

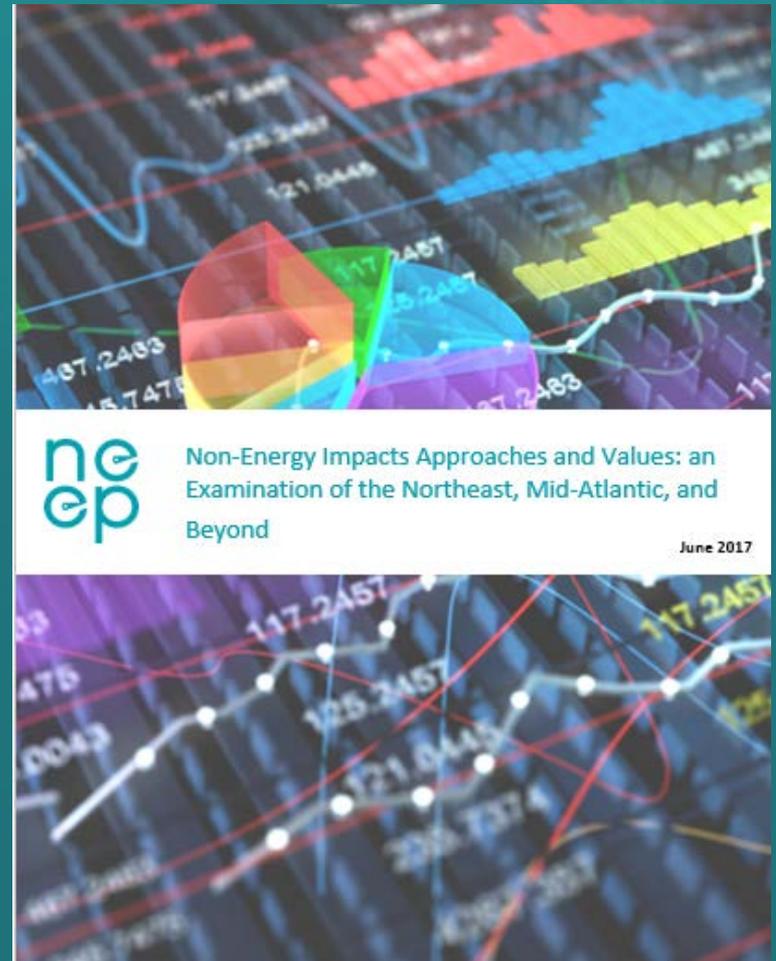


Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid- Atlantic, and Beyond

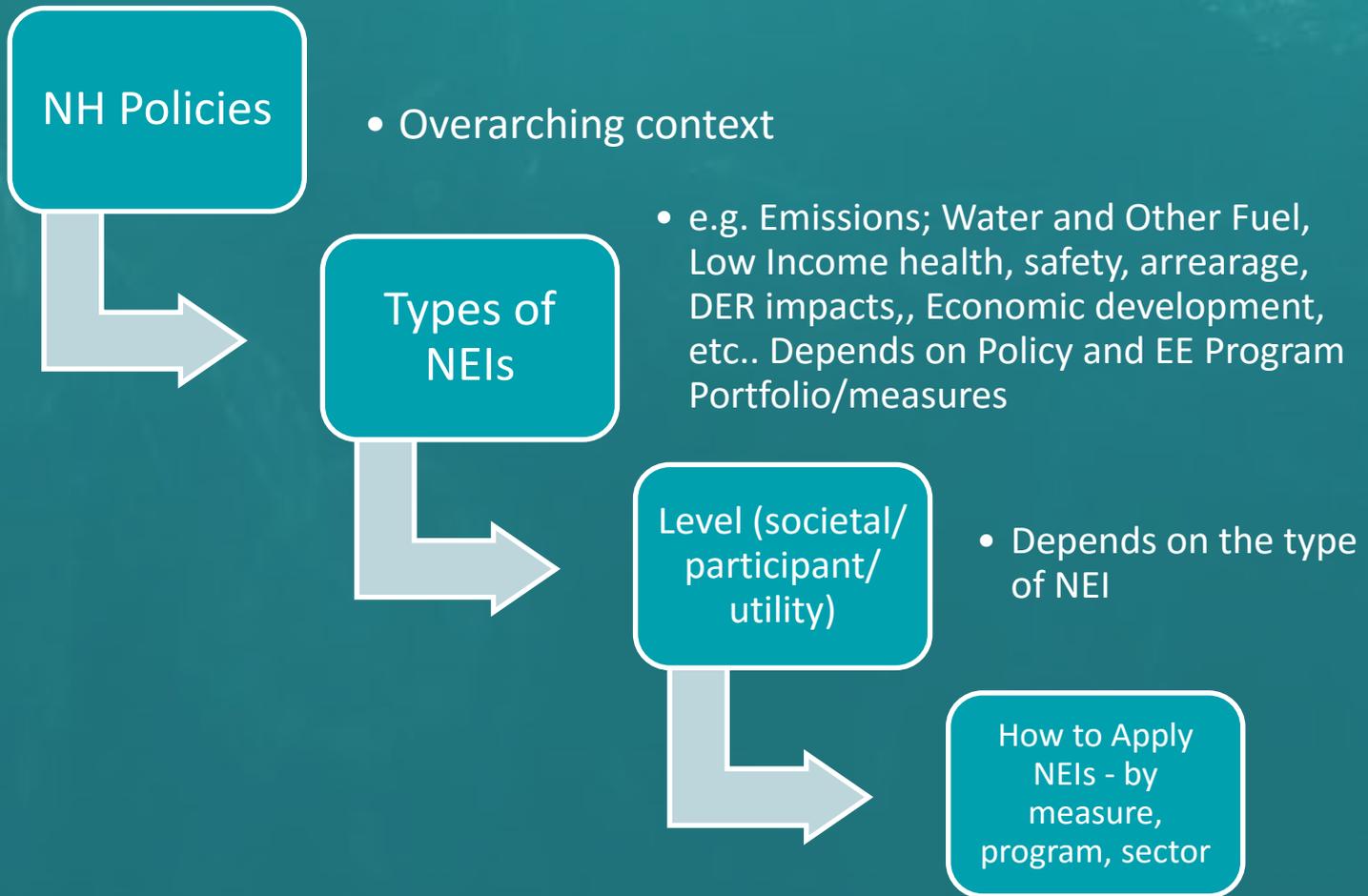
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Overview

- Summary of Report
- Types of Non-Energy Impacts (NEIs)
- Cost-effectiveness Tests
- Case Studies
- Summary of findings



The Report



Types of NEIs

Utility NEI categories:

- Peak load reductions
- Transmission and/or distribution savings
- Reduced payments arrearages
- Reduced carrying costs,
- Lower debt written off/ lower collection costs
- Fewer customer calls

Participant NEI categories:

- Operations and Maintenance (O&M) cost savings
- Participant health impacts
- Comfort
- Employee productivity
- Property values
- Benefits to low-income customers

Societal NEI categories:

- Public health and welfare effects
- Air quality impacts
- Water quantity and quality impacts
- Coal ash ponds and coal combustion residuals
- Economic development and employment effects
- Employment impacts
- Economic development constraints
- Other economic considerations
 - Societal risk and energy security
 - Benefits unique to low-income energy efficiency programs

Cost-Effectiveness Tests

- ★ Total Resource Cost Test (TRC)
 - program administrator + the participants (UCT + PCT)

- ★ Societal Cost Test (SCT)
 - TRC+ societal, and a lower discount rate

Utility Cost Test (UCT)

