Healthier and Wealthier Communities Through Energy Efficiency: Monetizing Non-Energy Benefits for Cost-effectiveness Tests Across Electric and Gas Efficiency Programs

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ABSTRACT

Both electric and gas utilities in Illinois are expected to achieve aggressive energy efficiency (EE) goals and improve equity by serving historically underserved income eligible customers and communities. Illinois' Climate and Equitable Jobs Act (CEJA)[1] applicable to electric utilities also includes requirements for equitable deployment of EE resources. In addition, Illinois utilities increased the scope of their EE portfolios, including comprehensive whole-home energy upgrades for income eligible households in single family and multi-family homes. This paper will present research to quantify and monetize the economic and public health non-energy impacts (NEIs)[2] achieved by gas and electric EE programs for ComEd, Nicor Gas, Peoples Gas, and North Shore Gas. Incorporating NEIs into cost-effectiveness tests better represent the holistic impacts of the EE portfolios for Illinois electric and gas utilities and can allow for increased scope of utility EE programs across the U.S., especially for the most vulnerable populations.

Energy efficiency programs reduce pollution and demand for electricity generation from fossil fuel and onsite natural gas usage, and improve outdoor air quality and subsequently public health, particularly in communities impacted by poor air quality days. Program investments also support the Illinois economy and create jobs for weatherization contractors and in the broader community. Beginning in 2020, Illinois utilities started reporting cost-effectiveness tests results with and without public health NEIs. This paper describes our methodologies and results for estimating benefits associated with EE programs including job creation and other economic benefits as well as reductions in air pollution.

Introduction

As the third-party evaluator for the EE portfolios of ComEd (2022), Nicor Gas (2021), Peoples Gas (2021), and North Shore Gas (2021), Guidehouse determines program-level cost-effectiveness using the Illinois total resource cost (TRC) test and utility or program administration cost test (UCT or PACT).[3] The Illinois TRC test for electric and gas EE programs

[1] In September 2021, Illinois enacted CEJA, which includes provisions for the equitable deployment of energy efficiency resources, and continues the activities started under the Illinois Future Energy Jobs Act (FEJA, 2016).
[2] Non-energy benefits or non-energy impacts are used interchangeably—both are captured here as NEIs.
[3] Public Utilities Act, Illinois (http://www.ilga.gov/legislation/ilcs). See 220 ILCS 5/8-104(b) for gas utilities (see 20 ILCS 3855/1-10 for electric utilities). "A total resource cost test compares the sum of avoided gas (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 (electricity) or other fuels, avoided

requires a reasonable estimate of the financial costs associated with future regulations and legislation on the emissions of greenhouse gases (GHG) and the use of the societal discount rate including NEIs and avoided water savings in the calculations. These differences from traditional TRC tests account for additional benefits to investments in efficiency programs that are included in the societal cost test in some other jurisdictions (ComEd 2022).

Through collaborative research since 2015, involving the Illinois utilities, their third-party evaluators, and other stakeholders,[4] we developed statewide consistent and defensible methodologies for quantifying and monetizing public health, economic, and participant NEIs associated with the electric and gas utilities' EE programs (Plympton et al. 2020). Including monetized societal health NEIs in TRC test values to better represent the holistic impacts of utilities' energy efficiency portfolio and the cost-effectiveness of comprehensive residential energy efficiency programs. Since 2020, the Illinois investor-owned utilities, including Ameren Illinois, have reported TRC test values with and without public health NEIs (Deo, Nwosu, and Maoz 2021; Ross 2021). Portfolio-level TRC are also provided with and without the income eligible (IE) programs because substantial NEIs are typically associated with these programs. Following the 2021 passage of CEJA, the analysis and reporting of TRC and UCT with and without NEIs, and with or without IE programs[5] were captured in the respective utilities' 2022–2025 portfolio plan filed with the Illinois Commerce Commission (ICC), the state utility regulator.[6]

NEIs are categorized into three groups: societal (public health and economic), participant, and utility (Plympton et al. 2022). Societal public health NEIs accrue to society and include improvements to the environment and the health of citizens due to the reduction of air pollution, including other economic and employment benefits. At a high level, societal public health NEIs associated with electric and gas utility EE programs are represented by the total monetary value of illnesses and deaths avoided due to program-induced reduced emissions over 25 years,[7] discounted to the year of implementation. Societal economic NEIs accrue to the citizens and industries affected by the economic activities of the energy efficiency portfolio and include job creation and other economic benefits. Participant NEIs accrue to participants living in homes that received energy efficiency upgrades[8] and to building owners and property managers (for

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…"

[4] Stakeholders including the Illinois Commerce Commission (ICC), Illinois Energy Efficiency Stakeholder Advisory Group's (SAG), the Illinois Statewide Technical Reference Manual Advisory Committee (TAC), Illinois Low Income Energy Efficiency advisory committee for the South (LIEEAC), also including other NEI Working Groups established by the SAG. SAG is a forum that allows parties to express different opinions, better understand the opinions of others, and foster collaboration and consensus.

