



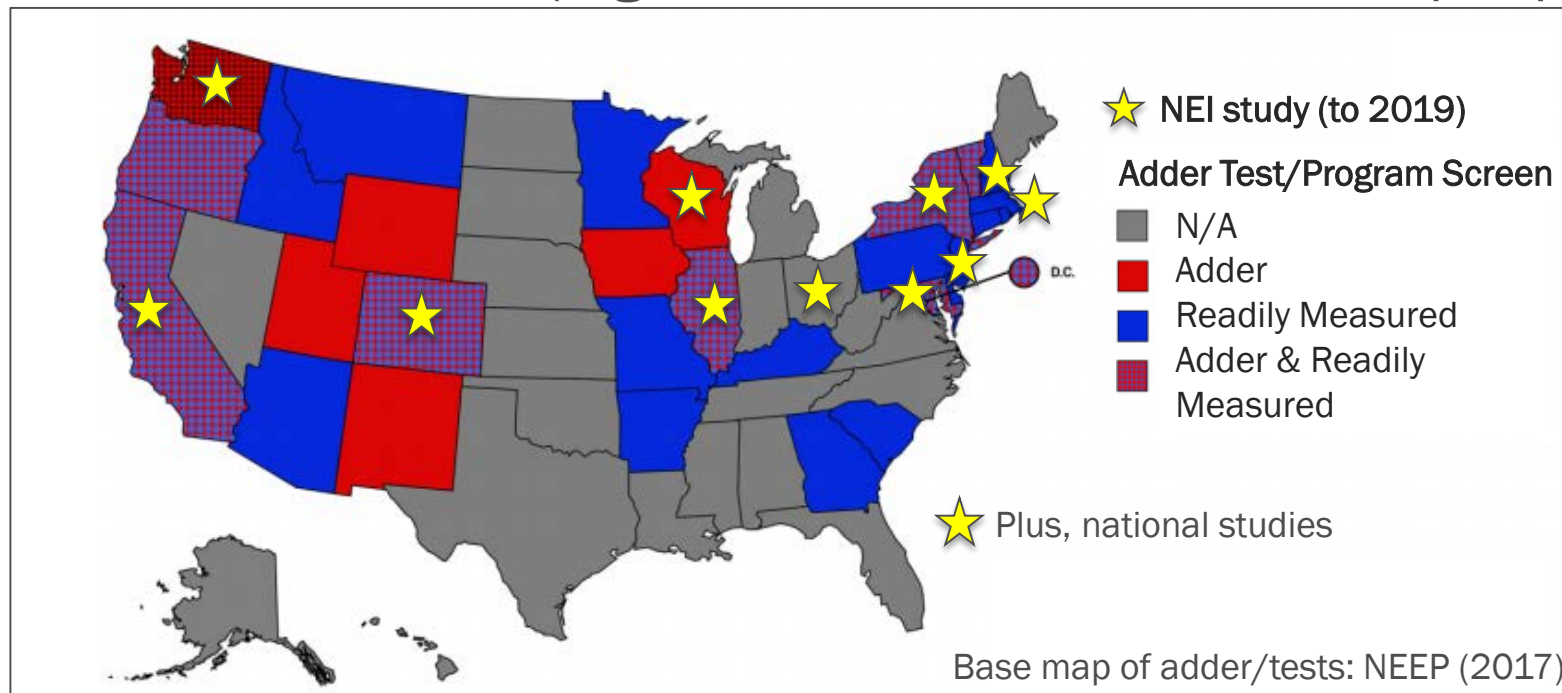
Opinion **Dynamics**

Bringing it Together: Non-Energy Health and Economic Impacts Research in Context of Policy and Evaluation



Non Energy Impact Research and Application in the U.S.

- >20 years of theory and research
- 26 states count multiple benefits of EE in cost-effectiveness tests (NEEP, 2017)
- To date, most data derives from one national and 11 state-specific studies
- Published results are variable (e.g., \$95 - \$800 or 47% - 400% per participant)



Non Energy Impact Research and Application in the U.S.

