

How Much are Non-Energy Benefits Worth? Quantifying and Monetizing Values to Include in ComEd's Income Eligible Energy Efficiency Programs' Cost-Effectiveness Tests

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ABSTRACT

Investor-owned utilities' energy efficiency programs must pass cost-effectiveness tests. In Illinois and most states, the majority of non-energy benefits (NEBs¹) are not included in these tests (DSESP 2020). In 2016, Illinois passed legislation to include quantifiable NEBs in total resource cost (TRC) tests (FEJA 2016) and ComEd agreed to identify and reflect NEBs in income eligible (IE) programs' TRC tests (Stipulation 2017). Since IE programs often include weatherization and HVAC improvements, participants gain health benefits associated with reduced indoor pollutants and thermal stress. IE programs also reduce utility costs such as arrearages. Reduced emissions from reduced electricity generation produces public health benefits. Programs also produce economic benefits such as job creation. To date, none of these types of NEBs have been included in ComEd's TRC tests. In 2017, Guidehouse, on behalf of ComEd, started research to quantify and monetize these types of NEBs (in both IE and non-IE programs) to possibly include in ComEd's TRC tests for the 2022-2025 portfolio. Currently, IE programs' TRC values are excluded from the portfolio's TRC value. Including IE programs' NEBs as well as IE programs' TRCs in the portfolio's TRC more accurately represents the true value of IE programs. Guidehouse developed methodology to quantify and monetize participant and utility NEBs associated with ComEd's IE programs and societal NEBs associated with ComEd's entire portfolio of energy efficiency programs. Guidehouse incorporated feedback from the Illinois Stakeholder Advisory Group to finalize the methodologies. This paper discusses Guidehouse's² research methodologies, analyses, and results as of July 2020.

Introduction

To better serve all customers, including historically underserved income eligible (IE) customers, ComEd requested Guidehouse, its independent third-party evaluator, to conduct non-energy benefits (NEBs) research to quantify and monetize NEBs to include in total resource cost (TRC) tests.³ ComEd plans to meet or exceed its investment goals in income eligible (IE) programs. In addition, ComEd wants to convey the benefits of living in a home that has received an energy efficiency upgrade by participating in an IE program. The results of Guidehouse's

¹ The terms non-energy benefits (NEBs) and non-energy impacts (NEIs) are currently used interchangeably in literature and this paper.

² Guidehouse acquired Navigant in 2019.

³ Because of COVID-19, ComEd suspended the implementation of energy efficiency programs that directly installed measures in customers' homes from March – July 2020, which delayed our participant surveys. We plan to start surveying participants in August 2020.

research will more accurately reflect the benefits of ComEd's IE programs in cost-effectiveness tests by including monetized NEBs. Also, ComEd intends to use this research to describe the health and financial benefits of participating in an IE program in outreach and educational information. To inform our NEBs research plan, Guidehouse incorporated feedback from the Illinois Energy Efficiency Stakeholder Advisory Group's (IL SAG)⁴ Non-Energy Impacts Working Group⁵ into our research plans and research methodologies. Guidehouse's approach includes:

- Quantifying health and other participant NEBs associated with IE energy efficiency programs that include weatherization by adapting the methodology used for the U.S. Department of Energy's Weatherization Assistance Program (Tonn et al. 2014);
- Monetizing health participant NEBs by working with an Illinois hospital system to develop costs associated with medical visits, and monetizing other participant NEBs by using Illinois-specific metrics;
- Quantifying and monetizing societal NEBs from the energy efficiency portfolio by using U.S. Environmental Protection Agency's AVOIDed Emissions and geneRation Tool (AVERT) and CO-Benefits Risk Assessment (COBRA) models (2020a; 2020b);
- Estimating job creation and other economic impacts for the energy efficiency portfolio by using IMPLAN (2018);⁶ and
- Quantifying and monetizing utility NEBs associated with IE programs by analyzing utility billing data.

NEBs are benefits that occur in addition to energy savings produced via energy efficiency programs. NEBs are categorized into three groups: participant, societal (public health and economic), and utility. Participant NEBs accrue to participants living in homes that received energy efficiency upgrades as well as the buildings' owners and property managers (for multi-family buildings); they include improvements in health, safety, and comfort as well as reduced operations and maintenance (O&M) costs. Societal NEBs accrue to society and include improvements to the environment; the health, safety, and comfort of citizens; and the economy. Utility NEBs mainly accrue to the utility and result from reduced administrative and compliance costs.