[5] On a prospective basis, portfolios should have a TRC value greater than 1.0. Programs targeted toward low-income customers do not have to be cost-effective. Eligibility to participate in utility's IE EE programs includes having a household income at or below 80% of the Area Median Income.

[6] Application pursuant to Section 8-103B and Section 8-104 of the Public Utilities Act for Consent to and Approval of an Energy Efficiency Plan for electric and gas utilities, respectively. Case Details for ICC, ComEd Docket No. P2021-0155, NSG-PGL Docket No. P2021-0159, Ameren Illinois Docket No. 2021-0158, Nicor Gas Docket No. 2021-0154. See Reference section for filed documents.

[7] The 25 years align with the longest effective useful life of the measures implemented.

[8] Energy efficiency upgrades that can produce participant NEIs include HVAC and building envelope measures. Participant NEIs include improvements participant's health, safety, and comfort, property value, and reduced operations and maintenance (O&M) costs. This paper does not include analysis of Participant NEIs in the utilities' TRC tests. Guidehouse primary research on Participant NEIs is expected to be concluded in 2024.

multifamily buildings) and from the benefits of these energy efficiency upgrades. Utility NEIs mainly accrue to the utility and result from reduced administrative and compliance costs and include reduced carrying costs on arrearages.

In this paper, we summarize how Guidehouse quantified and monetized societal public health and economic NEI[9] results from evaluating the EE portfolios of ComEd, Nicor Gas, Peoples Gas and North Shore Gas. We discuss the methods and findings from our study of the emission reductions and public health benefits resulting from the utilities' 2022 portfolio of electric and gas EE programs.

The primary goals of the study were to:

- Quantify changes in electric generation from fossil-fuel and their emissions of pollutants from the ComEd's 2022 electric portfolio by using U.S. Environmental Protection Agency's (EPA's) AVoided Emissions and geneRation Tool (AVERT) model (2024a).
- Estimate the reductions in emissions of pollutants from onsite natural gas usage, including particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ammonia (NH_3), and carbon dioxide (CO_2) resulting from Nicor Gas, Peoples Gas, and North Shore Gas' 2022 portfolios.
- Calculate and monetize the health benefits associated with decreased pollutant concentrations that accrue to customers and Illinois residents using the US EPA's model CO-Benefits Risk Assessment (COBRA) (2024b).
- Monetize the societal public health NEIs and produce values that could be used in the ComEd, Nicor Gas, Peoples Gas and North Shore Gas' TRC and utility cost testing.
- Estimate job creation and other economic impacts for the electric and gas EE portfolios by using IMPLAN (IMPLAN 2018).
- Apply the results to the TRC and UCT test to determine the overall utilities' programs and portfolio cost effectiveness.

We examine utility specific results and analyze separate TRC test values resulting from the impact of gas and electric interactive savings effects and costs from programs jointly implemented across utilities.

Public Health NEIs

Methodology

Our research relied on the U.S. Environmental Protection Agency (EPA) emission factors for natural gas from the National Emissions Inventory (NEI) database (2023a, 2023b), the EPA's AVERT (2024a), and COBRA Health Impacts Screening and Mapping Tool (2024b) to quantify and monetize these health impacts. Though the AVERT tool and the EPA's NEI database are both used to estimate emission reduction, AVERT is only used for ComEd's analysis since the tool quantifies changes in electricity generation.

[9] From CEJA: "The plan shall be determined to be cost-beneficial …[including] the societal value of reduced carbon emissions and surface-level pollutants, particularly in environmental justice communities." "The independent evaluator shall determine…an estimate of job impacts and other macroeconomic impacts of the efficiency programs for that [plan] year."

The AVERT tool uses a forecast, maintained by the EPA, to estimate marginal emission rates for $PM_{2.5}$, SO_2, NO_x, VOCs, NH_3, and CO_2, then applies these emission rates to energy efficiency savings to determine a county-level reduction in each of the pollutants from reduced fossil-fueled electricity generation across the EPA-defined Mid-Atlantic (EPA 2024a) region for ComEd, which includes an area of northern Illinois. The AVERT forecast is static and is recommended for use only up to five years.[10] According to the U.S. Energy Information Agency (EIA), transformations in the mix of electric generation sources, particularly marginal generation sources, can be expected to continue through 2050, as the use of renewables in electricity generation is forecasted to grow (EIA, 2020). To generate more reasonable bounds on electric emission reduction estimates, Guidehouse forecasted marginal emission rates from 2020-2050 using Pennsylvania-New Jersey-Maryland Interconnection (PJM) data and developed a set of adjustment factors for each year, downscaling the rates to the AVERT forecast.

As natural gas emissions are created on a local scale relative to electricity, the distinction between residential and non-residential emissions is essential, and these emissions from a given equipment type are not expected to change over time (Khursheed et al. 2022). The EPA's NEI database (2023a, 2023b) is used to facilitate the estimation of reduction in emissions attributed to the Illinois gas utilities' energy efficiency portfolios. Guidehouse utilized natural gas emission rates for residential and non-residential sectors from the EPA. These sectors correspond to the residential and commercial customers served by these gas utilities (Grabner et al. 2021a, 2021b). Table 1 summarizes the emission rate grouped by sector and pollutant type.