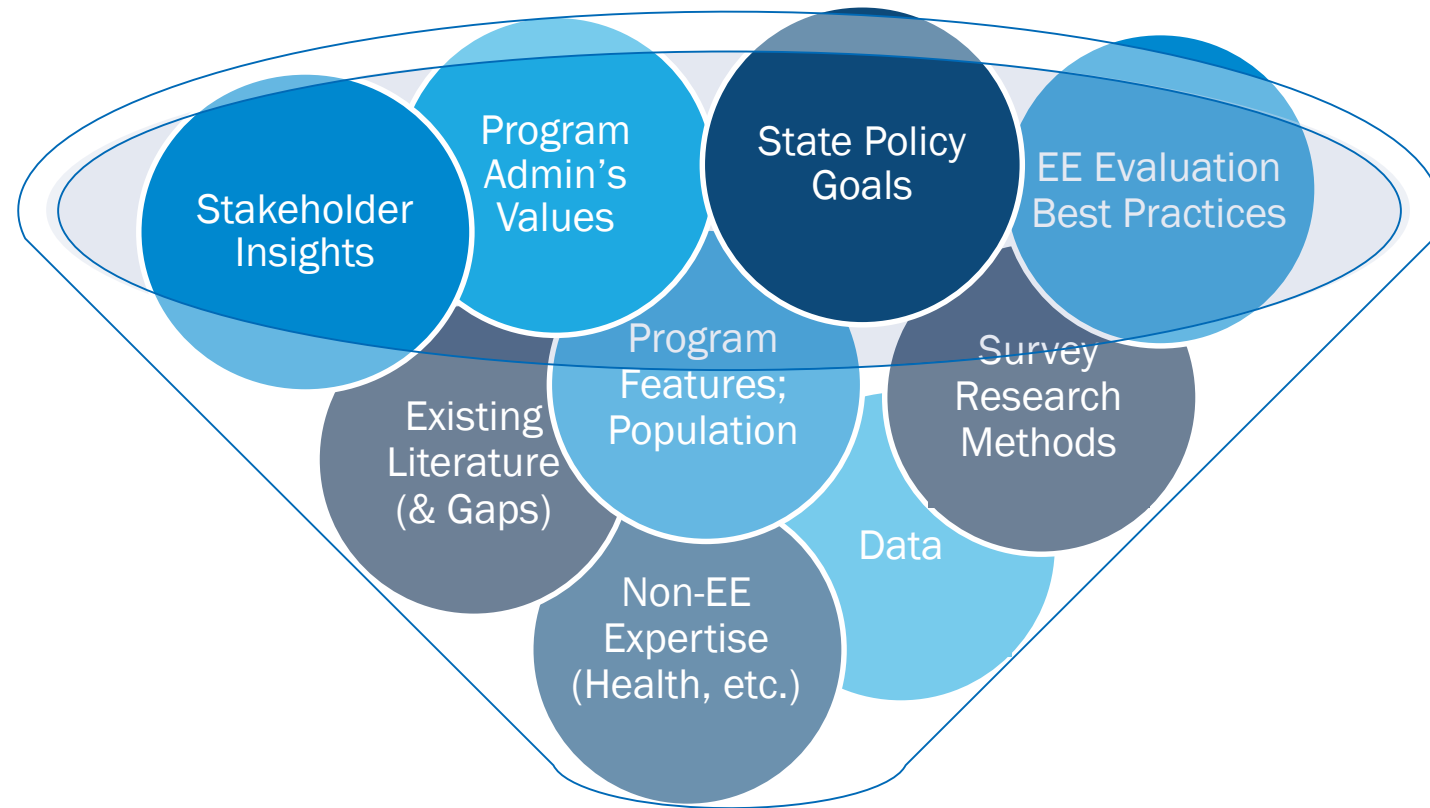
- Promoting EE as a resource calls for actionable information about NEIs
 - Evolution of cost-effectiveness testing
 - Decarbonization and distributed generation
 - Energy equity, accessibility, and reliability
 - Convergence with health, environment, and water
- Increasing momentum to gather primary data on NEIs
 - Who: Utilities, participants, society
 - What: 30 to 50 NEIs in economic, health, environmental, resilience categories
 - Why: program targeting/marketing, cost-effectiveness testing, advancing policy

