



Northeast Energy Efficiency Partnerships

Best Practices in Cost-Effectiveness Screening of Energy Efficiency Programs in the Northeast & Mid-Atlantic States

Presented to the
Delaware Energy Efficiency Advisory Council
February 10, 2016

Context: Evolving Energy Efficiency Policies in Northeast & Mid-Atlantic



- Increased recognition of the value of energy efficiency as an economic resource
 - 10 states enacted strong energy savings goals

- Role for EE in emissions reduction strategy
 - Delaware's EERS Targets
 - Delaware's Clean Power Plan Compliance Strategies

- Investments in EE have risen greatly, states are achieving strong electric savings of 2.5%+ of sales
 - 6 in Top 10 in 2015 ACEEE State Policy Scorecard
 - Energy efficiency in regional energy forecasts

Importance of Establishing Appropriate & Modern Cost-Effectiveness Screening

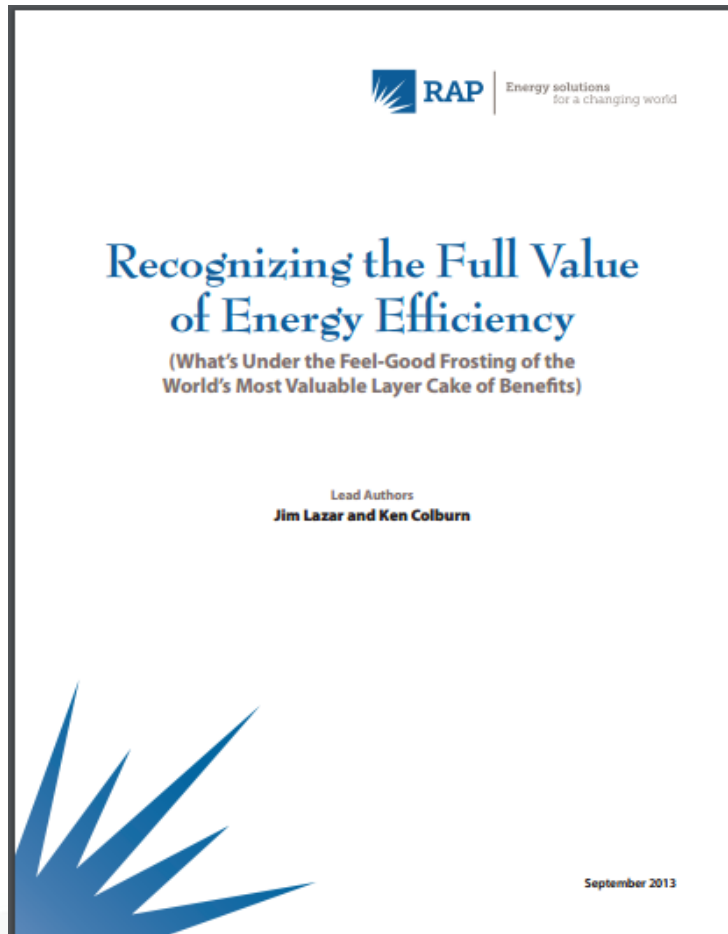


- PSC and utilities obligated to ensure “just and reasonable investment” of ratepayer dollars
 - What type of screening ensures best value for ratepayers?
 - What methods of screening best align with state public policy goals?
 - How to ensure symmetry between benefits & costs in screening?
- Delaware EERS planning process and DNREC promulgations are a good time to establish proper standards (get it right, from the start)

