

Cost-Effectiveness and TRC Test in 2011 (Follow Up); Update on Avoided Costs

EEAC Consultants

June 14, 2011



Part 1: Cost Effectiveness/TRC Test in EE Program Planning (follow up from last meeting)

1. Cost effectiveness is determined using a Total Resource Cost (TRC) Test
2. TRC Test calculates a benefit cost ratio (BCR)
3. $BCR = \text{ratio of total lifetime benefits and total costs}$
4. Benefits = value of the savings from program participation
5. Costs = all costs to the PA and the Participant that result from the program

How Does the TRC Test Determine Cost-Effectiveness?

- TRC test is applied by dividing the total lifetime **benefits** of a program by the total **costs** of the program, to create a Benefit Cost Ratio (BCR):

$$\text{BCR} = \frac{\text{Total benefits (\$)}}{\text{Total costs (\$)}}$$

If the BCR is	it is considered	because
≥ 1.0	cost-effective	benefits exceed costs
< 1.0	not cost-effective	costs exceed benefits

Benefit/Cost Ratio (BCR) and Net Benefits

- BCR = total lifetime benefits / total costs
- Net benefits = total lifetime benefits - total costs
 - When planning and assessing an entire energy efficiency portfolio, net benefits can indicate the magnitude of each sector’s contribution to the total economic value of the efforts

Massachusetts Three Year Gas and Electric Energy Efficiency Plans				
	Lifetime Benefits	Costs	BCR	Net Benefits
Residential	\$1,727	\$650	2.66	\$1,077
LI	\$485	\$209	2.32	\$276
C&I	\$3,759	\$1,275	2.95	\$2,484
Total	\$5,971	\$2,134	2.80	\$3,837

All values in \$ millions.

Cost-Effectiveness for 2011 – Residential Gas (NGrid)

Total Resource Cost Test, 2011			
Sector	Lifetime Benefits	Costs	B/C Ratio
New Construction & Major Renovations	\$3,117,152	\$2,364,748	1.3
Heating and Water Heating	\$32,962,261	\$10,041,026	3.3
MassSAVE	\$0	\$2,546,829	0.0
Weatherization Program	\$20,738,239	\$13,178,803	1.6
Multifamily Retrofit	\$10,603,565	\$3,056,781	3.5
Behavioral/Feedback Program	\$3,311,622	\$2,536,257	1.3
Deep Energy Retrofit	\$0	\$864,416	0.0
Building Practices and Demo	\$0	\$258,868	0.0
Energy Analysis: Internet Audit Program	\$0	\$316,876	0.0
Community based pilots	\$0	\$147,916	0.0
Workforce Development	\$0	\$0	0.0
Statewide Marketing & Education	\$0	\$137,825	0.0
EEAC Consultants	\$0	\$346,166	0.0
DOER Assessment	\$0	\$208,124	0.0
Sponsorships & Subscriptions	\$0	\$158,818	0.0
Residential	\$70,732,839	\$36,163,454	2.0

Part 2: Update on Regional Avoided Cost Study



Regional Avoided Cost Study

- Six New England States (ISO-NE area)
- Conducted every two years
- Provides consistent values for avoided costs throughout all New England states
- Used for Energy Efficiency programs only
- To be completed by July 8, 2011
- Will be applied going forward for:
 - 2012 Mid-Term Modifications (MTMs)
 - Next Three-Year Plans (2013-2015)

Example Calculation of Benefits

Benefits = net savings * avoided costs of supply

9.215 kW electricity
 13,823 kWh electricity
 0 mmbtu natural gas
 0 mmbtu other fuel
 0 gallons water
 0 units non-resources

\$50 per kW electric capacity
 \$0.08 per kWh electric energy
 \$10 per mmbtu natural gas
 \$13 per mmbtu other fuel
 \$0.01 per gallon water
 \$(variable) per units non-resources

$$\text{Year 1 benefits} = (9.215 * \$50) + (13,823 * \$0.08) + (\$10 * 0) + \dots = \$1,566.59$$

- The benefits are calculated for each year of the widget life and present valued using a discount rate (calculated per D.P.U. Guidelines) to determine lifetime benefits

Avoided Costs – Definitions (for electric)

Avoided energy = (wholesale electric energy price + REC cost and adjusted for wholesale risk premium). This is the largest component. Levelized annual values are about 18% lower than AESC 2009 due to lower natural gas prices, retirements, and more renewable generation

Avoided capacity = Revenue from bidding into Forward Capacity Market (FCM) OR value of reducing quantity of capacity from not bidding into FCM. Values for capacity bid into FCM are about 89% higher than AESC 2009 due to projections of new capacity requirements.