Table 1. U.S. EPA emission rates for residential and non-residential sectors

Pollutant	Residential emission rates (lbs/MMCF)	Non-residential emission rates (lbs/MMCF)
PM2.5	0.43	0.43
NOx	94	100
SO2	0.60	0.60
NH3	20	0.49
VOC	5.50	5.50

Source: Residential emission rates EPA 2023a, Non-residential emission rates 2023b.

The COBRA model estimates the number of health incidents avoided and the corresponding economic values for infant and adult mortality, emergency room visits, and other adverse conditions (Plympton et al. 2023b).

Estimation of Societal Health NEIs

Guidehouse generated societal NEI estimates for each utility's 2022 portfolio, using annual modeling approach illustrated in Figure 1 below.[11] Since the utilities' programs cover a

[10] The EPA recommends that AVERT's emission estimates only be conducted for up to five years into the future. This is because the model provides a representation of the dynamics of electricity dispatch in a historical base year, and because AVERT cannot currently control for changes in dispatch due to transmission resources, fuel prices, demand for electricity, variable costs, and other factors.

[11] Additional detail providing context for each step in the analysis model is provided in (Plympton et al. 2023b; Grabner et al. 2021a, 2021b).

variety of measures, with measure lives ranging from one to 25 years, we included lifetime savings or cumulative persisting annual savings (CPAS) from 2022 programs, which spanned from 2022 through 2046. This ensures that Guidehouse estimates can be associated with the full extent of 2022 programs' energy savings. Analyzing annually ensures that (1) each year's emission impacts are in line with that year's estimated program-induced energy reduction and (2) each year's health benefits estimates reflect that year's baseline population.

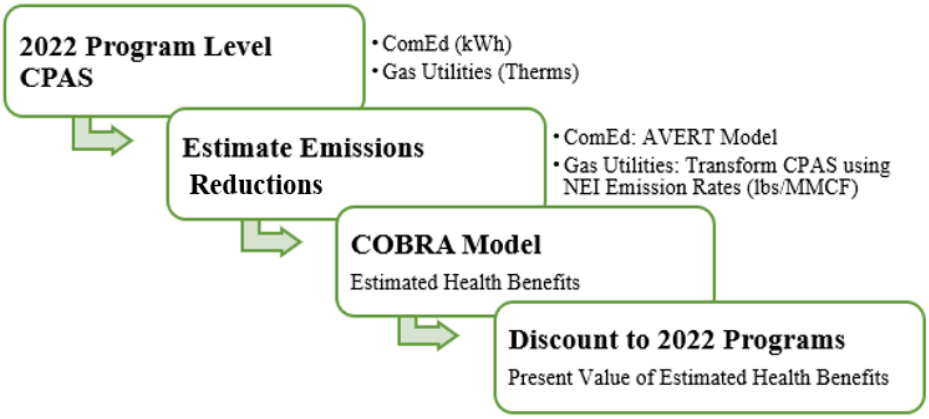

Figure 1. Flowchart of annual estimation of 2022 health benefits

To generate estimates of emission reductions for ComEd's 2022 program, Guidehouse followed the AVERT process described in our ComEd 2022 societal NEI research report (Plympton et al. 2023b). For the gas utilities, we used the emission rates provided by the US EPA's NEI database to develop estimates of emission reductions using the utilities' 2022 impact evaluation reports (Ampong et al. 2023b, 2023c, 2023d). Table 2 provides the total estimated emission reductions associated with the gas utilities' 2022 programs, via multiplication of residential and non-residential lifetime savings schedules and sector-specific emission rates presented in Table 1.

Table 2. Estimated emission reductions (in Tons) for residential and non-residential sectors

	Residential			Non-residential		
Pollutant	Nicor Gas	North Shore Gas	Peoples Gas	Nicor Gas	North Shore Gas	Peoples Gas
$PM_{2.5}$	2.03	0.11	0.93	1.27	0.18	0.92
NO_x	443.16	24.29	1.39	295.37	42.72	1.29
SO_2	2.83	0.16	217.30	1.77	0.26	214.52
NH_3	94.29	5.17	46.23	1.45	0.21	1.05
VOC	25.93	1.42	12.71	16.25	2.35	11.80

This is Guidehouse's analysis for the gas utilities 2022 programs. Guidehouse 2021 analysis (Grabner 2021a, 2021b) can be used as a reference to determine the steps Guidehouse took to update these values. *Source*: Guidehouse 2023 analysis.

Guidehouse used the estimated emission outputs for the gas utilities or ComEd's AVERT outputs in COBRA to estimate the health impacts of reduced pollution exposure over a 25-year period. Reduced exposure to emissions in one year reduces acute morbidity in the year of

analysis and reduces the incidence of premature mortality for up to 30 years.[12] COBRA includes adjustments for inflation throughout the 25 years, then discounts this stream of health benefits back to the year in which the energy savings are realized (i.e., 2022 total health benefits are presented in 2022 dollars). The values encompass all monetized health benefit categories within COBRA and cover all years between 2022 and 2046. EPA provided Guidehouse a custom valuation file using a 2.40% discount rate for 2022-2046 from the Illinois Technical Reference Manual (TRM) v10.0 (2021, 53).

