

Appendix D

Trends in DSM and CDM Benefit-Cost Tests

Introduction

This appendix summarizes the most commonly used benefit-cost tests for screening low income energy assistance programs in California, Wisconsin, and British Columbia and provides statistics on the major screening tests used in different US states.

The following table describes three major screening tests (Total Resource Cost test, Utility Cost Test, and Participant Cost test) and the modified versions currently used in California (Modified Participant Cost test and Expanded Utility Cost test) and Wisconsin (Expanded TRC test) to screen their low income energy assistance programs. More detailed descriptions of the tests and the non-energy benefits (NEBs) and environmental externalities included in the different tests can be found in the jurisdictional reviews below.

Benefit-Cost Tests for Screening DSM and CDM Programs

Test	Benefits	Costs
Total Resource Cost (TRC) test	<ul style="list-style-type: none"> • Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resource savings (i.e. gas and water if utility is electric) 	<ul style="list-style-type: none"> • Program overhead costs • Program installation costs • Incremental measure costs (whether paid by the utility or the customer)
Expanded TRC test	<ul style="list-style-type: none"> • <i>Same as above</i> • Environmental externalities • Societal non-energy benefits • Economic multiplier applied to benefits 	<ul style="list-style-type: none"> • <i>Same as above</i>
Utility Cost (UC) test or Program Administrator Cost (PAC) test	<ul style="list-style-type: none"> • Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution 	<ul style="list-style-type: none"> • Program overhead costs • Utility (program administrator) incentive to participant costs • Utility (program administrator) installation costs
Expanded Utility Cost test	<ul style="list-style-type: none"> • <i>Same as above</i> • Environmental externalities • Non-energy benefits to the utility (i.e. reduced arrears) 	<ul style="list-style-type: none"> • <i>Same as above</i>
Participant Cost (PC) test	<ul style="list-style-type: none"> • Bill savings for participant 	<ul style="list-style-type: none"> • Participant incremental installation costs • Participant incremental equipment costs
Modified Participant Cost (PC_m) test	<ul style="list-style-type: none"> • <i>Same as above</i> • Participant non-energy benefits (i.e. increased comfort, improved health, etc.) 	<ul style="list-style-type: none"> • <i>Same as UC test costs (see above)</i>

California

California has a long history of low income programs and has experimented with different benefit-cost tests. There are four distribution companies in the state: Pacific Gas and Electric Company (PG&E) and San Diego Gas and Electric Company (SDG&E) are combined gas and electricity utilities, Southern California Edison (SCE) provides electricity, and Southern California Gas Company provides gas (SGE). All four distribution companies have low income programs, regulated by the California Public Utilities Commission (PUC) under the overarching Low Income Energy Efficiency (LIEE) program moniker. Since 2002, the utilities have evaluated their programs on the basis of a modified Participant Cost (PC_m) test and an expanded Utility Cost (UC) test. For the purpose of this section, “UC” refers to the expanded UC test used in California rather than the generic Utility Cost test.

In a normal participant cost test (PC), the benefits to the participant are divided by the cost paid by the participant. The costs are normally comprised of the participant’s incremental installation and equipment costs, while the benefits are the bill savings, incentives, and any applicable tax credits¹. Because the LIEE programs are cost free for participants, PC results would simply be the net present value (NPV) of the total benefits to the participant.

The PC_m test differs from the PC test in two important ways. In addition to bill savings for the participant, the PC_m test includes participant NEBs such as increased comfort and improved health, and it uses utility costs instead of participant incremental equipment and installation costs. Benefits to the utility such as “fewer calls to the utility” are not counted as benefits and are not included in the PC_m test².

The normal Utility Cost test includes benefits from the avoided energy costs and avoided capacity costs³. However, the expanded UC test employed in California’s LIEE programs also includes environmental externalities, as well as NEBs to the utility, such as reduced bad debt and savings from less frequent disconnections⁴.

The 2008 Decision on Large Investor-Owned Utilities’ 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications details the minimum requirements to be met for measures to be included within LIEE⁵. In order for new measures to be included in LIEE programs, they must have a PC_m and UC ratio equal or greater than 0.25. Existing measures need only score 0.25 on one of the two tests, with the assumption being that if they fared acceptably on one test they can be modified to eventually pass the other⁶. The following tables show the two tests, as well as the TRC test, for each of the utilities regulated by the California PUC. Note that when they refer to the Utility Cost test they are in fact referring to the expanded Utility Cost test described above.