Energy DRIPE = Impact of kWh reductions on energy market prices. Values are approximately one-half AESC 2009, primarily due to changes in wholesale energy prices from AESC 2009.

Capacity DRIPE = Impact of kW reductions on FCM prices. Values are higher than AESC 2009 due to higher projections of capacity prices compared to AESC 2009.

Avoided CO₂ environmental externalities = cost of controlling CO₂ that is not reflected in wholesale energy market prices. Values are approximately 10% higher than AESC 2009 due to more efficient generating units on the margin offset by lower and delayed CO₂ pricing.

Avoided local T&D infrastructure. These costs are calculated by Program Administrators to be determined.

Electric Avoided Costs

Preliminary Avoided Electricity Costs for WCMA zone (Summer On Peak) AESC 2009 vs. AESC 2011 - Intrastate Energy DRIPE (Results are 15 year levelized in 2011\$)					
Component	AESC 2009	AESC 2011		Difference Relative to AESC 2009	
	cents/kWh	cents/kWh		cents/kWh	% Difference
Avoided Energy Costs	9.6	8.7		-0.9	-9.6%
Avoided Capacity Costs ^{1,2}	0.6	1.1		0.5	86.5%
Energy and Capacity Subtotal	10.2	9.8		-0.4	-4.1%
Intrastate DRIPE					
Intrastate Only Energy ³	2.8	1.5		-1.2	-45.0%
Capacity ²	0.3	1.2		1.0	371.9%
Intrastate DRIPE Subtotal*	3.0	2.7		-0.3	-9.1%
SUBTOTAL: Avoided Energy and Capacity + Intrastate DRIPE	13.2	12.5		-0.7	-5.2%
CO ₂ Externality	3.0	3.2		0.2	8.2%
Total*	16.2	15.7		-0.4	-2.8%

Values may not sum due to rounding. Avoided energy costs for Summer Peak incorporate avoided Class I REC costs.

AESC 2009 values levelized (2010-2024) escalated to 2011\$

1) Avoided capacity costs assumes 100% **selling** into Forward Capacity Markets

2) Assuming a 55% load factor

3) Values are for **Intrastate** energy DRIPE

4) Draft per 2011 CO₂ prices but 2009 CO₂ physical emissions

Natural Gas Avoided Costs

COMPARISON OF LEVELIZED AVOIDED COSTS OF GAS DELIVERED TO RETAIL CUSTOMERS
BY END USE: AESC 2009 AND AESC 2011

ASSUMING SOME AVOIDABLE RETAIL MARGIN

(2011\$/Dekatherm except where indicated as 2009\$/DT)

RESIDENTIAL				COMMERCIAL & INDUSTRIAL			ALL RETAIL
Non Heating	Hot Water	Heating	All	Non Heating	Heating	All	

Northern & Central New England: Massachusetts								
AESC 2009 (2009\$/DT)	10.87	10.87	13.54	12.67	10.02	12.05	11.40	12.03
AESC 2009 (a) (2011\$/DT)	11.08	11.08	13.79	12.91	10.21	12.28	11.61	12.25
AESC 2011 (2011\$/DT)	7.47	7.47	8.96	8.73	7.59	8.79	8.43	8.58
2009 to 2011 change	-32.57%	-32.57%	-35.03%	-32.38%	-25.64%	-28.37%	-27.41%	-29.99%

(a) Factor to convert 2009\$ to 2011 \$ 1.0186

Note: AESC 2009 levelized costs for 15 years, 2010 - 2024 at a discount rate of 2.22%.

AESC 2011 levelized costs for 15 years 2012 - 2026 at a discount rate of 2.465%.