

# ComEd CY2024 Societal Non-Energy Impacts Research Report

**Program Year 2024 (CY2024)**  
**(1/1/2024-12/31/2024)**

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## Introduction

Guidehouse, on behalf of ComEd, conducted research to quantify and monetize societal, utility, and participant Non-Energy Impacts (NEIs) associated with ComEd's CY2024 energy efficiency programs. This report presents research conducted by the Guidehouse team to develop monetized societal NEI values for use in ComEd's programs' cost-effectiveness tests. Since CY2020, ComEd has reported the total resource cost (TRC) test values with and without societal NEIs.

Societal NEIs occur when energy efficiency programs reduce electricity generated from fossil fuels which reduces emissions, including PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, VOCs, NH<sub>3</sub>, and CO<sub>2</sub>. This reduction in emissions causes reduced adverse health impacts, which are monetizable. We used U.S. Environmental Protection Agency's (EPA) AVOIDed Emissions and geneRATION Tool (AVERT)<sup>1</sup> and CO-Benefits Risk Assessment (COBRA)<sup>2</sup> Health Impacts Screening and Mapping Tool to quantify and monetize these health impacts. At a high level, Societal NEIs associated with a ComEd energy efficiency program are represented by the total monetary value of illnesses and deaths avoided<sup>3</sup> due to program-induced reduced emissions over 20 years, discounted to the year of implementation.

In this report, Guidehouse provides some background on NEIs in Illinois per both the Climate and Equitable Jobs Act (CEJA) and Future Energy Jobs Act (FEJA). Following this, Guidehouse presents the research and methodology used to quantify and monetize societal NEI values for use in ComEd's programmatic cost-effectiveness tests. This report also includes recommendations for using societal NEI values in ComEd's cost-effectiveness tests.

## Background

In December 2016, the Illinois General Assembly passed FEJA, which contains the following language on including additional non-energy benefits (now described as non-energy impacts, or NEIs) in energy efficiency programs' cost-effectiveness tests:

*"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*

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<sup>1</sup> U.S. EPA's AVERT web site: <https://www.epa.gov/avert> Accessed: May 15, 2025.

<sup>2</sup> U.S. EPA's COBRA tool web site: <https://www.epa.gov/cobra> Accessed: May 15, 2025.

<sup>3</sup> U.S. EPA. 2024. "Estimating the Co-Benefits of Clean Energy Policies CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool: How COBRA Works" [https://www.epa.gov/system/files/documents/2024-04/how-cobra-works\\_17-april-2024.pdf](https://www.epa.gov/system/files/documents/2024-04/how-cobra-works_17-april-2024.pdf).



*associated with reduced operation and maintenance costs, as well as other quantifiable social benefits...”<sup>4</sup>*

Additionally, in September 2021, the Illinois legislature passed CEJA with the following language directing Illinois utilities to continue including the Societal NEIs in TRC tests and to report economic NEIs:

*“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.”<sup>5</sup>*

Currently, the Illinois Technical Reference Manual<sup>6</sup> (TRM) includes several monetized values for societal NEIs. The NEI values were derived from various state and federal sources and were added to the TRM via a stakeholder vetting process. The TRM quantifies this following societal NEI to include in TRC tests:

***“Societal: 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.”***

Following FEJA's passage, ComEd and the Illinois Stakeholder Advisory Group (SAG) prioritized researching NEIs associated with the income eligible energy efficiency programs because substantial NEIs are typically associated with these programs. This prioritization is captured in the ComEd 2022–2025 Energy Efficiency and Demand Response Plan (Plan 6) Stipulation Agreement, below:

*“As part of ComEd’s 2022-2025 Plan filing and any ex post cost-effectiveness results reported for 2022-2025, ComEd agrees to present the TRC test results both with and without non-energy impacts (“NEIs”). NEIs specified within the Illinois Statewide Technical Reference Manual for Energy Efficiency (“IL-TRM”) will be included in both sets of calculations.”<sup>7</sup>*

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<sup>4</sup> FEJA (Illinois Future Energy Jobs Act). Public Act 099-0906. <https://www.ilga.gov/legislation/publicacts/99/PDF/099-0906.pdf>. (Passed December 7, 2016).

<sup>5</sup> CEJA (Illinois Clean and Equitable Jobs Act). Public Act 102-0662. <https://www.ilga.gov/legislation/publicacts/102/PDF/102-0662.pdf>. (passed September 15, 2021).

<sup>6</sup> IL SAG. 2023. Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 12.0. <https://www.ilsag.info/wp-content/uploads/IL-TRM-Version-12.0-Volumes-1-4-Compiled-Final.pdf>.

<sup>7</sup> ComEd. 2021. Commonwealth Edison Company 2022-2025 Energy Efficiency & Demand Response Plan (Plan 6) filed March 1. Springfield, IL: Illinois Commerce Commission (ICC). [www.icc.illinois.gov/docket/files.aspx?no=17-0312&docId=254601](http://www.icc.illinois.gov/docket/files.aspx?no=17-0312&docId=254601).

Prior to FEJA's passage, the SAG considered expanding the number of NEIs included in the TRM but did not reach consensus. Stakeholders provided the following feedback on including additional NEIs in the TRM:

- Base calculations for NEIs on reputable studies
- Ensure NEIs quantities are reproducible
- Establish a logical connection between the NEIs and the related energy efficiency measures
- Quantify both negative and positive NEIs
- Use Illinois-specific data rather than a generic adder<sup>8</sup>

In 2017, Guidehouse, on behalf of ComEd, conducted research to quantify and monetize societal, utility, and participant NEIs associated with ComEd's energy efficiency programs. At the May 5, 2020 SAG NEI Working Group meeting, Guidehouse presented early findings from the societal and utility NEI research and provided an update on the planned participant NEI research. We presented an updated methodology for our societal NEI research at the July 15 and October 6, 2020, SAG NEI Working Group meetings which was used to conduct this research and is presented in this report. This report focuses on the methodology we developed to estimate Societal NEIs associated with ComEd's energy efficiency programs.