ComEd plans to include the quantifiable and agreed upon NEBs (through a consensus process in the IL SAG) in its Draft 2022-2025 Portfolio Plan's TRC inputs which will be

⁴ The IL SAG is an advisory body established by the Illinois Commerce Commission that is open to all interested participants. SAG is a forum that allows parties to express different opinions, better understand the opinions of others, and foster collaboration and consensus. <https://www.ilsag.info/>

⁵ The purpose of the IL SAG Non-Energy Impacts Working Group (NEI Working Group) is to discuss research plans and results from Illinois NEI studies as well as defensible methodologies to use across the state related to calculating non-energy impacts. The NEI Working Group may make recommendations to the Policy Manual Subcommittee or IL-TRM Technical Advisory Committee regarding how NEI results may be included in utilities' reporting, cost-effectiveness analyses, and/or the IL-TRM. <https://www.ilsag.info/nei-working-group/> Accessed: July 12, 2020.

⁶ AVERT is a free tool designed to meet the needs of state air quality planners and other interested stakeholders. Non-experts can use AVERT to evaluate county, state, and regional emissions displaced at electric power plants by energy efficiency/renewable energy policies and programs. AVERT is designed to use public data that are accessible and auditable. COBRA is a peer reviewed screening tool that establishes the air quality, human health, and associated economic impacts of various state- and county-level emissions reduction scenarios. The IMPLAN software is a widely used economic input-output modeling tool for estimating job creation and economic impacts.

submitted to the Illinois Commerce Commission (ICC) in October 2020. The final 2022-2025 Portfolio Plan will be submitted to the ICC in March 2021. In a presentation to the IL SAG in June 2020, ComEd described its position on including NEBs in TRC tests as:

- Benefits must exceed costs on a lifetime basis for the EE portfolio (TRC>1.0).
- Total Benefits include avoided energy cost and quantifiable Non-Energy Impacts (NEIs).
- NEIs can improve TRC cost-effectiveness, but
 - A measure must compete for program resources on the basis of the cost of energy saved (\$/kWh).
 - The measure must improve the ability of the portfolio to meet its goals
 - NEIs alone are not enough to justify program measures (ComEd 2020).

NEBs in Illinois Energy Efficiency Programs' Cost-Effectiveness Tests

The current version of the Illinois Technical Reference Manual (IL TRM) includes several deemed savings values to quantify participant, societal, and utility NEBs (IL SAG 2020). The NEB values are linked to state or federal sources and were added to the TRM via a stakeholder vetting process.⁷ The IL TRM quantifies the following NEBs to include in program TRC tests:

- **Reduced participant O&M costs:** This is a deemed value based on the estimated savings from reduced labor and materials that occur once a building has received energy efficiency improvements. For example, switching to longer-lived lighting reduces the number of times custodial personnel must replace light fixtures.
- **Avoided use of water (water savings) from energy efficiency programs:** Water savings are based on measurements consistent with federal standards. The value of the savings is determined by what Illinois customers would have paid for the water saved.
- **Avoided utility environmental costs:** Environmental costs are the dollar per kilowatt-hour (\$/kWh) quantification of the benefits utilities achieved by generating electricity from renewable sources rather than conventional electric generation from coal- or gas-fired plants. This NEB includes the dollar value of reduced carbon emissions associated with switching to renewable energy sources. These values are based on the Energy Information Administration's (EIA's) *Annual Energy Outlook 2020* report (2020).

2015–2016 IL SAG Endeavor to Expand NEBs

In 2015 – 2016, the IL SAG considered expanding the number of NEBs included in the IL TRM but did not reach consensus (IL SAG 2016). Stakeholders provided the following feedback on including additional NEBs in the IL TRM:

⁷ The IL TRM is updated annually, and the stakeholder vetting and consensus process is described on page 9, SAG Consensus on TRM Development and Updates in the “Policy Document for the Illinois Statewide Technical Reference Manual for Energy Efficiency, v.3.” Sept. 19, 2019. s3.amazonaws.com/ilsag/IL-TRM_Policy_Document-Version-3.0_Final_9-19-19.pdf

- Base calculations for NEBs on reputable studies;
- Ensure NEBs quantities are reproducible;
- Establish a logical connection between the NEBs and the related energy efficiency measures;
- Quantify both negative and positive NEBs; and
- Use Illinois-specific data rather than a generic adder.

Illinois' Future Energy Jobs Act and NEBs

In December 2016, the Illinois General Assembly passed the Future Energy Jobs Act (FEJA), which contains language on including NEBs in energy efficiency programs' total resource cost tests (FEJA 2016):

A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and participant in the delivery of those efficiency measures and including avoided costs associated with reduced use of natural gas or other fuels, avoided costs associated with reduced water consumption, and avoided costs associated with reduced operation and maintenance costs, as well as other quantifiable social benefits.

ComEd and the IL SAG prioritized researching NEBs associated with ComEd's IE programs, because substantial NEBs are typically associated with these programs. This decision is captured in the Commonwealth Edison Company 2018–2021 Energy Efficiency and Demand Response Plan Settlement Stipulation (Stipulation 2017):

ComEd agrees to work in good faith to consult and reach consensus with the Income-Qualified Advisory Committee on issues of importance to the Committee, including but not limited to the following: Development of program information and practices for Income-Qualified programs, including the identification and reflection of non-energy benefits ("NEBs") such as comfort, health and safety, reduced tenant turnover, reduced shut-offs, reduction in revenue collection costs, and lower energy burden in Income-Qualified measures and programs.

