 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) and (2) determine a net-to-gross (NTG) value for bulbs offered in the energy kit and through the online coupon delivery method. The CY2021 gross impact evaluation will not vary significantly from the previous years.

The evaluation of this program in CY2021 will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Program Manager Interview	X
Implementer Interview	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research – Secondary	X

Coordination

Guidehouse 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, Guidehouse 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 CY2021 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. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?
4. What NTG values are other utilities using for bulbs offered through a similar program with an online voucher delivery method?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	All	Two Waves*
Gross Impact Approach	Student Survey Analysis	All	Two Waves*
In-Depth Interviews	Program Manager and Implementer	2	
Verified Net Impact	Calculation using deemed NTG ratios	NA	
NTG Research	NTG ratios other utilities are using for bulbs included in energy kits and coupon bulbs	NA	

*Guidehouse will coordinate with ComEd to determine appropriate dates to pull Wave 1 tracking data extract.

Program Tracking Data Review and Gross Impact Approach

EEE Program's savings are based on the TRM estimates. The gross impact evaluation's foundation will be a review of program tracking data that substantiates the type and quantity of measures installed. Guidehouse 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 Guidehouse 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.

Guidehouse will review program tracking data twice for the program year. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The final program tracking data review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Verified gross savings for all the measures included in the kits will be calculated for each participant using appropriate 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 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

Guidehouse 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.

Verified Net Impact Evaluation

The verified net impact evaluation will apply NTG ratios deemed through a consensus process by the SAG to estimate the verified net savings for the EEE Program. The NTG values for CY2021 are shown in the table below.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
Kit and Voucher LEDs	0.84
LED Nightlight	1.00[52]
Other EEE Measures	1.00

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

NTG Research

Updated NTG research is needed to inform the NTG value for free LEDs included in the energy kit because the current value of 0.84 is based on PY9 NTG research conducted for the Home Energy Assessments Program. Also, new to the program in CY2021 is the addition of a coupon in the energy kit that allows participants to redeem LED bulbs through ComEd's online marketplace. Because conducting primary research for this program is difficult, as we do not have access to participants' contact information, Guidehouse will conduct secondary research on LED bulbs offered in an energy kit and LEDs redeemed through an online marketplace via a coupon.

Recently, ComEd let Guidehouse know that this program is shifting to have income eligible program design focus for the next plan. Guidehouse is coordinating with ComEd to request more information to determine NTG activity for CY2021. Guidehouse will assess the available information that ComEd can share and the plan to conduct NTG research is subject to change.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

[52] Per the IL SAG's designation of a 1.0 NTG value for all other EEE kit measures other than standard LEDs, the evaluation team will use this value for the LED nightlight instead of the TRM default value of 0.80.

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

Guidehouse is not evaluating the EEE Program via an RCT because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	October 2020
CY2021 program tracking data for Wave 1	ComEd	July 14, 2021
Deliver Draft NTG Results Memo to ComEd	Evaluation	July 19, 2021
Finalize NTG Results Memo	Evaluation	August 30, 2021
Submit NTG Recommendation to SAG	Evaluation	September 1, 2021
Wave 1 project documentation, engineering reviews, feedback	Evaluation	September 15, 2021
Final CY2021 Program tracking and customer survey data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 9, 2022
Comments on draft	ComEd and SAG	March 30, 2022
Revised Draft	Evaluation	April 6, 2022
Comments on redraft	ComEd and SAG	April 13, 2022
Final Report to ComEd and SAG	Evaluation	April 20, 2022

Lighting Discounts Program CY2021 Evaluation Plan

Introduction

The ComEd Residential Lighting Discounts (Lighting Discounts) Program provides incentives to increase the market share of qualified LED directional and specialty bulbs, Connected LEDs, LED Nightlights, and LED 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. Additionally, the Lighting Discounts Program offers incentives on these lighting measures through ComEd's online retail channel called Marketplace 2.0.

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 year will include a review of the tracking databases, deemed savings reviews, verification of savings and measure-level and program-level realization rates, estimating net program impacts, and research activities for updating program net-to-gross (NTG) ratios for future program use. These activities are highlighted in the table below.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
Impact – Net Program Savings Estimate	X
ComEd Staff Interview	X
Implementer Interview	X
NTG Research - Customer Self Report Surveys	X

Coordination

Guidehouse 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 Technical Reference Manual (TRM) and are generally consistent. Guidehouse will also coordinate with the Income Eligible Retail Discounts Program evaluation team on LED bulb and fixture related issues.

Evaluation Research Topics

The CY2021 evaluation will seek to answer the following key researchable questions:

Impact Evaluation

1. What is the level of gross annual energy (kWh) and coincident peak demand (kW) savings induced by the program?
2. What are the net impacts from the program? What is the researched value for NTG ratio?

3. What updates are recommended for the TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation task for CY2021.

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

Activity	Target	Target Completes CY2021	Notes
Program Tracking Data Review	All Program Sales	Census	Wave 1 and Final
In-Depth Interviews	Program Manager and Implementers	2	
Customer Self-Report Surveys	Retail Lighting Purchasers	350	Fall 2021*

*Customer Self Report Surveys are planned for the Fall of 2021 as a result, NTG findings will be reported in CY2022 and applied in CY2023.Given the Covid-19 pandemic, the research method and timing may need to be altered.

Program Tracking Data Review

The evaluation team will review program tracking data twice for the program year. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. The evaluation team will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The final tracking data review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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.

NTG Research: Customer Self-Report Surveys

The CY2021 Customer Self Report Surveys' primary objective is to collect data for updating program NTG ratios. These surveys will comprise of in-store intercept surveys[53] and web surveys. The in-store Intercept surveys will target upstream customers as they are making lighting purchasing decisions in

[53] In-Store Intercepts will need to take the context of Covid-19 into account. As a result, these surveys may be delayed or another "Covid Friendly" method may be used.

program retail stores, whereas web surveys will be used to target lighting purchasers who receive incentives through the Marketplace 2.0 channel. Additionally these surveys provide an opportunity to estimate the following key residential lighting gross parameters: (1) first-year installation rate (by bulb type), (2) leakage of program bulbs outside of ComEd service territory, (3) percentage of bulbs being installed in non-residential locations and the business type of these non-residential installations (used to determine the appropriate non-residential hours-of-use [HOU] and peak coincidence factor [CF] used to estimate program savings). The intercept survey instrument used in CY2021 will be similar to the instrument used in previous ComEd evaluations, as well as the evaluation of the Ameren Illinois lighting program.

It should be noted that the timing of intercept surveys may be impacted by Covid-19. In the event that intercept surveys cannot be completed, the evaluation team may utilize an alternative NTG research methodology.

Research NTG Impact Evaluation

The evaluation team will conduct research in CY2021 to inform NTG recommendations for CY2023 savings. The required data collection activities include in-store intercepts (targeting retail store customers) and web surveys (targeting Marketplace 2.0 customers). The evaluation team plans to complete 200 in-store intercepts and 150 web surveys for a total of 350 completed surveys.

In-Store Intercept Self-Report Methodology

The in-store intercept self-report methodology employed in CY2021 will use data gathered directly from customers at the time of purchase to assess the residential lighting NTG. The data collected during the surveys will be used to estimate NTG. The NTG analysis includes items such as the influence of the program on the program bulb purchase (in terms of items such as monetary incentives and education materials), number of program LEDs purchased, the timing of purchase, and purchase of additional non-rebated LEDs (spillover) that were influenced by the program.

In CY2021 the evaluation team will aim to conduct 200 in-store intercept surveys at four or five different program retailers (multiple stores per retailer). As in past efforts, the in-store intercept data collection sample will be stratified by local area median income bins (i.e. high, medium income areas) to better represent the diversity of active stores participating in the program. At a minimum in-store intercepts will be conducted at Home Depot, Lowe's, Sam's Club, and Walmart program stores. Conducting intercepts at additional program retailers will be discussed with ComEd and CLEAResult

It should be noted that the scope, methodology and timing of in-store intercepts may need to be changed due to Covid-19 related challenges.

Web Survey Self-Report Methodology

The web survey methodology will use a questionnaire, similar to the in-store intercept surveys. The surveys will be sent to a random sample of Marketplace 2.0 lighting purchasers using the customer email addresses and names provided in the eTRACK database. The evaluation team will target 150 completed surveys. The overall sample and targeted completed surveys may change depending on the availability of Marketplace 2.0 participant contact information and the volume of Marketplace 2.0 sales data.

Gross Impact Evaluation

The evaluation team will perform an engineering review of savings calculations. For all lighting measures, excluding connected LEDs, Guidehouse 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[54]

Annual Winter Coincident Peak kW Savings = Annual kW Savings * Winter Peak Load CF[55]

Where Realization Rate = Installation Rate * (1-Leakage Rate) * Interactive Effects

For the verification analysis in CY2021, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2021 EM&V tracking database analysis.
- **Program Bulb Installation Rates** will be obtained from the TRM v9.0.
- **Delta Watts** will be calculated using the bulb type lumen-equivalence mapping in the TRM v9.0.
- **HOU and Summer Peak CF** will be obtained from both the residential and non-residential sections of the TRM v9.0. 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 TRM v9.0.
- **Interactive Effects** will be obtained from the TRM v9.0.
- **Leakage** will be obtained from the TRM v9.0.

Guidehouse will also calculate gross kWh, kW, and summer and winter peak kW savings for Connected LED measures based on values deemed in the TRM v9.0. Connected LED savings are comprised of two types of savings: efficiency savings from the reduced wattage of the LED over the baseline and control savings from connected control capabilities of the Connected LED. Savings from each energy reducing aspect of these lamps will be added together when calculating gross kWh, kW, and summer and winter peak kW savings.

Guidehouse 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 Guidehouse's calculated savings with the implementation contractor's calculated savings.