## Energy Efficiency's Impacts on Emissions and Human Health

Energy efficiency programs reduce demand for electricity generated by fossil fuels by implementing energy efficiency measures. The corresponding emissions reductions are from the electric generation facilities operating at the margin (i.e., not providing baseload) that have the most flexibility to add generation to the grid quickly. The reduction in air emissions causes a reduction in adverse human health outcomes and deaths. Our research focuses on calculating the emissions from the marginal generators and then estimating the health benefits from those emissions. As we describe below, Guidehouse used tools that the EPA develops and maintains to estimate the health benefits of reductions in exposure to emissions. The first tool estimates energy efficiency impacts on demand at the operating margin to quantify displaced emissions that can be attributed to demand savings. Displaced emissions are then used in a second tool informed by population health, epidemiology, and economics research to quantify the economic benefits of reduced adverse health outcomes.

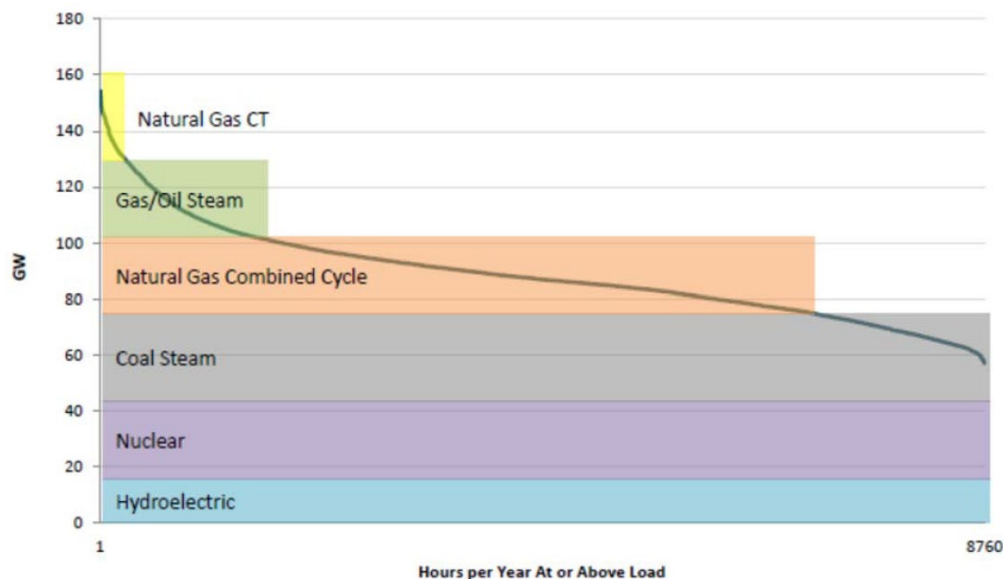
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<sup>8</sup> IL SAG (Illinois Stakeholder Advisory Group). 2016. Documentation of TAC Review of Non-Energy Benefits - Memorandum to Technical Advisory Committee. Springfield, IL: [s3.amazonaws.com/ilsag/IL-TAC\\_Documentation-of-TAC-Review-of-Non-Energy-Benefits\\_Memo\\_02-09-2016.pdf](https://s3.amazonaws.com/ilsag/IL-TAC_Documentation-of-TAC-Review-of-Non-Energy-Benefits_Memo_02-09-2016.pdf).

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Specific electric generating units impacted by these demand reductions depend on the load shape of the impacted customers, the hour of day, and time of year, among other factors. As Figure 1 shows below, electric generating units are dispatched in the order of their operating costs. Least-cost electric generating units tend to operate for the greatest portion of the year, and higher-cost electric generating units are reserved for periods of greater demand. Higher-cost, marginal generation units are often fueled by oil, coal, and natural gas combustion.

**Figure 1. Least – Cost Merit Order Dispatch**



Source: Synapse Energy Economics, 2015<sup>9</sup>

Energy efficiency programs reduce demand at the operating margin, therefore demand reductions attributed to energy efficiency programs displace electric generation amongst higher-cost marginal generation sources. In the PJM territory, marginal sources supply energy via combustion of natural gas (69.4% of marginal sources) and coal (24.4%).<sup>10</sup> Therefore, electric demand reductions due to ComEd energy efficiency programs can be linked to reductions in generation among natural gas, oil steam, and coal-fired electric generating units.

Reducing generation from PJM's marginal generators causes substantial reductions in emissions of PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, and CO<sub>2</sub>, since these pollutants are byproducts of coal and natural gas fuel combustion. The populations' exposure to these four pollutants increases the prevalence of numerous adverse health outcomes. For instance, premature infant and adult mortality have been

<sup>9</sup> Synapse Energy Economics, 2015. "Air Emissions Displacement by Energy Efficiency and Renewable Energy: A Survey of Data, Methods, and Results"

<sup>10</sup> 2019 PJM State of the Market Report, Table 3-52.

[https://www.monitoringanalytics.com/reports/PJM\\_State\\_of\\_the\\_Market/2019/2019-som-pjm-sec3.pdf](https://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2019/2019-som-pjm-sec3.pdf).

linked to increased exposure to ambient air pollution. On an annual basis, the World Health Organization (WHO) estimates around 4.2 million premature deaths globally are linked to ambient air pollution exposure, with the most harmful pollutants being PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and ozone.<sup>11</sup> Increased exposure to these pollutants also leads to the development or exacerbation of respiratory and cardiovascular conditions. Each of the adverse health effects from ambient pollution exposure, particularly exposure to PM<sub>2.5</sub> and ozone,<sup>12</sup> represents a substantial economic cost.<sup>13</sup>

## Methodology

This section presents the methodology and usage of EPA tools to estimate the Societal NEIs associated with ComEd's CY2024 programs. Guidehouse first provides a summary of the two tools developed by the EPA that are essential to this analysis. This is followed by a summary of Guidehouse's methodology to quantify the health benefits attributed to CY2024 energy efficiency programs.

