

# IL EE SAG NON-ENERGY IMPACTS WORKING GROUP

Quantifying and Monetizing NEIs in Illinois: Research Update

July 15<sup>th</sup>, 2020



# Overview – Types of NEIs



Societal: reduced public citizens' health impacts from reduced emissions from fossil-fuel generation



Participant: benefits accruing to participants i.e., reduced household members' health impacts like asthma and thermal stress due to air sealing and weatherization



Utility: reduced utility costs from reduced arrearages, disconnections, reconnections, etc.

# Ameren Illinois NEIs Research Update

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Research Activity	Status	Next Steps
Societal NEIs	<ul style="list-style-type: none"><li>Finalizing approach and beginning analysis</li></ul>	<ul style="list-style-type: none"><li>Review results and share with AIC, stakeholders</li></ul>
Income Qualified Participant NEIs	<ul style="list-style-type: none"><li>Preparing for cognitive pretest with small sample of customers</li></ul>	<ul style="list-style-type: none"><li>Review cognitive pretest results—late summer 2020</li><li>Revisit timelines and sampling—when program activity in customer homes resumes</li></ul>
Commercial Participant NEIs	<ul style="list-style-type: none"><li>Preparing short screening questions for use in 2020 evaluation surveys</li></ul>	<ul style="list-style-type: none"><li>Finalize instruments and field surveys by fall 2020</li></ul>
Utility NEIs	<ul style="list-style-type: none"><li>Submitted data request supporting arrearage and other analyses to AIC</li></ul>	<ul style="list-style-type: none"><li>Review data and begin analysis (fall 2020, anticipated)</li></ul>

# PARTICIPANT AND UTILITY NEI RESEARCH UPDATE



# ComEd Participant NEI Research



Participant surveys will begin when ComEd resumes implementation of IE Multi-Family Retrofits and Single Family Retrofits Programs.

Interviews with multi-family building owners and operators will begin when ComEd resumes implementation of IE Multi-Family Retrofits program.

We are developing screening questions for use in CY2020 evaluation surveys with ComEd business program participants.



# Monetizing Utility NEIs for IE Multi-Family Retrofits and Single Family Retrofits Programs

Working with several departments at ComEd to obtain data to quantify and monetize:

- Safety Related Emergency Calls
- IE Participation in Alternative Payment Programs
- Disconnections and Reconnections
- Customer calls, collections and notices

If data not available for some categories, use average values from secondary research.

Completed: ComEd's Carrying Cost of Arrearages is \$0.43

# ComEd SAG Presentation on NEIs and Cost Effectiveness

On June 16, ComEd presented to SAG on NEIs & Cost Effectiveness:

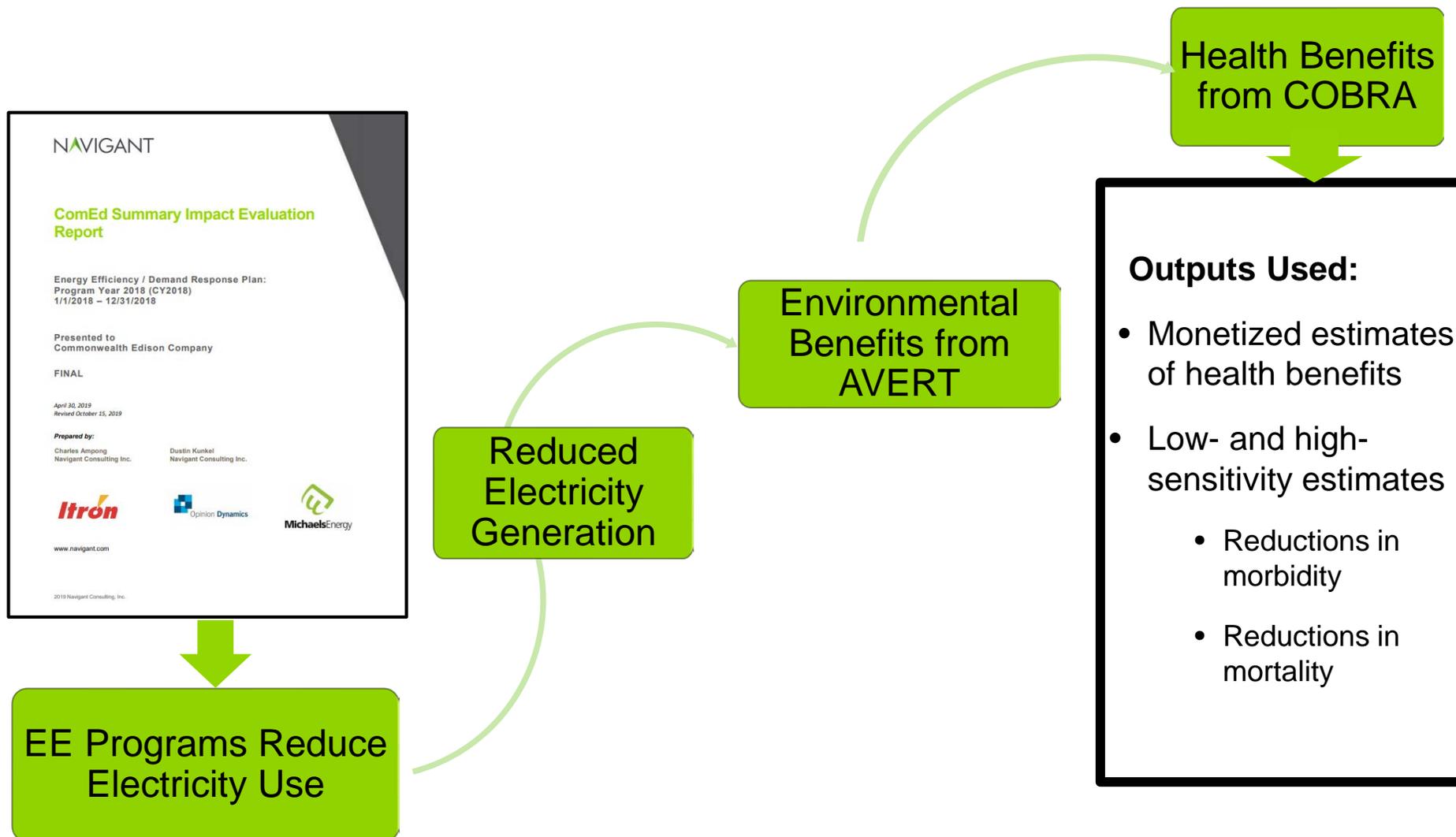
- Benefits must exceed costs on a lifetime basis for the EE portfolio (TRC>1.0).
- Total Benefits include avoided energy cost and quantifiable NEIs.
- NEIs can improve TRC cost-effectiveness, but
  - A measure must compete for program resources on the basis of the cost of energy saved (\$/kWh).
  - The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

[https://s3.amazonaws.com/ilsag/SAG\\_Presentation\\_ComEd\\_TRC\\_Inputs\\_6-16-2020.pdf](https://s3.amazonaws.com/ilsag/SAG_Presentation_ComEd_TRC_Inputs_6-16-2020.pdf)

# SOCIETAL NEI RESEARCH UPDATE



# METHODOLOGY FOR DEVELOPING SOCIETAL NEIS





# AMEREN ILLINOIS

## Societal NEI Research Update

# Societal NEI Research: Recap Key Goals

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- Opinion Dynamics is monetizing the societal health benefits associated with AIC's electric and gas energy efficiency portfolio
- Using peer-reviewed US EPA tools, we will model:
  - Emissions reductions ( $PM_{2.5}$ ,  $SO_2$ ,  $NO_x$ ,  $CO_2$ ,  $NH_3^*$ ,  $VOCs^*$ );
  - Air quality improvements (county-level  $PM_{2.5}$  concentrations);
  - Health benefits resulting from  $PM_{2.5}$  reductions (e.g., reduced asthma exacerbations, non-fatal heart attacks, etc.); and the
  - Dollar value of health benefits

\*Estimated for gas portfolio only, due to differences in emissions factors.