Using FEJA's guidance (2016) and the IL SAG memo on NEBs (2016), Guidehouse, developed a NEBs research plan and is conducting:

- Primary research to quantify participant NEBs associated with two IE energy efficiency programs that include weatherization;
- AVERT and COBRA modeling to estimate societal NEBs from the entire energy efficiency portfolio;
- Economic analyses to estimate job creation for the entire energy efficiency portfolio using IMPLAN; and
- Billing analysis to quantify utility NEBs associated with two IE programs.

Using national best practices to quantify and monetize NEBs, Guidehouse focused on easily quantifiable and reproducible NEBs. The following sections detail the methodology to quantify and monetize participant, societal (public health and economic), and utility NEBs.

Participant NEBs

Overall Approach for Quantifying Participant NEBs

Participant NEBs associated with IE energy efficiency programs include reduced medical costs associated with asthma and thermal stress, fewer missed days of work, less reliance on loans for household necessities, and reduced O&M costs of multi-family buildings. Guidehouse is quantifying participant NEBs associated with two IE comprehensive retrofit programs: IE Single Family Retrofits and IE Multi-Family Retrofits.⁸ (ComEd 2017). We are quantifying the NEBs using two methods: (1) surveying an adult member of the household that received the energy efficiency measures at the time of participation and 12 months after participation to determine changes in health and other outcomes; and (2) interviewing building owners and operators of buildings that received energy efficiency measures at the time of participation and 12 months after participation to determine changes in O&M costs.

Guidehouse developed a participant survey incorporating stakeholder feedback. Guidehouse modeled the survey questions on the national U.S. Department of Energy’s Weatherization Assistance Program’s (WAP) National Evaluation (Tonn et al. 2014). Table 1 shows sample questions for categories of participant NEBs.⁹ Guidehouse anticipates surveying program participants beginning in Q4 2020 (when the utility’s energy efficiency programs resume after suspending implementation in March 2020 because of COVID-19) and will continue surveying for approximately nine months. Beginning in Q4 2021, Guidehouse will invite participants to complete the survey again. Following the second round of participant surveys, Guidehouse will quantify the participants’ NEBs by analyzing the survey responses for differences in incidences. In Q4 of 2020, Guidehouse will also interview multi-family building owners and operators about O&M costs. In Q4 of 2021, Guidehouse will re-interview the building owners and operators to determine if they experienced a decrease in O&M costs following participation in ComEd’s programs.

Table 1. Sample Participant Survey Questions to Quantify NEBs

Type of NEB	Sample question 1	Sample question 2
Health	Other than a routine visit, has anyone in your household had to see a doctor, visit an ER, or be admitted to a hospital in the past 12 months for symptoms related to asthma?	In the past 12 months, has anyone in the household needed medical attention because your home was too hot or too cold?
Fewer missed days of work	Thinking about the past 12 months, how many days of work did you miss because you or someone else in the	Thinking of the other main wage earners in your household, how many days of work did they miss during the

⁸ Each program has two delivery channels. The IE Single Family Retrofits program channels are implemented through the Chicago Bungalow Association (CBA) and the Illinois Home Weatherization Assistance Program (IHWAP). The IE Multi-Family Retrofits program channels are implemented through Elevate Energy and IHWAP. The income eligibility requirements for IHWAP are more stringent than those for CBA.

⁹ Survey questions will be updated to reflect COVID-19’s impacts on the households in ComEd’s territory.

Type of NEB	Sample question 1	Sample question 2
	household were sick with a respiratory infection?	past year because they or someone else in the household were sick with a respiratory infection?
Reduced reliance on payday loans and assistance programs	What types of financial assistance or loans did your household use in the past 12 months?	What types of programs provided your household with assistance during the past 12 months?
Reduced O&M Costs	During the last 12 months, approximately how much was spent on preventative maintenance or maintenance cost because of equipment failure on this property?	During the last 12 months, approximately how much was spent on marketing to find new tenants?

Guidehouse modified questions from the national WAP survey to develop a survey for ComEd IE program participants. *Source:* Guidehouse draft participant survey, 2020.

Monetizing Participant Health NEBs

Guidehouse will monetize participant health impacts (i.e. decreased need for medical visits associated with asthma symptoms and thermal stress) by multiplying the change in healthcare utilization by its associated costs. ComEd customers’ change in healthcare utilization will be measured via the participant survey, while healthcare costs are the average emergency department and hospital inpatient admission costs obtained from a representative northern Illinois health system. Guidehouse completed the monetization analysis prior to the participant survey analysis which will quantify the changes in healthcare utilization.