### ***AVERT and COBRA***

The EPA developed the Avoided Emissions and geneRation Tool (AVERT) to estimate the emissions benefits of energy efficiency and renewable energy policies and programs.<sup>14</sup> The EPA also developed the CO-Benefits Risk Assessment (COBRA) to estimate the health and economic benefits associated with energy efficiency and renewable energy policies and programs.<sup>15</sup>

The EPA's AVERT translates the impacts of energy efficiency programs into county-level reductions in PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, VOCs, NH<sub>3</sub>, and CO<sub>2</sub> from reduced electricity generation across fossil-fueled electricity generating units. AVERT was first released in 2014 and has been reviewed, well-documented, and tested across multiple scenarios. More specifically, since the AVERT's inception, the EPA has:

- Conducted external and internal peer reviews
- Benchmarked AVERT against an industry-standard electric power sector model, PROSYM

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<sup>11</sup> World Health Organization. "Ambient (outdoor) air pollution" [https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health) Accessed: May 15, 2025.

<sup>12</sup> U.S. EPA. "Air Pollution: Current and Future Challenges" <https://www.epa.gov/clean-air-act-overview/air-pollution-current-and-future-challenges> Accessed: April 15, 2025.

<sup>13</sup> U.S. EPA. "Mortality Risk Valuation" <https://www.epa.gov/environmental-economics/mortality-risk-valuation> Accessed: May 17, 2025.

<sup>14</sup> U.S. EPA's AVERT web site: <https://www.epa.gov/avert> Accessed: May 15, 2025.

<sup>15</sup> U.S. EPA's COBRA tool web site: <https://www.epa.gov/cobra> Accessed: May 15, 2025.



- Worked with states to beta-test the tool for functionality, appropriate uses, and clarity of the user manual.<sup>16</sup>

COBRA is a peer-reviewed screening tool that establishes the air quality, human health, and associated economic impacts of various state- and county-level emission reduction scenarios.<sup>17</sup> COBRA was updated in 2024 by the EPA to estimate changes in annual ambient concentrations of both particulate matter (PM<sub>2.5</sub>) and ozone, in previous years COBRA only estimated the health impacts of PM<sub>2.5</sub>.<sup>18</sup> COBRA continues to use the county-level emissions reduction results from AVERT to estimate health outcomes changes. Using information from AVERT on county-level changes in emissions, COBRA quantifies county-level air quality changes, estimates the resulting changes in health outcomes, and then calculates monetary values associated with these changes in health outcomes. COBRA estimates the number of health incidents avoided and the corresponding economic values for the following conditions. The last three health incidence (Hospital Admissions related to Alzheimer's and Parkinson's Disease, Stroke and Lung Cancer, Hay Fever/Rhinitis) are additions to the 2024 COBRA update.

- Infant and Adult Mortality
- Non-fatal Heart Attacks
- Hospital Admissions related to Respiratory and Cardiovascular Conditions
- Acute Bronchitis
- Upper and Lower Respiratory Symptoms,
- Asthma Exacerbations (attacks, shortness of breath, & wheezing)
- Asthma Emergency Room visits
- Minor Restricted Activity Days
- Work Loss Days
- Hospital Admissions related to Alzheimer's and Parkinson's Disease
- Incidence of Stroke and Lung Cancer
- Incidence of Hay Fever/Rhinitis

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<sup>16</sup> U.S. EPA. "AVERT – Tutorial Homepage" <https://www.epa.gov/avert/avert-tutorial-homepage>. Accessed: May 15, 2025.

<sup>17</sup> U.S. EPA. 2024. "Estimating the Co-Benefits of Clean Energy Policies CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool: How COBRA Works". [https://www.epa.gov/system/files/documents/2024-04/how-cobra-works\\_17-april-2024.pdf](https://www.epa.gov/system/files/documents/2024-04/how-cobra-works_17-april-2024.pdf).

<sup>18</sup> COBRA Revision History <https://www.epa.gov/cobra/cobra-revision-history>. Accessed: April 15, 2025.

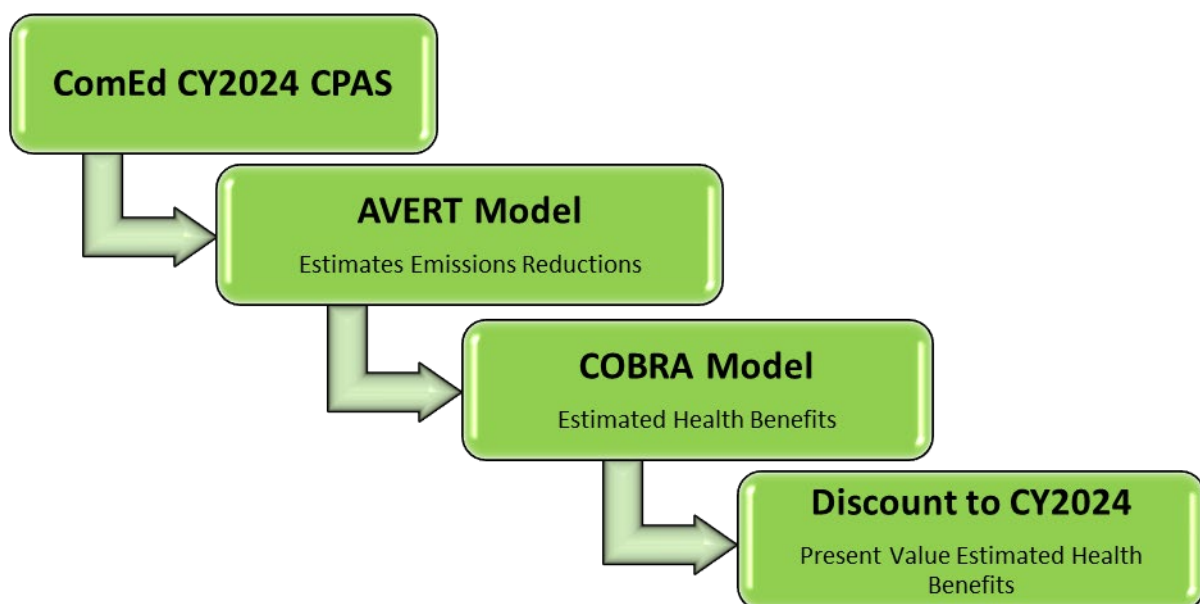
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## Estimation of Societal NEIs

Guidehouse generated Societal NEI estimates for ComEd's CY2024 programs. Since ComEd programs cover a variety of measures with measure lives ranging from one to 30 years, Guidehouse included all cumulative persisting annual savings (CPAS) from CY2024 programs. This ensures that Guidehouse estimates can be associated with the full extent of CY2024 programs' energy savings.

