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Pairing energy benefits with non-energy impacts in ComEd's cost-effectiveness tests

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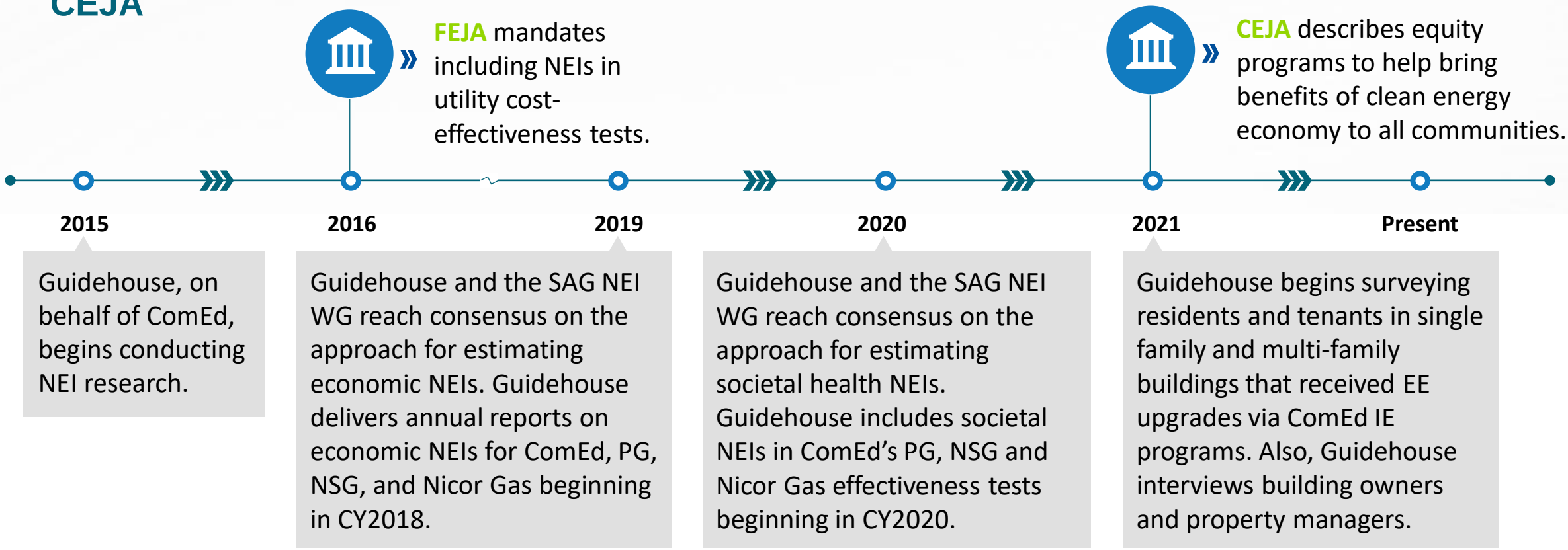
October 20th, 2022

Agenda

- Background on Illinois Non-Energy Impacts research and including NEIs in cost effectiveness tests
- Preliminary findings for income qualified multi-family participant NEI research with building owners and managers
- Residential participant NEI update – single family and multi-family
- NEI research next steps
- Q&A

CEJA specifies that utilities include societal and participant NEIs in cost-effectiveness tests and report economic NEIs

"….the societal value of reduced carbon emissions and surface-level pollutants, particularly in EJ communities" Also – "job impact and other macroeconomic impacts" CEJA



Non-energy impacts – what are we talking about?

Societal – Health
"Cleaner outside air"

Societal – Economic
"Jobs"

Participant
"Improved health and productivity"

Non-Energy Impacts are categorized into three buckets

NEIs associated with EE Portfolio

Societal Health

- ✓ Public health impacts from improved air quality because of reduced emissions associated with energy efficiency programs

Societal Economic

- ✓ Jobs created and other economic impacts of EE programs

NEIs associated with Comprehensive Income Eligible Programs

Participant

- ✓ Reduced medical costs associated with asthma, arthritis, and thermal stress from improvements to air sealing, insulation and HVAC
- ✓ Fewer missed days of work
- ✓ Less reliance on loans for household necessities
- ✓ Reduced O&M costs for multifamily buildings