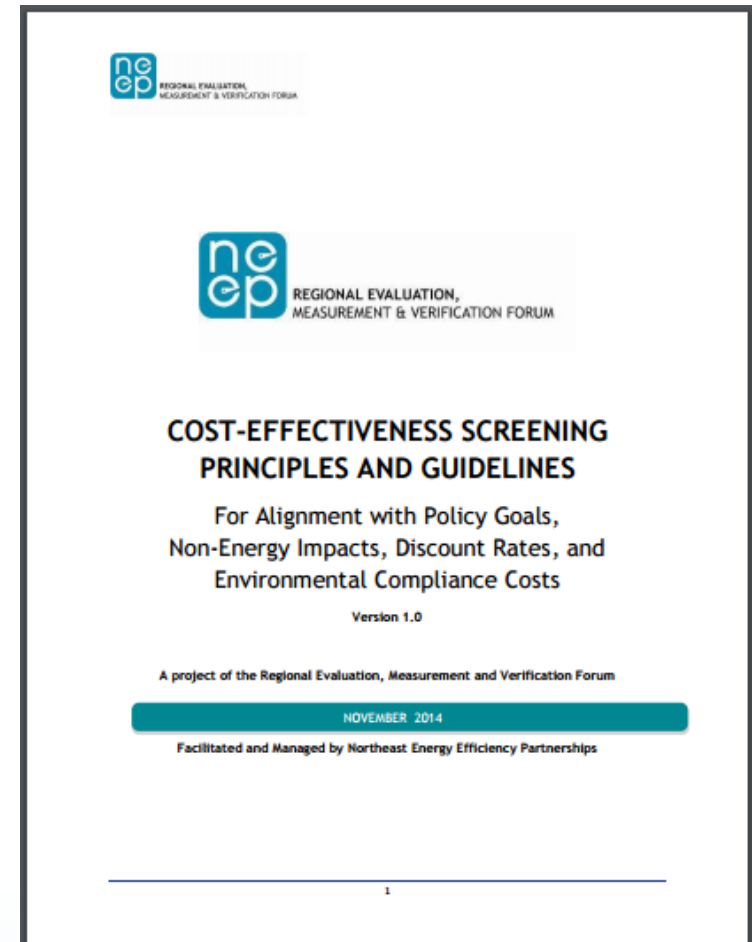
Key Resources:



Overview



Other States' Approaches w/ specific examples of how to quantify Non-Energy Benefits (NEBS)



1. Regulatory Assistance Project's "Recognizing the Full Value of Energy Efficiency"
2. NEEP EM&V Forum's "Cost Effectiveness Principles and Guidelines"

Primary Cost-Effectiveness Tests in the Northeast & Mid-Atlantic Region

- Total Resource Cost (TRC) Test is most common test
- CT, MD, NY & VT use secondary tests in addition

Primary Screening Test	States
Total Resource Cost Test (5)	<ul style="list-style-type: none"> • Delaware • Massachusetts • New Hampshire • Rhode Island • Pennsylvania
Societal Cost Test (4)	<ul style="list-style-type: none"> • Maryland • New York • District of Columbia • Vermont
Program Administration Cost Test (1)	<ul style="list-style-type: none"> • Connecticut

Total Resource Cost: An Evolving Test

The Ins and Outs of the TRC Test

Table 1. Summary of Key Benefits and Costs Included in Different Tests

	Partic. Test	RIM Test	TRC Test	Societal Test	PACT Test
Benefits⁴					
Primary Fuel(s) Avoided Supply Costs		✓	✓	✓	✓
Secondary Fuel(s) Avoided Supply Costs			✓	✓	
Primary Fuel(s) Bill Savings (retail prices)	✓				
Secondary Fuel(s) Bill Savings (retail prices)	✓				
Other Resource Savings (e.g. water)	✓		✓	✓	
Environmental Benefits				✓	
Other Non-Energy Benefits			rarely ⁵	in theory only	
Costs⁶					
Program Administration ⁷		✓	✓	✓	✓
Measure Costs					
Program Financial Incentives		✓	✓	✓	✓
Customer Contributions	✓		✓	✓	
Utility Lost Revenues		✓			

From: *Is it Time to Ditch the TRC?: Examining Concerns with Current Practice in Benefit-Cost Analysis*
Neme and Kushler, ACEEE Summer Study on Energy Efficiency in Buildings 2010, paper 5-299.

The TRC: An Evolving Test



	PAC Test	TRC Test	Societal Test
Energy Efficiency Program Benefits:			
Avoided Energy Costs	Yes	Yes	Yes
Avoided Capacity Costs	Yes	Yes	Yes
Avoided Transmission and Distribution Costs	Yes	Yes	Yes
<u>Wholesale Market Price Suppression Effects</u>	Yes	Yes	Yes
<u>Avoided Cost of Environmental Compliance</u>	Yes	Yes	Yes
Reduced Risk	Yes	Yes	Yes
<u>Other Program Impacts (utility-perspective)</u>	Yes	Yes	Yes
<u>Other Program Impacts (participant-perspective)</u>	---	Yes	Yes
Other Program Impacts (societal-perspective)	---	---	Yes
Energy Efficiency Program Costs:			
Program Administrator Costs	Yes	Yes	Yes
EE Measure Cost: Program Financial Incentive	Yes	Yes	Yes
EE Measure Cost: Participant Contribution	---	Yes	Yes
Other Program Impacts (participant costs)	---	Yes	Yes

From: EM&V Forum's "Cost Effectiveness Screening Principles and Guidelines"
 2/9/2016
 (November 2014)

Different Screens, Very Different Results: Potential Study vs. Proposed Plans



Consumer Products Program (cont.)