# Societal NEI Research: Customizing to Illinois

Customization Opportunity	Approach
Use discount rates consistent with cost-effectiveness testing*	<ul style="list-style-type: none"> <li>EPA is providing custom discount rate input files that teams will apply to reflect each utility's approach to TRC calculations</li> </ul>
Capture societal NEIs of natural gas programs*	<ul style="list-style-type: none"> <li>Estimate natural gas emissions reductions using emissions factor analysis</li> <li>Combine with emissions reductions due to electric energy efficiency and input to COBRA for health benefits modeling</li> </ul>
Capture future persisting savings (i.e., CPAS) in addition to first-year savings*	<ul style="list-style-type: none"> <li>Model savings from as many years of the CPAS trajectory as possible, within limits of EPA tools (e.g., first-year savings plus 4 additional years of the measure-life)</li> <li>Exploring added approaches to extend benefits timeline</li> </ul>
Report findings consistently with economic impact valuation	<ul style="list-style-type: none"> <li>Run models as-designed, for the entire US</li> <li>Report benefits affecting Illinois residents specifically</li> </ul>

\*Suggested by IL EE SAG NEI Working Group members in response to preliminary presentation in May 2020.

# Societal NEI Research: Additional Modeling Recommendations

Tool	Use	Model Inputs
US EPA AVERT v2.3	Model emissions reductions resulting from AIC 2018 and 2019 electric initiatives	<ul style="list-style-type: none"> <li>■ Analysis Region: Upper Midwest</li> <li>■ Baseline Year: 2018</li> <li>■ Load Reduction: Evaluated GWh EE savings (no adjustment to generation mix)</li> </ul>
US EPA National Emissions Inventory 2017 Emissions Factors	Model emissions reductions resulting from AIC 2018 and 2019 gas initiatives	<ul style="list-style-type: none"> <li>■ Apply sector-specific emissions factors for commercial and residential programs</li> <li>■ Apply factors to evaluated MMBtu savings</li> </ul>
US EPA COBRA v4.0	Model air quality improvements from gas and electric emissions reductions and subsequent health benefits	<ul style="list-style-type: none"> <li>■ Baseline year: 2016</li> <li>■ Discount rate: 2.22% for 2018 and 2019 programs, 2.38% for future programs</li> <li>■ Inputs: County-level emissions reductions from electric and gas programs</li> </ul>

# Societal NEI Research: Details of Gas Emissions Reductions

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1. Estimate total emissions avoided from evaluated gas savings using 2017 National Emissions Inventory (NEI) emissions factors
  - Separately quantify emissions reductions of residential and commercial initiatives using published sector-specific factors
  - <https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei>
2. Distribute savings to counties in AIC territory for health valuation
  - Option A (*Opinion Dynamics recommendation*): Distribute in proportion to US Census data—share of commercial sector employment (commercial) and share of homes using natural gas as primary heating fuel (residential)
  - Option B: Distribute equally across all counties
3. Combine with electric efficiency emissions reductions and input to COBRA

# Societal NEI Research: CPAS Methodology

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- Goal is to capture as much of the future CPAS savings as possible, to provide consistency with C-E testing and reduce under-counting
- EPA tools are designed to model short-run changes (5 years from baseline)
  - Because 2018 is most recent AVERT generation and emissions baseline--
    - AVERT can capture annual emissions reductions through 2022
    - COBRA captures health changes relative to a 2016 emissions, population, and health incidence baseline
- Run annual models (one per CPAS year) for up to five benefit years
- Sum model runs to estimate total health benefits and emissions reductions
  - 2018 program: 2018-2022 (5 years)
  - 2019 program: 2019-2022 (4 years)
- This captures more than first-year savings but omits benefits from “out-years” of CPAS trajectory

# COMED SOCIETAL NEI RESEARCH UPDATE



# ComEd Societal NEI Research Refinements

- Health benefits reflect program-level CPAS
- Health benefits for entire US and Illinois residents
- Discount rate revised to 2.38% per IL TRM v6

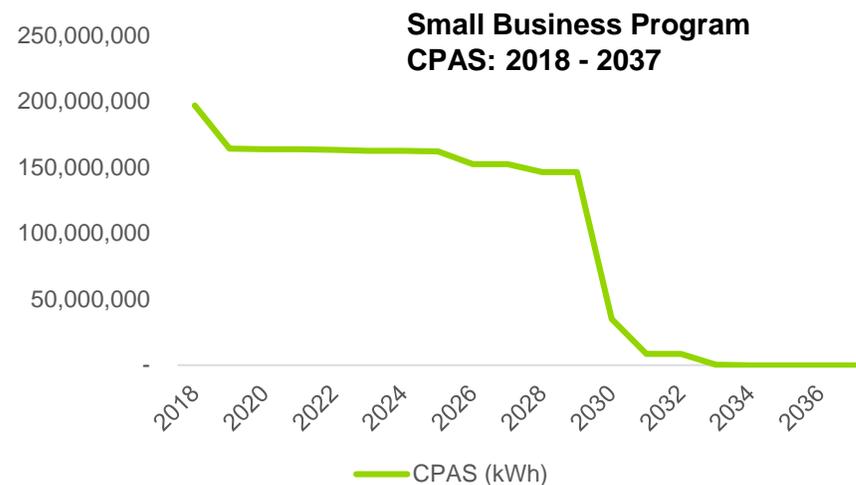
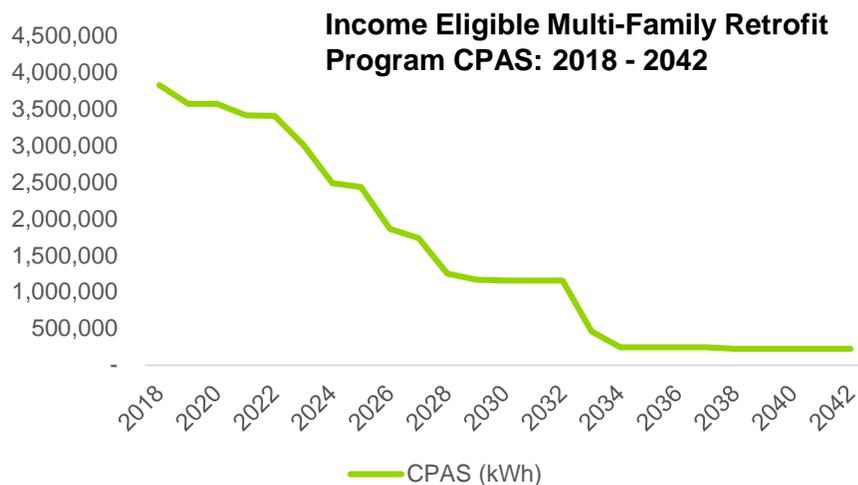


Source: <https://freespiritmedia.org/> Chicago skyline. Photo by Nicole Shih

# Societal NEIs using CPAS

Analysis expanded to estimate emissions impacts and health benefits associated with program-level CPAS.