Objective

- Develop research strategy to evaluate NEIs, given the need to:
 - Provide **valid** data on NEIs with a **credible** link to programs
 - Cultivate **transparency** to promote **consensus on priorities**
 - Correct and avoid **asymmetry** – capture both benefits and costs
 - Reflect **local** conditions – utilities, programs, consumers, climate, markets
 - Enable **consistent** measurement across jurisdictions and time

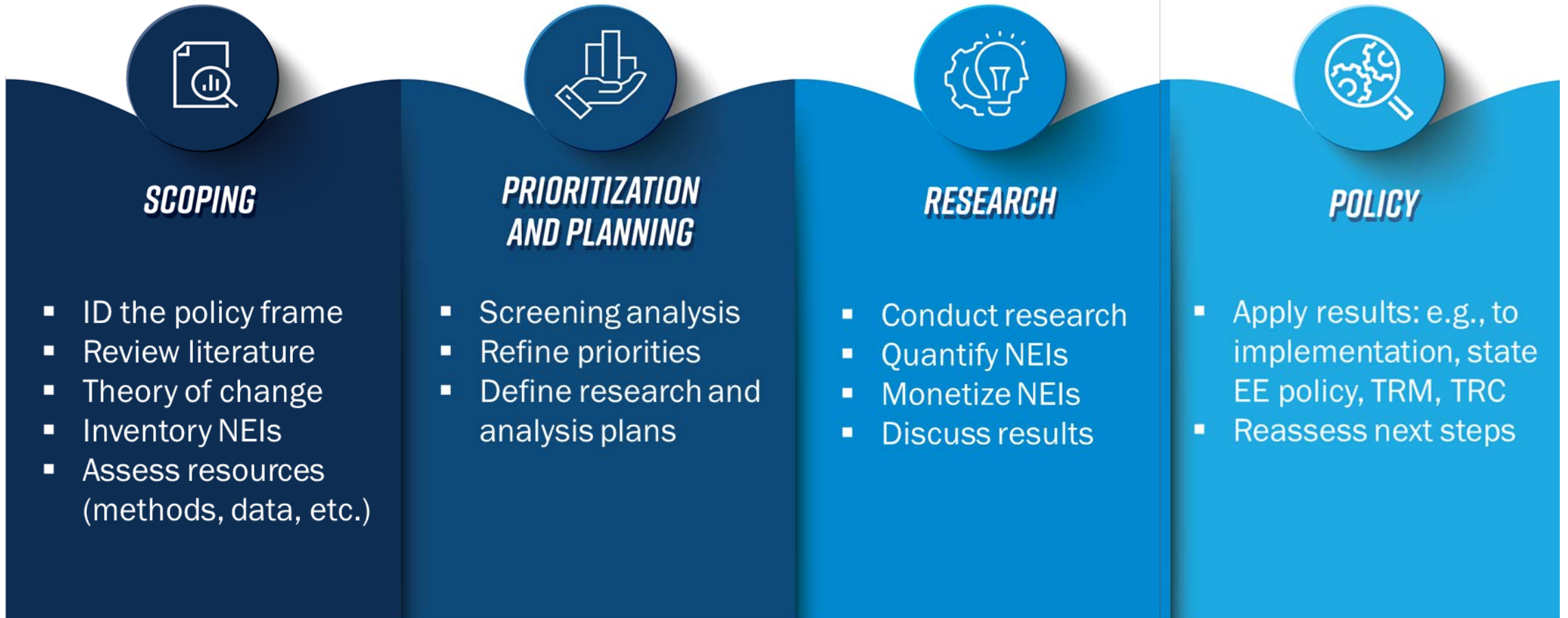


Quantifying Non-Energy Impacts through EM&V



What are the best opportunities for NEI evaluation?

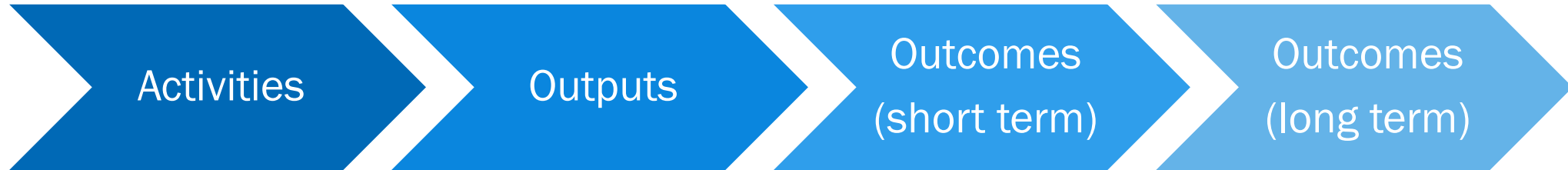
Expanding NEI Research to Support Strategic Planning