[54] 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).
[55] 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).

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 in CY2021. The CY2021 EM&V NTG estimates are shown in the table below and available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 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: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021/

Lifecycle Savings Estimation – Effective Useful Life Research

In addition to first year (annual) savings, ComEd will be reporting lifecycle savings in CY2021 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. Additionally, lifecycle savings take into account any applicable midlife adjustments to baseline assumptions and their effect on measure EULs. Lifecycle savings will be presented in the Cumulative Persistent Annual Savings (CPAS) analysis discussed below. In CY2021 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), Guidehouse will report ex post gross and ex post net savings for the program and CPAS in CY2021 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)

Guidehouse is not evaluating the Residential Lighting Discounts Program via a RCT because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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 CY2021 evaluation. Adjustments will be made, as needed, as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2021 Calculators/Workpapers Review	Evaluation	October/November 2020
CY2021 Data Request	Evaluation	October/November 2020
Wave 1 CY2021 Data Available for Ex Ante Review and Analysis	ComEd	June 30, 2021
Wave 1 CY2021 Ex Ante Review Assessment Memo	Evaluation	August 20, 2021
In-Store Intercepts and Web Survey Instrument Review	ComEd and Evaluation	August/September 2021
ComEd to provide YTD Marketplace 2.0 data for web surveys	ComEd	September 2021
In-Store Intercept Surveys Fielded	Evaluation	September/October 2021
Web Surveys Fielded	Evaluation	September/October 2021
Tracking system is final	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 2, 2022
NTG Draft Memo to ComEd	Evaluation	March 2, 2022
Comments on Draft Report	ComEd	March 22, 2022
Revised Draft Report to ComEd and SAG	Evaluation	March 29, 2022
Comments on Revised Draft Report	ComEd	April 2, 2022
Final Report to ComEd and SAG	Evaluation	April 10, 2022
Finalize NTG Results Memo	Evaluation	April 15, 2022

Multi Family Assessments Program CY2021 Evaluation Plan

Introduction

The Multi Family Assessments Program is jointly implemented by ComEd and Nicor Gas Company, and ComEd and Peoples Gas and North Shore Gas 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. In 2021, Franklin Energy will also offer a "self-install" offering as another option instead of direct install. This offering will include the same measures listed above however instead of having them installed by Franklin Energy staff they will be installed by property staff. The program further provides Energy Efficiency Service Provider (EESP) installations in common areas and exterior areas for lighting retrofits and gas measures, such as pipe wrap. Measures not covered by the Multi Family Assessments Program are transferred as leads to other programs.

The Multi Family Assessments 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.
- Self-installation of electric and gas saving measures in tenant and common area spaces by property staff.
- EESP installation of electric and gas saving measures at no cost to customers, following agreed upon program pricing.

The primary objectives of the CY2021 evaluation are to quantify gross and net savings impacts from the program. The evaluation of this program over the next year will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

The evaluation team determined the evaluation approach for the 2021 period based upon the needs of the program and the program's history. The one-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

Guidehouse 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 Gas and North Shore Gas, and the Nicor Gas Multi-Family programs. The joint program evaluations and reporting timelines will be the same.

In addition, Guidehouse 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 CY2021 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)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Census	
In Depth Interviews	Program Manager and Implementer	2	
Gross Impact	Data Review and Analysis	Census	Wave 1 and Final Data*
Verified Net Impact	Calculation using deemed NTG ratio	Census	

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

Program Tracking Data Review

The program tracking data 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.

Guidehouse will review program tracking data twice for the program year. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The final program tracking data review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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 the Wave 1 analysis to help ComEd and the implementation contractor plan for final reporting.

Gross Impact Evaluation

The Multi Family Assessments Program savings verification will be completed using the TRM (v9.0) 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 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) ratios 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 CY2021.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 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
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: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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)

Guidehouse is not evaluating the Multi Family Assessments Program via a RCT because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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 2020
CY2021 Wave 1 Tracking Data Request	Evaluation	November 2020
Program Manager and Implementer Interviews	Evaluation	TBD
CY2021 Wave 1 Tracking Data	ComEd	June 30, 2021
Wave 1 data review and analysis memo	Evaluation	September 17, 2021
Final CY2021 Tracking Data to Guidehouse	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 4, 2022
Comments on Draft	ComEd and SAG	March 25, 2022
Revised Draft	Evaluation	April 1, 2022
Comments on Revised Draft	ComEd and SAG	April 8, 2022
Final Report to ComEd and SAG	Evaluation	April 15, 2022

Residential Behavior Program CY2021 Evaluation Plan

Introduction

The Residential Behavior (aka Home Energy Report [HER]) Program is a behavioral-based energy efficiency program implemented by Oracle. In CY2021, ComEd's HER program will consist of at least 13 waves of varying sizes.

The evaluation of this program over the coming year will focus on estimating energy savings generated by regularly mailing customers home energy reports that provide information about energy use and conservation. Table 1 lists tasks that we plan to complete as part of the evaluation.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Regression Analysis	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 evaluation team to evaluate the program is closely aligned with the Ameren Illinois and gas utility HER program evaluations.

Evaluation Research Topics

The CY2021 evaluation will seek to answer the following key impact researchable questions:

Impact Evaluation

1. How much energy do customers in the program save during the program year?
2. What is the uplift in other ComEd energy efficiency programs due to the reports?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021.

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

Activity	Target	Target Completes CY2021	Timeline
ComEd Staff Interviews	ComEd Program Management	1	August 27, 2021
Implementer Interviews	Implementer Program Management	1	August 27, 2021
Program Tracking Data Review	Tracking System	Census	September 3, 2021
Impact*	Regression analysis and uplift analysis	Census	February 1 -March 14, 2022

*Regression analysis produces impacts which are intrinsically net savings, aside from uplift.

ComEd Staff and Implementer Interviews

The evaluation team will interview the ComEd 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 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.

Program Tracking Data Review

The evaluation team will perform a program tracking data review partway through CY2021, as well as review the final tracking data. This review is needed due to the volume of data involved in our evaluation and allows us to identify any missing data from our request and ensure that items like number of program waves, customer counts by wave, and program participation start dates match our expectations based on our understanding of the program. The wave 1 review will allow us to identify and rectify any issues with the data before the final evaluation and results in an early data characterization memo sent to ComEd.

Gross and Verified Net Impact Evaluation

For all waves, the evaluation team will measure CY2021 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.

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 CY2021 and legacy uplift from PY5 to CY2020. 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.

Given the ongoing coronavirus pandemic, a policy decision was made by the Illinois Stakeholder Advisory Group (SAG) to normalize savings for CY2020 across the portfolio. The details of the normalization approach for the HER program specifically are being worked out as of the writing of this plan but will likely rely on historic program savings information. SAG intends to make a decision on whether or not to

normalize CY2021 savings later in 2021.[56] If a decision is made to normalize CY2021 savings, the evaluation team will follow the method agreed to for CY2020 with any necessary, agreed to adjustments.[57] If a decision is made not to normalize CY2021 savings, the evaluation team will work with the appropriate stakeholders to ensure persistence is treated appropriately given the CY2020 normalization. Whether or not claimed savings are normalized, the evaluation team will run our customary regression to estimate actual CY2021 savings (described above) to have that information.

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

As required by the Future Energy Jobs Act (FEJA), the evaluation team will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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 1 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
Mid-year data request	Evaluation	Jul 16, 2021
Mid-year data delivery	ComEd	Aug 13, 2021
ComEd staff interviews	Evaluation	Aug 27, 2021
Implementer interviews	Evaluation	Aug 27, 2021
Early data characterization memo	Evaluation	Sep 3, 2021
Final data request	Evaluation	Dec 3, 2021
Final data delivery[58]	ComEd	Jan 30, 2022
Draft Report to ComEd and SAG	Evaluation	Mar 14, 2022
Comments on Draft	ComEd	April 4, 2022
Revised Draft	Evaluation	Apr 11, 2022
Comments on Revised Draft	ComEd/SAG	Apr 18, 2022
Final Report to ComEd and SAG	Evaluation	Apr 25, 2022

[56] As of the time of writing this plan, this timeline is not set.
[57] Any adjustments to what is agreed to for CY2020 would be discussed with ComEd and the implementer in a timely manner.
[58] This data will include approximately 70% of bills ending on or before December 31, 2021.

Residential HVAC Program CY2021 Evaluation Plan

Introduction

The Residential HVAC 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[59]), 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 except for CACs which are now offered through a midstream channel. 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 CY2020 to CY2021 include:

- ASHPs and DMSHPs will now be offered through a midstream channel rather than a downstream channel. Guidehouse will work with the implementer to evaluate these projects now that measures are being incentivized through distributors rather than customers.

The primary objective of the evaluation of the HVAC Rebates Program is to determine gross and net program savings.

The CY2021 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 next year will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Impact – Engineering Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

The evaluation team determined the evaluation approach for the CY2021 period based upon the needs of the program and program's history. The one-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)

[59] Electronically commutated motors

- Interviews with the program manager and implementer will be conducted in CY2021 to inform the Guidehouse team of any substantial changes to the program for the upcoming year.
- Guidehouse will review the survey instrument provided by ComEd and the implementers for the participant survey focused on the measures now offered through a midstream channel.

Coordination

Guidehouse 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 Technical Reference Manual (TRM) and are generally consistent.

Evaluation Research Topics

The CY2021 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. Are there any updates recommended for the TRM?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Notes
Program Tracking Data Review	Tracking System	Census	One interim and one final
In-Depth Interviews	Program Manager and Implementer	2	
Gross Impact Evaluation	TRM Review	Census	One interim and one final
Verified Net Impact Evaluation	Calculation using deemed NTG ratio	NA	Deemed Value

Program Tracking Data Review

Guidehouse will review program tracking data twice for the program year. Guidehouse will perform an Wave 1 program tracking data review in the summer of 2021 in line with program changes and an accelerated evaluation schedule for delivering tracking data to the evaluation team. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. Guidehouse will perform final program tracking data review in February 2022 once Guidehouse receives the end of year tracking data from ComEd in preparation for the final CY2021 report.