Total Resource Cost

The equation used to calculate the Illinois TRC is presented below:

Equation 1. Illinois TRC

$$BCR_{ILTRC} = B_{ILTRC} / C_{ILTRC}$$

Where,

BCR_{ILTRC}	=	Benefit-cost ratio of the Illinois total resource cost test
B_{ILTRC}	=	Present value of benefits of an Illinois program or portfolio
C_{ILTRC}	=	Present value of costs of an Illinois program or portfolio

The benefits of the Illinois TRC are calculated using the following equation:

Equation 2. Illinois TRC Benefits

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

Where benefits are defined as:

UAEPt	=	Utility avoided electric and capacity production costs in year t
UATDt	=	Utility avoided transmission and distribution costs in year t
UAAt	=	Utility avoided ancillary costs in year t
EBt	=	Environmental Benefits in year t
UACat	=	Utility avoided supply costs for the alternate fuel in year t
PACat	=	Participant avoided costs in year t for alternate fuel devices
RC	=	NPV of replacement costs of incandescent equivalents
NPV SNEI	=	Net present value of program-specific societal non-energy impacts

The costs of the Illinois TRC are calculated using the following equation:

Equation 3. Illinois TRC Costs

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

And costs are defined as:

PNICt	=	Program Non-Incentive costs in year t
IMCNt	=	Net Incremental costs in year t
UICt	=	Utility increased supply costs in year t

And:

d	=	Societal discount rate

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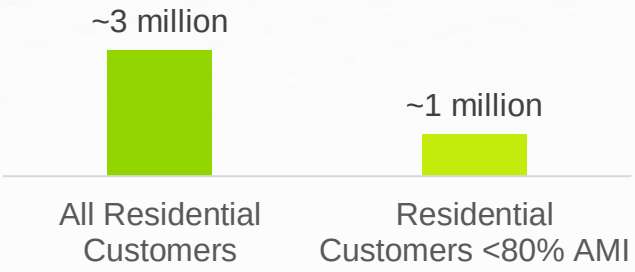
Participant NEI Research Update

ComEd IE programs serve vulnerable communities

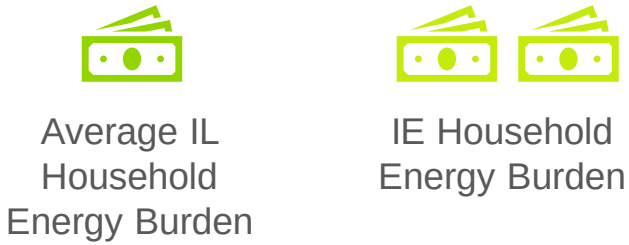
Participant

Number of IE customers
(Commonwealth Edison Company, 2020)



Chicago's single family housing stock
(Chicago Bungalow Association, 2021)

Disproportionate Electricity Burden
(Gazze, 2019)



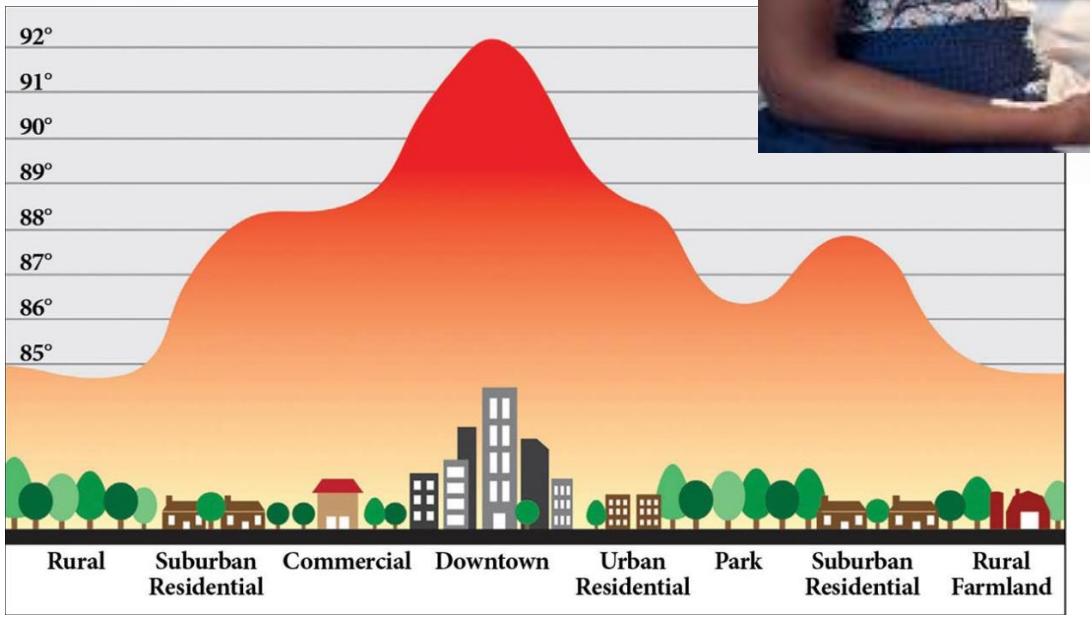
Since the Future Energy Jobs Act passed in 2016, ComEd and other Illinois utilities (rather than the IL DCEO) provide weatherization and whole house EE improvements for income eligible households in single family and multi-family homes.