To generate Societal NEI estimates, Guidehouse adopted an annual modeling approach. For each year, Guidehouse used CPAS values for CY2024 programs, which spanned 2024 through 2053. The annual approach is illustrated in Figure 2. Analyzing on an annual basis ensures that (1) each year's emissions impacts are consistent with generation activity expected in that year and (2) each year's health benefits estimates reflect the baseline population in that year. Additional detail providing context for each step in the analysis is provided in the following paragraphs.

**Figure 2. Flowchart of Annual Estimation of CY2024 Health Benefits**



Source: Guidehouse

### Step 1: Gather ComEd CY2024 Portfolio-Level CPAS Values

For this methodological summary, we focus on the annual estimation of societal health benefits for one program using that program's CY2024 CPAS values beginning in CY2024. In this first step, we gathered and aggregated ComEd CY2024 programs' CPAS data<sup>19</sup> to construct a 30-year portfolio-level CPAS curve.

<sup>19</sup> ComEd CY2024 Summary Impact evaluation Report – Table 2-3 CPAS Electric. April 30, 2025.

## **Step 2: Execute AVERT**

For each year, execute AVERT using portfolio-level CPAS values. AVERT uses a forecast<sup>20</sup> of patterns of dispatching electric generating units to estimate marginal emissions rates (lbs/MWh) for PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, VOCs, NH<sub>3</sub>, and CO<sub>2</sub>, then applies these emissions rates to energy efficiency savings (MWh) to determine a county-level reduction (lbs) in each of the four pollutants.

EPA currently maintains a 2024 baseline forecast of patterns of dispatching electric generating units for AVERT. This forecast is based on historical data through 2024, and EPA warns that this forecast is static and is only recommended for use for up to five years.<sup>21</sup> Guidehouse considered the use of county-level estimates of emissions reductions from AVERT without any adjustments; however, historical trends in marginal emissions rates do not support this approach. For ComEd and PJM, marginal emissions rates have dropped considerably over the past four years.<sup>22</sup> In PJM's territory, the share of coal marginal generation sources dropped from 51.7% in 2015 to 24.4% in 2019. 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.<sup>23</sup> Marginal emissions rates are expected to continue to decline as the energy mix becomes cleaner. Failing to adjust the AVERT analysis approach to accommodate trends in marginal emissions rates beyond five years into the future, therefore, overstates county-level emissions reductions. In turn, this will overstate health benefits for these years.

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. To account for the 30-year measure life in CPAS, Guidehouse used a trendline of adjusted factors from 2040-2050 to determine adjustment factors for 2050-2053.

## **Step 3: Execute COBRA**

Guidehouse used the AVERT outputs in COBRA to estimate health impacts of reduced pollution exposure over a 30-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

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<sup>20</sup> This forecast is updated by the EPA once annually and is based on historic patterns of dispatch of electric generating units and resource mix within the Mid-Atlantic region.

<sup>21</sup> The EPA recommends that AVERT's emissions 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.

<sup>22</sup> PJM 2015 – 2019 CO<sub>2</sub>, SO<sub>2</sub>, and NO<sub>x</sub> Emission Rates Report. April 2020. <https://www.pjm.com/-/media/library/reports-notices/special-reports/2019/2019-emissions-report.ashx?la=en>

<sup>23</sup> Annual Energy Outlook 2020 (AEO2020) <https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Electricity.pdf>

years.<sup>24</sup> COBRA includes adjustments for inflation throughout the 30 years, then discounts this stream of health benefits back to the year in which the energy savings are realized.<sup>25</sup> EPA provided Guidehouse a custom valuation file using a 2.40% discount rate for 2024-2053 from the Illinois Technical Reference Manual (TRM) v12.0.<sup>26</sup>

For each year of COBRA analysis, we used the average of national low- and high-sensitivity estimates for the health benefit estimate. Low- and high-sensitivity estimates of health benefits are based on two peer-reviewed studies estimating the link between ambient air pollution exposure and increases in premature mortality. Each study assessed premature mortality using a robust sample pool intended to represent the United States population, paying special attention to urban and rural populations and age brackets. Since both studies are credible, Guidehouse does not believe that either estimate is more representative than the other of the United States population and resulting population health impacts. Therefore, we used the mean of national low- and high-sensitivity estimates to construct annual health benefits estimates. In addition, since emission reductions and health benefits due to ComEd's energy efficiency programs accrue both without and outside of Illinois, we used national societal NEIs in our analyses.

#### **Step 4: Discount Results to CY2024**

Health benefits estimates are expressed using dollars in the analysis year of interest. For the cost-effectiveness test on a CY2024 program, we used the CY2024 program's Societal NEI value adjusted to 2024 dollars. To remain consistent with other inputs to TRC tests, Guidehouse discounted each year's county-level COBRA results back to 2024 using a 0.42% real discount rate.

## **Analysis Findings and Recommendations**

### ***Analysis Findings***

Figure 3 shows the CPAS Lifetime Net Saving estimates for CY2024, which is diminishing year-over-year from 2024 through 2053 as measures begin to reach their effective useful lives. Following Guidehouse's annual analysis methodology, the curve of Lifetime Health Benefits of Societal NEIs is shown in Figure 4, which follows a similar trend as the program-level CPAS, diminishing at a steeper rate than CPAS due to predicted improvements in the efficiency of marginal generation.