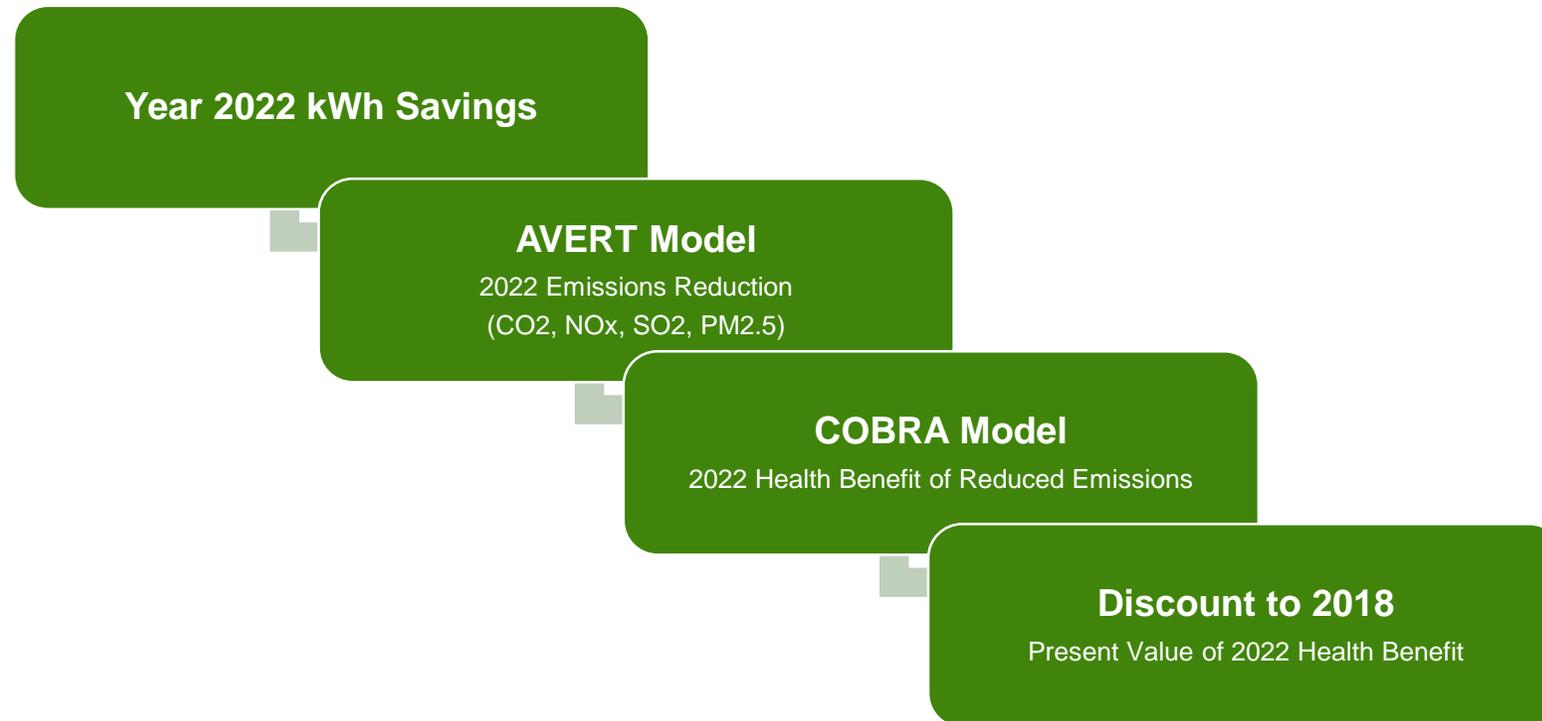
- Program-level CPAS vary in duration and magnitude depending on the measures implemented
- Programs with longer-persisting savings will realize health benefits over longer period of time



• Source: *Guidehouse Analysis*

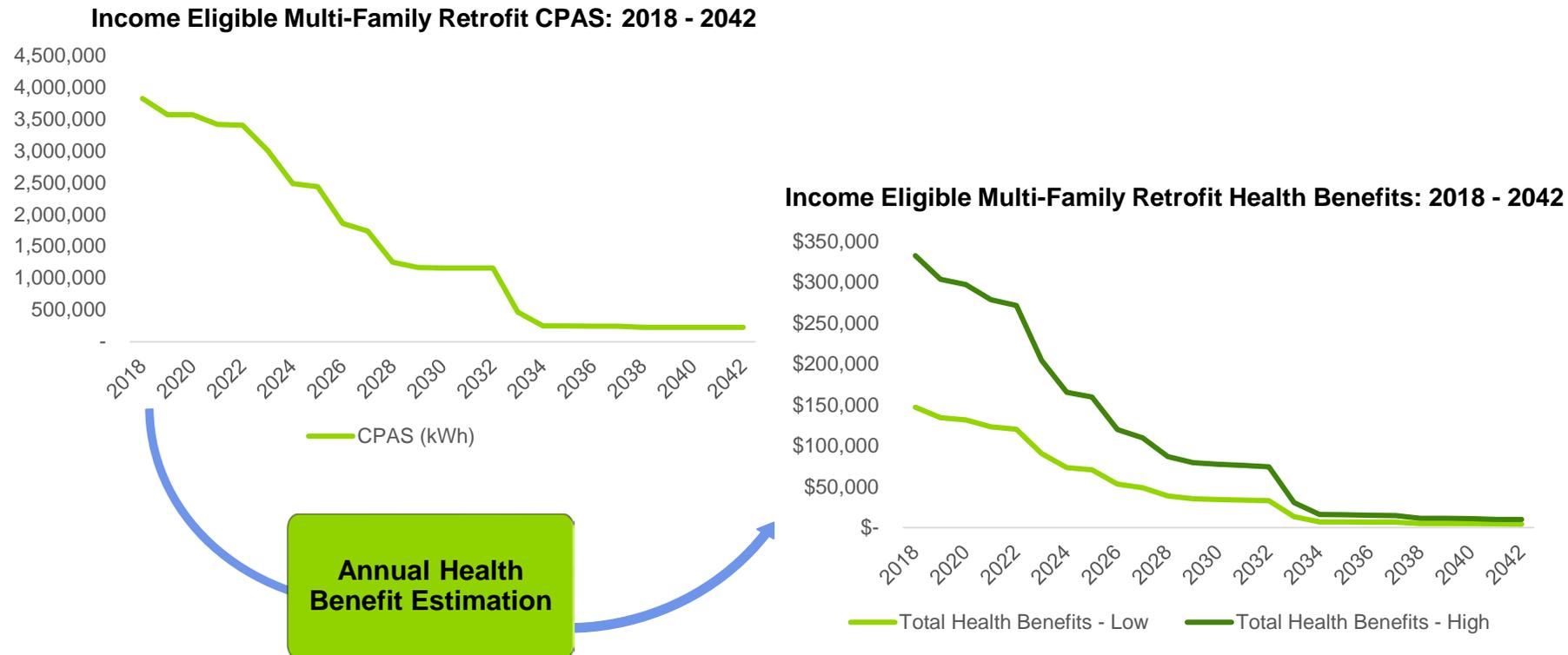
# Societal NEIs using CPAS

With the refined approach, Societal NEIs are estimated for each year from 2018 through 2043, for a total of 25 separate modeling runs.