Guidehouse estimated health impacts on two specific acute health conditions identified via the literature as having significant association with energy efficiency improvements: asthma and thermal stress. Asthma exacerbations are caused by three primary factors: allergens (e.g., dust mites), irritants (e.g., combustion gases), and moisture or mold (Kanchongkittiphon et al. 2014). Thermal stress (includes heat stress and cold stress), often attributable to a lack of heating or cooling on extreme weather days, can lead to a heat-related illness such as dehydration or heat stroke and exacerbates cardiovascular diseases. (Norton et al. 2018). Thermal stress can also lead to a cold-related illness such as hypothermia.

Heating, ventilation, and air conditioning (HVAC) and building envelope measures address these two health conditions by:

- Decreasing asthma symptoms through air sealing, insulation, and ventilation measures that improve indoor air quality by reducing allergens, moisture, and mold via reducing air infiltration and maintaining healthy relative humidity levels.
- Decreasing thermal stress through improved HVAC, air sealing, and insulation measures, while also making it more affordable to keep households at a more comfortable temperature.

Other housing-related health conditions were not included in the survey instrument because they either had an insufficient evidence base (e.g., chronic obstructive pulmonary disease and low birth weight), relatively few linkages with energy efficiency measures (e.g.,

unintentional injuries, trip/falls, or lead poisoning), or are not correlated with changes in short-term, discrete health utilization events (e.g., anxiety or depression).

Estimating average healthcare costs is challenging because of the wide variance in healthcare costs and difficulty in obtaining accurate place- and condition-specific healthcare cost data. At least four relevant sources of variance in estimating the costs of an emergency department visit or hospital admission are relevant for this study's purpose:

Differences in patient condition: Hospitalization costs generally increase with age (Polanczyk et al. 2001) and lower socio-economic status (Epstein et al. 1990), because these patients are more likely to have complex health conditions that require longer hospital stays and additional treatment. Additionally, the cost of hospitalizations varies greatly by health condition, whereas Emergency Department visits are relatively similar in costs across illness type. Figure 1 below illustrates both of these trends.

Differences in insurers' negotiated rates: The amount paid to the hospital for the same hospital admission varies greatly depending on the insurer. For example, in Illinois, Medicare pays approximately 35% less than private insurers for the same service (White and Whaley 2019). Nationally, those without insurance are billed up to 10 times the amount Medicare pays for the same service (Bai and Anderson 2015).

Differences in regional pricing: Both Medicaid and Medicare adjust for geographic variation in negotiating prices with hospitals.

Difficulties in accounting for related non-hospital costs: The costs for a hospitalization or emergency department visit are split between the hospital's facility fee and the fees for the physicians who provided treatment. Follow-up treatment associated with the initial hospitalization is rarely included in the reported costs of a hospital admission or emergency department visit (Peterson et al. 2015).

To determine healthcare costs associated with changes in participant healthcare utilization, Guidehouse accounted for the first variance listed above by obtaining average costs for emergency department visits and hospital admissions related to asthma and thermal stress from a representative health system in northern Illinois. As shown in Figure 1, these data were patient- and condition- specific, with prices segmented by age, insurer status, and health condition. As an example of cost trends across these variables, Figure 1 shows that adults and seniors on Medicaid (light blue dot) tend to have higher average costs per hospitalization compared to those receiving private insurance.