For each year of COBRA analysis, Guidehouse used the mean of the national low- and high-sensitivity estimates for the health benefit estimate. In addition, since the emission reductions and health benefits due to these utilities' EE programs accrue both within and outside of Illinois, national societal health NEIs are used for the analyses. To remain consistent with other inputs to TRC tests, Guidehouse discounted each year's county-level COBRA results back to 2022 using a 0.42% real discount rate (IL TRM 2021, 53).

Table 3 presents the final societal health benefits estimates from the utilities' 2022 portfolios. We estimate that measures implemented in 2022 for each EE program will produce health benefits of $0.031 per kWh for ComEd, $0.162 per therm for Nicor Gas, $0.197 per therm for North Shore Gas and $0.203 per therm for Peoples Gas. These benefits are the net-present value of the total national health benefits produced over the lifetime of the measures divided by the lifetime energy savings.

Table 3. Total Discounted Societal NEI Estimates from 2022 Programs

2022 Program	State of IL Utility			
	ComEd	Nicor Gas	North Shore Gas	Peoples Gas
Verified Net Lifetime Savings (kWh or Therms)	16,403,452,597	159,038,149	14,219,521	92,436,573
$ Total Health Benefits	$512,873,458	$25,730,463	$2,798,704	$18,720,379
$ Total Health Benefits per kWh or Therm (Average)	$0.031	$0.162	$0.197	$0.203

Verified Net Lifetime Savings are from Guidehouse' Summary Reports (Ampong et al. 2023a, 2023b, 2023c, 2023d) for each utility. Guidehouse 2021 analysis can be used as a reference to determine the steps Guidehouse took to update total health benefits. *Source*: Guidehouse analysis 2023.

Figure 2 shows the estimates of societal health NEIs, represented in the MWh for ComEd's 2022 portfolio and Therms for the gas utilities' 2022 portfolios. The CPAS curves are diminishing year-over-year from 2022-2046 as the savings from measures that have reached the end of their effective useful life drops out.

[12] COBRA assumes that the incidences of premature mortality attributed to pollution exposure occur over a 20-year period following exposure. COBRA currently assumes that 30% of premature deaths occur in the first year, 50% of deaths occur in years two through five, and the remaining 20% of deaths occur in years six through twenty. For more information, see page F-8 of the COBRA user manual: https://www.epa.gov/sites/production/files/2020-06/documents/cobra_user_manual_june_2020.pdf

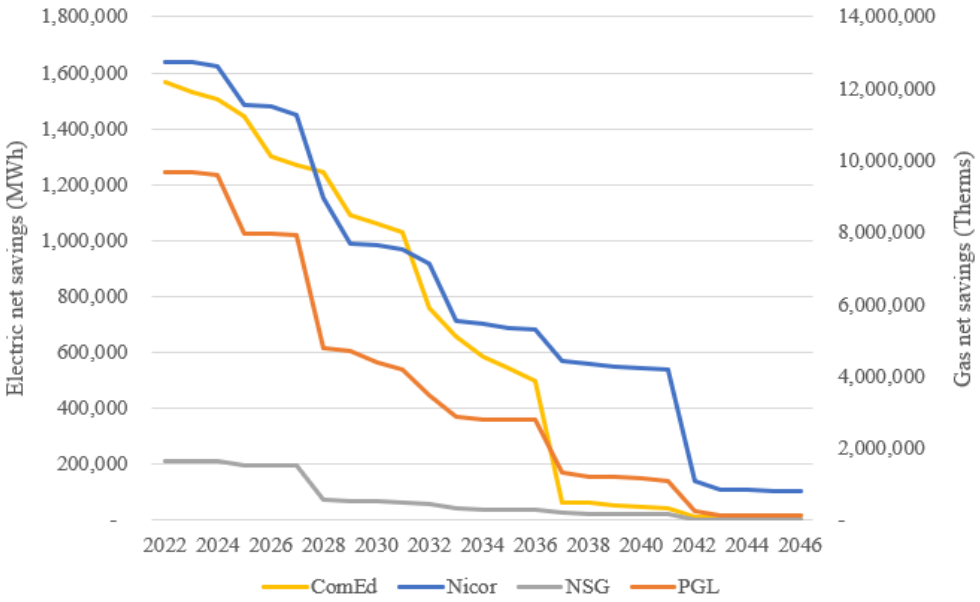

Figure 2. Total lifetime net CPAS, 2022-2046. Left y-axis displays ComEd's data range, while the right displays the gas utilities' range. *Source*: Guidehouse analysis 2023.

Figure 3 shows that the curve of lifetime health benefits of societal NEIs. It follows a similar trend as the CPAS curves in Figure 1, diminishing at a steeper rate than the CPAS curves due to predicted improvements in the efficiency of marginal generation.