Net Wholesale Forecast of Consumer Products Program

Consumer Products Program	2016	2017	2018	Total
Annual MWh Savings	4,656	6,318	9,476	20,451
Annual MW Savings	0.60	0.81	1.21	2.61
Participants	14,531	18,899	26,913	60,342
Measures	243,702	326,388	489,626	1,059,717
Incentive Costs	\$1,116,001	\$1,402,249	\$1,912,063	\$4,430,313
Implementation Costs	\$1,168,331	\$1,589,959	\$2,346,374	\$5,104,664
Total Program Costs	\$2,284,331	\$2,992,208	\$4,258,437	\$9,581,977
TRC Ratio				1.12
SCT Ratio				1.22

Why?

Part of the Puzzle
is DRIPE and
OPIs/NEBs...

Until the rules are
known, the program
administrators may be
acting overly cautious.

Table 8 | Residential Total Resource Cost Test Economics by Program

Program	Costs (Million\$)	Benefits (Million\$)	Net Benefits (Million\$)	BCR
Residential New Construction	31	56	25	1.8
Home Energy Services	167	316	149	1.9
Multi-Family	20	27	8	1.4
Residential Products	258	703	445	2.7
Income-Eligible Single Family	95	175	80	1.8
Residential Behavior	28	30	2	1.1
Total	571	1,278	707	2.2

*More measures could
and would screen
favorably using
regional best practices
for CE testing. Too
narrow a test, and less
efficiency happens.*

Insights from Delmarva's Draft:



Assumptions used for Cost-Effectiveness Calculations

Draft – For Discussion
Purposes Only

- Total Resource Cost (TRC) Test measures the net cost of a program, including both the participants' and the utility's costs.
 - Calculation includes Avoided Capacity Costs, Avoided Energy Costs, Avoided Transmission Costs and Avoided Distribution Costs
 - Calculation excludes Capacity DRIPE, Energy DRIPE, non-energy benefits, RPS Compliance and Air Emissions benefits
 - Company's Weighted Cost of Capital is used as the discount rate
- Societal Cost Test (SCT) was calculated in the same manner as the TRC Test but the societal discount rate (3%) was used

Energy System Benefits (Avoided Costs)



Avoided Energy & Capacity Costs	Price Suppression (DRIPE)	Risk Premium
All States	Yes: CT, DC, MA, RI No: NH, NY, VT	Yes: CT, DC, DE, MA, NH, RI, VT No: NY
New England: Regional Cost study (include environmental compliance costs) NY: NYISO & PSC studies (RGGI carbon credit) DC & DE: Evaluation contractor	New England: 3.44 cents/kWh	Risk premiums in energy cost Lower discount rate