- Costs and benefits experienced by the program administrator

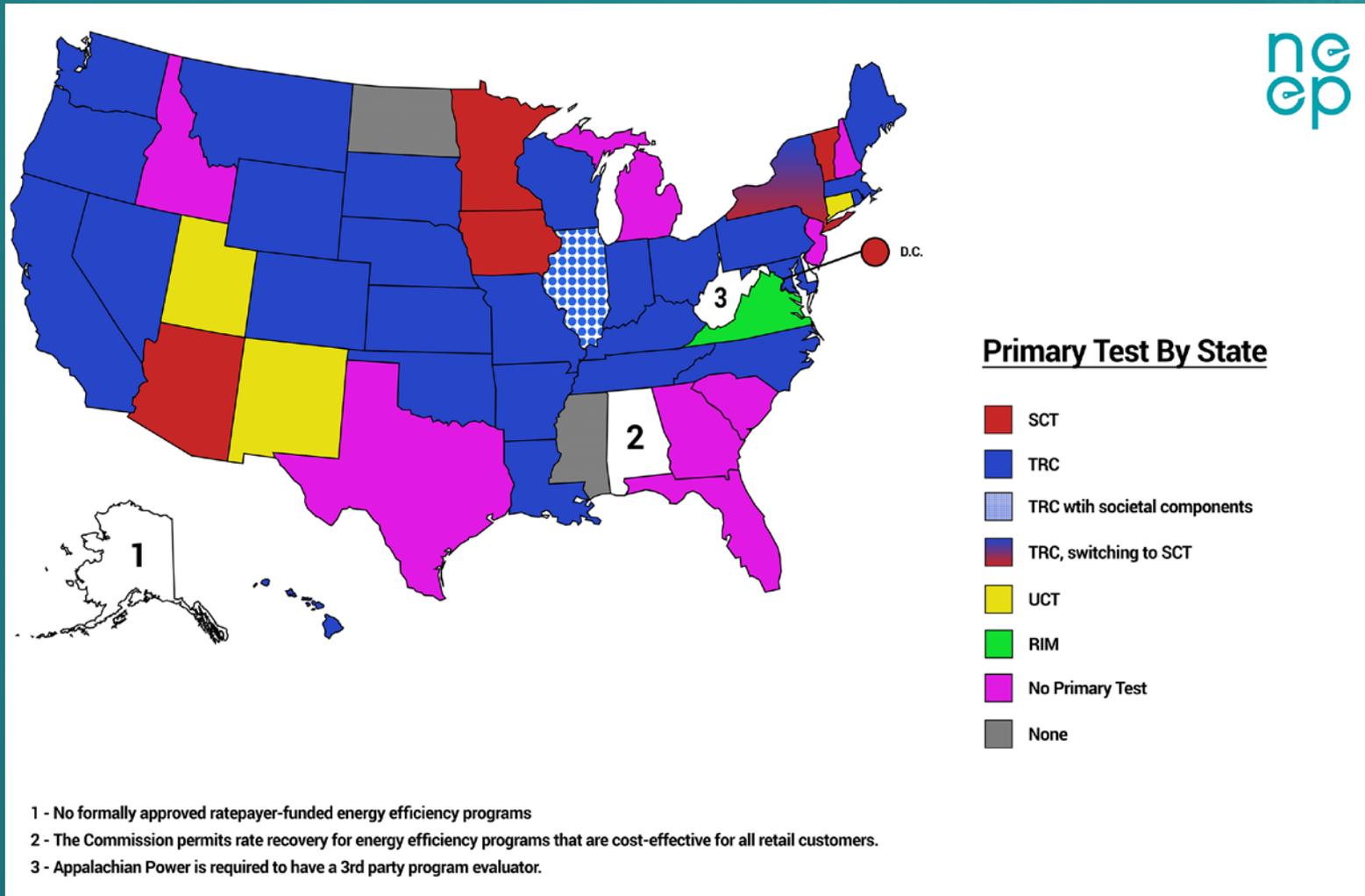
Participant Cost Test (PCT)

- Costs and benefits experienced by the participants

Ratepayer Impact Measure (Impact on Rates)

- All program administrator costs and benefits, plus changes in revenues

Cost-Effectiveness Tests Across the U.S.



Core Principles

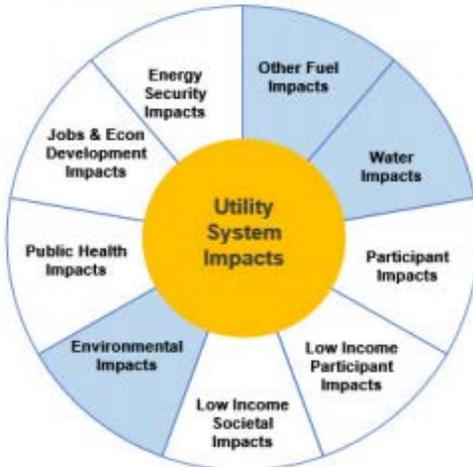
- Efficiency as a Resource
- Energy Policy Goals
- Hard-to-Quantify Impacts
- Symmetry
- Forward looking
- Transparency

Resource Value Test Process

1. Applicable policy goals
2. Utility system costs/benefits
3. Non-utility impacts to include, based on policy
4. Symmetrical test
5. Ensure forward-looking
6. Account for all relevant impacts
7. Ensure transparency