# Societal NEIs using CPAS

- Program-level CPAS and health benefits follow similar curves over time, with health benefits persisting as long as program-level savings continue to be realized.
- Annual AVERT and COBRA estimation ensures health benefits are quantified for each year of CPAS and discounted appropriately.

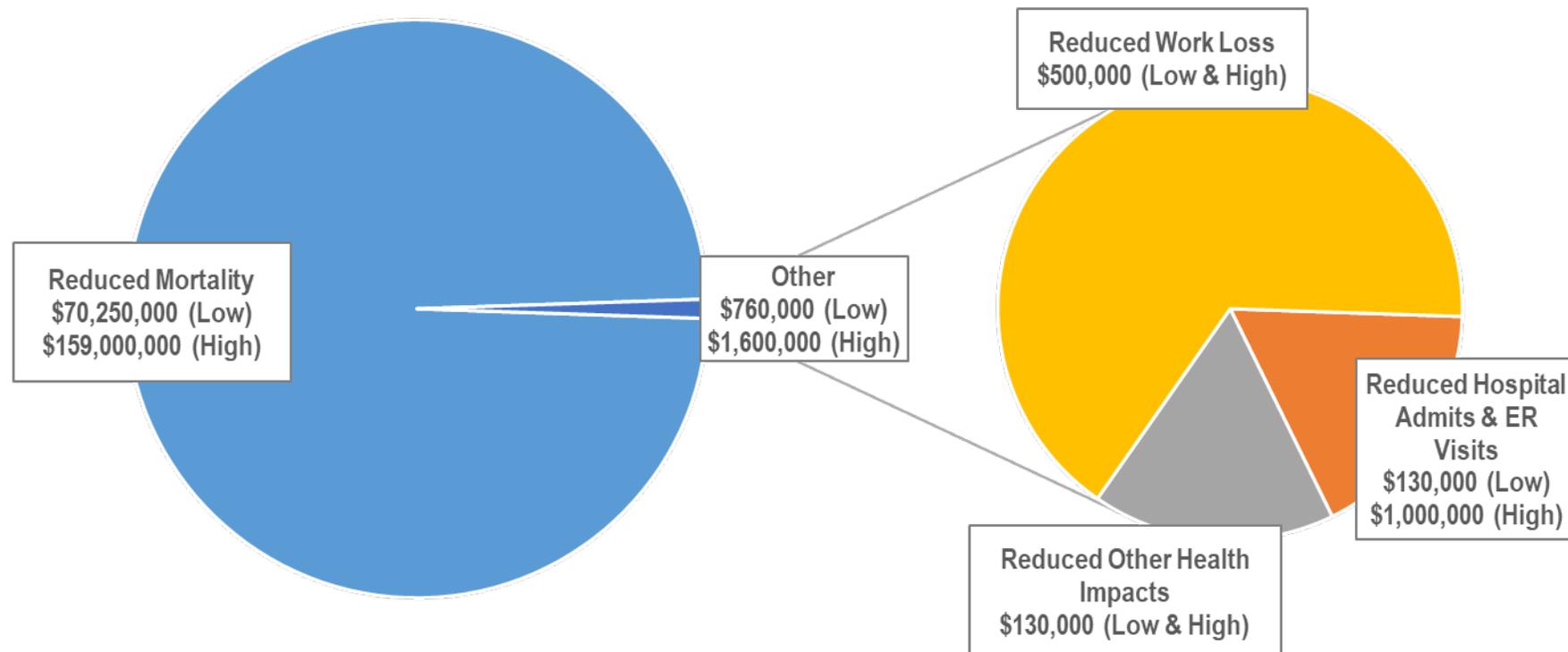


Source: Guidehouse Analysis

# Societal NEIs Estimates for Four ComEd Programs:

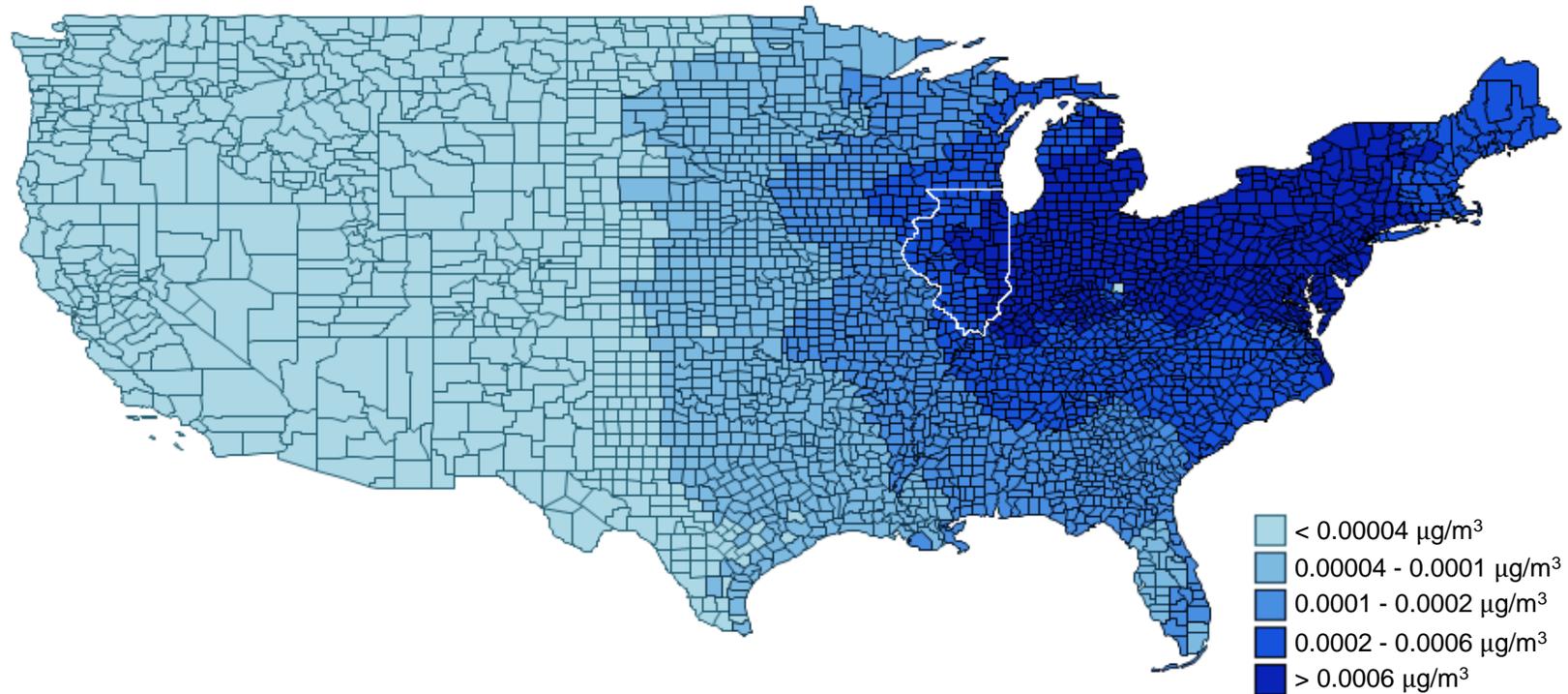
- Small Business
- Multi-Family Energy Savings
- IE Multi-Family Retrofits
- IE Single Family Retrofits

Monetized health benefits range from **~\$71 million** (low estimate) to **~\$160 million** (high estimate) from 2018 to 2043