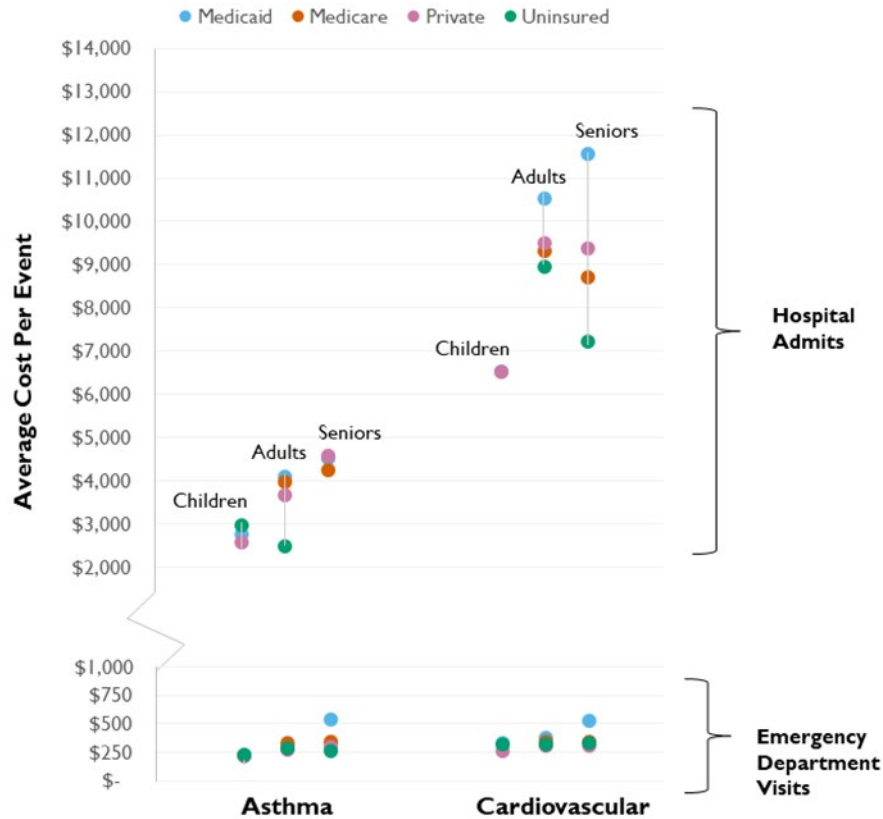


Figure 1. Comparison of hospital actual costs by age, health condition, and insurance coverage. Sources: Northern Illinois health system (costs are incurred) and Green & Healthy Homes Initiative analysis 2020.

Guidehouse addressed the second variance by using the hospital’s actual incurred costs rather than what it bills or receives from insurers or patients. To address the third variance, we developed a price index using public data listing each hospital’s average cost per diem for hospital admissions, see Table 2 (IL HFS 2020). The index allowed us to extrapolate the cost data obtained from the northern Illinois health system to the rest of the state. Each utility can multiply its index value to obtain the average hospital cost for its service territory, adjusting for regional differences.

Table 2. Illinois hospital admission price index

Utility	Avg. inpatient cost per diem (2017)	Index value
ComEd	\$1,177	1.29
Source hospital system	\$915	1

Guidehouse used a random sampling of hospital inpatient admissions to generate a price index to extrapolate the incurred costs from a representative source hospital system to ComEd’s territory. Source: Green & Healthy Homes Initiative analysis, 2020.

However, this methodology did not address the fourth variance, non-related hospital costs; therefore, it is conservative in two ways: 1) it reflected only the hospital facility costs and did not include the physician or pharmacy costs associated with a hospital admission or emergency department event; and 2) it did not account for either the improvements in chronic

health conditions (e.g., anxiety) or other indirect improvements to acute health from improved housing conditions (e.g., unintentional injuries).

Once results from the participant surveys are available, Guidehouse will calculate healthcare cost impacts individually for each survey respondent, using the appropriate price for their demographic, health condition, and utility territory. The estimated cost of a hospitalization can be calculated by looking up the appropriate price from Figure 1 and multiplying it by the price index listed in Table 2. For example, estimating the cost for thermal stress-related hospital admissions of adults on Medicaid and living in ComEd territory would be:

$$\$10,750 * 1.29 = \$13,867$$

This value will be multiplied by the reported reduction in thermal stress-related hospital admissions to obtain the cost savings and then aggregated across the ComEd territory for this particular NEB.

Monetizing Participants' Financial NEBs

Guidehouse will quantify participant health NEBs using survey questions responses (Table 1 lists sample questions which will be updated to reflect COVID-19's impact on ComEd customers' households) and monetize the health benefits using the information in the previous section. In addition, Guidehouse will quantify missed fewer days of work and participants' reduced need for payday loans, credit card usage, and participation in assistance programs using survey responses. Using Illinois-specific secondary sources that reflect the impacts of COVID-19 on ComEd's customers, Guidehouse will identify appropriate sources of information for the values used to monetize the financial NEBs accrued to participants.

Monetizing Participants' Reduced O&M Costs

Guidehouse will quantify participants' reduced O&M costs by interviewing multifamily building owners and operators. Using ComEd territory-specific sources, Guidehouse will determine the average annual cost for property maintenance, equipment maintenance, and marketing to monetize these NEBs.

By including monetized participant NEBs associated with IE energy efficiency programs into these programs' cost-effectiveness tests, ComEd has the ability to expand programs that represent significant health and financial benefits to ComEd customers.

Societal NEBs

Societal NEBs are considered as benefits that accrue to parties beyond utilities and program participants. For this analysis, Guidehouse focused on (1) the public health impacts from improved air quality because of reduced emissions associated with energy efficiency programs, and (2) economic impacts including job creation.

Public Health Impacts Associated with Reduced Emissions

Guidehouse has also conducted the societal NEB public health analysis using two models developed and maintained by the U.S. Environmental Protection Agency (EPA): AVERT and COBRA (2020a; 2020b). We selected these models because:

- State energy efficiency and renewable energy analyses commonly use these models to estimate societal NEBs.
- The monetized results from the models align with other impacts calculated at the participant level of this study.