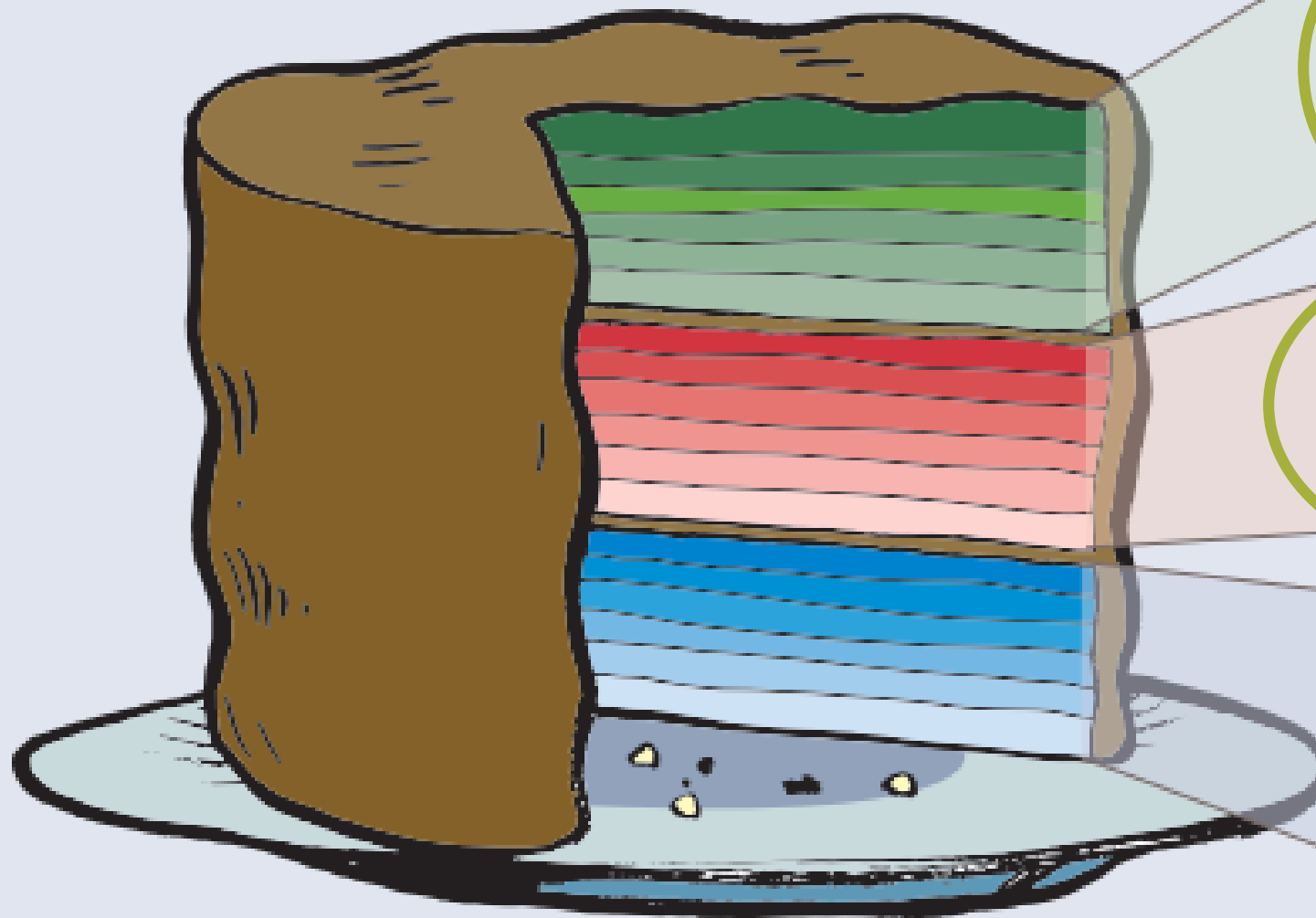
Other Program Impacts (OPIs)/(NEBs)



- Other resource savings, including non-primary fuels, oil & propane, and water
- Non-energy benefits
 - Utility-perspective
 - Participant-perspective
 - Societal-perspective
- Range & Values of OPIs vary widely
 - Majority of states attempt to account for OPIs to varying degrees
 - Can be challenging to quantify
- *Inclusion of OPIs is important to capture symmetry of program benefits as well as costs*

Participant and Utility OPIs/NEBs

A "Layer Cake" of Benefits from Electric Energy Efficiency



Utility System Benefits

- Power Supply
- T&D Capacity
- Environmental
- Losses and reserves
- Risk
- Credit and Collection

Participant Benefits

- Other Fuels
- Water, Sewer
- O&M Costs
- Health Impacts
- Employee Productivity
- Comfort

Societal Benefits

- Air Quality
- Water
- Solid Waste
- Energy Security
- Economic Development
- Health Impacts

State Practices with OPIs



OPI Category	Examples	States Using
Utility Perspective	<ul style="list-style-type: none">• Reduced arrearages• Improved customer service	MA, RI, VT
Participant Resource Benefits	<ul style="list-style-type: none">• Secondary fuels• Oil & propane• Water savings	ALL
Participant Non-Energy Benefits	<ul style="list-style-type: none">• Productivity• Comfort• Health• Operations & Maintenance Costs	DC, MA, NY, RI, VT
Low-Income		ALL
Societal	<ul style="list-style-type: none">• Environmental benefits• Economic development• National security	DC, RI, VT