ComEd's comprehensive income eligible EE programs address health and productivity issues as well as increase energy efficiency of homes.

Certain environmental factors disproportionately affect vulnerable households in ComEd's service territory

Participant

- Hotter summer temperatures in Chicago than surrounding areas due to urban heat island effect can cause heat stress.
- Living in a large city can make asthma symptoms worse for children in income eligible households (Keet, 2017).
- Chicago has 10+ code orange and code red air quality days every year – predominantly from ground-level ozone. Power plants are one source of ground level ozone (Ruppenthal, 2019).



Methodology: Guidehouse is researching participant NEIs in ComEd's comprehensive IE programs

Participant

Energy Savings for Single-Family Homeowners

Multi-Family Energy Upgrades

Energy Savings for Public Housing Authorities

Home energy upgrades include:

Single Family

- HVAC system upgrades and replacements
- Energy efficient room air conditioners and refrigerators
- Smart thermostats and advanced power strips
- Energy efficient water heaters
- Low-flow faucet aerators
- Boiler replacement and tune ups
- Steam trap testing, repair and replacement
- Variable speed motor drives
- Air sealing and insulation
- Health and safety measures necessary to make the energy upgrades

Multifamily

Through our IE participant surveys (pre- and post-energy upgrades), we anticipate certain NEIs and resulting monetary impacts

Participant




Anticipated NEIs	Anticipated Monetary Impacts
Reduced asthma symptoms Reduced arthritis symptoms Reduced heat or cold-related illnesses	Reduced need for asthma and arthritis-related medical visits and rescue inhaler use
Fewer missed days at work	Increased ability to afford prescriptions and other essentials

Monetizing Participant Health NEIs

Northern Illinois hospital data is used to convert health benefits from EE programs to monetary benefits

Multi-family building owners and property manager interview research results

Improvements in building resiliency and reduced tenant complaints

Building Resiliency

Our analysis of the pre- and post-interviews determined that after energy efficiency upgrades in CY2021, building owners and property managers reported:

- 20% **reduction** in major repairs for damaged walls/roofs,
- 10% **reduction** in minor repairs for damaged walls/roofs, and
- 20% **reduction** in water damage to apartments.

Tenant Complaints

From our analysis of tenant complaints, we found:

- 50% **reduction** in complaints of apartments being hot,
- 10% **increase** in complaints of apartments being cold,
- the greatest significant difference for the decrease in tenant complaints about pests,
- the second greatest significant difference for the decrease in tenant complaints about heat stress,
- a minor significant difference for the decrease in tenant complaints about mold, and
- the smallest significant difference for the decrease in tenant complaints about cold stress.

Participant

IE Single Family participant NEI survey results to-date

In 1+ years of data collection, respondents reported cases of asthma, arthritis, and thermal stress (n=170 completed surveys)

32 households with asthma

44 adults **5** children

61%

of households used an emergency inhaler at least once in the last year

82 households with arthritis

103 adults **0** children

68%

of households with arthritis went to urgent care or their doctor at least once in the last year

7

households sought medical treatment for heat stress

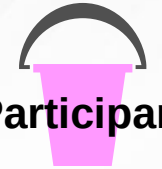
8

households sought medical treatment for cold stress

42-74% of households struggled to pay energy bills, their mortgage, medical expenses, or food expenses over the past 12 months

- IE Single Family pre-surveys began May 2021.
- IE Single Family post-surveys began May 2022, preliminary data not yet available.
- IE Multi-Family pre-surveys began July 2022.