The AVERT tool calculates avoided PM_{2.5}, SO₂, NO_x, and CO₂¹⁰ emissions associated with energy efficiency and renewable energy programs. The emissions are based on generation across an EPA-defined eGrid¹¹ region. For ComEd, this region is the Great Lakes/Mid-Atlantic Region, which stretches from northern Illinois to the Mid-Atlantic coast. COBRA is a peer-reviewed screening tool that estimates human health and associated economic impacts of various county-level emissions reduction scenarios. COBRA calculates the societal health impacts of chronic and acute bronchitis, non-fatal heart attacks, respiratory or cardiovascular hospital admissions, work loss days, and other impacts associated with improved outdoor ambient particulate matter.

Guidehouse used the AVERT tool to develop estimates of emissions reductions using ComEd's 2018 Summary Impact Evaluation Report (Navigant 2019). Estimates of reduced emissions reflects both annual energy savings and cumulative persisting annual savings (CPAS) for each installed energy efficient measure. For ComEd, the program-level CPAS values vary in duration and magnitude depending on the measures implemented. Therefore, programs with longer persisting savings will realize emissions reductions and, in turn, health benefits over a longer period of time. Figure 2 compares the CPAS curves for two ComEd programs from 2018 through their measures' respective effective useful lives: IE Multi-Family Retrofits and Small Business.

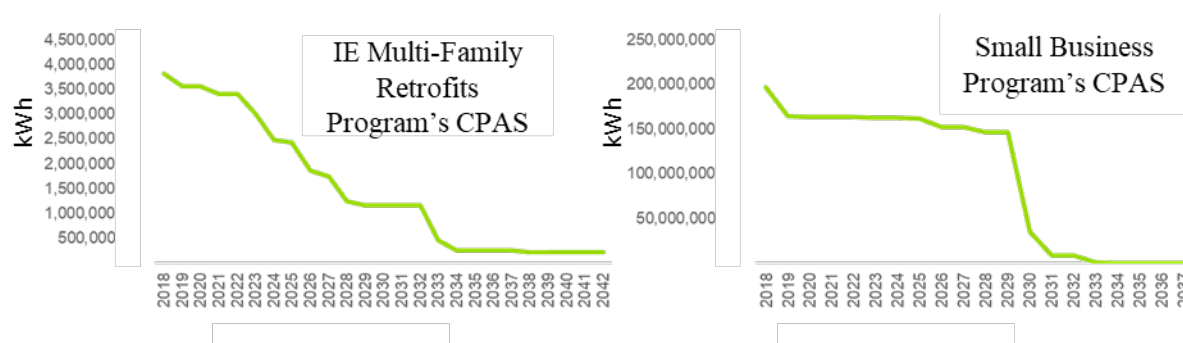


Figure 2. CPAS curves over the duration of the measures' expected useful lives for two ComEd programs. *Source:* Guidehouse analysis 2020.

¹⁰ Particulate matter with a diameter of 2.5 micrometers and smaller, sodium dioxide, nitrogen oxides, and carbon dioxide.

¹¹ eGrid regions refer to regions referenced in the EPA-developed emissions and generation resource integrated database, which is a source of data on the environmental characteristics of almost all electric power generated in the US.

Guidehouse used the AVERT outputs as COBRA inputs. In addition, Guidehouse worked with EPA to obtain a customized COBRA module for ComEd’s discount rate of 2.38 percent, which is applied to net present values of the monetized health benefits. In August 2020, Guidehouse will produce monetized public health benefits for Illinois counties for ComEd to use in their Draft 2022-2025 Portfolio Plan for both low and high estimates commensurate with differing human sensitivities to outdoor air pollutants.¹² As an example, Figure 3 shows the total health benefits (low estimates) for four ComEd programs in their current portfolio: Small Business, Multi-Family Market Rate, IE Multi-Family Retrofits and IE Single Family Retrofits.