Evaluators Collaborate; Involve Stakeholders for Input & Feedback



Add NEIs to Program's Theory of Change



Home Intervention	Output	Outcome	Healthy People 2020 Indicator	SDOH
Weatherization Insulation: Improve homes insulation Ventilation: Increase the volume of indoor to outdoor air exchanged	Thermal Comfort Improved indoor climate	Lower Incidence of Thermal stress related CVD Emergency Room Visits and Hospitalizations Thermal stress related hospitalization and death	HDS-2 Reduce coronary heart disease deaths	Neighborhood & Built Environment Quality of Housing Environmental Conditions <hr/> Health & Health Care Access to primary care and literacy
Healthy Homes Education on HVAC maintenance protocols				

Source: Green & Healthy Homes Initiative (2017). "Weatherization and its Impact on Occupant Health Outcomes"

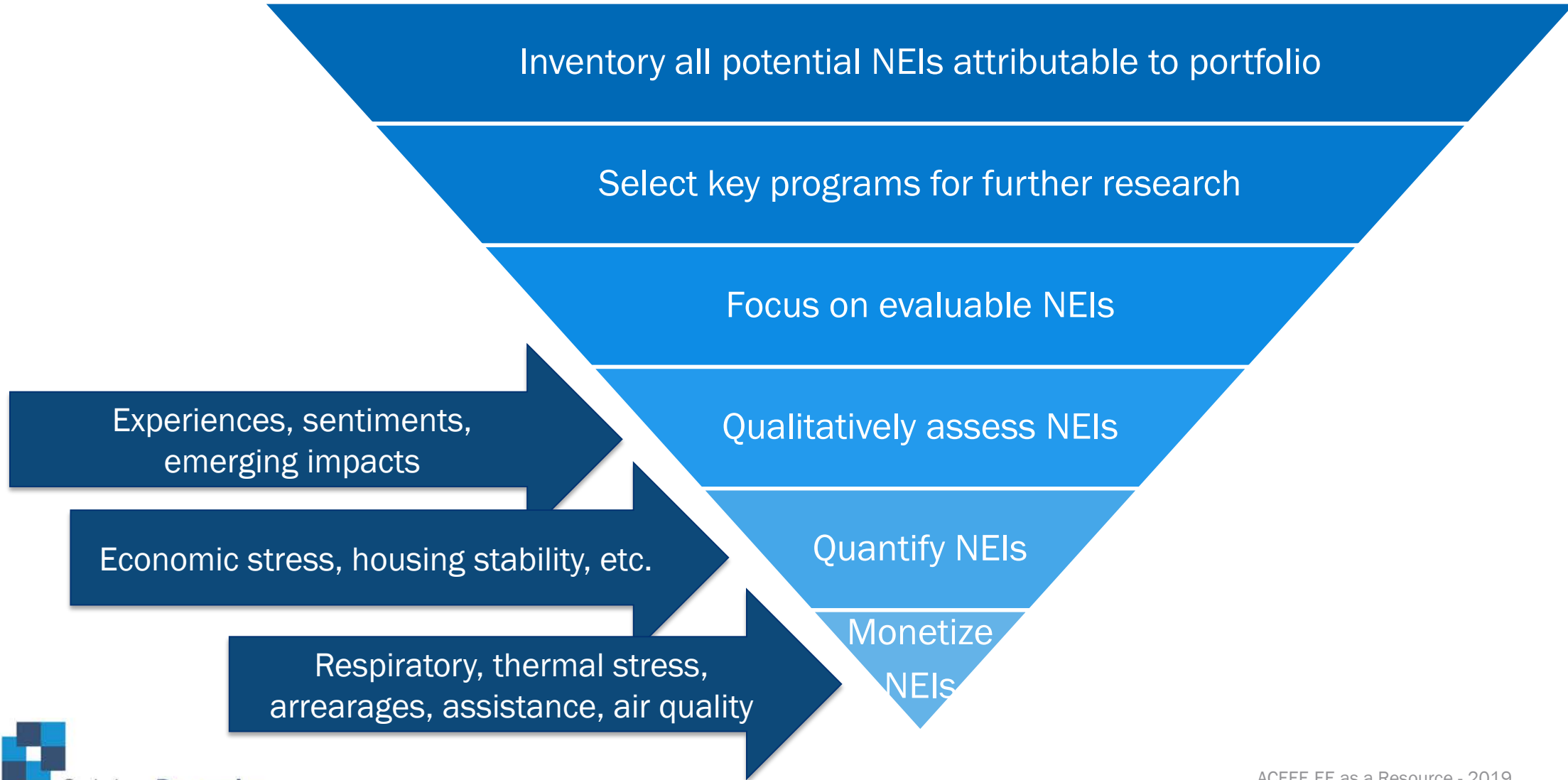
Inventory Probable NEIs



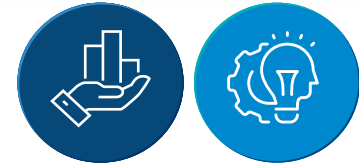
- Map NEIs by program to identify richest areas for research

Program Feature	Low Income Wx	Multifamily	Efficient Products
Measures			
Lighting (interior & exterior)	◆	◆	◆
Water-saving products	◆	◆	◆
Envelope	◆	◆	
Population Served			
General population			◆
Commercial multifamily	◆	◆	
Tenants	◆	◆	
Low Income	◆		
Fuel Savings			
Electricity	◆	◆	◆

Frame a Prioritized Research Agenda



Screen for NEIs During Ongoing Evaluation



- Ground-truth results from other regions and confirm local priorities
- Designed for rapid feedback and priority-setting

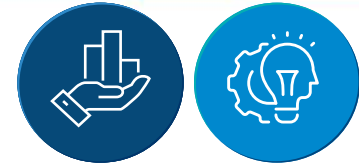
Benefits

- Well documented and validated questions provide confidence
- Lower-budget and easier start-up
- Provides results within months/year
- Cross-cutting, simpler approach has efficiencies of scale while also enabling review of relative results

Limits

- Convenience samples may be too small ($n < 100$) to estimate rare events at 90/10
- Evaluation surveys are generally retrospective (no pre-period data)