Program Manager 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 TRM. Guidehouse 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 program. If new measures are included in CY2021, Guidehouse will perform a desk review of program calculations and compare savings to the 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. ASHPs and DMSHPs will now be offered through a midstream channel rather than a downstream channel, and Guidehouse will determine the NTG ratio for these two measures via secondary research.

Table 3. NTG Values for CY2021

Program Measure	CY2021 NTG Value
Advanced Thermostat	0.80 Cooling 0.90 Heating
Air Source Heat Pump	0.57
ASHP Tune-Up	0.80
CAC Tune-Up	0.80
Duct Sealing	0.88
Ductless Mini-Split	0.63
ECM Furnace Motor – without Furnace Upgrade	0.78
Geothermal Heat Pump	0.59
Midstream Air Source Heat Pump	TBD
Midstream Ductless Mini-Split	TBD
Midstream HVAC	0.80

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

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

As required by the FEJA, Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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 2020
Program Manager and Implementers Interviews	Evaluation	TBD
CY2021 Wave 1 program tracking data request	Evaluation	November 2020
NTG Ratio Secondary Research	Evaluation	January 2021
CY2021 Wave 1 program tracking data for Interim Review	ComEd	June 30, 2021
Program Tracking Data Wave 1 Ex Ante Review Findings and Recommendations	Evaluation	September 17, 2021
CY2021 EOY program tracking data for Final Review	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 8, 2022
Comments on Draft	ComEd and SAG	March 29, 2022
Revised Draft	Evaluation	April 5, 2022
Comments on Revised Draft	ComEd and SAG	April 12, 2022
Final Report to ComEd and SAG	Evaluation	April 19, 2022

Single Family Assessment Program CY2021 Evaluation Plan

Introduction

The Single Family Assessment (SFA) 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, and air conditioning) from the respective utility portfolios. The implementer will also ask participants if they would like to learn more about weatherization measures (insulation and air sealing).

For CY2021, 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 SFA 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 SFA Program will continue to offer the virtual assessment program offering in CY2021 that was introduced in Spring of 2020 due to COVID-19.

The primary objectives of the evaluation of the SFA Program are to: (1) quantify gross and net savings impacts from the program, and (2) determine an updated net-to-gross (NTG) value for free LEDs offered through this program through primary research. Our evaluation report will capture the electric savings for ComEd, and the gas savings will be captured in separate reports for PGL/NSG and Nicor Gas. The CY2021 gross impact evaluation will not vary significantly from previous years, but adjustments will be made to reflect specific measure and project characterizations. The evaluation of this program in CY2021 will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 5. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Data Collection – Participant Surveys	X
ComEd Staff Interview	X
Implementer Interview	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
NTG Research	X

Coordination

Guidehouse will coordinate with the evaluation teams for other utilities on any issues relevant to this program. Specifically, the SFA 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 in CY2021 are similar for these utilities.

Evaluation Research Topics

The CY2021 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. What is the free ridership for LEDs offered through this program?
4. Is there any spillover attributed to this program?
5. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions.

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

Activity	Target	Target Completes CY2021	Notes
Program Tracking Data Review	Tracking System	Census	
In Depth Interviews	Program Manager and Implementer	2	
Gross Impact	Engineering File Review	Census	Two Waves*
Verified Net Impact	Calculation using deemed NTG ratio	NA	
NTG Research	CY2020 and CY2021 participants that installed LED bulbs	TBD	Primary research on LED bulbs only

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

Program Tracking Data Review

The program tracking data 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, Guidehouse will perform tracking system review in twice in 2021. Wave 1 is expected to

cover about half of the projects. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 8. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The final program tracking data review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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.

Gross Impact Evaluation

The key gross impact evaluation activities for the program in CY2021 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 CY2021, the primary method to determine net and gross savings will be a program tracking system review and applying measure-level NTG ratios that are deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG).

The verified net impact evaluation will apply the NTG ratios accepted by SAG consensus to estimate the verified net savings for the program. Those NTG values are shown in the following table.

Table 7. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
Free LEDs	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 Advanced Thermostats - Cooling	0.80
Co-Pay Advanced Thermostats – Heating	0.90

Source:
https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

NTG Research

Using program tracking data with 2020 and 2021 participants' email addresses, we will conduct research on free ridership in Spring of 2021 through a participant internet survey[60]. Free ridership research will only focus on participants that installed LED bulbs. If insufficient email addresses are available for 2020 and 2021 participants, then participants will be sampled for a telephone survey. In the Spring of 2021, Guidehouse will also conduct participant spillover research with 2020 participants through a participant telephone survey.

Recently, ComEd let Guidehouse know that this program is shifting to have income eligible program design focus for the next plan. Guidehouse is coordinating with ComEd to request more information to determine NTG activity for CY2021. Guidehouse will assess the available information that ComEd can share and the plan to conduct NTG research is subject to change.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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)

Guidehouse is not evaluating the Single Family Assessment Program via an RCT because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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.

[60] The evaluation team may calculate free ridership using the new free ridership algorithm currently under development by the SAG NTG Working Group if indicated by a comparison of old algorithm and new algorithm results in our pilot of the new algorithm.

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 8. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	November 2020
Program Manager and Implementers Interview	Evaluation	TBD
CY2021 Wave 1 Program Tracking Data	ComEd	June 30, 2021
Deliver Draft NTG Results Memo to ComEd	Evaluation	July 16, 2021
Tracking System Ex Ante Review Findings and Recommendations	Evaluation	August 27, 2021
Finalize NTG Results Memo	Evaluation	August 30, 2021
Submit NTG Recommendation to SAG	Evaluation	September 1, 2021
CY2021 Final Program Tracking Data	Evaluation	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 10, 2022
Comments on Draft	ComEd and SAG	March 31, 2022
Revised Draft	Evaluation	April 7, 2022
Comments on Revised Draft	ComEd and SAG	April 14, 2022
Final Report to ComEd and SAG	Evaluation	April 21, 2022

APPENDIX D. INCOME ELIGIBLE PROGRAMS

Affordable Housing New Construction Program 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 three participation levels: 1) major renovation, 2) new multi-family, and 3) new single-family. The program is a coordinated program with Peoples Gas, North Shore Gas, and Nicor Gas.

The CY2021 evaluation of this program will include a variety of data collection and analysis activities, including those indicated in Table 1.

Table 1. Evaluation Activities

Tasks	CY2021
Program Tracking Data Review	X
Impact - Engineering Review	X
Impact - Measure-Level Deemed Savings Review	X
Impact - Verification & Gross Realization Rate	X

Coordination

As this is a coordinated program with Nicor Gas, Peoples Gas and North Shore Gas, Guidehouse will work closely with all gas utilities and their respective evaluation teams on issues common to this program. The evaluation activities and timing for each utility evaluation are the same for all utilities. Additionally, Guidehouse will solicit feedback from and coordinate with the Income Qualified Energy Efficiency Advisory Committee.

Evaluation Research Topics

The CY2021 evaluation will 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. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program,

and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

Table 2 summarizes the evaluation tasks for CY2021 including data collection methods, data sources, timing, and targeted sample sizes that will be used to answer the evaluation research questions. In lieu of ComEd Staff and Implementer interviews, Guidehouse will continue to meet monthly with ComEd staff and implementer staff to discuss and determine approaches to estimate savings for this program.

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

Activity	Target	Target Completes CY2021	Notes
Program Tracking Data Review	Tracking System	Census	
Gross Impact Evaluation	Preliminary project review	3-5 projects	Early feedback
Gross Impact Evaluation	End of Year engineering review	All	
Verified Net Impact Evaluation	Calculation using deemed net-to-gross (NTG) ratio	NA	

Program Tracking Data Review

Guidehouse will review the program tracking system data to ensure that required data is available to support evaluation activities and to allow program managers to consistently monitor program performance. The evaluation team will review the tracking system data to ensure that all fields are populated and consistent with the values in the project savings calculators.

Gross Impact Evaluation

Since the AHNC Program savings are derived from deemed values contained in the TRM[61], gross savings will be evaluated 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 to verify participation, installed measure quantities, and associated savings.

Guidehouse will conduct two assessments in CY2021:

1. **Preliminary Project Review**: A comprehensive mid-year project review to provide early feedback to the implementation team. The (implementation contractor (IC) may determine which projects to submit for preliminary review. Guidehouse anticipates projects submitted for this review will include:
    - Projects likely to close in the current program year
    - Projects about which the IC has specific questions and is requesting feedback
    - Projects anticipated to demonstrate the greatest savings

[61] Illinois Statewide Technical Reference Manual for Energy Efficiency, available at: http://www.ilsag.info/technical-reference-manual.html. Guidehouse will apply TRM versions to engineering review based on AHNC project enrollment date.

Guidehouse expects the IC will submit three to five projects for the Preliminary Project Review and requests the submittal include:

- Project memo, describing analysis approach, and source of relevant measure specific data points. Consistent with the 2020 Preliminary Project Review, Slipstream's Verification Report may be used to deliver the requested topics.
- Savings calculators and relevant tracking data (specific fields detailed in separate submittal)
- Relevant project files (invoices, specification sheets, plans, etc.)

The Guidehouse evaluation team will verify savings calculation methodologies and deliver a memorandum of analysis findings and recommendations. Guidehouse will review calculation accuracy, appropriateness of baselines, and consistency with the Illinois Energy Conservation Code (IL ECC) where appropriate.