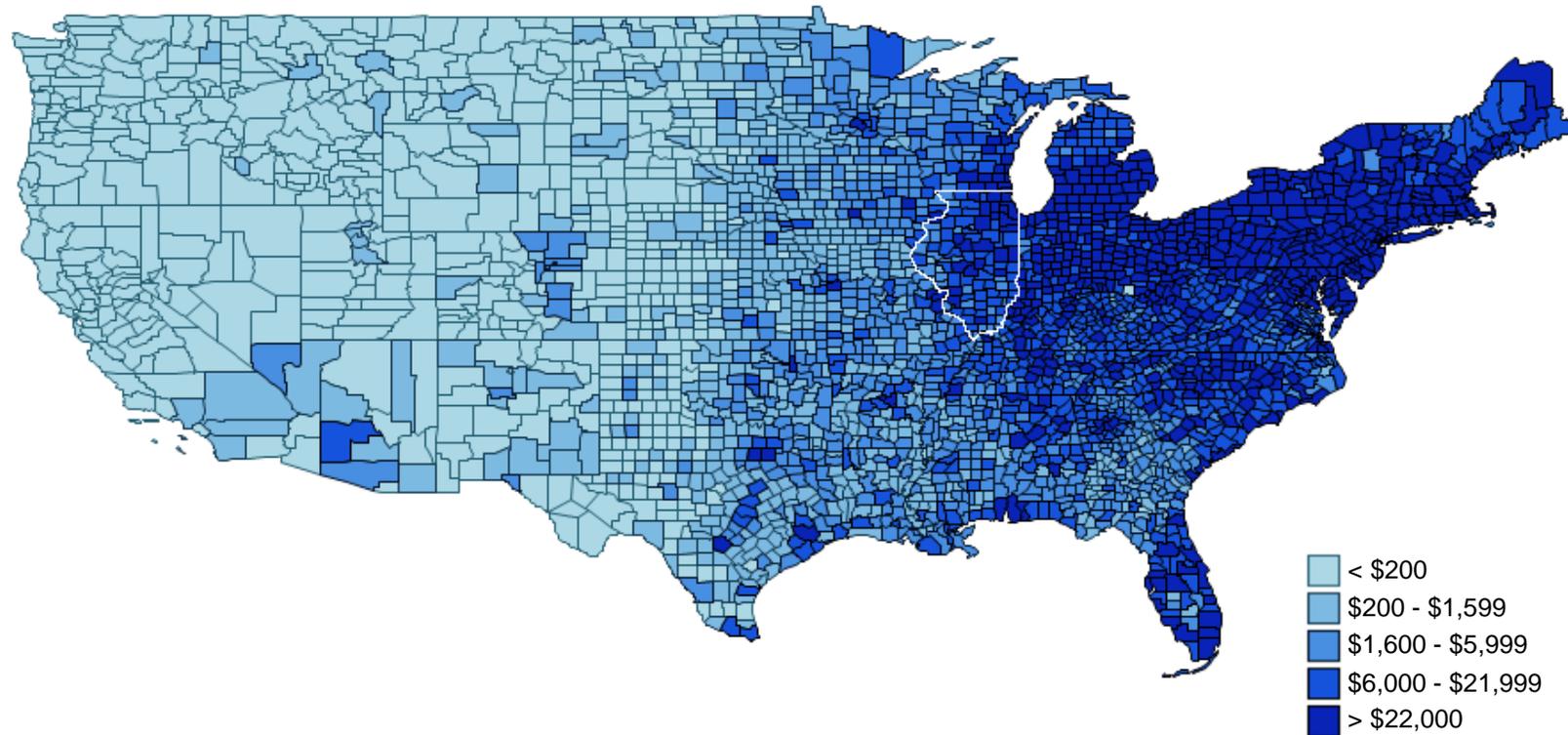
# ESTIMATED CHANGE IN PM<sub>2.5</sub> FROM FOUR COMED PROGRAMS 2018 - 2043

- Preliminary results show **1.13  $\mu\text{g}/\text{m}^3$**  (or 0.01%) reduction in PM<sub>2.5</sub> across the country.
- Majority of reductions occur in states east of Mississippi.



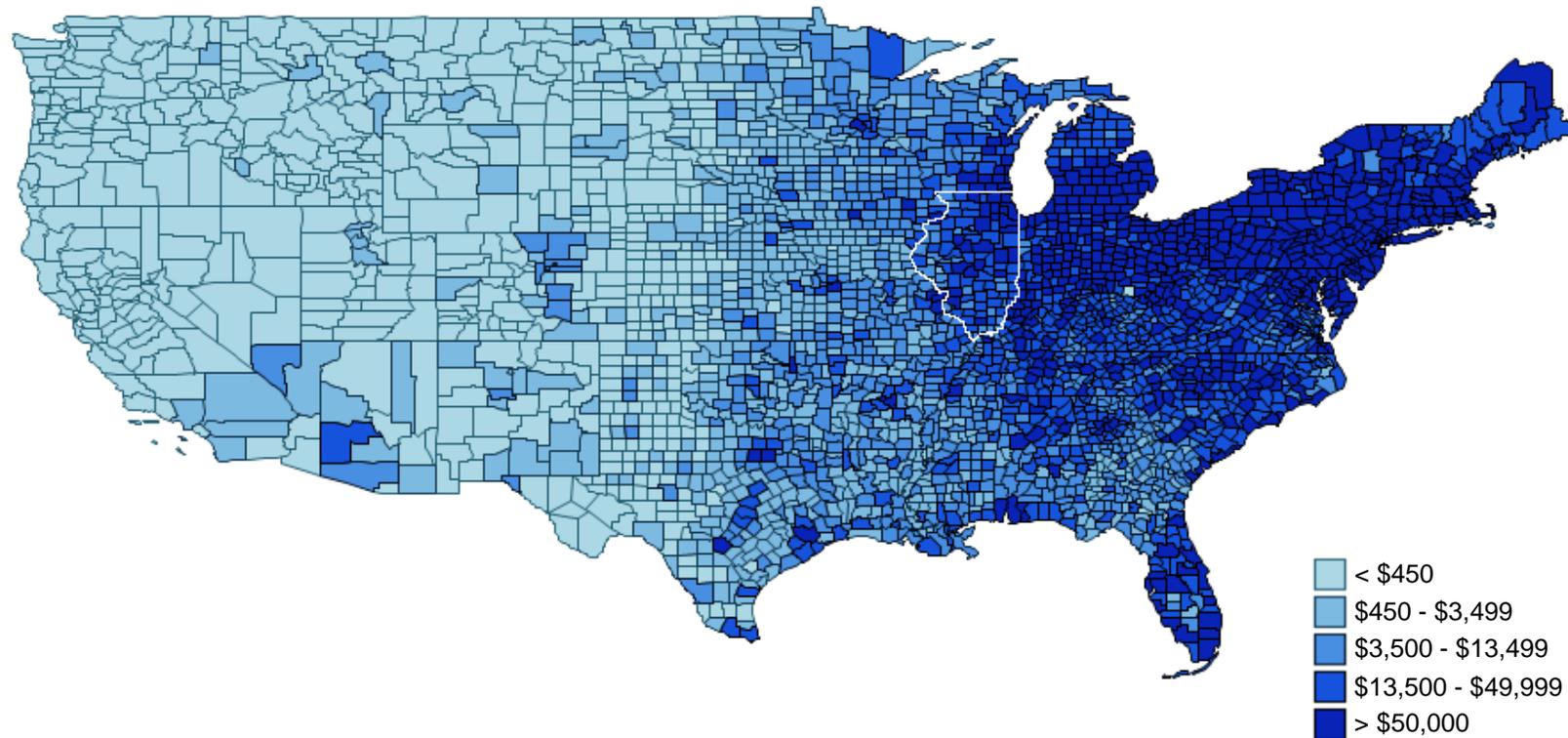
# HEALTH BENEFITS (LOW ESTIMATE) FROM FOUR COMED PROGRAMS 2018 - 2043

- Preliminary results show ~\$71 million in health benefits (low-sensitivity assumptions) for all counties impacted by emissions reductions due to energy efficiency.
- Majority of health benefits occur in states east of Mississippi.