¹ *Understanding Cost-Effectiveness of Energy Efficiency Programs*. US Department of Energy. November 2008. pp. 3-2

² *Report for LIEE Program and Measure Cost Effectiveness*. Cost Effectiveness Subcommittee of the RRM Working Group and Standardization Project Team. March 28th, 2002. pp. 9

³ *Understanding Cost-Effectiveness of Energy Efficiency Programs*. US Department of Energy. November 2008. pp. 3-2

⁴ *Report for LIEE Program and Measure Cost Effectiveness*. Cost Effectiveness Subcommittee of the RRM Working Group and Standardization Project Team. March 28th, 2002. pp. 10

⁵ *Decision on Large Investor-Owned Utilities’ 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications*. Public Utilities Commission of California. May 15, 2008.

⁶ *Decision on Large Investor-Owned Utilities’ 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications*. Public Utilities Commission of California. May 15, 2008. pp. 51

	A	B	C	D	E
1	Summary of LIEE Program Cost Effectiveness				
2	Pacific Gas and Electric Company				
3					
4	Ratio of Program Benefits over Program Costs ²				
5		Utility Cost Test	Modified Participant Test	Total Resource Cost Test	
6	PY 2008 ¹	0.46	0.63	0.36	
7	PY 2009	0.48	0.70	0.37	
8	PY 2010	0.47	0.72	0.36	
9	PY 2011	0.45	0.71	0.34	
10	¹ These forecasted values for 2008 are based on 2007 actuals				
11	² The Utility Cost Test (UCT) and Modified Participant Cost Test (PC _m) both include NEBs and were adopted for LIEE in D.02-08-034. The TRC is included for information purposes only, as specified in the ACR Providing Guidance for LIEE 2009-2011 Budget Applications, dated 4/01/08. Cost Benefit tests are described in this 2009-2011 LIEE testimony, Section IV.A.				
12					

7

	A	B	C	D
1	Summary of LIEE Program Cost Effectiveness			
2	San Diego Gas & Electric Company			
3				
4	Ratio of Program Benefits over Program Costs			
5		Utility Cost Test	Modified Participant Test	Total Resource Cost Test
6	PY 2008	0.40	0.58	0.31
7	PY 2009	0.61	0.86	0.51
8	PY 2010	0.61	0.86	0.51
9	PY 2011	0.61	0.86	0.51
10				
11				
12	NOTE: The benefit cost ratio for PY 2009 - 2011 was calculated using energy impacts primarily from the 2005 LIEE Impact Evaluation. The benefit cost ratio for PY 2008 was calculated using energy impacts from previous studies.			

8

	A	B	C	D
1	Summary of LIEE Program Cost Effectiveness			
2	Southern California Edison			
3				
4	Ratio of Program Benefits over Program Costs			
5		Utility Cost Test	Modified Participant Test	Total Resource Cost Test
6	PY 2008 ¹	0.59	1.29	0.52
7	PY 2009	0.72	2.15	0.57
8	PY 2010	0.68	2.12	0.55
9	PY 2011	0.64	2.08	0.54

9

¹ Decision on Large Investor-Owned Utilities' 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications. Public Utilities Commission of California. May 15, 2008. pp. 48

⁸ Decision on Large Investor-Owned Utilities' 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications. Public Utilities Commission of California. May 15, 2008. pp. 49

⁹ Decision on Large Investor-Owned Utilities' 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications. Public Utilities Commission of California. May 15, 2008. pp. 49

	A	B	C	D
1	Summary of LIEE Program Cost Effectiveness			
2	Southern California Gas Company			
3				
4	Ratio of Program Benefits over Program Costs			
5		Utility Cost Test	Modified Participant Test	Total Resource Cost Test
6	PY 2008	0.23	0.57	0.17
7	PY 2009	0.45	0.92	0.35
8	PY 2010	0.45	0.92	0.35
9	PY 2011	0.45	0.92	0.35
10				
11	Note: The benefit cost ratio for PY 2009 - 2011 was calculated using energy impacts primarily from the 2005 LIEE Impact Evaluation. The benefit cost ratio for PY 2008 was calculated using energy impacts from previous studies.			