The Preliminary Project Review Memo will specifically *not* include:

- Measure-specific and total ex post gross and net savings for the program
- Cumulative Persisting Annual Savings (CPAS)
- Weighted average measure life

The implementation team may make project changes based on the preliminary project review which will be incorporated in the final end of year review.

2. **End of Year (EOY) Evaluation**: A final review of all completed projects. The EOY evaluation will be conducted independently from the Preliminary Project Review and will be limited to the final EOY data and project file submission only. The EOY evaluation will incorporate Preliminary Project Review methodology recommendations, but will not include data, project files, or analyses from the Preliminary Project Review. The end of year analysis will include project verification reports and/or project memos, project savings calculators, project documentation and review of the program data tracking system. Proposed gross impact timelines for CY2021 are shown below:
    a. Preliminary project review will start in May 2021 and be completed in August 2021
    b. The final tracking data is provided by ComEd by January 30, 2022, with reporting finalized by April 30, 2022. The implementation team is encouraged to deliver completed project files as they are 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 in CY2021. The CY2021 EM&V NTG estimates are shown in the table below and are available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All measures	1.0

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

Monthly Program Evaluation Coordination Calls

Monthly calls with ComEd program staff and implementation contractors will be conducted to exchange information about program design and program changes, and reach consensus on energy savings

calculations. The IC will provide a draft agenda in advance of the monthly calls. Guidehouse will take meeting notes and distribute them. The evaluation team will communicate with program staff on an ongoing basis to gather additional information as needed.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report measure-specific and total ex post gross and net savings for the program, and the CPAS in CY2021 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 program level.

Randomized Controlled Trial and Quasi-Experimental Design

The AHNC Program will not be evaluated via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Quasi-experimental design will not be used because it would not be possible to create a valid matched control group for the customers in this program.

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

Activity or Deliverable	Responsible Party	Date Delivered
CY2021 Preliminary Project Review: three to five project savings calculators, and project documentation	Slipstream	May 14, 2021
CY2021 Preliminary Project Review: Findings Memo	Evaluation	August 30, 2021
Final CY2021program tracking data, project savings calculators, and project documentation	ComEd	January 29, 2022
Draft Report to ComEd and SAG	Evaluation	March 8, 2022
Comments on Draft (15 business days)	ComEd and SAG	March 29, 2022
Revised Draft	Evaluation	April 5, 2022
Comments on Revised Draft (5 business days)	ComEd and SAG	April 12, 2022
Final Report to ComEd and SAG	Evaluation	April 26, 2022

Food Bank Distribution Program CY2021 Evaluation Plan

Introduction

The Food Bank Distribution Program provides packages of ENERGY STAR certified LEDs, Advanced Power Strips (APS), and Weatherstripping to select Feeding America food banks and community organizations. The food banks use their network of local food pantries within ComEd's service territory to distribute the energy efficiency measures to utility customers. The measures 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.

Table 1 lists the measures provided through the Food Bank Distribution Program.

Table 1. Food Bank Distribution Measures

Measures
7-Plug Advanced Power Strip
8.5W LED bulb
4.5W LED Candelabra bulb
7W Battery Backup
LED Night Light
Weatherstripping

The primary objectives of the evaluation of the Food Bank Distribution Program are to: (1) quantify gross and net savings impacts from the program, and (2) provide recommendations to enhance the program focused on the current priorities as determined by the program manager. The evaluation of this program will include a variety of data collection and analysis activities, including those indicated in Table 2.

Table 2. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Ex ante Calculation Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Engineering Review	X
Impact – Verification & Gross Realization Rate	X

Coordination

As needed, Guidehouse 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 CY2021 evaluation will 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 verified net savings?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Timeline
Program Tracking Data Review	Tracking System	Census	Two waves
In-Depth Interviews	ComEd Staff and Implementer	2	April 2021
Gross Impact Evaluation	Engineering Impact Review	Census	Two waves
Calculation of CPAS	Engineering Impact Review	Census	Two waves

Program Tracking Data Review

Guidehouse will review the Wave 1 and final program tracking data. The Wave 1 is expected to cover about half of the measures.

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 5 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

ComEd Staff and Implementer Interviews

Guidehouse will conduct two in-depth interviews—one with ComEd program manager and one with the implementation program manager or team. These interviews allow us 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 will be based on (1) reviewing the tracking system to determine whether all data required to verify program participation and distribution of efficient 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 v9.0. Verified gross savings will be estimated by multiplying deemed per unit kWh savings (including the in-service rate) by the verified quantity of eligible measures 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 CY2021. The CY2021 EM&V NTG estimates are shown in the table below and available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 4. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All measures	1.0

Source: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021/

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

Guidehouse is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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 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
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	October 2020
ComEd Staff Interview	Evaluation	April 2021
Implementer Interview	Evaluation	April 2021
Updated Data Request for Wave 1 CY2021 program tracking data (if needed)	Evaluation	May 14, 2021
Wave 1 CY2021 Program Tracking Data	ComEd	June 11, 2021
Wave 1 CY2021 Ex Ante Review Assessment Memo	Evaluation	August 13, 2021
Final CY2021 Program tracking data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	February 26, 2022
Comments on Draft	ComEd and SAG	March 19, 2022
Revised Draft	Evaluation	March 26, 2022
Comments on Revised Draft t	ComEd and SAG	April 2, 2022
Final Report to ComEd and SAG	Evaluation	April 9, 2022

Income Eligible Energy Savings Kit Program CY2021 Evaluation Plan

Introduction

The University of Illinois at Chicago Energy Resources Center (Implementation Contractor)) 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 an advanced power strip, LED bulbs, low flow faucet aerators for bathroom and kitchen, a low flow showerhead, and plumber's tape. 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 multi-family housing 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 (4)
15W LED bulb (2)
5W LED 60W replacement Candelabra (1)
6W LED 60W replacement Globe (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)
Plumber's tape (1)

The Implementation Contractor will be responsible for the program implementation, including purchasing the kit materials, assembling the kits, delivering the kits to customers through various channels, including Community Action Agencies ("CAA's") and Community Based Organizations ("CBO's"). CAA's and CBO's will be utilized for kit distribution, and collecting the data required for proper evaluation, measurement and verification.

The IE Kits will be provided to program participants through two forms of delivery; hand delivery via the CAAs and CBOs; and direct mail. The CAA's and CBO's are able to choose their delivery mechanism based on current circumstances. Through hand delivery, the program participants meet with CAA and CBO staff during in-person appointments and are offered the opportunity to participate in the IE Kits program if they meet the income verification requirements. If eligible, the CAA and CBO provide an IE Kit to the participant.
If the CAA's and CBO's choose to deliver kits through direct mail due the COVID-19 pandemic, social unrest, or any other reason, they are able to do so. Through the direct mail approach, the program participant's information is taken over the phone through a remote appointment with CAA or CBO staff and then an IE Kit is directly mailed to the participant's home.

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 2021 will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 2. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Ex ante Calculation Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Engineering Review	X
Impact – Verification & Realization Rate	X

Coordination

As needed, Guidehouse 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 CY2021 evaluation will 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 verified net savings?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Timeline
In-Depth Interviews	ComEd Staff and Implementer	2	April 2021
Program Tracking Data Review	Tracking System	Census	Two waves
Gross Impact	Tracking System	Census	Two waves
Calculation of CPAS	Engineering Impact Review	Census	Two waves

ComEd Staff and Implementer Interviews

Guidehouse 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

Program Tracking Data Review

Guidehouse will perform a program tracking data review in two waves in CY2021, Wave 1 as well as reviewing the final tracking data. The tracking data will be reviewed for completeness and Guidehouse will identify any missing inputs needed for conducting the evaluation.

The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 5 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

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 TRM v.9.0.

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 CY2021. The CY2021 EM&V NTG estimates are shown in the table below and available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 4. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All measures	1.0

Source: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021/

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

Guidehouse 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. Guidehouse 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
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	October 2020
ComEd Staff Interviews	Evaluation	April 2021
Implementer Interviews	Evaluation	April 2021
Data Request for Wave 1 CY2021 program tracking data	Evaluation	May 14, 2021
CY2021 program tracking data for Wave 1data review and analysis	ComEd	June 11, 2021
Wave 1 CY2021 Ex Ante Review Assessment Memo	Evaluation	August 13, 2021
Final CY2021 Program tracking data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Income Eligible Multi-Family Energy Efficiency Program CY2021 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.[62]

The evaluation of this program for CY2021 will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
ComEd Staff Interviews	X
Implementer Interviews	X
Program Tracking Data Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact - Custom Analysis to confirm TRM savings estimates	X
Impact – Verification & Gross Realization Rate	X
Impact - Field Work (IEMS component)	X
Other Research Topics – Interviews and Focus Groups	X

Coordination

These are coordinated programs with the gas utilities and Guidehouse will work 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 the gas utilities. Ameren Illinois has a suite of energy efficiency programs for income eligible

[62] 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).

customers and we will coordinate with Ameren Illinois' evaluation team as needed. Additionally, Guidehouse will solicit feedback from and coordinate with the Income Qualified Advisory Committee North, as appropriate.

Evaluation Research Topics

The CY2021 evaluation will answer the following key researchable questions:

Impact Evaluation

1. What is the program's verified gross savings?
2. What is the program's verified net savings?
3. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

1. What are the barriers to program participation from the perspective of non-participants?
2. What are the barriers to program participation from the perspective of program implementers and Income Qualified Advisory Committee (IQAC) stakeholders?