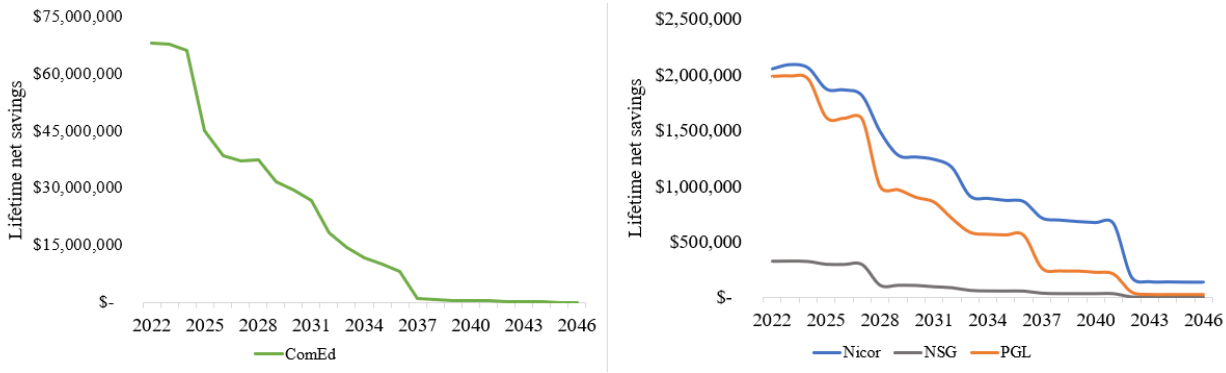

Figure 3. Lifetime health benefit savings of societal NEIs, 2022-2046. *Source*: Guidehouse analysis 2023.

Monetized Impacts

We determined the impact of the societal health NEIs on TRC and UCT test values for all energy efficiency programs for each utility. Table 4 shows the results at the sector level, including the portfolio values with and without IE sectors (Gin et al. 2023; Ampong et el. 2023a, 2023b, 2023c, 2023d). We found that most IE programs produced TRC test values below 1.0 without NEI impacts, however, the addition of NEI impacts improves the overall monetized benefits from the utility programs and improve the TRC test results above 1.0 for almost all cases. Other sectors including joint utility programs show much higher TRC test values with the

inclusion of NEIs. The results indicate that continued growth of utility investment in underserved IE customers and communities will improve their wellbeing and equity and secure the utility investment in EE programs.

Table 4. Utilities' 2022 sectors IL TRC and UCT values with and without societal NEIs

Utility	Sectors	TRC test (with societal NEIs)	TRC test (without societal NEIs)	UCT (with societal NEIs)	UCT (without societal NEIs)
ComEd	Residential & Income Eligible	4.9	3.4	1.7	-
	Business & Public	2.9	1.9	1.7	-
	Pilot & Market Transformation	2.5	1.6	3.0	-
	Portfolio Total (with IE)	3.0	2.0	1.4	-
	Portfolio Total (without IE)	2.9	1.9	1.4	-
Nicor Gas	Income Eligible	1.2	0.7	0.5	0.4
	Residential	3.6	2.1	3.6	3.2
	Business & Public	3.3	1.9	2.6	2.5
	Portfolio Total (with IE)	2.6	1.6	1.8	2.1
	Portfolio Total (without IE)	3.0	1.6	2.3	1.6
North Shore Gas	Income Eligible	1.1	0.6	0.7	0.4
	Residential	2.6	1.5	2.3	1.5
	Business	4.9	2.3	2.3	2.1
	Portfolio Total (with IE)	3.1	1.6	1.9	1.5
	Portfolio Total (without IE)	3.6	1.8	2.2	1.8
Peoples Gas	Income Eligible	0.8	0.4	1.1	0.5
	Residential	3.5	1.7	2.5	1.7
	Business	3.1	1.2	1.6	1.6
	Portfolio Total (with IE)	1.7	0.8	1.5	1.0
	Portfolio Total (without IE)	3.2	1.4	1.9	1.6
Joint Utility Programs		1.98		1.13	

ComEd's values represent the total residential and income eligible programs as those are not uniquely identified programs, as opposed to the gas utilities. *Source*: Guidehouse analysis 2023.

Economic Impacts

Methodology

Energy efficient programs also lead to economic and employment impacts on the Illinois economy, including jobs created, industry output, and labor income. Guidehouse estimates the economic impacts the utility EE programs accrue, the impact these programs have on the state of Illinois and utility customers, both participants and non-participants of these programs. Figure 4 displays the comprehensive economic transactions throughout the lifecycle of energy efficiency programs. These transactions include positive and negative economic impacts associated with industries affected by EE programs.