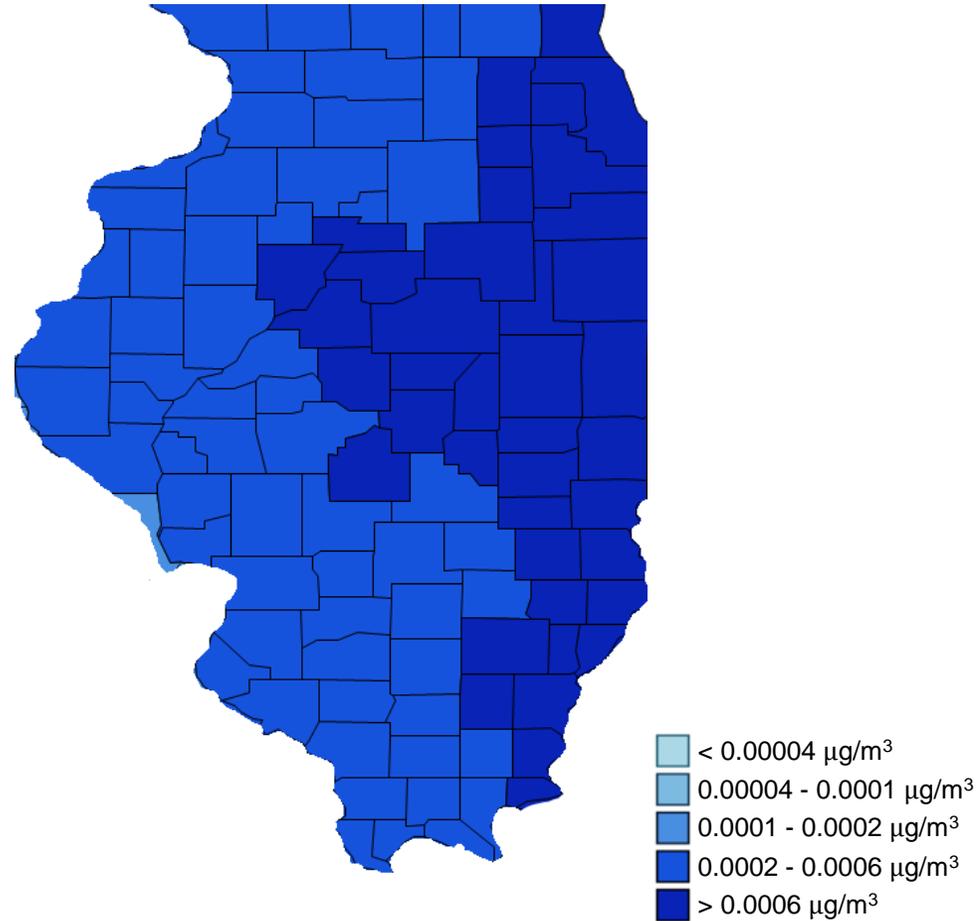
# HEALTH BENEFITS (HIGH ESTIMATE) FROM FOUR COMED PROGRAMS 2018 - 2043

- Preliminary results show ~**\$160 million** in health benefits (high-sensitivity assumptions) for all counties impacted by emissions reductions due to energy efficiency.



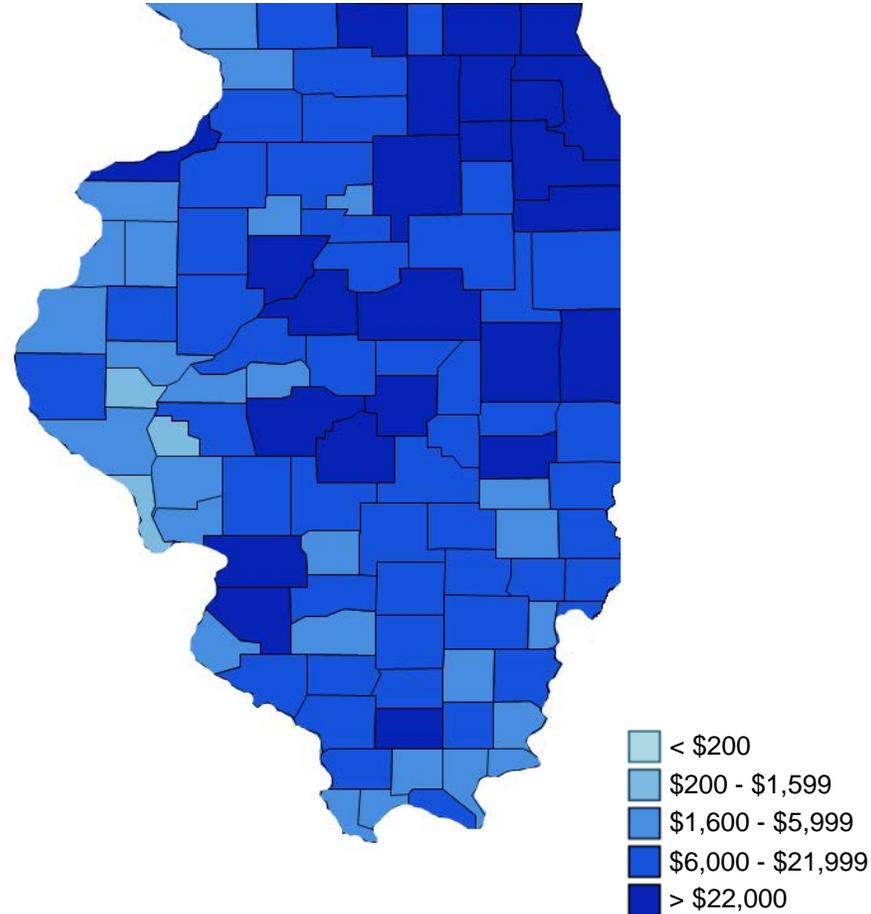
# ESTIMATED CHANGE IN PM<sub>2.5</sub> FROM FOUR COMED PROGRAMS 2018 - 2043

Preliminary results show a **0.06  $\mu\text{g}/\text{m}^3$**  (or 0.01%) reduction in PM<sub>2.5</sub> in Illinois.