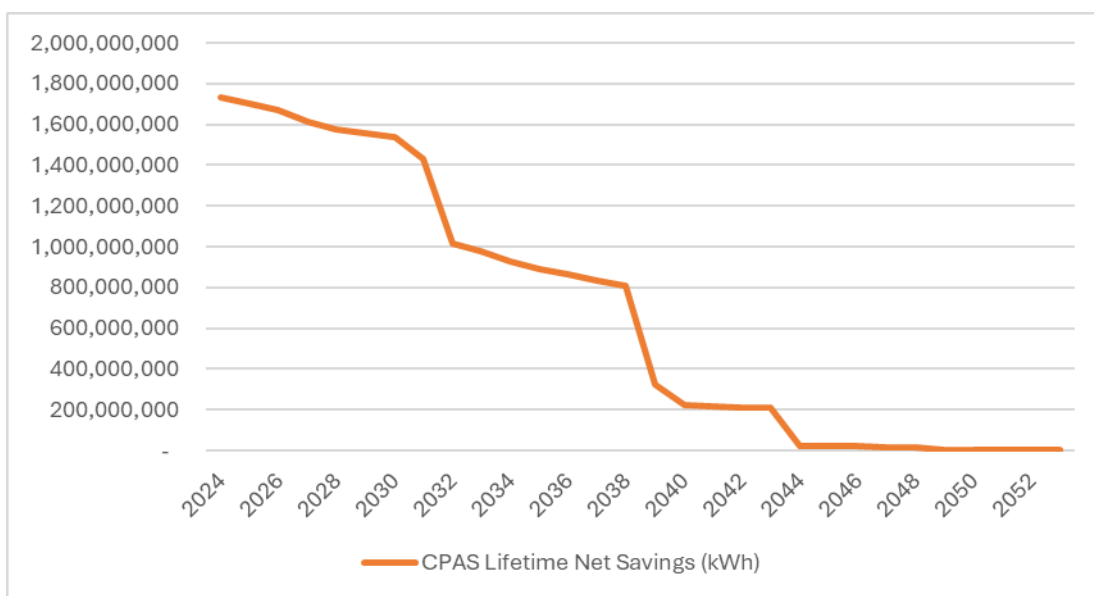
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<sup>24</sup> COBRA assumes that the incidences of premature mortality attributed to pollution exposure occurs over a 20 year period following exposure. COBRA currently assumes that 30% of premature deaths occur in the first year, 50% of deaths occur 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](https://www.epa.gov/sites/production/files/2020-06/documents/cobra_user_manual_june_2020.pdf).

<sup>25</sup> In the case of analysis of emissions reductions in the year 2032, COBRA models the associated reductions in morbidity and mortality that can be expected to occur over a 20 year period between 2032 and 2051. This 20 year stream of health benefits is then discounted back to the analysis year, which in this case is 2032.

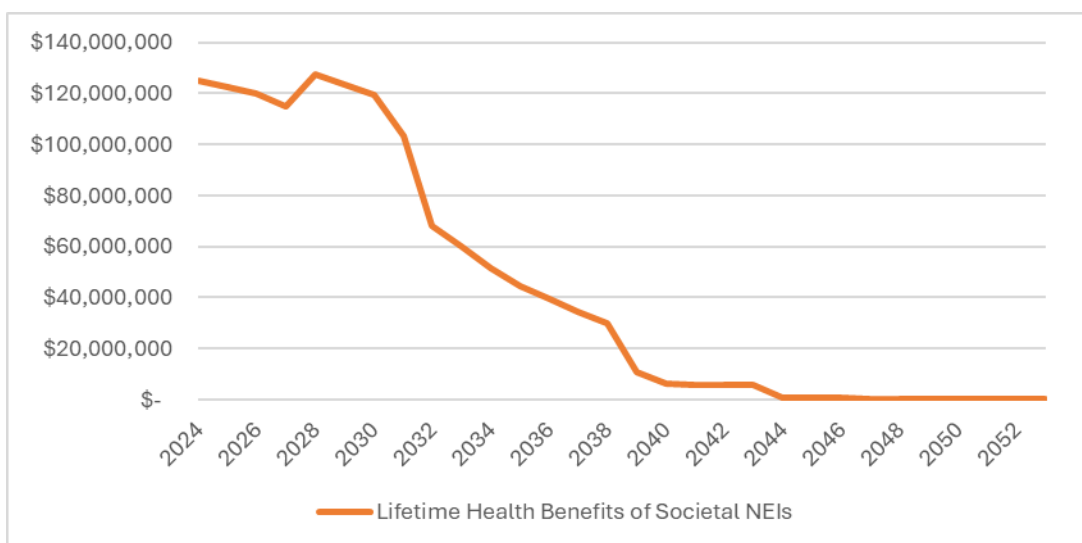
<sup>26</sup> IL SAG. Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 12.0. <https://www.ilsag.info/wp-content/uploads/IL-TRM-Version-12.0-Volumes-1-4-Compiled-Final.pdf>.

**Figure 3. ComEd CY2024 Electric CPAS Estimates: 2024-2053**



Source: ComEd Summary Impact Evaluation Report, CY2024 CPAS Electric.

**Figure 4. ComEd CY2024 Societal NEI Estimates: 2024-2053**



Source: Guidehouse analysis of ComEd CY2024 verified program savings.

Table 1 presents the final societal health benefits estimates for ComEd's CY2024 programs implemented between January 1, 2024 – December 31, 2024. Societal health benefits are discounted to the program year of interest (i.e., CY2024 total health benefits are presented in 2024 dollars).

**Table 1. Total Discounted Societal NEI Estimates, CY2024 Programs**

Program Year	CY2024 Verified Net Lifetime Savings (kWh)	\$Total Health Benefits	\$Total Health Benefits per kWh (Average)
<b>CY2024</b>	<b>20,460,960,697</b>	<b>\$1,322,476,188</b>	<b>\$0.0646</b>

Source: Guidehouse analysis of ComEd CY2024 verified program savings.