How States Account for OPIs



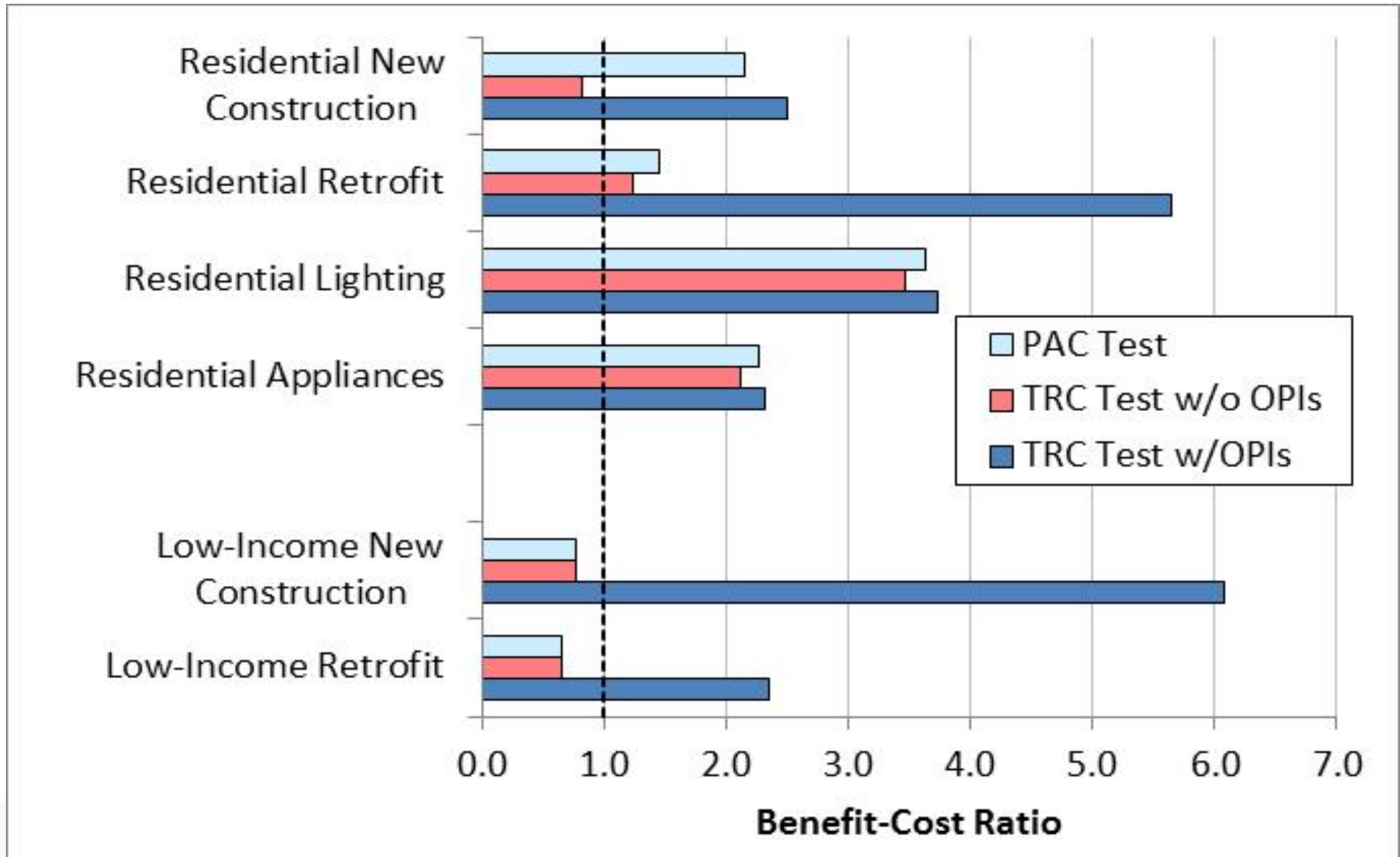
- Quantifies Broad Range of OPIs (sometimes called non-energy impacts)
 - Massachusetts & Rhode Island (*See Appendix C of Report*)
- Use Adders for OPIs
 - Estimate value of benefits using a percentage adder
 - D.C. & Vermont (10-15%)
- Value Qualitatively
 - Commission discretion if BCR <1.0
 - Low-Income: CT, NH, NY
 - Operations & Maintenance: NY