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Timeline	Notes
Program Tracking Data Review	Tracking system	Census	June – August 2021 and February 2022	Wave 1 and Final program tracking data
In-Depth Interviews	ComEd Staff and Implementers	4	April 2021	
Gross Impact	Early Impact Review	Wave 1 Projects	June 2021 – Aug 2021	Early Impact review for Wave 1 Projects
Gross Impact	On-site M&V	Sample	Sept 2021 – Dec 2021	Only for the IEMS component
Gross Impact	Measure-Level Deemed Savings Review	EOY data	Feb 2022 – April 2022	Both components
Gross Impact	Custom Analysis for non-TRM projects	All custom projects	Feb 2022 – April 2022	Both components
Gross Impact	Verification & Gross Realization Rate	EOY data	Feb 2022 – April 2022	Both components
Other Research Topics	Non-participants building managers and owners	Sample	June 2021 – Oct 2021	Both components
Other Research Topics	Program implementers and IQAC North stakeholders	Sample	June 2021 – Oct 2021	Both components

Program Tracking Data Review

Guidehouse will perform a program tracking data review in two waves in CY2021, Wave 1 as well as reviewing the final tracking data.

The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

The IEMS and IER-MF savings verification will be based on using the applicable TRM v9.0, or secondary research for any measure with custom savings input. Gross savings will be evaluated primarily by: (1) reviewing the program tracking data to ensure that all fields are appropriately populated; (2) reviewing measure algorithms and values in the tracking data 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 CY2021 for the IEMS component with a field work effort which will be focused on verifying measure quantities and installation. Additionally, Guidehouse 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 CY2021. The CY2021 EM&V NTG estimates are shown in the table below and available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All measures	1.0

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

ComEd Staff and Implementation Contractor Interviews

The evaluation team will conduct interviews with ComEd staff and implementers to:

1. Discuss the program findings and recommendations from CY2020 impact evaluations.
2. Identify tracking data issues and discuss potential ways of resolving them in CY2021.
3. Identify any remaining issues with the CY2021 ex ante calculators and discuss potential ways of resolving them.
4. Review the CY2021 evaluation timeline to avoid any delays.
5. Talk about any changes in the program structure or measure mix being offered in CY2021.

Other Research Topics: Interviews and Focus Groups

From ComEd's presentation to the Income Qualified Advisory Committee Meeting on November 10, 2020:

- There is a lower-than-expected concentration of Income Eligible program participation in areas with the greatest need
- Residential Program participation is not occurring in high density low-income areas[63]

Guidehouse's research will provide primary-source insights into the above participation issues and recommended solutions for ComEd's consideration for Plan 6. Guidehouse will conduct a third-party research effort in collaboration with ComEd's ongoing efforts. Guidehouse will survey and interview non-participant building managers and owners to explore perceptions regarding barriers to program participation. Potential topics include participation eligibility, time required to participate, interest in measures offered, application process, and confidence and acceptance in the ComEd offerings.

To identify the building owners and property managers who have not participated in the past, Guidehouse will conduct one or both of the following options:

1. The first option is to use the ComEd customer database to identify non-participants and their contact information. We are optimistic that this option is viable based on our experience interviewing Property Managers in the summer of 2020.

[63] "Feedback Discussion Income Eligible Elements ComEd Energy Efficiency Program Draft Portfolio Plan – 2022-25," https://iqadvisorycommittee.com/wp-content/uploads/2020/11/2020-11-10-ComEd-EE-Draft-Plan-6_IQAC-Presentation_Final.pdf
November 10, 2020.

2. The second option is to use a data processing company to procure the data. We have worked with a data processing company in the past and have found that they are usually responsive and successful at this task at a nominal cost.

In addition, Guidehouse will conduct focus groups and one-on-one in-depth interviews with program implementers, community focused stakeholders, including Community Based Organizations, municipalities, and income qualified advisory committee stakeholders.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

Guidehouse is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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 1 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
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Requests	Evaluation	October 2020
ComEd Staff Interviews	Evaluation	April 2021
Implementer Interviews	Evaluation	April, 2021
Updated Wave 1 Data Request to ComEd, if needed	Evaluation	May 4, 2021
CY2021 program tracking data for Wave 1	ComEd/Gas Utilities	June 15, 2021
Wave 1 CY2021 Ex Ante Review Assessment Memo	Evaluation	August 31, 2021
CY2021 data extract for on-site sampling	ComEd/Gas Utilities	September 15, 2021
Findings and Recommendations from Interviews and Focus Groups	Evaluation	November 1, 2021
On-site Verification	Evaluation	December 30, 2021
Final CY2021 program tracking data	ComEd/Gas Utilities	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 11, 2022
Comments on Draft	ComEd and SAG	April 1, 2022
Revised Draft	Evaluation	April 8, 2022
Comments on Revised Draft	ComEd and SAG	April 15, 2022
Final Report to ComEd and SAG	Evaluation	April 22, 2022

Income Eligible Product Discounts Program CY2021 Evaluation Plan

Introduction

The Income Eligible Product Discounts Program, comprised of the Income Eligible Lighting Discounts (LDIS-IE) and Income Eligible Appliance Rebates (APR-IE) programs, provides incentives to increase the market share of ENERGY STAR® certified LED bulbs and fixtures and efficient products such as air purifiers, dehumidifiers, room air conditioners 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 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 (AMI).

The primary objective of the evaluation of the Income Eligible Product Discounts Program is to quantify net savings impacts from the program and conduct research for net-to-gross (NTG) ratio updates at Big Box and DIY stores. The evaluation of this program over the next year will include a review of the tracking databases, deemed savings reviews, verification of savings and measure-level and program-level realization rates, estimation of net program impacts, NTG research for lighting measures. These activities are highlighted in the table below.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X
Impact – Net Program Savings Estimate	X
ComEd Staff Interview	X
Implementer Interview	X
NTG Research - Lighting Customer Self Report Surveys	X

Coordination

Guidehouse will coordinate with the ComEd Residential Lighting Discounts Program on any LED bulb and fixture related issues relevant to this program. Ameren Illinois has programs offering time of sale discounts on energy-efficient lighting and appliances similar to those offered in the Income Eligible Product Discounts Program. As a result, Guidehouse will coordinate relevant research with the Ameren Illinois evaluation team as needed. Guidehouse will also collaborate with the Income Qualified Energy Efficiency Advisory Committee.

Evaluation Research Topics

The CY2021 evaluation will answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual total verified gross and net energy savings (kWh) and coincident peak demand (kW) savings?
2. 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? What is the level of participant and nonparticipant spillover from the program?
3. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Timeline
In-Depth Interviews	ComEd Staff and Implementer	2	April 2021
Program Tracking Data Review	All Program Sales	Census	Wave 1 and Final
Customer Self Report Surveys*	Retail Lighting Purchasers	350	Fall 2021

* Customer Self Report Surveys are planned as In-Store Intercept Survey for the Fall of 2021, as a result, NTG findings will be reported in CY2022 and applied in CY2023. However, given the context of COVID-19, In-Store intercepts may be delayed or changed to another method agreed upon by the SAG and Income Qualified Advisory Committee.

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any data discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report

Gross Impact Evaluation

The evaluation team will perform an engineering review of savings calculations. For all lighting measures, Guidehouse 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[64]

Annual Winter Coincident Peak kW Savings = Annual kW Savings * Winter Peak Load CF[65]

Where Realization Rate = Installation Rate * (1-Leakage Rate) * Interactive Effects

For the verification analysis in CY2021, the evaluation team will calculate gross savings using the following parameter estimates:

- **Program Bulb Sales** data will be obtained from the CY2021 EM&V tracking database analysis.
- **Program Bulb Installation Rates** will be obtained from the TRM v9.0.
- **Delta Watts** will be calculated using the bulb type lumen-equivalence mapping in the TRM v9.0.
- **HOU and Summer Peak CF** will be obtained from both the residential and non-residential sections of the TRM v9.0. 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.
- **Residential Bulb Installation Rate** will be obtained from the TRM v9.0.
- **Interactive Effects** will be obtained from the TRM v9.0.
- **Leakage** will be obtained from the TRM v9.0.

Guidehouse will also calculate gross kWh and summer peak kW savings for all non-lighting measures (dehumidifiers, room air conditioners, air purifiers and Tier 1 APS) based on the relevant values and savings equations deemed in the TRM v9.0. Guidehouse 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 Guidehouse'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 (SAG) consensus to estimate the verified net savings for the program in CY2021. The CY2021 EM&V NTG estimates are shown in the table below and available on the SAG website:

[64] 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).
[65] 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 CY2021

Program Measure	CY2021 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: https://www.ilsag.info/evaluator-ntg-recommendations-for-2021

NTG Research: Surveys

In accordance with section 7.3 "NTG Ratio for Income Eligible Programs" of the Illinois Energy Efficiency Policy Manual Version 2.0[66], Guidehouse will present our proposed NTG research to the SAG and Income Qualified Advisory Committees for determination of the value in performing the NTG research. The discussions with the SAG and Income Qualified Advisory Committee (IQAC) will include the value in and methods for performing such research and the timing of the application of such research. Guidehouse will work with the SAG facilitator to schedule a joint meeting with both SAG and the IQAC to present our proposed NTG research for this Income Eligible program.

The evaluation team proposes research in CY2021 to inform NTG Lighting recommendations for CY2023 savings. The data collection activity would consist of Customer Self Report Surveys, specifically In-Store Intercepts. The evaluation team proposes completing 350 in-store intercept surveys at Big Box and DIY locations.

The in-store intercept self-report methodology proposed for CY2021 would use data gathered directly from customers at the time of purchase to assess the lighting NTG. The NTG analysis would include items such as the influence of the program on the program bulb purchase (in terms of items such as monetary incentives and education materials), number of program LEDs purchased, the timing of purchase, and purchase of additional non-rebated LEDs (spillover) that were influenced by the program.