## Program-Level Societal NEI Estimates

Table 2 provides Societal NEI estimates for ComEd CY2024 programs, expressed in both absolute dollars and dollars per kWh. Note that program-level dollar per kWh values are levelized to each program's CPAS. Each table assumes that CY2024 savings begin in the program year of interest, and societal health benefit estimates are expressed in the program year's dollars. Societal NEI estimates for each year are then estimated using the annual approach highlighted in the Methodology section, discounted back to 2024, then summed. The result is a lifetime Societal NEI estimate expressed in 2024 dollars.

**Table 2. CY2024 Societal NEI Estimates by Program in 2024 Dollars**

Sector	Program	CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	Incentives	2,903,841,280	\$0.0638	\$185,336,499
Business & Public Sector	Small Business	2,821,464,864	\$0.0647	\$182,430,463
Business & Public Sector	Midstream/Upstream	2,739,376,500	\$0.0640	\$175,264,196
Business & Public Sector	Targeted Systems	738,403,456	\$0.0692	\$51,114,551
Business & Public Sector	Behavior Bus/Pub	320,889,755	\$0.0751	\$24,100,517
Business & Public Sector	New Construction - Bus/Pub	99,690,777	\$0.0591	\$5,888,412

Sector	Program	CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	EMS - Small Business - Pilot	932,516	\$0.0637	\$59,441
Res & IE	Retail/Online	5,014,446,357	\$0.0605	\$303,323,959
Res & IE	Product Distribution	2,192,667,999	\$0.0735	\$161,110,888
Res & IE	Contractor/Midstream Rebates	855,965,102	\$0.0652	\$55,822,811
Res & IE	Multifamily Upgrades	499,876,395	\$0.0598	\$29,887,791
Res & IE	Single-Family Upgrades	160,582,637	\$0.0645	\$10,355,483
Res & IE	New Construction - IE	113,376,311	\$0.0636	\$7,210,739
Res & IE	Whole Home Electric	102,671,841	\$0.0635	\$6,524,134
Res & IE	ASI kWh Purchase	16,291,033	\$0.0522	\$849,859
Res & IE	Electric Homes New Construction	22,961,656	\$0.0623	\$1,429,523
Res & IE	Behavior - Res/IE	358,650,175	\$0.0731	\$26,224,503
Voltage Optimization	Voltage Optimization	1,498,872,043	\$0.0637	\$95,542,419
<b>CY2024 Portfolio Total Electric Contribution to CPAS</b>		<b>20,460,960,697</b>	<b>\$0.0646</b>	<b>\$1,322,476,188</b>

Source: Guidehouse analysis of ComEd CY2024 verified program savings.

## Portfolio-Level Societal NEI Estimates

Table 3 highlights the annual portfolio-level Societal NEI estimates for 2024-2053. For new or redesigned energy efficiency programs, ComEd should estimate the new or redesigned programs' CPAS based on the new measure mix. This program-level CPAS should then be applied to annual portfolio-level benefit per kWh estimates provided in Table 3 to generate an annual Societal NEI estimate. ComEd should then take the summation of all years' estimates to generate a total Societal NEI estimate for the new or redesigned program.

**Table 3. CY2024 Annual Portfolio-Level Societal NEI Estimates in 2024 Dollars**

Year	Lifetime Health Benefits	Lifetime Health Benefits per kWh	CY2024 Verified Net Lifetime Savings (kWh)
2024	\$125,218,651	\$0.0724	1,730,229,988
2025	\$122,479,905	\$0.0721	1,699,631,100
2026	\$119,994,146	\$0.0718	1,672,255,737
2027	\$115,054,597	\$0.0714	1,610,440,770
2028	\$127,554,762	\$0.0809	1,575,932,882
2029	\$123,689,076	\$0.0794	1,558,478,265
2030	\$119,675,192	\$0.0778	1,538,241,803
2031	\$103,516,409	\$0.0722	1,433,382,288
2032	\$67,926,297	\$0.0667	1,018,582,805
2033	\$60,018,113	\$0.0612	980,559,279
2034	\$51,676,329	\$0.0558	926,546,883
2035	\$44,735,177	\$0.0504	887,961,310
2036	\$39,672,947	\$0.0459	865,165,364
2037	\$34,391,778	\$0.0414	831,413,840
2038	\$29,920,089	\$0.0369	810,430,071
2039	\$10,623,210	\$0.0325	326,545,643
2040	\$6,218,344	\$0.0281	221,042,777
2041	\$5,945,494	\$0.0274	217,093,719
2042	\$5,712,662	\$0.0267	214,332,272
2043	\$5,544,212	\$0.0259	213,907,628



Year	Lifetime Health Benefits	Lifetime Health Benefits per kWh	CY2024 Verified Net Lifetime Savings (kWh)
2044	\$556,789	\$0.0251	22,182,781
2045	\$540,797	\$0.0244	22,182,085
2046	\$520,906	\$0.0236	22,115,333
2047	\$342,694	\$0.0227	15,126,675
2048	\$330,186	\$0.0218	15,126,675
2049	\$133,770	\$0.0209	6,410,544
2050	\$128,587	\$0.0201	6,410,544
2051	\$123,445	\$0.0193	6,410,544
2052	\$118,343	\$0.0185	6,410,544
2053	\$113,282	\$0.0177	6,410,544
<b>Total Lifetime Health Benefits</b>	<b>\$1,322,476,188</b>	<b>\$0.0646</b>	<b>20,460,960,697</b>

Source: Guidehouse analysis of ComEd CY2024 verified program savings.

## Portfolio-Level Carbon Reduction Estimates

AVERT estimates CO<sub>2</sub> emission rates, but those estimates are not used in the COBRA analysis to determine health benefits. The following table presents the CO<sub>2</sub> reduction estimates for 2024-2053. The CO<sub>2</sub> reduction estimates are produced by AVERT and adjusted by Guidehouse's reduction factors described in *Estimation of Societal NEIs* section.