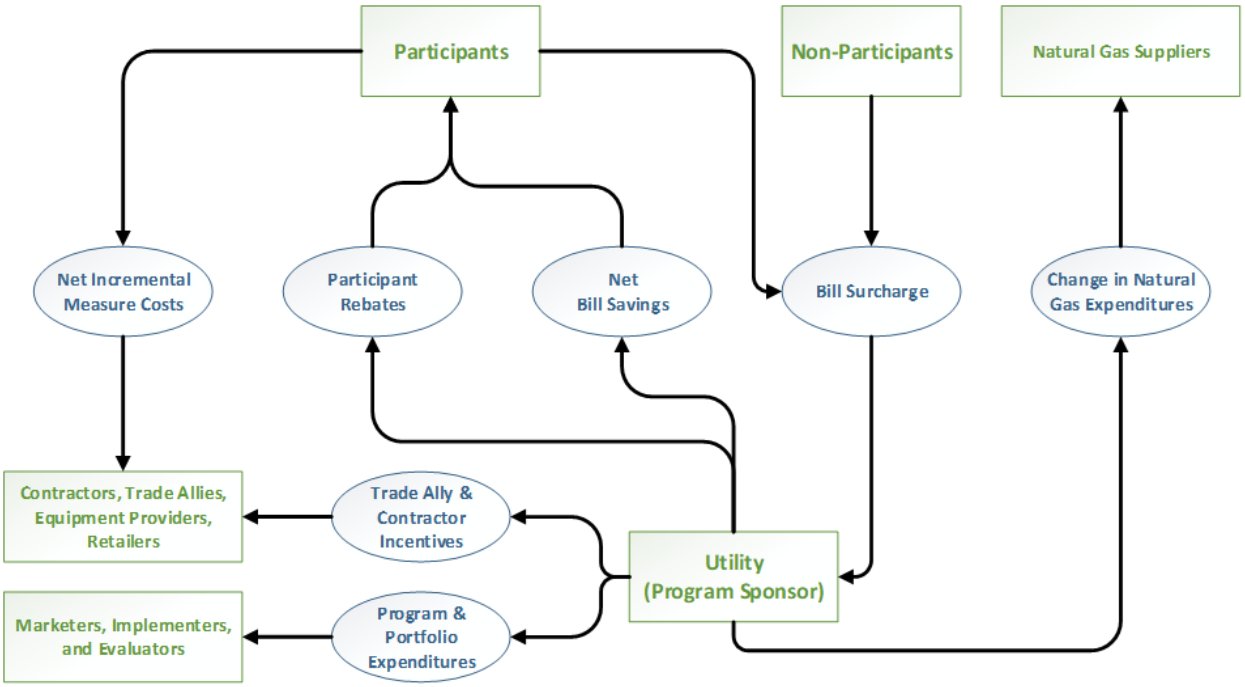

Figure 4. Economic transactions throughout the lifecycle of EE programs. *Source*: SAG Non-Energy Impact Working Group, Guidehouse 2023.

Guidehouse assessed economic benefits collecting economic transactions throughout the lifecycle of the EE programs including the following: gas bill savings, program funding, lost utility fuel expenditures, incentives and rebates, net incremental measure costs, and program administration costs. Guidehouse used the data in the regional economic analysis software tool IMPLAN. Guidehouse then analyzed the IMPLAN output to summarize the economic impacts. The annual economic impact assessment methodology is illustrated in Figure 5.

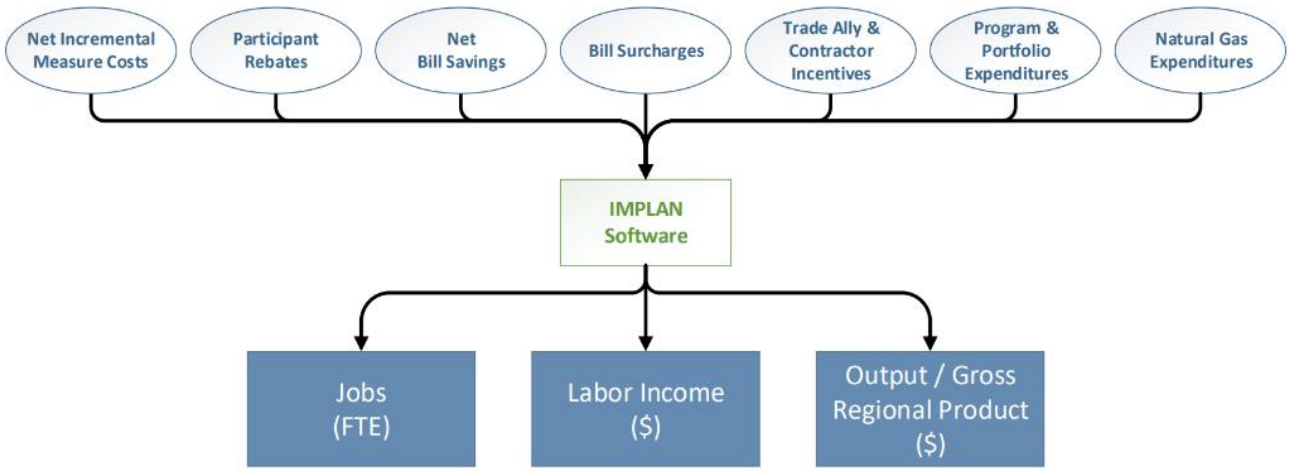

Figure 5. Flowchart of the economic impact methodology. Source: Guidehouse analysis 2023.