Table 3.3: Whether and How States Account for NEIs

Primary Test	UCT	Total Resource Cost Test					Societal Cost Test	
State	CT	MA	RI	NY	NH	DE	VT	DC
Utility-Perspective NEIs		Quantified	Quantified				15% Adder	
Low-Income / Economic Development	Alt. Benchmark	Quantified	Quantified	Alt. Benchmark	Alt. Benchmark		30% Adder	10% Adder
Improved Operations		Quantified	Quantified	Alt. Benchmark			O&M Quantified	O&M Quantified
Comfort		Quantified	Quantified				15% Adder	10% Adder
Health & Safety		Quantified	Quantified				15% Adder	10% Adder
Home Improvements		Quantified	Quantified				15% Adder	10% Adder
Participant's Utility Savings		Quantified	Quantified				15% Adder	10% Adder
Education and Contributions							15% Adder	10% Adder
Other Participant-Perspective							15% Adder	10% Adder
Societal-Perspective NEIs			Quantified				15% Adder	10% Adder

A blank cell indicates that the state does not account for this type of NEI. Source Synapse 2013.

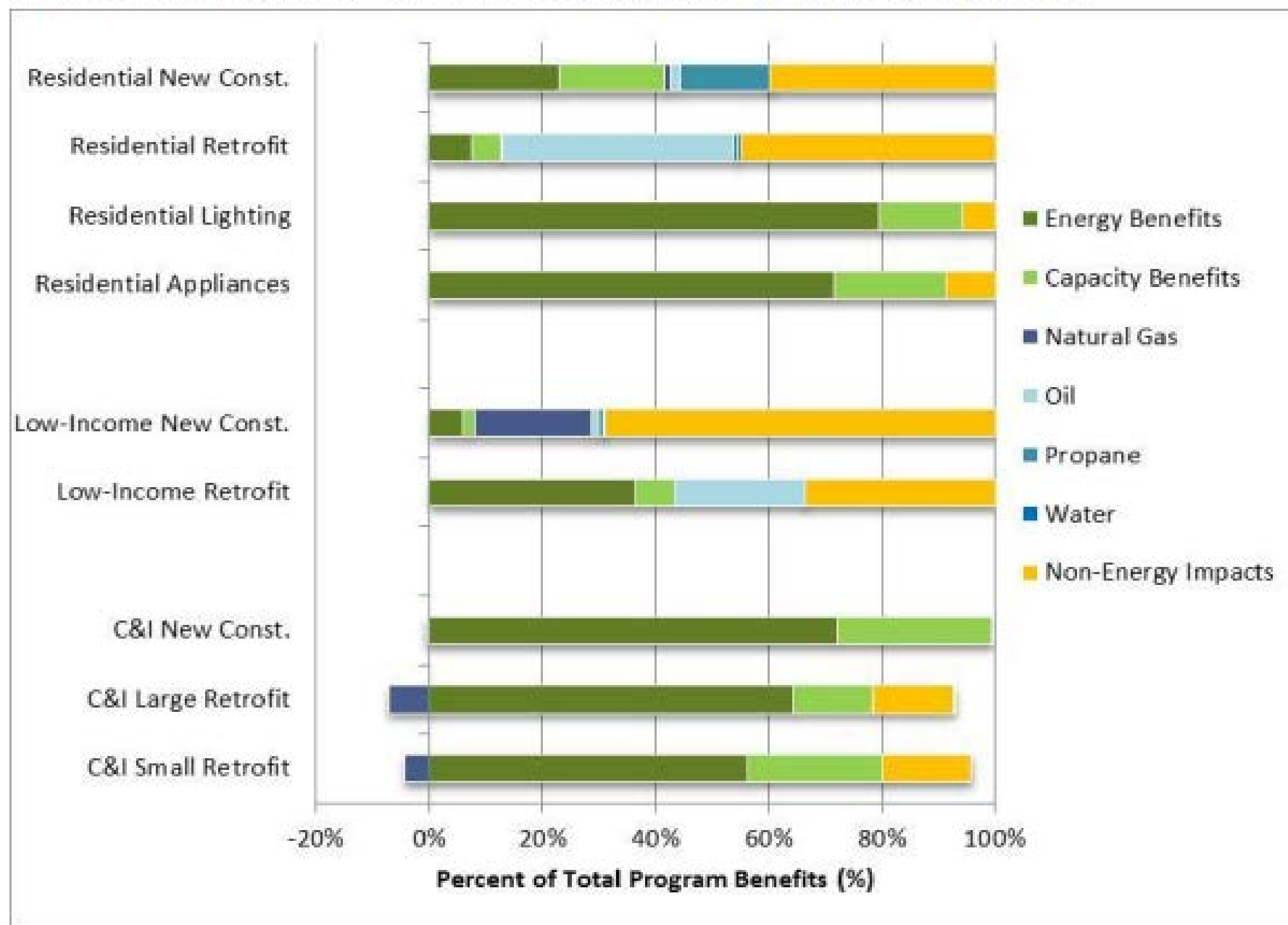
Impact of OPIs/NEBs on Program Screening



This Massachusetts utility example from 2012 shows how different screens = different results.