**Table 4. CY2024 Annual Portfolio-Level Carbon Reduction Estimates**

Year	CY2024 Verified Net Lifetime Savings (kWh)	CY2024 Carbon Reductions (Tons)	CY2024 Carbon Reductions (Tons/MWh)
2024	1,730,229,988	1,179,295	0.6816
2025	1,699,631,100	1,158,446	0.6816

Year	CY2024 Verified Net Lifetime Savings (kWh)	CY2024 Carbon Reductions (Tons)	CY2024 Carbon Reductions (Tons/MWh)
2026	1,672,255,737	1,139,793	0.6816
2027	1,610,440,770	1,097,654	0.6816
2028	1,575,932,882	941,037	0.5971
2029	1,558,478,265	798,999	0.5127
2030	1,538,241,803	658,720	0.4282
2031	1,433,382,288	594,456	0.4147
2032	1,018,582,805	408,805	0.4013
2033	980,559,279	380,371	0.3879
2034	926,546,883	346,911	0.3744
2035	887,961,310	320,540	0.3610
2036	865,165,364	308,832	0.3570
2037	831,413,840	293,384	0.3529
2038	810,430,071	282,723	0.3489
2039	326,545,643	112,632	0.3449
2040	221,042,777	75,343	0.3409
2041	217,093,719	73,878	0.3403
2042	214,332,272	72,821	0.3398
2043	213,907,628	72,560	0.3392
2044	22,182,781	7,508	0.3385
2045	22,182,085	7,496	0.3379
2046	22,115,333	7,424	0.3357

Year	CY2024 Verified Net Lifetime Savings (kWh)	CY2024 Carbon Reductions (Tons)	CY2024 Carbon Reductions (Tons/MWh)
2047	15,126,675	5,044	0.3334
2048	15,126,675	5,010	0.3312
2049	6,410,544	2,108	0.3289
2050	6,410,544	2,094	0.3266
2051	6,410,544	2,080	0.3244
2052	6,410,544	2,065	0.3221
2053	6,410,544	2,051	0.3199
<b>Total Lifetime Carbon Reduction</b>	<b>20,460,960,697</b>	<b>10,360,079</b>	<b>0.5063</b>

Source: Guidehouse analysis of ComEd CY2024 verified program savings.

## Appendix

Table 5 provides Societal NEI estimates for ComEd CY2024 compared to CY2023 programs, expressed in both absolute dollars and dollars per kWh. This is to show the difference in health benefits from the updates that have occurred in COBRA, as stated in Section 4.1. The EPA updated COBRA which now includes the health impacts of ozone which were not included in COBRA estimates when it was used for CY2023 analysis, PM<sub>2.5</sub>, were the only health impact functions that were included. Table 5 results were included in the CY2024 cost effectiveness analysis.

**Table 5. CY2024 vs CY2023 Societal NEI Estimates by Program - PM<sub>2.5</sub> and Ozone Health Impact**

Sector	Program	2024			2023		
		CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits	CY2023 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	Incentives	2,903,841,280	\$0.0638	\$185,336,499	2,716,726,762	\$0.0301	\$81,828,582
Business & Public Sector	Small Business	2,821,464,864	\$0.0647	\$182,430,463	2,902,350,098	\$0.0312	\$90,558,296
Business & Public Sector	Midstream/Upstream	2,739,376,500	\$0.0640	\$175,264,196	1,566,918,012	\$0.0308	\$48,305,598
Business & Public Sector	Targeted Systems	738,403,456	\$0.0692	\$51,114,551	617,059,570	\$0.0329	\$20,313,344
Business & Public Sector	Behavior Bus/Pub	320,889,755	\$0.0751	\$24,100,517	288,553,690	\$0.0339	\$9,785,799
Business & Public Sector	New Construction - Bus/Pub	99,690,777	\$0.0591	\$5,888,412	181,696,446	\$0.0282	\$5,118,830
Business & Public Sector	EMS - Small Business - Pilot	932,516	\$0.0637	\$59,441	-	-	-
Business & Public Sector	Assessments	-	-	-	8,316,215	\$0.0337	\$280,164
Res & IE	Retail/Online	5,014,446,357	\$0.0605	\$303,323,959	2,144,085,171	\$0.0303	\$65,004,199
Res & IE	Product Distribution	2,192,667,999	\$0.0735	\$161,110,888	2,415,609,366	\$0.0331	\$80,057,282
Res & IE	Multifamily Upgrades	499,876,395	\$0.0598	\$29,887,791	426,798,392	\$0.0292	\$12,460,496
Res & IE	Contractor/Midstream Rebates	855,965,102	\$0.0652	\$55,822,811	171,214,859	\$0.0301	\$5,146,918
Res & IE	Single-Family Upgrades	160,582,637	\$0.0645	\$10,355,483	129,227,661	\$0.0306	\$3,957,904
Res & IE	New Construction - IE	113,376,311	\$0.0636	\$7,210,739	17,520,340	\$0.0291	\$510,440
Res & IE	Whole Home Electric	102,671,841	\$0.0635	\$6,524,134	-	-	-
Res & IE	ASI kWh Purchase	16,291,033	\$0.0522	\$849,859	15,115,464	\$0.0264	\$398,431

Sector	Program	2024			2023		
		CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits	CY2023 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Res & IE	Electric Homes New Construction	22,961,656	\$0.0623	\$1,429,523	4,541,660	\$0.0299	\$135,705
Res & IE	Behavior - Res/IE	358,650,175	\$0.0731	\$26,224,503	291,987,668	\$0.0337	\$9,845,075
Pilot	Industrial Energy Management Information Systems	-	-	-	6,746,976	\$0.0336	\$226,854
Pilot	Heat Pump Water Heater Pilot	-	-	-	306,544	\$0.0303	\$9,281
Market Transformation	ENERGY STAR Retail Products Platform	-	-	-	137,797,829	\$0.0308	\$4,240,879
Voltage Optimization	Voltage Optimization	1,498,872,043	\$0.0637	\$95,542,419	1,034,874,812	\$0.0303	\$31,330,740
<b>Portfolio Total Electric Contribution to CPAS</b>		<b>20,460,960,697</b>	<b>\$0.0646</b>	<b>\$1,322,476,188</b>	<b>15,077,447,533</b>	<b>\$0.0311</b>	<b>\$469,514,818</b>

Source: Guidehouse analysis of ComEd CY2024 and CY2023 verified program savings.