NSPM Relationship to Traditional Tests

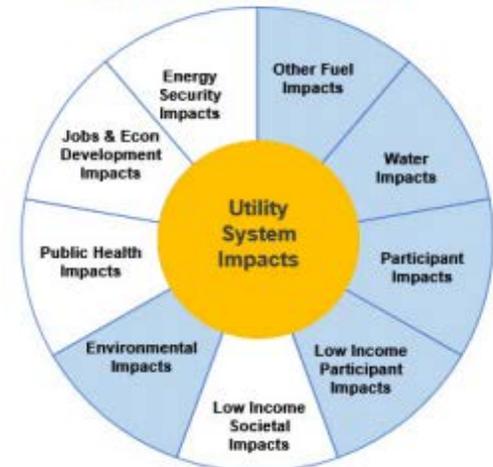
JURISDICTION 1: RVT



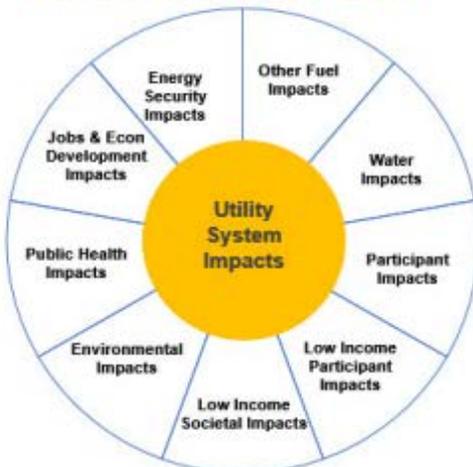
JURISDICTION 2: RVT



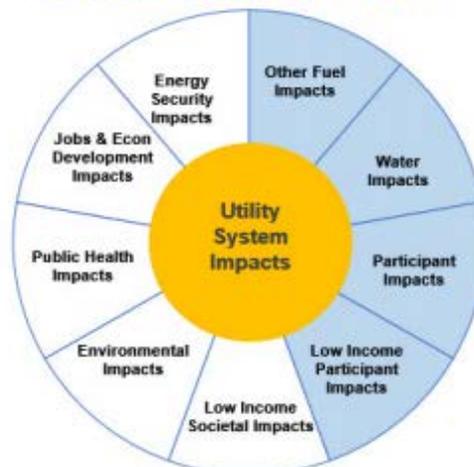
JURISDICTION 3: RVT



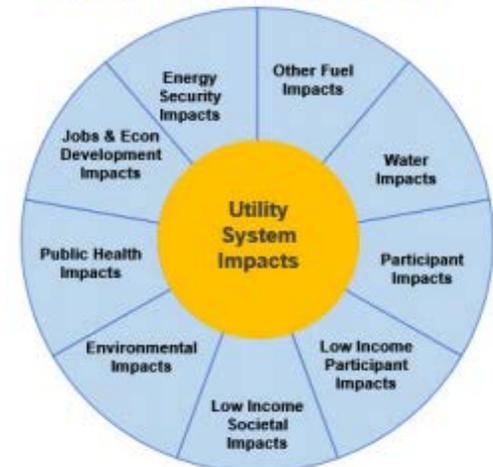
JURISDICTION 4: RVT = UCT



JURISDICTION 5: RVT = TRC



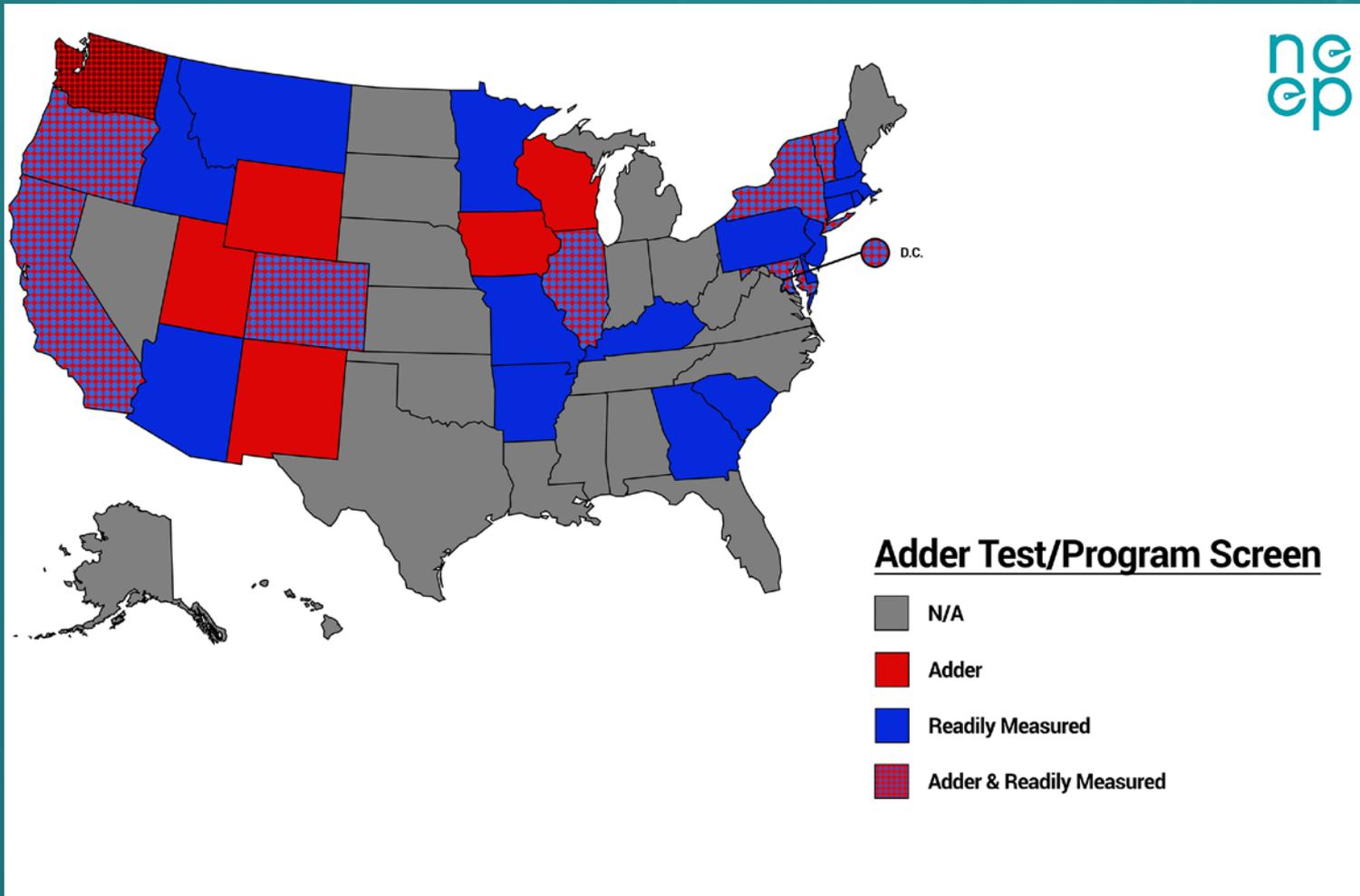
JURISDICTION 6: RVT = SCT



Approaches to Quantifying NEIs

- Adder
 - Omitted factors related to environmental or emissions effects
- Readily Measureable
 - Ex: easy to measure water bill savings from clothes washer programs and omitting NEI factors, such as comfort (measured from surveys)
- Hybrid
 - Adder + Readily Measureable
- All In
 - Measure all NEIs