Impact of NEBs/OPIs on Program Screening

Figure B.1: Massachusetts - Percent of Benefits Made Up by NEBs, by Program



How States Account for OPIs, Applied

Table B.3: NEI Values in Massachusetts & Rhode Island, and Maryland (proposed) (\$ per household)

Perspective / NEI Category	Maryland (SERA 2014)		Massachusetts	Rhode Island		Average Across
	Dollar Range	Typical Value	Dollar Range	Dollar Range		All NEIs
Utility-Perspective						
Financial and Accounting	\$2.55 - \$25.00	\$9.70	\$2.61 - \$39.90	\$2.61	- \$3.74	\$13
Customer Service	\$0.10 - \$8.50	\$3.25	\$0.34 - \$8.43	\$0.34	- \$8.43	\$4
Other Utility Impacts	\$0.13 - \$2.60	\$1.40	na - na	na	- na	\$1
Participant-Perspective						
Participant's Utility Savings	\$0.27 - \$36.70	\$3.60	na - na	na	- na	\$18
Low-Income / Economic Development	\$0 - \$115	\$75	na - na	na	- na	\$58
Improved Operations	\$26 - \$127	\$82	\$0.96 - \$124	\$0.96	- \$102.40	\$64
Comfort	\$26 - \$105	\$69	\$31 - \$125	\$1.42	- \$125	\$69
Health & Safety	\$3.02 - \$100.50	\$16.50	\$4 - \$45	\$0.13	- \$45	\$33
Education and Contributions	\$26.25 - \$177.00	\$89.75	na - na	na	- na	\$102
Home Improvements	\$10.50 - \$77	\$36	\$17* - \$1,998*	\$0.32*	- \$678.52*	\$464
Other Participant-Perspective	\$0 - \$4	\$0	na - na	-\$0.015 per kWh saved		\$2
Societal-Perspective						
Economic Development	\$8 - \$340	\$115	na - na	\$0.39 per kWh saved*		\$116
Environmental / Emissions	\$3 - \$180	\$60	na - na	na	- na	\$92
Health Care / Health & Safety	\$0 - \$0.30	\$0	na - na	\$0	\$172.53*	\$58
Tax Impacts	na - na	na	na - na	na	- na	n/a
National Security	na - na	na	na - na	\$1.83 per MMBtu oil saved		n/a
Other Societal-Perspective NEIs	na - na	na	na - na	na	- na	n/a

**Indicates a one-time benefit, not an annual benefit that accrues for the duration of a measure's lifetime.*

Dollar values are per house hold per year.

The Massachusetts values are based on the 2013 Technical Reference Manuals. The Rhode Island values are based on the 2014 Technical Reference Manual.