10

PG&E and SDG&E are both combined gas and electric utilities, and have similar results for 2008. SCE (an electric utility) and SCG (a gas utility) are markedly different. However, when combined the results are quite similar¹¹.

Wisconsin

The Public Service Commission (PSC) of Wisconsin has been running a low income energy efficiency program called the Weatherization Assistance Program (WAP) since 2002, funded by a combination of ratepayer and Department of Energy dollars¹². In order to assess the cost effectiveness of WAP, the PSC uses an expanded TRC test. The expanded TRC used by the PSC includes only those NEBs that have quantifiable monetary impact on the economy. In addition, the expanded TRC test takes into account monetized societal benefits, environmental benefits, and avoided emissions, and applies a net economic multiplier¹³.

The avoided emissions are valued at prices derived from active and planned emissions trading markets, projected using data and a modeling tool from the EPA. The emissions accounted for are NO_x, SO_x, CO₂, and mercury¹⁴. The environmental externality costs add 12% on to the value of avoided energy costs – a value derived from current literature on the topic¹⁴.

The economic multiplier, applied to the sum of the energy and non-energy benefits, is set at 1.5¹⁴. It is intended to represent the ripple effects of the program, including but not limited to impacts such as the jobs created through the implementation of the program and participants in the program having more disposable income as a result of lowered energy costs.

¹⁰ 2008 *Decision on Large Investor-Owned Utilities' 2009-11 Low Income Energy Efficiency (LIEE) and California Alternate Rates for Energy (CARE) Applications*. Public Utilities Commission of California. May 15, 2008. pp. 50

¹¹ *Report for LIEE Program and Measure Cost Effectiveness*. Cost Effectiveness Subcommittee of the RRM Working Group and Standardization Project Team. March 28th, 2002. pp.1

(The 2002 Final Report for LIEE Program and Measure Cost Effectiveness recognized that the latter two companies serve essentially congruent jurisdictions, and for the purpose of comparison with the combined gas and electric utilities combines their numbers, with the results being quite similar to those reported at the time by PG&E and SDG&E)

¹² *Low-income Public Benefits Evaluation: Interim Benefit-Cost Analysis*. State of Wisconsin Department of Administration: Energy Division. February 26th, 2007. pp. 1-1

¹³ *Low-income Public Benefits Evaluation: Interim Benefit-Cost Analysis*. State of Wisconsin Department of Administration: Energy Division. February 26th, 2007. pp. 1-3

¹⁴ *Low-income Public Benefits Evaluation: Interim Benefit-Cost Analysis*. State of Wisconsin Department of Administration: Energy Division. February 26th, 2007. pp. 3-7

Using the expanded TRC test calculated over a 25 year period (at a 3% discount rate)¹⁵, WAP had a benefit-cost ratio of a little over 1 in 2007. Using traditional TRC, the programs score in the same range as California's, at 0.4¹⁶.

British Columbia

BC Hydro's Energy Conservation Assistance Program (ECAP) is a low income weatherization initiative that operates under the broader umbrella of BC Hydro's Power Smart energy conservation program¹⁷. ECAP is very recent, having only launched in May 2009. The program includes both basic (i.e. caulking and sealing) and extended (i.e. appliance replacement) measures, with an average of \$2 500 and a maximum of \$10 000 spent on each home, not including grants from the ecoENERGY program. The BC Government has a memorandum of understanding (MOU) with NRCan for its regular DSM programs; because of this, NRCan is comfortable transferring funds directly to BC Hydro, despite not having a specific MOU for the ECAP¹⁸.

For the ECAP, BC Hydro is currently estimating a TRC of 0.7. This is an estimate, as the program has yet to run for a full year. BC Hydro calculates the cost effectiveness of their DSM programs on a portfolio basis, as per the British Columbia Utility Commission's regulations. The portfolio is mandated to include educational programs for both students and community members, as well as programs targeted specifically at low income sectors¹⁹. For their low income portfolio, BC Hydro is projecting a TRC of 0.96¹⁹. This includes the ECAP program as well as a successful energy saving kit for low income households that does well on TRC. Of their low income energy efficiency programs, BC Hydro applies a TRC test with a 30% adder²⁰. That adder accounts for societal benefits, and brings the TRC the ECAP to approximately 1, and the TRC for their overall portfolio to approximately 1.25¹⁹.