ComEd NEI research next steps



Single Family Surveys

Guidehouse will continue collecting pre- and post-survey data until quotas are reached, anticipated in CY2023.

Multi-Family Surveys

Guidehouse will continue collecting pre- and post-survey data until quotas are reached, anticipated in CY2024.

Multi-Family Interviews

Guidehouse will continue collecting data from building owners and property managers to monetize NEIs.

Annual Calculation

Guidehouse estimates societal health NEIs to include in annual cost-effectiveness test report due June 28.

Annual Calculation

Guidehouse estimates economic NEIs for annual report due April 30.

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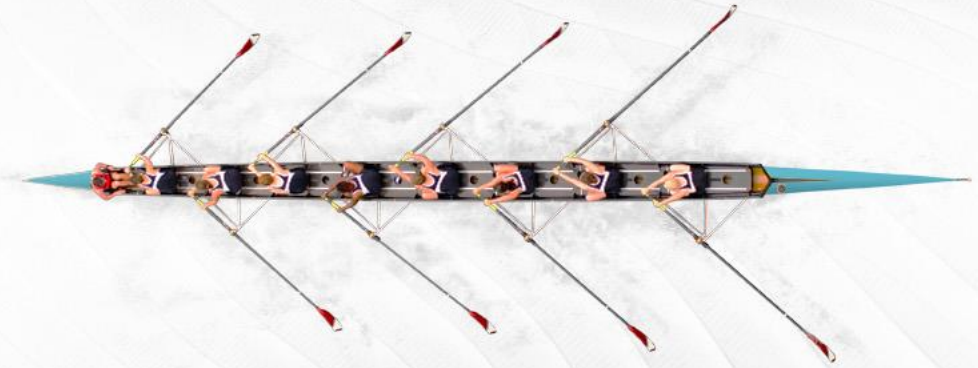

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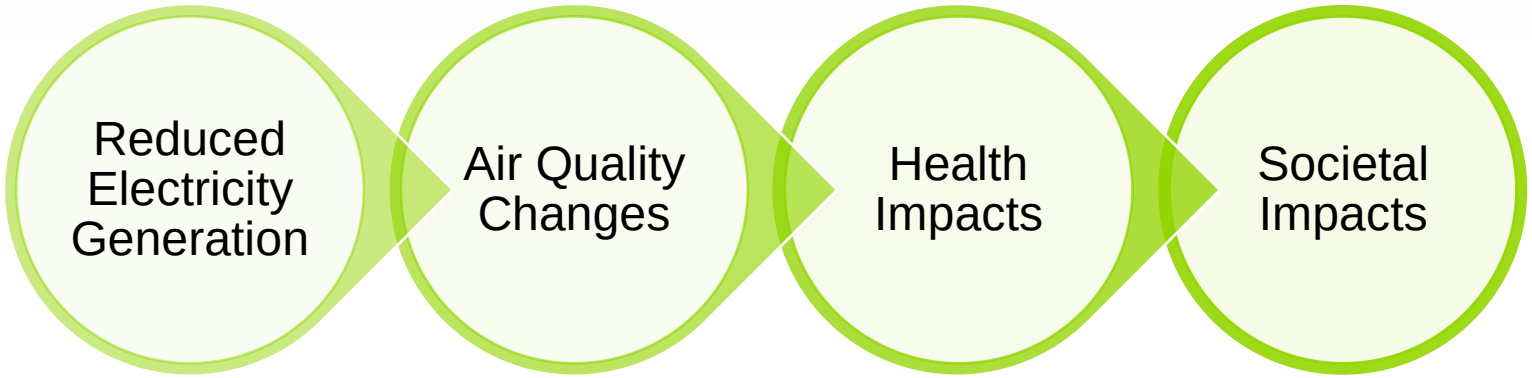
Appendix