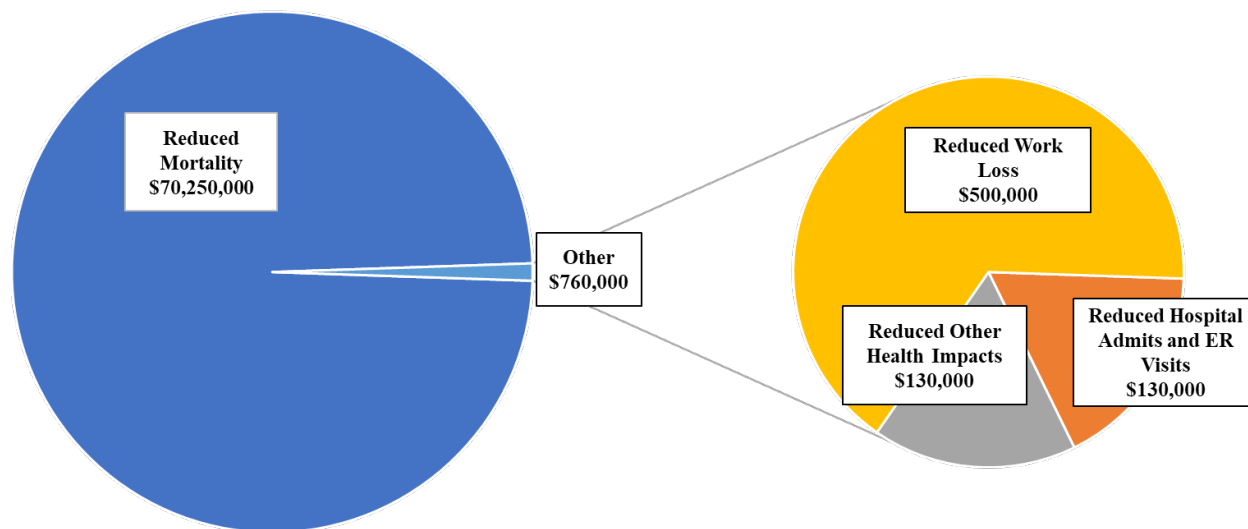


Figure 3. COBRA monetized health benefits showing low estimates for reduced mortality and other health-related health benefits associated with four ComEd Energy Efficiency program from 2018-2043. *Source:* Guidehouse analysis 2020.

Impacts on Illinois’ Economy

FEJA requires that Illinois’ utilities report the economic impacts of their energy efficiency programs (FEJA 2016). Guidehouse also conducted an economic NEB analysis using IMPLAN software, a widely used economic input-output modeling tool, to estimate job creation and economic impacts of the 2018 energy efficiency portfolios for ComEd and Ameren Illinois (IMPLAN 2018). Using information on utility energy efficiency portfolio funding, expenditures, participant impacts, and the IMPLAN software, Guidehouse built a model for the economic effects of energy efficiency portfolios based on a matrix of underlying economic relationships among various sectors of the economy; these include households, industries, and government. Assumptions about these relationships are an underlying component of the IMPLAN software based on localized economic and employment data from sources such as the Bureau of Economic Analysis Regional Economic Accounts and the Bureau of Labor Statistics Census of Employment and Wages. These assumptions are specific to the regional economy defined for the analysis (i.e., utility service territory, state of Illinois), and contain information on how activity

¹² Low and high estimates are generated using assumptions about the sensitivity of adverse health outcomes to changes in ambient PM2.5 levels.

within each sector of the economy affects other local sectors, as well as what portion of activity may extend beyond the local economy.¹³

Table 3 summarizes the direct impacts on each market actor that were modeled to quantify the effects of energy efficiency portfolios. Each market actor was assigned to the IMPLAN industrial classifications or household segments that most closely represent the businesses or households affected by the energy efficiency portfolio. This modeling approach associates each direct impact with the spending patterns of market actors and the resulting economic impacts.

Table 3: Summary of cash flows and direct impacts on market actors

Direct Impact	Market Actors					
	Utility (Program Sponsor)	Participants	Non-Participants	Marketers, Implementers, Evaluators	Contractors, Trade Allies, Equipment Providers	Power Generation Fuel Suppliers
Program and Portfolio Administration	+					
Energy Efficiency Program Surcharge			-			
Program and Portfolio Expenditure	+	-		+	+	
Participant Rebates		+				
Net Incremental Measure Costs		-			+	
Trade Ally/Contractor Incentives					+	
Net Bill Savings		+				
Change in Power Generation Fuel Expenditures						-

This analysis identifies whether each type of direct impact is a positive effect, negative effect, or no effect on each market actor. *Source:* Guidehouse analysis of energy efficiency portfolio impacts 2020.

Within IMPLAN, the impacts for each utility were modeled with a Multi-Regional Input-Output (MRIO) model. This approach allows for indirect and induced impacts to be estimated for secondary geographic regions in addition to the primary geographic region where the direct impacts occur—in this case, the utility service territory. The MRIO model also allows for impacts that occur outside of the utility’s service territory, but within Illinois, to be estimated.

Inputs to the MRIO model include all direct impacts attributable to an individual utility’s programs. The portfolio impacts were modeled as direct impacts to the utility’s service territory, defined as any Illinois counties that are at least partially served by the utility. The remaining counties in Illinois not served by the utility are defined as the other region in the MRIO model.

When direct impacts are modeled in the utility’s territory, there are linkages within the state to the other non-utility regions and out of state. The MRIO modeling approach allows for

¹³ IMPLAN makes several simplifying assumptions, such as fixed prices, no substitution effects, no supply constraints, and no changes in competitiveness or other demographic factors. Such assumptions are not worrisome in assessing short-term impacts, in which the focus is on attaining a snapshot of a regional economy. This methodology is generally accepted to be an effective tool for evaluating impacts that do not shift economic equilibrium conditions and has been used within the utility industry for economic impact evaluations of energy efficiency programs.

the estimation of direct, indirect, and induced impacts in the utility’s territory as well as in the rest of the state by entering the direct cash flows attributable to the utility portfolio in the utility service territory with a separate and defined non-utility region. The summation of these effects provides a total economic impact for the state without double counting impacts. Table 4 shows the draft results from the economic impact analysis of the 2018 energy efficiency portfolios for ComEd (Navigant 2019) and Ameren Illinois (ODC 2019).