- Participant surveys designed to achieve multiple objectives

Use Screening Results to Plan Further Study



- Assess potential transfer validity from prior studies
- Review priorities within the portfolio
- Refine study planning to reflect local baseline conditions, needs

NEI Baseline Condition	National IE Wx Single Family* (n=665)	Midwest IE Wx Single Family (n=201)	Midwest Market Rate MF (n=89)
Cold home in winter	39%	57%	46%
Hot home in summer	41%	43%	21%
Home often drafty	29%	38%	25%
Asthma incidence	14%	22%	25%
Budget billing	39%	41%	27%
SNAP or WIC	56%	27%	11%

* Source: Oak Ridge National Laboratory (2014). "Health and Household-Related Benefits Attributable to the Weatherization Assistance Program"

Advancing the Science of NEI Self-Report



- Evaluation techniques can move us beyond “hard to measure”

Research Component	Tools to Advance
Planning	<ul style="list-style-type: none">■ Program theory/logic models■ Gathering expertise from non-EE disciplines■ Power analysis
Data Sources	<ul style="list-style-type: none">■ Participant and non-participant data■ GIS and spatial information■ Prior studies, literature, healthcare cost databases
Analytical Methods	<ul style="list-style-type: none">■ Cognitive pretests■ Surveys vs. in-depth interviews■ Regression analysis■ Modeling software (IMPLAN, etc.)■ Publicly-available tools (EPA COBRA/AVERT)
Collaboration	<ul style="list-style-type: none">■ Evaluator peer-review■ EE Stakeholder groups and networks■ Regional Technical Reference Manual framework

Policy-Oriented NEI Research Opportunities



- Program evaluation is a natural opportunity to replicate prior findings
- Moving beyond data tables to inform the human story
- Codifying the process of gathering, vetting, and reflecting on monetized results
- Using NEIs as a bridge between the programs that are, to the programs that will be– anticipating and incorporating new impacts



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