The energy savings resulting from a given year's energy efficient programs will also lead to persisting economic impacts over time, which are primarily derived from the net ratepayer bill

savings realized by those who were treated by or participated in the utility's EE program. Table 5 presents a summary of input data used in IMPLAN for the 2022 economic and employment impact analysis (McCreery et al. 2023a, 2023b, 2023c).

Table 5. Summary of utilities' economic and employment impact analysis input data

Impact Category	Amount (2022 $)				Description of Impact	Time Period
	ComEd	Nicor Gas	North Shore Gas	Peoples Gas		
Gas Bill Savings	$2.03B	$147M	$9M	$72M	Positive economic effect on ratepayers	2022-2046
Program Funding	-$443M	-$40M	-$3M	-$22M	Negative economic effect on ratepayers	Over WAML[13] period (Gas: 2022, Electric: 2022-2034)
Net Ratepayer Gas Bill Savings	$1.59B	$107M	$6M	$50M	Net economic effect on ratepayers	2022-2046
Lost Utility Fuel Expenditures	-$85M	-$10M	-$1M	-$5M	Negative economic impact on fuel production and transportation	2022-2046
Incentives and Rebates	$260M	$18M	$1M	$13M	Positive economic effect on ratepayers	2022
Net Incremental Measure Costs	$355M	$42M	$2M	$37M	Negative economic effect on ratepayers; positive economic effect on retailers and suppliers	2022
Program Administration Costs	$87M	$22M	$1M	$8M	Positive economic effect on utilities	2022
Voltage Optimization	$96M	-	-	-	Positive economic effect on utilities	2022

Source: Guidehouse analysis 2023.

Results

Utility energy efficiency programs produce direct, indirect, and induced effects on labor income and industry output. Direct effects may include the initial changes in employment and demand for regional production triggered by the implementation and management of utility energy efficiency programs. Indirect effects may include but are not limited to secondary impacts generated from business-to-business spending as firms and households directly impacted by the energy efficiency programs increase purchases from their suppliers who must in turn increase purchases from their suppliers and so forth as the initial expenditure ripples through interconnected industries. Induced effects may include secondary impacts generated from

[13] WAML refers to the weighted average measure life; the measure life for each program is based on the measure life of each measure weighted proportionally to its gross savings contribution to that program.

household to business spending as labor income changes resulting from direct and indirect activity affect the local economy (SAG 2022).

Since the portfolios produce long-term economic effects due to persisting energy savings, employment impacts produced are not confined to a particular year but occur over the 2022-2046 period. Our analysis indicates that the electric and gas utility programs offered in 2022 produced a net increase of 17,947 job-years. The direct, indirect, and induced job-years for program years 2022-2046 for each utility are presented in Table 6.

Table 6. Job year impacts by category 2022-2046

	State of IL (in Job Years)			
Impact Type	ComEd	Nicor Gas	North Shore Gas	Peoples Gas
Direct	6,227	227	25	219
Indirect	2,178	161	14	122
Induced	8,049	555	22	148
Total	16,454	943	62	488

Note: Totals may not sum due to rounding. Job-year represents full time employee for one year.
Source: Guidehouse analysis 2023.

Economic impacts in 2022 result from initial spending triggered by the implementation and management of the utilities' 2022 EE programs, including, but not limited to program spending and program-induced spending (incentives, rebates, net incremental costs, and program administration costs). The impacts beyond 2022 are derived from the persisting effects of 2022 EE programs in the form of net ratepayer bill savings and fuel/transportation expenditures (for gas utilities) realized by those who participated in 2022 programs.

Table 7 presents the direct, indirect, induced, and total economic and employment expenditures each utility will contribute from 2022 through 2046 from the utilities' 2022 EE portfolio. In our analyses, Guidehouse estimated each utility's total investment for their EE portfolio were the following, $5.188B for ComEd, $354.9M for Nicor, $20.8M for North Shore Gas and $165M for Peoples Gas.

Table 7. Industry labor income and industry output investments 2022-2046 ($ millions)

	ComEd		Nicor Gas		North Shore Gas		Peoples Gas	
Impact type	Labor income	Industry output	Labor income	Industry output	Labor income	Industry output	Labor income	Industry output
Direct	$426	$1,184	$22	$77	$2	$7	$20	$65
Indirect	$187	$556	$14	$38	$1	$4	$11	$29
Induced	$527	$2,307	$37	$166	$2	$5	$10	$30
Total	$1,141	$4,047	$73	$282	$5	$16	$41	$124

Note: Totals may not sum due to rounding. *Source*: Guidehouse analysis 2023.

Table 8 presents the estimated cumulative economic impact each utility's EE portfolio will have within the state of Illinois from 2022 through 2046. We estimated the state total impact of labor income as $1.259B and of the industry output as $4.472B from the EE programs offered by the utilities in 2022.