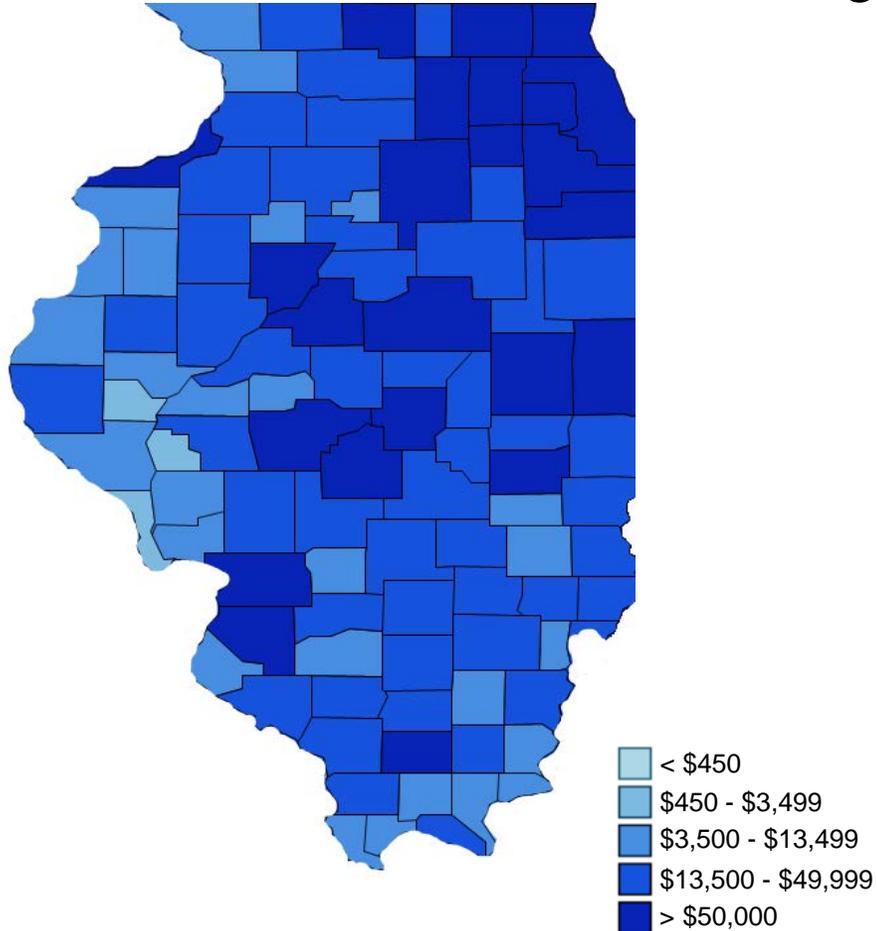
# HEALTH BENEFITS (LOW ESTIMATE) FROM FOUR COMED PROGRAMS 2018 - 2043

Preliminary results show ~\$4.4 million in health benefits (low-sensitivity assumptions) for all counties impacted by emissions reductions due to energy efficiency.



# HEALTH BENEFITS (HIGH ESTIMATE) FROM FOUR COMED PROGRAMS 2018 - 2043

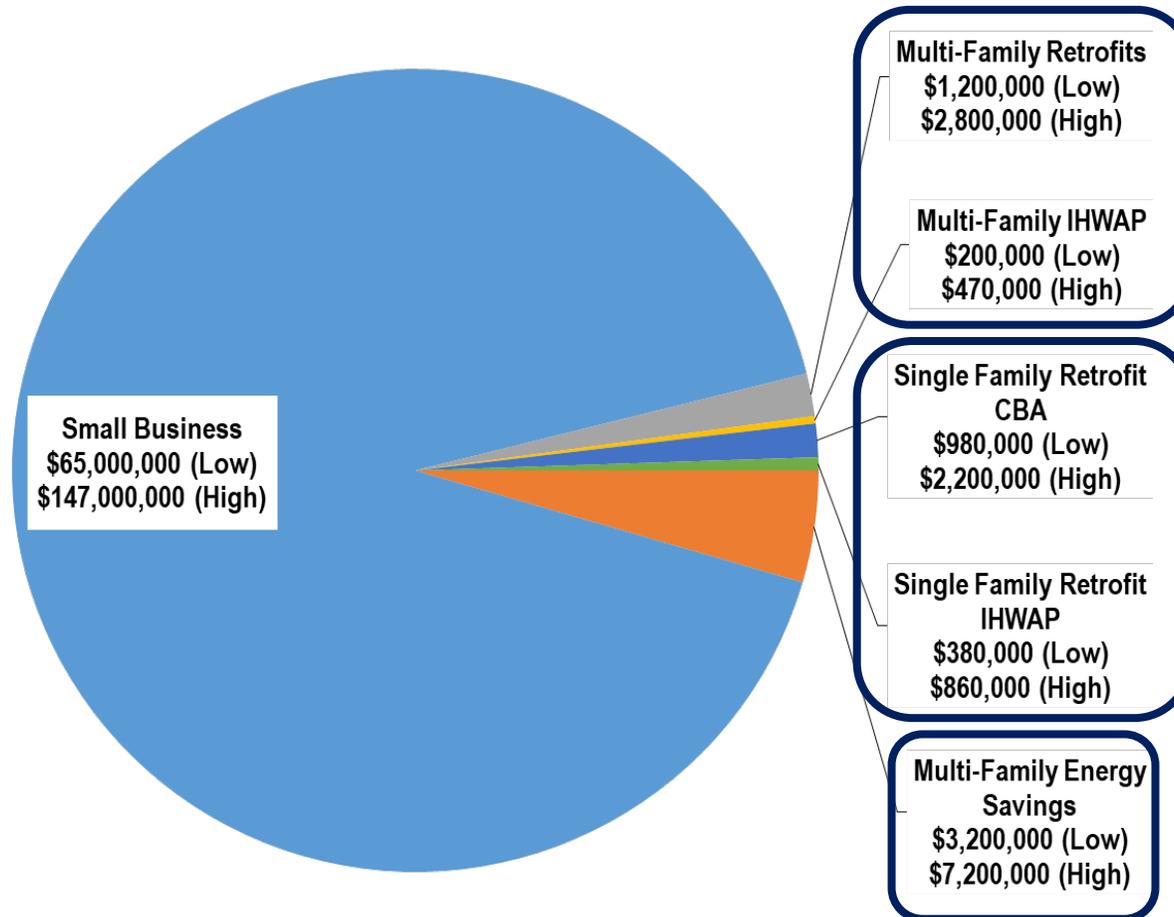
Preliminary results show ~\$10 million in health benefits (high-sensitivity assumptions) for all counties impacted by emissions reductions due to energy efficiency.



# RELATIVE HEALTH BENEFITS FROM FOUR COMED PROGRAMS

Preliminary results show ~\$71 million and ~\$160 million in health benefits across the US (low- and high-sensitivity estimates).

- Small Business program accounts for ~90% of estimated health benefits
- Multi-Family Energy Savings accounts for ~5% and IE Multi-Family Retrofits and IE Single-Family Retrofits each account for ~2% of estimated health benefits



# RESULTS: FOUR PROGRAMS

- COBRA estimates **\$71 to \$160 million** nationally and **\$4.7 to \$10 million** in the state of Illinois in total health benefits due to energy saved by four ComEd programs.