Adders & Program Screening



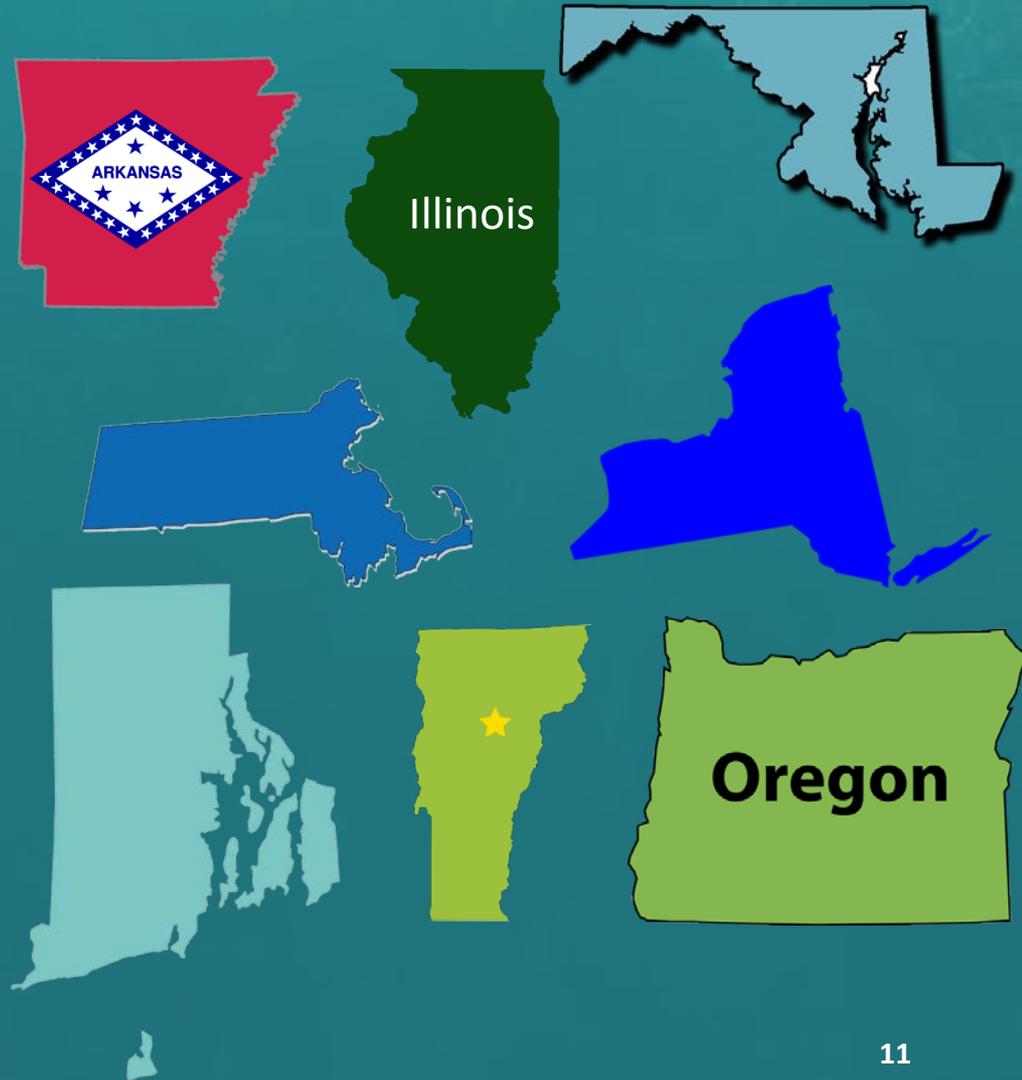
National Adder Landscape



State	Adder
California	\$30/ton carbon
Colorado	10% electric adder, 25% low-income program adder, 5% gas
Illinois	Ameren 10% electric, 7.5% gas; DCEO 10% adder; ComEd NA; Emissions adder \$0.0139/kWh
Iowa	10% adder for electric, 7.5% adder for gas
Maryland	A 1.115 cent per kWh adder: ex-ante societal cost test in developing EmPOWER plans
New Mexico	15% adder; low income weatherization multiplier of 1.25 for benefits.
New York	\$15/ton carbon adder
Oregon	\$15/ton carbon adder, 10% adder
Utah	Environmental “adder” of 10% of benefits for low income cost-effectiveness if regulators allow
Vermont	15% NEI adder, 10% cost reduction for risk & flexibility advantages + 15% low income
Washington	10% adder
Washington D.C.	10% adder, 10% risk, 10% environ + NEIs in goals and measured benchmarking
Wisconsin	\$30/ton carbon adder

Common Readily Measured NEIs

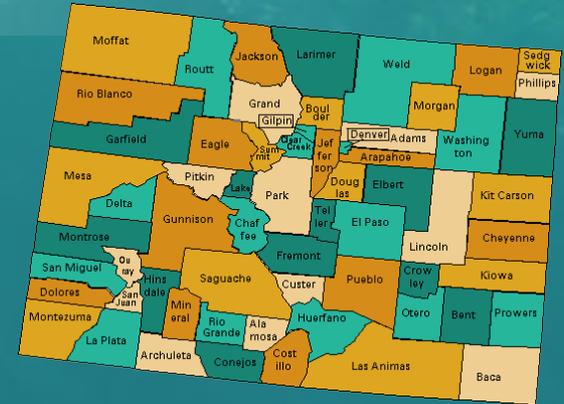
- Equipment
- Comfort
- Health and safety
- Property values
- Reduced air emissions
- Job impacts
- Water savings
- Other fuels
- Low-income programs