In CY2021 the evaluation team proposed conducting 350 in-store intercept surveys at different program retailers (multiple stores per retailer). At a minimum, in-store intercepts would be conducted at Home Depot, Lowe's, Sam's Club, and Walmart program stores. Conducting intercepts at additional program retailers would be discussed with ComEd and CLEAResult. The evaluation team would work with CLEAResult to select stores where the in-store intercepts would be conducted. Program stores would be sampled based on geography and sales volumes to ensure that the collected data are representative of the sampled program store types.

It should be noted that the scope, methodology and timing of proposed in-store intercepts may change due to COVID-19 related challenges.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

[66] Illinois Policy Manual version 2.0. file://chi1islfls01/energy/ComEd%20EMV/Programs/Income%20Eligible/Product%20Discounts%20(Lighting%20Discounts)/Year%202021/Evaluation%20Plan/IL_EE_Policy_Manual_Version_2.0_Final_9-19-19.pdf

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
CY2021 Calculators/Workpapers Review	Evaluation	October/November 2020
CY2021 Data Request	Evaluation	October/November 2020
ComEd Staff Interview	Evaluation	November 2020
Implementer Interview	Evaluation	November 2020
Wave 1 CY2021 Data Available for Ex Ante Review and Analysis	ComEd	June 30, 2021
Wave 1 CY2021 Ex Ante Review Assessment Memo	Evaluation	August 20, 2021
In-Store Intercepts Instrument Review	Evaluation	August/September 2021
CY2021 In-Store Intercept Surveys Fielded	Evaluation	September/October 2021
CY2021 Tracking system is final	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 2, 2022
CY2021 NTG Draft Memo to ComEd	Evaluation	March 2, 2022
Comments on Draft	ComEd	March 22, 2022
Revised Draft to ComEd and SAG	Evaluation	March 29, 2022
Comments on Revised Draft	ComEd	April 2, 2022
Final Report to ComEd and SAG	Evaluation	April 10, 2022
Final NTG Results Memo	Evaluation	April 15, 2022

Income Eligible Single-Family Retrofits Program CY2021 Evaluation Plan

Introduction

The Income-Eligible Single-Family Retrofits (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 for CY2021.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews	X
Implementer Interviews	X
Impact – Engineering Review	X
Impact – Verification & Gross Realization Rate	X
Other Research Topics – Surveys, Interviews and Focus Groups	X

The evaluation team created the evaluation approach for the 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) [67] 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. The 2021 evaluation will include a tracking

[67] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 6.0, http://www.ilsag.info/technical-reference-manual.html

system review and analysis to calculate gross and net impact and Cumulative Persisting Annual Savings (CPAS).

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. We expect to 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 (SAG) and as needed, with the Ameren Illinois evaluation team on the Residential Income Qualified Initiative. Similar to SFR, Ameren Illinois' initiative has two channels: A Moderate-Income Implementation Contractor Channel and an Income Qualified Community Action Agency Channel.

Evaluation Research Questions

The CY2021 evaluation will answer the following key research questions:

Impact Evaluation

1. What is the program's annual total verified gross savings for lighting and non-lighting measures?
2. What is the program's verified net savings?
3. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

1. What are the barriers to program participation from the perspective of non-participants?
2. What are the barriers to program participation from the perspective of program implementers and Income Qualified Advisory Committee North (IQAC North) stakeholders?

Evaluation Approach

The team will conduct the evaluation tasks in Table 2 for both components to answer the above evaluation questions.

Table 2. CY2021 Core Data Collection Activities, Sample, and Analysis

Activity	Target	Target Completes	Timeline	Notes
Program Tracking Data Review	Tracking System	Census	July 2021 and February 2022	Two waves for each program component
In-Depth Interviews	ComEd Staff and Implementers	4	April 2021	
Gross Impact Evaluation	Engineering Impact Review	NA	Two waves	Two waves for each program component
Calculation of CPAS and Annual Savings	Engineering Impact Review	NA	Feb 2022 – April 2022	Two waves for each program component
Other Research Topics - Surveys	Non-participants	Sample	June 2021 – Oct 2021	CBA
Other Research Topics – Interviews and Focus Groups	Program Implementers and IQAC North Stakeholders	Sample	June 2021 – Oct 2021	Both Components

Program Tracking Data Review

Guidehouse will review program tracking data in two waves. The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

Gross Impact Evaluation

Since the SFR Program derives savings from deemed values contained in the TRM[68], the team will continue to 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
- Totals to ensure accurate summation of savings

Verified Net Impact Evaluation

The verified net impact evaluation will apply the net-to-gross (NTG) ratio accepted by SAG consensus to estimate the verified net savings for the program in CY2021. The CY2021 EM&V NTG estimates are shown in the table below.

[68] Illinois Statewide Technical Reference Manual for Energy Efficiency Version 9.0, http://www.ilsag.info/technical-reference-manual.html

Table 3. Deemed NTG Values for CY2021

Program Measure	CY2021 Deemed NTG Value
All Measures	1.0

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

ComEd Staff and Implementer Interviews

The evaluation team will conduct interviews with the program managers and implementers to:

1. Discuss the program findings and recommendations from CY2020 impact evaluations.
2. Identify tracking data issues and discuss potential ways of resolving them in CY2021.
3. Identify any remaining issues with the CY2021 ex ante calculators and discuss potential ways of resolving them.
4. Review the CY2021 evaluation timeline to avoid any delays.
5. Talk about any changes in the program structure or measure mix being offered in CY2021.

Other Research Topics

From ComEd's presentation to the Income Qualified Advisory Committee Meeting on November 10, 2020:

- There is a lower-than-expected concentration of Income Eligible program participation in areas with the greatest need
- Residential Program participation is not occurring in high density low-income areas[69]

Guidehouse's research will provide primary-source insights into the above participation issues and recommended solutions for ComEd's consideration for Plan 6. Guidehouse will conduct a third-party research effort in collaboration with ComEd's ongoing efforts by mailing survey invitation cards to households in communities with lower-than-expected participation. Guidehouse will survey non-participants to explore perceptions regarding barriers to program participation. Potential topics may include participation eligibility, time required to participate, interest in measures offered, application process, and confidence and acceptance in the ComEd offerings. In addition, Guidehouse will conduct focus groups and one-on-one in-depth interviews with program implementers and community focused stakeholders, including Community Based Organizations, municipalities, and income qualified advisory committee stakeholders.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS. Additionally, the weighted average measure life will be estimated.

[69] "Feedback Discussion Income Eligible Elements ComEd Energy Efficiency Program Draft Portfolio Plan – 2022-25," https://iqadvisorycommittee.com/wp-content/uploads/2020/11/2020-11-10-ComEd-EE-Draft-Plan-6_IQAC-Presentation_Final.pdf November 10, 2020.

Use of Randomized Controlled Trial and Quasi-Experimental Design

Guidehouse is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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. If needed, we will adjust the schedule as evaluation activities progress.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	October 2020
ComEd Staff Interviews	Evaluation	April 2021
Implementer Interview	Evaluation	April 2021
Updated CY2021 Wave 1 Data Request, if needed	Evaluation	June 25, 2021
CY2021 Program Tracking Data for Wave 1	ComEd, Gas Utilities	July 23, 2021
Wave 1 Tracking System Ex Ante Review Findings and Recommendations to ComEd and Gas Utilities	Evaluation	September 1, 2021
Findings and Recommendations from Surveys, Interviews and Focus Groups	Evaluation	November 1, 2021
CY2021 Final Program Tracking Data	ComEd, Gas Utilities	January 30, 2022
Draft Report to ComEd, Gas Utilities, and SAG	Evaluation	February 22, 2022
Comments on Draft	ComEd, Gas Utilities, and SAG	March 15, 2022
Revised Draft	Evaluation	March 29, 2022
Comments on Revised Draft	ComEd, Gas Utilities, and SAG	April 5, 2022
Final Impact Reports to ComEd, Gas Utilities, and SAG	Evaluation	April 12, 2022

Public Housing Retrofits Program 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.

The evaluation of this program in CY2021 will include a variety of data collection and analysis activities, including those indicated in the following table.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interview	X
Implementer Interview	X
Impact – Measure-Level Deemed Savings Review	X
Impact – Verification & Gross Realization Rate	X

Coordination

Guidehouse will coordinate with the evaluation teams for Nicor Gas and Peoples Gas on any issues relevant to this program. Specifically, Guidehouse will coordinate impact research with the Ameren Illinois Public Housing Initiative evaluation team. Guidehouse will coordinate with the Ameren Illinois evaluation team on data collection to ensure consistency where appropriate.

Evaluation Research Topics

The CY2021 evaluation will answer the following key researchable questions:

Impact Evaluation

1. What are the program's annual verified gross savings (energy, coincident peak demand)?
2. What are the program's annual verified net savings?
3. Are there any updates recommended for the Illinois Technical Reference Manual (TRM)?

Process Evaluation and Other Research Topics

There will be no formal process evaluation of the program in CY2021. Guidehouse will conduct periodic check-ins and an interview with ComEd staff as well as interview with the implementer to ensure a comprehensive understanding of the current program design, identify points of friction within the program, and remain responsive to the growth and changes within the program. This insight will inform discussions about process evaluation and other research needs as CY2021 unfolds.

Evaluation Approach

The table below summarizes the evaluation tasks for CY2021 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 CY2021	Timeline
Program Tracking Data Review	Tracking System	Census	Two waves
In-Depth Interviews	ComEd Staff and Implementer	2	April 2021
Wave 1 Review	Tracking system	Census	August – September 2021
Gross Impact Evaluation	Engineering File Review	Sample	August – September 2021
Gross Impact Evaluation	Engineering Impact Review	Census	January – April 2022
Calculation of CPAS and Annual Savings	Engineering Impact Review	Census	January – April 2022

Program Tracking Data Review

Guidehouse will perform two reviews, a Wave 1 and final program tracking data. The Wave 1 is expected to cover about half of the projects.