BC Hydro indicated that when determining which houses qualify for ECAP, they look for those which are the most cost effective¹⁹. The requirements for the program stipulate that in addition to being below the appropriate LICO, the household must have energy use that exceeds 8 000 kWh or energy bills that exceed \$5 000 annually¹⁸.

Trends in North America

The following table details the primary and secondary benefit-cost tests currently used in various American states. The second column, "Primary Test", indicates the test used in those states that designate one metric above others. For most states, however, a variety of tests are used. Of the forty two states listed in the table, six of them use the TRC as their primary test followed by five that use the societal cost test and three that use the utility cost test as their primary test. The remaining states use a combination of different tests. Of those using the TRC test, the vast majority are not using it as their primary test but in conjunction with other tests.

¹⁵ *Low-income Public Benefits Evaluation: Interim Benefit-Cost Analysis*. State of Wisconsin Department of Administration: Energy Division. February 26th, 2007. pp. 3-5

¹⁶ *Low-income Public Benefits Evaluation: Interim Benefit-Cost Analysis*. State of Wisconsin Department of Administration: Energy Division. February 26th, 2007. pp. 1-2

¹⁷ *Energy Conservation Assistance*. BC Hydro. Accessed on July 18th, 2009. - http://www.bchydro.com/powersmart/residential/energy_conservation.html

¹⁸ Informal conversations with staff at BC Hydro and the British Columbia Provincial Government during the week of July 12th - 19th, 2009.

¹⁹ *Utilities Commission Act - Demand Side Measures Regulation*. November 7th, 2008. Accessible at: http://www.bclaws.ca/Recon/document/freeside/--%20u%20--/utilities%20commission%20act%20%20rsrc%201996%20%20c.%20473/05_regulations/10_326_2008.xml#FOUND-NOTHING

According to Nick Hall, a consultant with TecMarket Works currently working with the Obama Administration on energy efficiency policy, the US Federal Government is moving away from TRC as a test for screening federally funded energy efficiency programs. The TRC's simple valuation of avoided energy costs puts an undue prioritization on measures with the least initial cost. Hall argued that while useful as a blunt metric, TRC is a poor planning tool; a sentiment echoed by Oscar Bloch III, staff member in charge of conservation metrics at the Wisconsin Public Services Commission. The US Federal Government is likely to move towards a benefit-cost test that focuses more on long term energy savings rather than immediate benefits.

Cost Efficiency Tests in the US²⁰

State	Primary Test	Total Resource Cost Test	Societal Cost Test	Participant Cost Test	Utility Cost Test	Ratepayer Impact Measure Test	Other	No Specific Test Required
Arizona	Societal (proposed)		X					
Arkansas		X		X	X	X		
California	TRC	X			X			
Colorado		X	X					
Connecticut	Utility	X			X			
District of Columbia						X	X	
Delaware		X						
Florida	RIM	X		X		X		
Georgia		X	X	X		X		
Hawaii		X	X	X	X	X		
Iowa			X	X	X	X		
Idaho								X
Illinois		X						
Indiana		X	X	X	X	X		
Kansas		X				X		
Kentucky								X
Massachusetts	TRC	X						
Maryland								X
Maine	Societal		X					
Minnesota	Societal	X	X	X	X	X		
Missouri	TRC	X			X			
Montana		X	X					
North Carolina								X
North Dakota								X
New Hampshire	TRC	X				X		
New Jersey							X	
New Mexico	TRC	X						
Nevada			X		X		X	

State	Primary Test	Total Resource Cost Test	Societal Cost Test	Participant Cost Test	Utility Cost Test	Ratepayer Impact Measure Test	Other	No Specific Test Required
New York	TRC	X						
Oklahoma								X
Oregon			X		X			
Pennsylvania								X
Rhode Island							X	
South Carolina								X
Utah	Utility	X			X			
Virginia		X	X	X	X	X		
Vermont	Societal		X					
Texas	Utility				X			
Washington		X			X		X	
Wisconsin	Societal		X					
Wyoming								X

²⁰ *An Efficient Balance? Applying the Total Resource Cost Test to Conservation and Demand Management Initiatives of Local Distribution Companies in Ontario.* Winfield, Mark S; Koveshnikova, Tatiana. York University. June 2009. pp. 57