- Test(s): TRC, RIM

- TRC Test (primary)

- Regulatory order
 - Adder: 10% electric, 5% gas, and 25% for low income programs
 - Readily Measured Test: Measurable with market value



Key Drivers for Change

- NEI study of low income programs
- 2008 and 2011 research NEI cost effectiveness screening
- Large support for NEIs to be counted as an electric and gas adder

Delaware NEI values



Type of NEI	Value (2016\$)	Source	Notes
Weatherization			
LI Weatherization	\$164 per home (NPV)	ORNL (2002)	Participant health and safety benefits, based on literature review
	OR		
	\$182 per home (annual)	Three ³ (2016)	Participant health & safety benefits, no avoided death value; ultimately based on national WAP evaluation
LI Weatherization reduced arrearages	2% of participant bill savings	Itron (2014); MD PSC (2015)	Low end of published estimates for relevant programs
Non-LI HPwES/shell measures/ etc.	\$35.35 per home (annual)	Itron (2014); MD PSC (2015)	Low case, derived from data in 2011 MA study; included in MD PSC order
Air Emissions			
Air emissions externalities	\$0.002 per kWh (annual)	Itron (2014); MD PSC (2015)	Low case; includes health impacts, does not include compliance costs for NO _x or SO ₂
	OR		
	\$0.009 per kWh (annual)	PJM (2015); DPL IRP (2014)	Based on low end of avoided costs for NO _x and SO ₂ from DPL IRPs (2012/2014) & reported PJM emissions rates for 2014/5, emissions de-rated by 75%, & inflated to 2016\$
Other Benefits			
Water Savings	\$5 per 1,000 gallons	Conservative value based on AWWA (2016) & U of DE (2014)	Water savings indicated in the TRM should be valued at this rate; water savings can also be estimated using IPMVP Method C
O&M savings	TRM specified	DE TRM	

Test: TRC

– Regulatory Order and Legislative Mandates

- Readily Measured: NEIs must be “reliable with real economic value”
 - Resource benefits (oil, wood, and water savings) and non-resource benefits (customer O&M, reduced environmental and safety cost, and all low-income benefits)
- Systems Benefit Charge Adopted (1998)
- NEIs first included in Cost Benefit Analysis (1999)
- Green Communities Act (2008)
- NMR Group and Tetra Tech Study (2011)



Massachusetts NEI Values



Participant Perspective NEI	Value or Range of Values
Low Income	
Economic Development	\$0.04 per KWh saved
Equipment	
Light Quality	\$3.50 per LED or CFL fixture; \$3.00 per LED or CFL bulb
Equipment Maintenance	\$9.42 to \$124 per participant depending on the customer sector, heating or cooling system, and program
Window AC Replacement	\$45 per measure
Comfort	
Thermal Comfort	\$3.92 to \$125 per participant depending on the customer sector, heating or cooling system, and program
Noise Reduction	\$1.42 to \$40 per participant depending on the customer sector, heating or cooling system, and program
Health & Safety	
Health Benefits	\$0.13 to \$19 per participant depending on the customer sector, heating or cooling system, and program
Improved Safety	\$45.05 per measure
Property Value	
Home Durability	\$1.54 to \$149 per participant depending on the customer sector, heating or cooling system, and program
Property Value Increase	\$62.65 to \$1,998 per participant depending on the customer sector, heating or cooling system, and program

- Test(s): SCT, PCT and UCT
 - **SCT (Primary)**
- Regulatory Order & Legislative Mandate
 - Adder: 15% non-energy adder, 10% reduced risk adder + 15% low income adder and 3% discount
 - Readily Measured: maintenance, equipment replacement, low income comfort, and utility and societal NEIs
 - » Water and operations and maintenance savings are directly quantified where appropriate.



Summary of Findings

- **Credibility** and **convenience** are factors in states' decisions about what to include in NEIs, particularly for states with monetized NEIs.
- AR, CO, IL, OR, MD are explicit that NEIs must be “**easily measured.**”
- MA requires NEIs be “reliable with real economic value.”
- States that adopt monetized NEIs from other sources may **apply discounts** to make the values more conservative; MD & DE are examples



Thank you!

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