Societal Health

Cleaner air promotes societal health NEIs

EE programs reduce fossil fuel generated electricity, which in turn reduces regional air emissions and improves societal health

- Different than indoor air quality, which improves participant health
- Fine Particulate Matter (PM2.5) and ground level ozone has been linked to a variety of health problems



Methodology: we used EPA tools AVERT and COBRA to calculate ComEd's societal health impacts annually

Societal Health

Portfolio-Level Annual Savings

AVERT AVoided Emissions and geneRation Tool www.epa.gov/avert

Co-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool

Discount Impacts to CY2021

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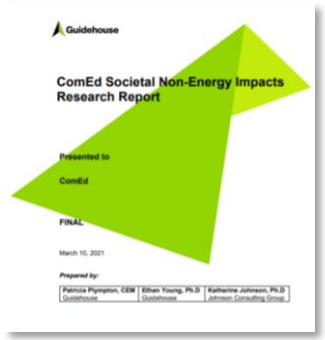
Total Discounted Societal NEI Estimates



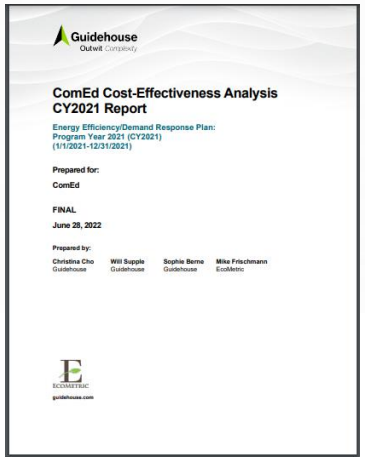
The ComEd Societal Non-Energy Impacts Research Report with detailed methodology is available on the Illinois Energy Efficiency Stakeholder Advisory Group website www.ilsag.info.

Societal NEI Findings: Health Benefits of Cleaner Air

Energy efficiency programs reduce fossil fuel generated electricity, which reduces regional air emissions and improves societal health.

TRC Values: a sample of ComEd programs' 2021 TRC values with and without societal NEIs

Program	TRC (w/o societal NEIs)	TRC (with societal NEIs)
Business Instant Discounts	4	6
Strategic Energy Management	2.5	5
Affordable Housing New Construction	0.8	1.2
Income Eligible - Multifamily	0.84	1.07
Income Eligible -Single-Family	0.76	0.95
Portfolio Total	**2.6**	**3.9**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ComEd Cost-Effectiveness Analysis
CY2021 Report

Energy Efficiency/Demand Response Plan:
Program Year 2021 (CY2021)
(1/1/2021-12/31/2021)

Prepared for:
ComEd

FINAL
June 28, 2022

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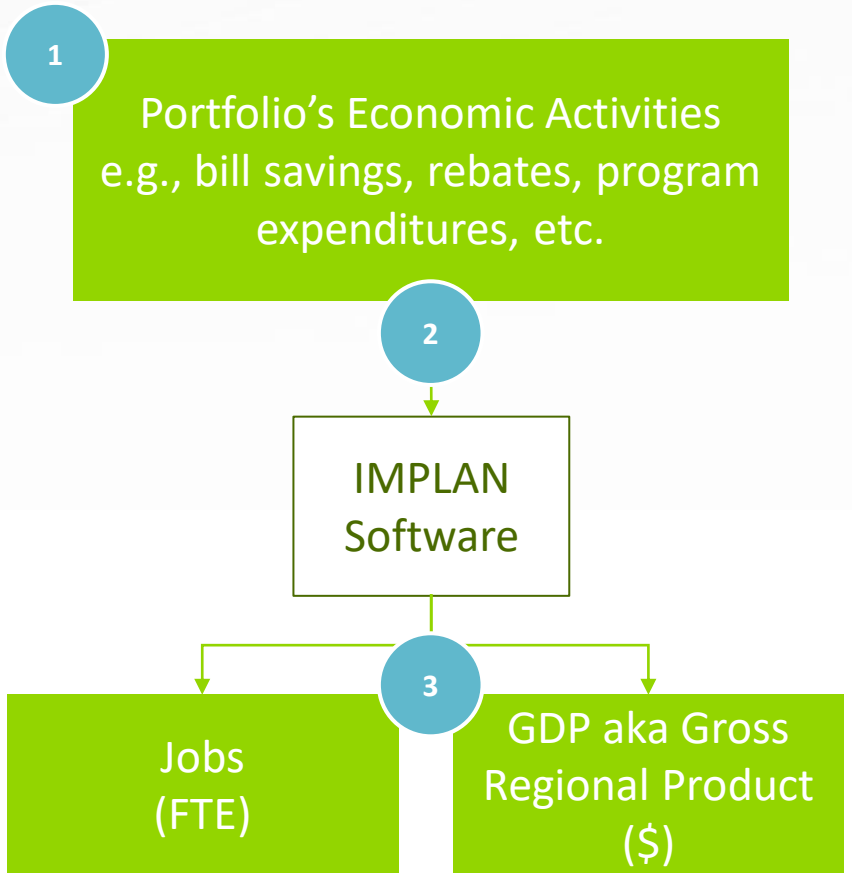
The 2021 ComEd Cost-Effectiveness Analysis Report is available at www.ilsag.info.