The Wave 1 review of the program tracking data will be conducted mid-year per the schedule detailed in Table 4 below. The purpose of the Wave 1 review is to ensure program tracking data consists of all necessary fields required for evaluation and check that the energy and demand savings calculations are being done correctly. Guidehouse will draft a Wave 1 memo that will detail verified savings for Wave 1 measures and key findings and recommendations explaining any discrepancies. The Wave 2 review will focus on the final evaluation data after the end of the program year and inform annual savings calculations for the final report.

ComEd Staff and Implementer Interviews

The evaluation team will conduct a discussion with the program manager and implementation contractor to:

1. Discuss the program findings and recommendations from CY2020 impact evaluations.
2. Identify tracking data issues and discuss potential ways of resolving them in CY2021.

3. Identify any remaining issues with the CY2021 ex ante calculators and discuss potential ways of resolving them.
4. Review the CY2021 evaluation timeline to avoid any delays.
5. Talk about any changes in the program structure or measure mix being offered in CY2021.

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, Guidehouse 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, Guidehouse 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 CY2021. The CY2021 EM&V NTG estimate is shown in the table below and available on the SAG Website: http://www.ilsag.info/net-to-gross-framework.html.

Table 3. Deemed NTG Value for CY2021

Program Measures	CY2021 Deemed NTG Value
All Measures	1.0

Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.xlsx

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 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

Guidehouse is not evaluating the program via a randomized controlled trial because the program was not designed with randomly assigned treatment and control groups. Guidehouse 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
CY2021 Calculators and Workpapers Review	Evaluation	October 2020
CY2021 Wave 1 Data Request	Evaluation	October 2020
ComEd Staff Interview	Evaluation	April 2021
Implementer Interview	Evaluation	April 2021
Updated CY2021 Wave 1 Data Request, if needed	Evaluation	June 30, 2021
CY2021 Program Tracking Data for Wave 1 Data Review and Analysis	ComEd	July 30, 2021
Tracking System Wave 1 Ex Ante Review Findings and Recommendations	Evaluation	September 1, 2021
Final CY2021 Program Tracking Data	ComEd	January 30, 2022
Draft Report to ComEd and SAG	Evaluation	March 1, 2022
Comments on Draft	ComEd and SAG	March 22, 2022
Revised Draft	Evaluation	March 29, 2022
Comments on Revised Draft	ComEd and SAG	April 5, 2022
Final Report to ComEd and SAG	Evaluation	April 12, 2022

APPENDIX E. VOLTAGE OPTIMIZATION PROGRAM

Voltage Optimization Program CY2021 Evaluation Plan

Introduction

The ComEd Voltage Optimization (VO) Program comprises ComEd's plan to install hardware and software systems on a significant portion 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[70] to implement the VO Program on selected parts of its distribution grid over the 2018-2025 period. This Evaluation Plan covers the fourth year (CY2021) of the planned VO Program roll-out and is based on the program description provided in ComEd's 2018-2021 Portfolio Plan[71] as well as ongoing discussions with ComEd's VO implementation team.

The primary objective of the VO Program CY2021 evaluation will be to verify the net impacts of VO on the feeders on which it is installed and commissioned in CY2021 using the method described in the Illinois Technical Reference Manual (TRM V9.0), which is consistent with the CY2019 and CY2020 evaluations.[72] The program evaluation will include a variety of data collection and analysis activities, including those shown in Table 1.

Table 1. Evaluation Approaches

Tasks	CY2021
Program Tracking Data Review	X
ComEd Staff Interviews*	X
Data Collection –SCADA Data from VO Substations/feeders†	X
Impacts – Measure Net Savings Impact of VO in Affected Feeders	X

* These activities will be in the context of ongoing bi-weekly meetings with the VO implementation team.
† SCADA data will be collected for feeders on which VO is installed during CY2021 and will be used to measure impacts.

Coordination

Ameren Illinois is implementing a similar program and Guidehouse will coordinate with the Ameren evaluation, as well as with ICC staff, on issues relevant to measurement and verification of VO impacts.

Evaluation Research Topics

The evaluation will answer the following key researchable questions:

[70] Open Systems International (OSI) of Medina, Minnesota.
[71] "Commonwealth Edison Company's 2018-2021 Energy Efficiency and Demand Response Plan," June 30, 2017, pp. 192-195.
[72] IL-TRM V9.0, vol. 4, measure 6.2.1 pp. 23-30 (https://ilsag.s3.amazonaws.com/IL-TRM_Effective_010121_v9.0_Vol_4_X-Cutting_Measures_and_Attach_09252020_Final.pdf).

Impact Evaluation

1. What are the program's incremental and cumulative persistent annual verified energy savings?
2. What are the program's coincident peak demand reductions?
3. What voltage reductions did the program achieve?

Process and Net-to-Gross Research

Guidehouse 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 Illinois, Guidehouse, Opinion Dynamics, Illinois Commerce Commission (ICC) staff, and interested stakeholders proposed an approach that was accepted by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) for inclusion in the TRM V9.0. The CY2021 evaluation will follow this approach.

Table 2 below summarizes the evaluation tasks for CY2021.

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

Activity	Target	Target Completes CY2021	Timeline	Notes
ComEd Staff Interviews*	ComEd Program Management	1	Ongoing	This activity will be in the context of ongoing bi-weekly meetings with the ComEd VO team.
Program Tracking Data Review	Tracking system	Census	Ongoing	This activity is completed throughout the year based on monthly data transfer from ComEd
SCADA data from VO substations/feeders	SCADA system	Census	Ongoing	This activity is completed throughout the year based on monthly data transfer from ComEd
Impact*	Calculation using TRM-based method	Census	February 1 - March 14, 2022	

ComEd Staff Interviews

The evaluation team will interview the ComEd program staff confirming our understanding of the nuances needed for the CY2021 evaluation. This will occur in the context of our ongoing bi-weekly meetings with the ComEd VO team.

Program Tracking and SCADA Data Review

The evaluation team will perform regular reviews of the program tracking and SCADA system data throughout the year. This review is needed due to the volume of data involved in our evaluation and allows us to identify any missing or problematic data and receive updated data as needed throughout the year.

Gross and Verified Net Impact Evaluation

Guidehouse will calculate the annualized gross energy savings and summer coincident peak demand savings separately for each VO-enabled feeder as described in the TRM V9.[73] Throughout the year, Guidehouse will review data transfers from ComEd and produce QC memos to ensure the transfer has worked properly and Guidehouse has the best available data. We will continue to have bi-weekly meetings with ComEd and ICC staff to discuss, document, and resolve any issues or concerns as they arise throughout the year.

Since the VO Program will require no actions by any affected ComEd customers, net and gross impacts are identical.

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

As required by the Future Energy Jobs Act (FEJA), Guidehouse will report ex post gross and ex post net savings for the program and the CPAS in CY2021 will be calculated along with the total CPAS.

Data Requirements

Table 3 shows the data Guidehouse will need for the CY2021 evaluation. Data transfers should be kept consistent with CY2020 unless otherwise discussed.

Table 3. Data Requirements for CY2021 VO Evaluation

Data Source	Information Required for CY2021 Feeders
Substation SCADA System	• Feeder
	• Substation
	• Date / times stamp (30-minute intervals)
	• Voltage (at substation bus)
	• Real power (MW or MWh)*
	• Weather data (temperature, humidity, wind speed)†
Other	• VO control status
	• Static feeder characteristics

* Where power (MW) data collection has not yet been established, best available data from the feeder line measurement devices (e.g., amps) should be considered.
† Guidehouse 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 CY2021 evaluation. Adjustments will be made, as needed, as evaluation activities progress.

[73] Ibid.

Table 4. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date Delivered
Periodic team meetings and ComEd staff interview	ComEd, Guidehouse, ICC staff	Bi-weekly, as needed
Ongoing data deliveries to Guidehouse	ComEd	Monthly, Jan 2021-Feb 2022
Data QC memos	Guidehouse	Following each data delivery
Final CY2021 evaluation data (Jan 2020 – Dec 2021) delivered to Guidehouse	ComEd	January 30, 2022
Final CY2021 evaluation data (Jan 2022) delivered to Guidehouse	ComEd	February 18, 2022
Draft CY2021 summary report to ComEd and SAG	Guidehouse	March 14, 2022
Comments on draft	ComEd and SAG	April 4, 2022
Revised draft by Guidehouse	Guidehouse	April 11, 2022
Comments on redraft	ComEd and SAG	April 18, 2022
Final summary report to ComEd and SAG	Guidehouse	April 25, 2022

APPENDIX F. PILOT PROGRAMS

Guidehouse is developing evaluation plans for the following list of ComEd Pilots. Since Pilots are launched throughout the program year, these evaluation plans will be posted to the Illinois Stakeholder Advisory Group website upon ComEd approval.

- Commercial Food Service Equipment
- Efficient Choice
- Electric Homes New Construction
- ENERGYSTAR Retail Products Platform
- Normalized Meter Energy Consumption - Power TakeOff
- Normalized Meter Energy Consumption - Recurve
- SEM Water Savings
- Very High Efficiency HVAC
- Water infrastructure leak reduction

APPENDIX G. CROSS CUTTING RESEARCH EVALUATION PLANS

Technical Reference Manual CY2021 Evaluation Plan

Introduction

The purpose of the Illinois Technical Reference Manual (TRM) is to provide a transparent and consistent basis for calculating energy and demand savings in Illinois.[74] The overall goal of this evaluation research is to improve the TRM input parameter assumptions. All evaluators in Illinois, including Guidehouse, are part of the Illinois Stakeholder Advisory Group (SAG) and Technical Advisory Committee (TAC) and are charged with providing materials to continually update and improve the TRM to provide the most accurate input parameter assumptions and impact evaluation methodology.