Background: Regional States Energy Efficiency Cost-Effectiveness Summary



Cost-Effectiveness Metric		Connecticut	Delaware	District of Columbia	Massachusetts	New Hampshire	New York	Rhode Island	Vermont
Primary Policy Driver		Focus on electric system impacts only	Still under development	Energy efficiency programs must meet the Societal Cost test	All available cost-effective energy efficiency	Reduce market barriers to investments in cost-effective energy efficiency	Maximize cost-effectiveness given limited funding	All cost-effective energy efficiency	Least cost planning including environmental costs
Cost-Effectiveness Test(s) & Application	Primary Test	PAC	TRC	Societal	TRC	TRC	TRC	TRC	Societal
	Secondary Test	TRC	Societal; RIM						TRB; PAC
	Primary Screening Level	Program	Portfolio	Portfolio	Program	Program	Measure	Portfolio	Portfolio
	Additional Screening Level(s)		Program	Program, Project, Measure			Project, Program		Program, Project, Measure
	Discount rate used in Test	Cost of Capital	Societal	Prime Rate	10Yr Treasury	Prime Rate	Utility WACC	10Yr Treasury	Societal
	Study period over which Test is applied	Measure Life	Measure Life	Measure Life	Measure Life	Measure Life	Measure Life	Measure Life	Measure Life
Avoided Costs Included in Primary Cost-Effectiveness Test	Capacity Costs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Energy Costs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	T&D Costs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Environmental Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Price Suppression	Yes	Yes	Yes	Yes	No	No	Yes	No
	Line Loss Costs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Reduced Risk	No	Yes	Yes	No	No	No	No	Yes
OPIs/NEBs Included in Primary Cost-Effectiveness Test	Utility OPIs	No	No	No	Quantified	No	No	Quantified	Part of 15% Adder
	Participant OPIs								
	Resource	No	Yes - Calculation TBD	Quantified	Quantified	Quantified	Quantified	Quantified	Quantified
	Low-Income	Qualitative	No	Part of 10% Adder	Quantified	Qualitative	Qualitative	Quantified	Additional 15% Adder
	Equipment	No	No	O&M Quantified	Quantified	No	Qualitative	Quantified	O&M Quantified
	Comfort	No	No	Part of 10% Adder	Quantified	No	No	Quantified	Part of 15% Adder
	Health & Safety	No	No	Part of 10% Adder	Quantified	No	No	Quantified	Part of 15% Adder
	Property Value	No	No	Part of 10% Adder	Quantified	No	No	Quantified	Part of 15% Adder
	Utility Related	No	No	Part of 10% Adder	Quantified	No	No	Quantified	Part of 15% Adder
	Societal OPIs	No	No	Part of 10% Adder	No	No	No	Quantified	Part of 15% Adder

Sample Efficiency Screening Template



Table 6.1: A Sample Efficiency Screening Template

Efficiency Screening Template			
1. Key Assumptions, Parameters, and Summary of Results			
Program Administrator:		Reporting Period:	
Program Name:		Date of Filing:	
Analysis Level (e.g., program, portfolio):		Relevant State Policies: [ADD LINK TO SUPPORTING DOCUMENT]	
Average Program Measure Life		Discount Rate	
Projected Annual Savings		Projected Lifetime Savings	
2. Monetized Utility Costs		Monetized Utility Benefits	
Program Administration		Avoided Energy Costs	
Incentives Paid to Participants		Avoided Capacity Costs	
Shareholder Incentive		Avoided T&D Costs	
Other Utility Costs		Wholesale Market Price Suppression	
		Avoided Environmental Compliance Costs	
		Other Utility System Benefits	
NPV Total Utility Cost		NPV Total Utility Benefits	
3. Monetized Participant Costs		Monetized Participant Benefits	
Participant Contribution		Participants' Savings of Other Fuels	
Participant's Increased O&M Costs		Participant Non-Energy Benefits	
Other Participant Costs		Participants' Water and Sewer Savings	
		Participants' Reduced O&M Costs	
		Participants' Health Impacts	
		Participant Employee Productivity	
		Participant Comfort	
		Additional Low-Income Participant Benefits	
		Other Participant Non-Energy Benefits	
NPV Total Participant Cost		NPV Total Participant Benefits	
4. Monetized Energy Policy Costs		Monetized Energy Policy Benefits	
Public Costs		Public Benefits of Low Income Programs	
		Reduced Environmental Impacts (if monetized)	
		Public Fuel and Water Savings	
		Reduced Public Health Care Costs	
		Other Public Benefits	
NPV Total Participant Cost		NPV Total Public Benefits	
Total Monetized Costs and Benefits			
Net Benefits (PV\$): Utility		BCR: Utility Impacts	
Net Benefits (PV\$): Utility + Participant		BCR: Utility + Participant Impacts	
Net Benefits (PV\$): Utility + Participant + Public		BCR: Utility + Participant + Public Impacts	
5. Non-Monetized Energy Policy Benefits and Costs			
Benefits or Cost	Comments (how considered in screening)		
Promotion of Customer Equity			
Promotion of Market Transformation			
Reduced Environmental Impacts (if not monetized)			
Increased Jobs and Economic Development			
6. Determination			
Program Benefits Exceed Costs		Program Benefits Do Not Exceed Costs	

REGIONAL EVALUATION, MEASUREMENT & VERIFICATION FORUM

REGIONAL EVALUATION, MEASUREMENT & VERIFICATION FORUM

COST-EFFECTIVENESS SCREENING PRINCIPLES AND GUIDELINES

For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates, and Environmental Compliance Costs

Version 1.0

A project of the Regional Evaluation, Measurement and Verification Forum

NOVEMBER 2014

Facilitated and Managed by Northeast Energy Efficiency Partnerships

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Thank you!

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