In Table 6, we show the difference in health benefits for the purpose of comparing the PM<sub>2.5</sub> only health impact considered in the societal evaluation for CY2024 against CY2023. The 2024 COBRA update included additional health incidents (Hospital Admissions related to Alzheimer's and Parkinson's Disease, Stroke and Lung Cancer, Hay Fever/Rhinitis) which resulted in higher CY2024 total health benefits compare to CY2023.

**Table 6. CY2024 vs CY2023 Societal NEI Estimates by Program - PM<sub>2.5</sub> Health Impact**

Sector	Program	2024			2023		
		CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits	CY2023 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	Incentives	2,903,841,280	\$0.0468	\$135,969,017	2,716,726,762	\$0.0301	\$81,828,582
Business & Public Sector	Small Business	2,821,464,864	\$0.0474	\$133,773,171	2,902,350,098	\$0.0312	\$90,558,296
Business & Public Sector	Midstream/Upstream	2,739,376,500	\$0.0470	\$128,831,599	1,566,918,012	\$0.0308	\$48,305,598
Business & Public Sector	Targeted Systems	738,403,456	\$0.0503	\$37,157,848	617,059,570	\$0.0329	\$20,313,344
Business & Public Sector	Behavior Bus/Pub	320,889,755	\$0.0541	\$17,352,191	288,553,690	\$0.0339	\$9,785,799
Business & Public Sector	New Construction - Bus/Pub	99,690,777	\$0.0434	\$4,326,924	181,696,446	\$0.0282	\$5,118,830

Sector	Program	2024			2023		
		CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits	CY2023 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	EMS - Small Business - Pilot	932,516	\$0.0469	\$43,731	-	-	-
Business & Public Sector	Assessments	-	-	-	8,316,215	\$0.0337	\$280,164
Res & IE	Retail/Online	5,014,446,357	\$0.0441	\$221,364,942	2,144,085,171	\$0.0303	\$65,004,199
Res & IE	Product Distribution	2,192,667,999	\$0.0531	\$116,354,717	2,415,609,366	\$0.0331	\$80,057,282
Res & IE	Multifamily Upgrades	499,876,395	\$0.0436	\$21,803,905	426,798,392	\$0.0292	\$12,460,496
Res & IE	Contractor/Midstream Rebates	855,965,102	\$0.0477	\$40,797,896	171,214,859	\$0.0301	\$5,146,918
Res & IE	Single-Family Upgrades	160,582,637	\$0.0468	\$7,511,630	129,227,661	\$0.0306	\$3,957,904
Res & IE	New Construction - IE	113,376,311	\$0.0467	\$5,299,395	17,520,340	\$0.0291	\$510,440
Res & IE	Whole Home Electric	102,671,841	\$0.0466	\$4,782,319	-	-	-
Res & IE	ASI kWh Purchase	16,291,033	\$0.0382	\$622,072	15,115,464	\$0.0264	\$398,431
Res & IE	Electric Homes New Construction	22,961,656	\$0.0458	\$1,050,921	4,541,660	\$0.0299	\$135,705
Res & IE	Behavior - Res/IE	358,650,175	\$0.0526	\$18,879,080	291,987,668	\$0.0337	\$9,845,075
Pilot	Industrial Energy Management Information Systems	-	-	-	6,746,976	\$0.0336	\$226,854
Pilot	Heat Pump Water Heater Pilot	-	-	-	306,544	\$0.0303	\$9,281
Market Transformation	ENERGY STAR Retail Products Platform	-	-	-	137,797,829	\$0.0308	\$4,240,879
Voltage Optimization	Voltage Optimization	1,498,872,043	\$0.0469	\$70,290,256	1,034,874,812	\$0.0303	\$31,330,740
<b>Portfolio Total Electric Contribution to CPAS</b>		<b>20,460,960,697</b>	<b>\$0.0472</b>	<b>\$966,211,613</b>	<b>15,077,447,533</b>	<b>\$0.0311</b>	<b>\$469,514,818</b>

Source: Guidehouse analysis of ComEd CY2024 and CY2023 verified program savings.

In Table 7 provides Societal NEI estimates for ComEd CY2024 Income Eligible (IE) programs, expressed in absolute dollars and dollars per kWh.

**Table 7. CY2024 Societal NEI Estimates by IE Program in 2024 Dollars**

Sector	Program	CY2024 Verified Net Lifetime Savings (kWh)	\$ Health Benefits per kWh	\$ Total Health Benefits
Business & Public Sector	Midstream/Upstream	32,281,289	\$0.0637	\$2,057,702
Income Eligible	Product Distribution	2,159,521,000	\$0.0736	\$158,874,567
Income Eligible	Retail/Online	2,320,197,104	\$0.0651	\$151,025,342
Income Eligible	Multifamily Upgrades	451,856,200	\$0.0582	\$26,304,172
Income Eligible	Single-Family Upgrades	153,954,436	\$0.0642	\$9,886,487
Income Eligible	New Construction - IE	113,376,311	\$0.0636	\$7,210,739
Income Eligible	Whole Home Electric	102,671,841	\$0.0635	\$6,524,134
Income Eligible	Contractor/Midstream Rebates	59,733,951	\$0.0651	\$3,888,455
<b>CY2024 IE Total Electric Contribution to CPAS</b>		<b>5,393,592,132</b>	<b>\$0.0678</b>	<b>\$365,771,598</b>