This evaluation research plan summarizes Guidehouse's approach for conducting evaluation research to update measures in the 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.

Evaluation Research Topics

The objectives of TRM evaluation research are:

1. Utilize framework for ongoing evaluation research contributions to 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 TRM administrator to provide valuable input while avoiding duplication of efforts.
    c. Share results with ComEd, the Illinois gas utilities, Ameren Illinois and their evaluator, and other TAC members (e.g., Citizen Utility Board [CUB], Environmental Law and Policy Center [ELPC]).
    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 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 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.

Evaluation Approach

This evaluation plan segments activities for TRM research into four discrete activities, as summarized in Table 1 below. We expect to conduct these activities on an ongoing basis, resulting in an updated list of measures for evaluation research each year.

[74] Policy Document for the Illinois Statewide Technical Reference Manual for Energy Efficiency, https://ilsag.s3.amazonaws.com/IL-TRM_Policy_Document-Version-3.0_Final_9-19-19.pdf

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	• Utilize 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 workpaper
Primary Research	• Conduct primary research effort through metering, data collection, modeling, or other engineering method	• Primary research evaluation plan (as needed) • Primary research memo • TRM workpaper

Statewide Coordination

Guidehouse prioritizes and coordinates evaluation research with relevant stakeholders, including the following:

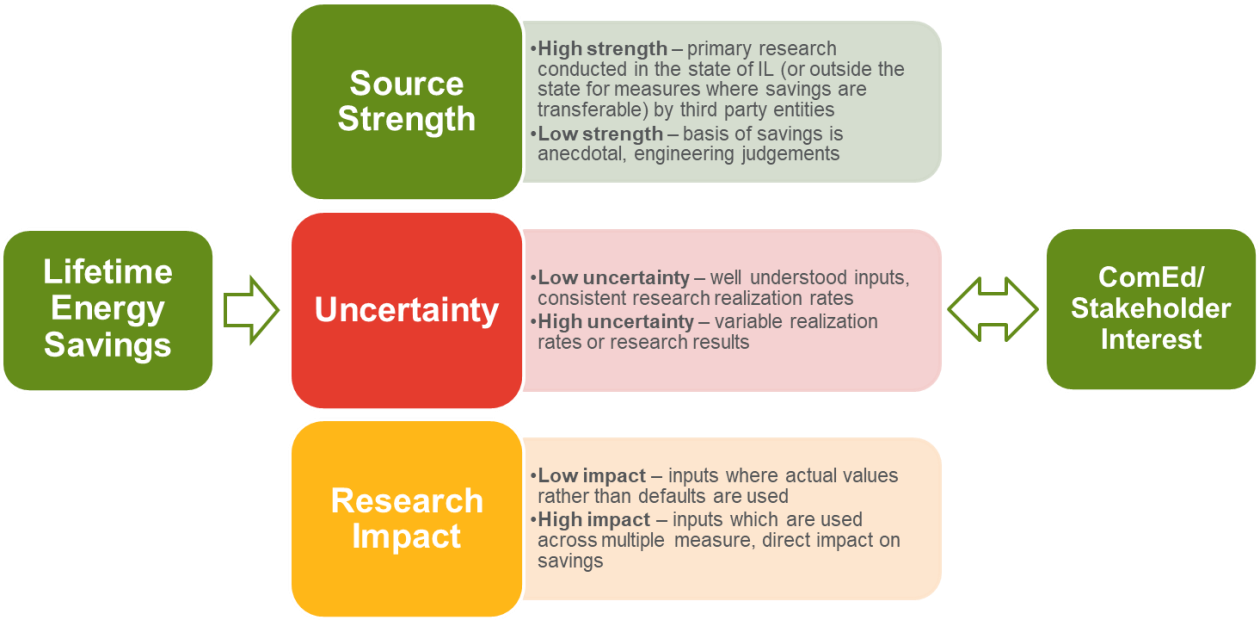
- **Ameren Illinois evaluation team.** Guidehouse holds monthly calls with the Ameren Illinois evaluation team and coordinates on statewide evaluation research.
- **Illinois Gas Utilities.** Guidehouse also evaluates Nicor Gas', Peoples Gas' and North Shore Gas' energy efficiency programs and will coordinate with our internal team on research items of interest to the gas utilities.
- **Continued Illinois SAG and TAC participation.** Guidehouse will continue to participate in Illinois 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 (such as similar studies in other regions when relevant). Additionally, Guidehouse 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

Guidehouse has developed a prioritization framework for TRM evaluation research tasks. The purpose of this framework is to aid the TRM Administrator and TAC in identifying current TRM measures that have the highest potential for updating current TRM algorithms or savings estimates. Figure 1Figure below provides a schematic of the prioritization framework. Guidehouse 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) or high anticipated savings.
- **Measure Research Criteria**. Rank each measure based on three criteria. Guidehouse 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 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: Guidehouse

The framework will assist Guidehouse in (1) identifying gaps in our current TRM research plans and (2) determining the appropriate level of rigor for each research effort. The following tables present results from the CY2019 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?	Target TRM Version Update
Lighting	763,842,893	62%	8,997,278,146	60%	TRM updates are planned for wattage, lumen, and cost values	V10
Voltage Optimization	184,041,503	15%	2,760,622,546	18%		
Other (Custom, RCx, etc.)	136,347,404	11%	1,472,015,313	10%	Review Custom Program data for instances of Hydraulic Oils and Gear Lubricants measures	V10
Compressor system	37,607,241	3%	257,507,152	2%	EUL research proposal for 2021	V11+
Other (HVAC)	28,655,367	2%	489,580,369	3%	Research into HVAC fan energy factor for C&I applications for Small Commercial Thermostats measure	V10
EC Motor for Cooler or Freezer	15,647,358	1%	220,324,709	1%		
Other (Refrigeration)	11,711,870	1%	110,219,554	1%		
Other (Industrial Systems)	9,170,530	1%	131,201,156	1%	Review Industrial Systems Program data for instances of Vortex Tube Thermostat measure Review Industrial Systems Program data for instances of Hydraulic Oils and Gear Lubricants measures	V10
Occupancy Sensor & Other Controls	6,769,427	1%	51,494,348	0%	Possible research into Networked Lighting Controls	V11
EMS	6,713,766	1%	100,706,494	1%		

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?	Target TRM Version Update
Other					Research outside the areas listed above includes: - Review Data Centers Program data for instances of Energy Efficient Rectifiers measure - Propose new measures for Computer Room AC/HP and EC Plug Fans based on Data Centers Program - Review ISR, end uses, and hours of operation for Smart Sockets measure in the Small Business Kits Program	- Data Centers V10 - Smart Sockets V10-V11
Total*	**1,241,205,626**	**100%**	**15,118,489,019**	**100%**		

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Guidehouse 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?	Target TRM Version Update
LED Lamps and Fixtures	330,619,382	76%	3,395,721,741	77%	TRM updates are planned for wattage and lumen values	V10
Freezer & Refrigerators - Recycled	40,347,877	9%	262,261,201	6%		
Advanced Thermostat	24,179,231	6%	265,971,538	6%		
ECM Furnace Blower & Motor	7,840,846	2%	117,612,686	3%		
Air Purifier	5,998,518	1%	53,986,662	1%		
Advanced Power Strips Tier 1	4,669,766	1%	32,688,363	1%		
Dehumidifier	4,254,792	1%	51,057,509	1%		
Room & Central Air Conditioner	3,286,122	1%	58,302,100	1%		
Low Flow Showerhead	3,034,930	1%	30,349,304	1%		
Clothes Washer	2,814,403	1%	39,401,648	1%		
Total*	435,945,257	100%	4,416,911,301	100%		

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Guidehouse 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?	Target TRM Version Update
LED Lamps and Fixtures	157,809,790	89%	1,520,149,959	85%	TRM updates are planned for wattage and lumen values	V10
Advanced Power Strips Tier 1	10,972,642	6%	76,808,493	2%		
Low Flow Showerhead	1,551,648	1%	15,516,479	1%		
Kitchen & Bathroom Faucet Aerator	1,277,719	1%	12,777,187	1%		
Air Sealing	898,069	1%	17,961,379	2%		
Attic/Wall/Basement /Floor/Foundation Insulation	888,928	1%	17,778,566	0%		
Room & Central Air Conditioner	613,598	0%	10,786,935	1%		
Other (Shell)	594,907	0%	12,066,147	1%		
Other (HVAC)	588,059	0%	10,938,747	1%		
Refrigerator & Freezer	571,038	0%	9,547,584	0%		
Total*	**177,533,607**	**100%**	**1,728,040,923**	**100%**		

* Indicates that these are total values for the sector, not for the tabulated values.
Source: Guidehouse 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 Guidehouse 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 or econometric review
	• Recommendations
	  ○ Changes recommended to the TRM in the short term
	  ○ Recommendations for additional primary or other type of research

TRM Workpaper	A TRM workpaper will include TAC submittal procedure and deadlines to share this information with statewide stakeholders and to submit workpapers 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: Guidehouse

Primary Evaluation Research

Once a need for primary evaluation research is identified, Guidehouse 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 TRM evaluation research.

Table 6. Schedule – Key Deadlines

Activity or Deliverable	Responsible Party	Date
2021 TRM research priorities established by stakeholders (complete)	Evaluation/ComEd/ Stakeholders	October 31, 2020
Evaluation review/prioritization (complete)	Evaluation	October 31, 2020
Secondary research	Evaluation	January 1 - May 15, 2021
Submit TRM workpapers	Evaluation	May 15, 2021
Feedback to inform next TRM prioritization	Evaluation	August 31, 2021
2022 TRM research priorities established by stakeholders	Evaluation/ComEd/ Stakeholders	October 31, 2021