Table 8. Cumulative economic impacts 2022-2046 within Illinois

	State of IL			
Impact category	ComEd	Nicor Gas	North Shore Gas	Peoples Gas
Job Years	16,460	943	62	488
Labor Income	$1.14B	$73M	$5M	$41M
Industry Output	$4.05B	$282M	$16M	$124M

Source: Guidehouse analysis 2023.

Figure 6 presents direct, indirect, and induced effects on labor income and industry output from the 2022 utilities EE portfolios. From Figure 6, when comparing the total savings for ratepayers to the utilities' expenditures, ratepayer's savings are four times more than the utilities' cost, ensuring that utilities' EE programs are cost effective for ratepayers. Overall, the positive economic effects are greater than program costs and lost revenues, indicating that these EE programs are beneficial to the Illinois economy and utility customer. With the combination of gas and electric utilities, these programs have a vast impact on the state both within their utility territories and outside of their direct impact territory.

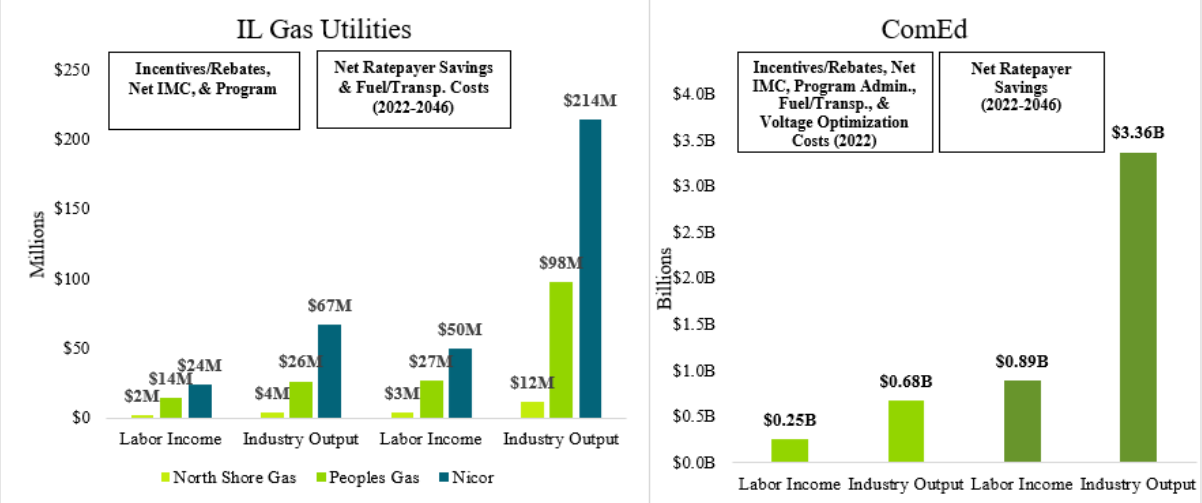

Figure 6. Utilities' energy efficiency portfolio labor income and industry output impacts, 2022-2046. *Source*: Guidehouse analysis 2023.

Conclusion

Illinois electric and gas utilities EE programs will continue to expand to achieve energy efficiency, climate goals and improve equity by serving historically underserved income eligible customers and communities facing challenges regarding economic, environmental, and social justice issues. Continual collaboration among utilities enables statewide consistent and defensible methodologies and tools that enable a more predictable estimation and monetization of the benefits associated with EE programs including job creation, economic benefits and public health benefits from reductions in air pollution. We estimated that measures implemented in 2022 for each EE portfolio will produce public health benefits of $0.031 per kWh for ComEd,

$0.162 per therm for Nicor Gas, $0.197 per therm for North Shore Gas and 0.203 per therm for Peoples Gas. These benefits are determined by the estimated total lifetime health benefits divided by the lifetime energy savings. We find a potential improvement in the efficiency of marginal generation due to EE emission reduction and NEIs.

The employment impacts from our analysis will result in 17,947 job-years across Illinois due to these EE electric and gas utilities' portfolios, over the 2022-2046 period. We estimated the state total impact of labor income as $1.259B and of the industry output as $4.472B from the EE programs offered by the utilities in 2022. Higher total avoided benefits more than the utilities' costs ensure utilities' EE programs are cost effective for ratepayers. Overall, the positive economic effects are greater than program costs and lost revenues, indicating that these EE programs are beneficial for the Illinois economy and utility customers.

The results from this study feed into discussion on the future of energy efficiency in Illinois by giving a fuller picture of the benefits accruing to spending on energy efficiency. The higher TRC and UCT calculation with public health and economic NEIs improve the cost effectiveness of income eligible programs and indicate that the utilities programs are making a significant impact in the communities they serve and can be used to promote EE programs across other jurisdictions. The societal health NEIs on TRC provides utilities measurable benefits achieving TRC > 1, that will allow continued growth and utility investment in underserved income eligible customers and communities. In addition, the utility can expand their portfolios to include a Market Development Initiative[14] that supports local communities and fosters growth with diverse contractors by creating direct jobs in energy efficiency and demonstrating an even larger economic impact.

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