Table 4: Summary of 2018 Energy Efficiency Portfolio Economic Impacts

Impact category	Statewide total
Jobs created	18,227 Jobs
Labor income	\$1,050.4 M
Economic output	\$3,631.5 M

Summary of statewide 2018 energy efficiency portfolio economic impacts for ComEd and Ameren Illinois. *Source:* Guidehouse analysis, 2020.

Utility NEBs

The utility NEBs in this paper include benefits associated with the utility billing process. Some benefits, like reducing carrying costs because of arrearages, accrue to the utility. Other benefits accrue to participants. For example, customers may be better able to pay their bills on time, resulting in fewer late payment fees.

Guidehouse used a quasi-experimental method to quantify utility NEBs from ComEd’s IE Single Family Retrofits and IE Multi-Family Retrofits programs. The quasi-experimental method used one year of pre- and one year of post-program payment data and administrative cost data for both a treatment group and a comparison group. Comparison group participants were chosen from a database of customers receiving payment assistance from ComEd or outside entities. The payment data includes:

- Payment transaction dates,
- Actual billed amounts by billing period,
- Source and amount of external payment assistance by billing period,
- Deferred payment agreement amounts, and
- Reconnections by billing period.

Using these data, Guidehouse is quantifying utility metrics such as number of reconnections and the average carried arrearage. We are also quantifying benefits that accrued to participants, such as the portion of households receiving payment arrangements, the portion of each payment that is covered by bill assistance, like the Low Income Home Energy Assistance Program or assistance from ComEd programs and services,¹⁴ and the number of late payments.

For participant-level benefits, the draft results (shown in Table 5) indicate that benefits do accrue to participant. While the average annual bill increased¹⁵ for all customers in the analysis, participants in both IE programs experienced a smaller increase than non-participants. The

¹⁴ ComEd offers programs and services to help those in need, including energy assistance. www.comed.com/MyAccount/Customersupport/Pages/AssistancePrograms.aspx

¹⁵ Bill increases are likely attributable to rate changes and weather, including the Polar Vortex in January 2019.

incidence of late payments is small, but both the average late payment and the percentage of customers with a late payment decreased after program participation.

Table 5: Draft results for payment metrics

Metric	Program Implementer	Non-Participant Change (2019–2017)	Participant Change (2019–2017)	Participant – Non-Participant
Average Annual Bill (\$)	Chicago Bungalow Association and Franklin Energy	99.75	37.96	-61.78
	Illinois Home Weatherization Assistance Program	135.93	12.89	-123.04
Average Late Payment Amount (\$)	Chicago Bungalow Association and Franklin Energy	6.05	-0.07	-6.12
	Illinois Home Weatherization Assistance Program	0.66	-14.07	-14.73
Percentage with Late Payment (%)	Chicago Bungalow Association and Franklin Energy	0.70%	-1.30%	-2.00%
	Illinois Home Weatherization Assistance Program	-3.00%	-6.00%	-3.00%

Draft analysis results showing the change in payment metrics for participants and non-participants between 2017 and 2019. *Source:* Guidehouse analysis, 2020.

Next Steps to Include NEBs in ComEd’s Cost-Effectiveness Tests

Although utilities in several states have used one or more categories of monetized NEBs in their utilities’ cost-effectiveness tests (ACEEE 2018), ComEd in Illinois is the first to monetize a diverse range of NEBs using state-specific research and consider including those monetized NEBs in its 2022-2025 portfolio cost-effectiveness tests for all of its programs including IE programs. Including IE programs’ NEBs as well as IE programs’ TRCs in the portfolio’s TRC value more accurately represents the true value of IE programs. In the summer and fall of 2020, ComEd, the ICC, and IL SAG will continue to refine the approach to include NEBs in the 2022-2025 portfolio cost-effectiveness tests through the IL SAG NEI Working Group¹⁶ including a planned meeting in December 2020 to review results from IE NEI studies for both ComEd and Ameren Illinois. The final ComEd 2022-2025 portfolio plan will be filed with the ICC in March 2021. By including NEBs in energy efficiency programs’ cost-effectiveness tests, ComEd customers will have greater opportunities to participate in programs that provide health and financial benefits in addition to energy savings, especially in historically underserved limited wealth communities facing challenges regarding environmental and social justice issues.

¹⁶ www.ilsag.info/nei-working-group/ Accessed: July 12, 2020.

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