Sector	Program	\$ National Health Benefits (low estimate)	\$ National Health Benefits (high estimate)	\$ Illinois Health Benefits (low estimate)	\$ Illinois Health Benefits (high estimate)
Residential	Multi-Family Market Rate	\$ 3,201,271	\$ 7,227,614	\$ 198,601	\$ 447,777
Business	Small Business	\$ 65,005,360	\$ 146,724,910	\$ 4,046,906	\$ 9,122,661
Income Eligible	Multi-Family IHWAP	\$ 207,617	\$ 468,606	\$ 12,837	\$ 28,938
Income Eligible	Multi-Family Retrofits	\$ 1,232,193	\$ 2,781,338	\$ 75,913	\$ 171,133
Income Eligible	Single Family Retrofit - IHWAP	\$ 380,741	\$ 859,201	\$ 23,292	\$ 52,499
Income Eligible	Single Family Retrofit CBA	\$ 976,771	\$ 2,204,018	\$ 59,479	\$ 134,053
<b>Total</b>		<b>\$ 71,003,953</b>	<b>\$ 160,265,688</b>	<b>\$ 4,417,029</b>	<b>\$ 9,957,060</b>

# Participant NEI Values for IE Multi-Family Retrofits and IE Single Family Retrofits Programs' TRCs



Participant NEI Category	Maryland Values (Adjusted for \$2018) per Household	Massachusetts Values (Adjusted for \$2018) per Household	Average Values (\$2018) per Household
Thermal Comfort	\$73.19	\$134.63	\$103.91
Health & Safety (Asthma Reduction)	\$17.50	\$24.84	\$21.17
Reduced missed days of work	\$9.55	\$133.47	\$71.51
<b>Total</b>	<b>\$100.24</b>	<b>\$292.94</b>	<b>\$196.59</b>

# Utility NEI Values for IE Multi-Family Retrofits and IE Single Family Retrofits Programs' TRCs



Utility NEI Category	Maryland Values (Adjusted for \$2018) per Household	Massachusetts Values (Adjusted for \$2018) per Household	Average Values (\$2018) per Household
Safety-related Emergency Calls	\$3.45	\$9.71	\$6.58
Reduced income eligible participation in alternative payment programs	\$13.79	\$4.31	\$9.05
Disconnections/reconnections	\$0.69	\$0.50	\$0.60
Notices	\$0.64	\$0.39	\$0.52
Customer calls/collections	\$0.95	\$0.67	\$0.81
SubTotal	\$19.52	\$15.58	\$17.55
ComEd's Carrying Cost of Arrearages			\$0.43
<b>Total</b>			<b>\$17.98</b>

# TRCs FOR MULTI-FAMILY ENERGY SAVINGS & SMALL BUSINESS PROGRAMS WITH AND WITHOUT SOCIETAL NEIs

CY2018 ComEd Program	TRC w/o NEIs	TRC w/National Societal NEIs (Low Estimate)	TRC w/National Societal NEIs (High Estimate)	TRC w/Illinois Societal NEIs (Low Estimate)	TRC w/Illinois Societal NEIs (High Estimate)
Multi-Family Energy Savings	1.54	2.38	3.44	1.60	1.66
Small Business	1.11	1.59	2.21	1.14	1.18



# TRCs for IE Multi-Family Retrofits and IE Single Family Retrofits Programs With and Without Participant, Utility, and Societal NEIs

CY2018 ComEd Program	TRC w/o NEIs	TRC w/Part NEIs	TRC w/Utility NEIs	TRC w/National Societal NEIs (Low Estimate)	TRC w/National Societal NEIs (High Estimate)	TRC w/Illinois Societal NEIs (Low Estimate)	TRC w/Illinois Societal NEIs (High Estimate)
IE MF Retrofits	0.76	1.83	0.86	0.93	1.15	0.77	0.78
IE MF IHWAP	0.26	0.34	0.27	0.38	0.53	0.27	0.28
IE SF CBA	0.71	1.23	0.76	0.84	1.00	0.72	0.73
IE SF IHWAP	0.39	0.57	0.41	0.48	0.60	0.40	0.40



# TRCs FOR IE MULTI-FAMILY RETROFITS AND IE SINGLE FAMILY RETROFITS PROGRAMS WITH AND WITHOUT ALL NEI CATEGORIES

CY2018 ComEd Program	TRC w/o NEIs	TRC w/ Part and Utility and National Societal NEIs (Low Estimate)	TRC w/ Part and Utility and National Societal NEIs (High Estimate)	TRC w/ Part and Utility and Illinois Societal NEIs (Low Estimate)	TRC w/ Part and Utility and Illinois Societal NEIs (High Estimate)
IE MF Retrofits	0.76	2.10	2.32	1.94	1.95
IE MF IHWAP	0.26	0.46	0.61	0.35	0.36
IE SF CBA	0.71	1.41	1.57	1.29	1.30
IE SF IHWAP	0.39	0.68	0.79	0.59	0.60

# NEXT STEPS TO INCORPORATE NEIS INTO COMED'S 2022-2025 DRAFT PLAN

## July

- Incorporate Stakeholder feedback into Societal NEI methodology
- Continue to quantify and monetize available ComEd data for additional utility NEI categories

## August

- Create inputs for AVERT from ComEd build-ups of programs in draft 2022 – 2025 plan

## September

- Using COBRA, produce Societal NEI values for programs in draft 2022-2025 plan
- Using combination of ComEd and secondary research, produce Utility NEI values for IE Multi-Family Retrofits and Single Family Retrofits Programs
- Using values from secondary research, produce Participant values for IE Multi-Family Retrofits and Single Family Retrofits Programs

# **Responses to Stakeholder Feedback on April 30 Memo & May 5 Presentation**



**Illinois Industrial Energy  
Consumers (IIEC):  
Reasonableness of Including NEIs  
in ComEd's Cost-Effectiveness  
Tests**

**Nicor Gas: Methodologies to  
quantify and monetize societal,  
utility and participant NEIs for  
Nicor Gas**

# IIEC Feedback

- *Objection to include monetized NEIs in TRCs in Illinois “based on the fact that NEIs are subjective and inherently difficult to quantify and monetize...and the methods used...require assumptions that are highly speculative and arbitrary.*
- Guidehouse’s research excludes NEIs that are not readily quantifiable and reproducible by using methodologies proven in other jurisdictions such as DOE’s national WAP studies for participant NEIs, and EPA’s tools for societal NEIs, and several states using billing and participant data for utility NEIs. Our research methods were vetted by the SAG NEI WG in 2018 and 2019 through a stakeholder feedback process.

# IIEC Feedback - continued

- ***Including NEIs in TRC tests has the potential to significantly and artificially expand the scope of utility EE programs.***
- On June 16, ComEd presented to SAG on NEIs & Cost Effectiveness:
  - Benefits must exceed costs on a lifetime basis for the EE portfolio (TRC>1.0).
  - Total Benefits include avoided energy cost and quantifiable 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 presentation on NEIs & Cost Effectiveness; June 16, 2020](#)

# IIEC Feedback - continued

- ***The monetization of NEIs in EE cost-effectiveness tests does not appear to be standard practice in the U.S.***
- While our memo identified 11 states that use primary research to monetize NEIs for their cost-effectiveness tests, 26 states and the District of Columbia use monetized NEIs in their cost-effectiveness tests.

- Arizona
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Idaho
- Illinois
- Iowa
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- Ohio
- Oklahoma
- Oregon
- Rhode Island
- Texas
- Vermont
- Washington

# Methodologies to quantify and monetize societal, utility and participant NEIs for Nicor Gas\*

\*Ongoing research

# Nicor Gas Feedback

## Societal NEIs

- *The societal NEI analysis can be simply adapted for gas utilities by applying the EPA COBRA model to emissions from natural gas combustion.*
- We agree and our approach is similar to ODC's research for Ameren Illinois
- Guidehouse will use U.S. EPA's provided gas emission rates (lbs/MMcf) for business and residential sectors as well as a customized 2.38 percent discount rate to evaluate Nicor Gas's societal NEI impact.

# Nicor Gas Feedback - continued

## Participant NEIs

- *How would these values be applied to electric and gas utilities? Which values are additive across utilities? Which values should be allocated between utilities?*
- Guidehouse will use secondary research from MassSAVE (which includes gas) for participant NEI estimates.
- Once ComEd results are available in 2021, these estimates are proposed to be allocated based on utility investment proportions in programs.