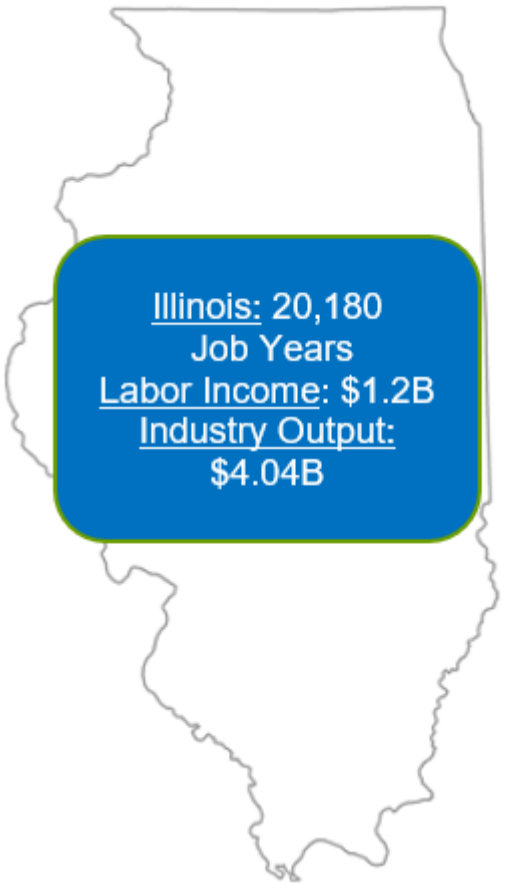
Societal NEI Methodology: Guidehouse uses IMPLAN software to model societal economic NEIs

Societal Economic

Three Step Process:

1. **Input Data** – Economic activities of EE programs
2. **Economic Modeling** – IMPLAN Software
3. **Analyze Outputs** – Jobs and Economic Stimulus





Economic NEI Findings: Job Creation

Societal
Economic

Energy efficiency programs shift from capital-intensive industries and imported commodities to labor-intensive industries.

20,000 job years created from 2021 EE programs with $1.2B in labor income

$4 billion lifetime economic output from 2021 EE programs

The ComEd 2021 Economic Non-Energy Impact Memo with detailed methodology is available on the Illinois Energy Efficiency Stakeholder Advisory Group website www.ilsag.info

Key takeaways when considering NEIs in cost-effectiveness tests

Results from Guidehouse research to-date

Societal Health	Societal Economic	Participant
Guidehouse's methodology for ComEd can be easily applied for other utilities to include societal NEIs into cost-effectiveness tests EPA tools AVERT and COBRA are well-maintained and produce monetized values for societal health impacts using portfolio annual savings for inclusion in cost-effectiveness analyses.	**Energy efficiency programs create jobs** Using IMPLAN, utilities can estimate the economic impacts from their EE portfolios.	**Collecting data from participants at the time of weatherization or HVAC upgrade is time intensive** Guidehouse research represents the value of NEIs in communities where household incomes are at or below 80% of Area Median Income. Our findings support increasing the scope of equity-focused energy efficiency programs. Guidehouse's methodology for ComEd can be applied to other utilities to include participant NEIs into cost-effectiveness tests.