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Cost-Benefit Analysis of the PSE&G Energy Efficiency Program 2014 Prospective

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A. Introduction

The Center for Energy, Economic and Environmental Policy (CEEEP) of the Edward J. Bloustein School of Planning and Public Policy, Rutgers University was asked by the New Jersey Board of Public Utilities (NJBPU) to conduct a cost-benefit analysis of PSE&G's 2014 prospective energy efficiency programs. The purpose of this report is to document the assumptions used for evaluation and summarize the evaluation results of the 2014 energy efficiency programs. Please note that non-energy impacts, such as reductions in water usage and improved health and safety, have not been included in this analysis. These types of impacts should be investigated and quantified in future.

The three energy efficiency programs proposed by PSE&G are as follows:

(a) Residential Multi-Family Housing Sub-Program
(b) Direct Install Sub-Program
(c) Hospital Efficiency Sub-Program

Results presented herein are based on the program information as provided by PSE&G in its final data file dated July 3, 2014.

The key assumptions and data sources are explained in Section C.

B. Cost-Benefit Tests

Five costs tests are utilized for the cost-benefit analysis: Participant Cost Test, Program Administration Cost Test, Ratepayer Impact Measure Test, Total Resource Cost Test and Societal Cost Test[1].

Participant Cost Test: The measure of the quantifiable benefits and costs to the customer attributed to participation in a program. The participant benefits are equal to the sum of any participant incentives paid, any reductions in bills, and any federal or state tax deductions or credits. Participant costs include any out-of-pocket costs associated with the program.

Program Administrator Cost Test: The costs of a program as a resource option based on the costs incurred by the program administrator (including incentive costs), excluding any costs incurred by the participant. The benefits are the avoided supply costs of energy and demand and the reduction in capacity valued at marginal costs for the periods when there is a load reduction. The costs are the program costs incurred by the administrator, the incentives paid to the customers, and the increased supply costs for the periods in which load is increased.

[1] California Standard Practice Manual. Economic Analysis of Demand-Side Projects, October 2001

Ratepayer Impact Measure Test: Measure of what happens to customer bills or rates due to changes in revenues and operating costs caused by the program. The benefits equal the savings from avoided supply costs, including the reduction in capacity costs for periods when load has been reduced and the increase in revenues for periods in which load has increased. The costs are the program costs incurred by administration of the program, the incentives paid to the participant, decreased revenues for any periods in which load has been decreased and increased supply costs for any periods when load has increased.

Total Resource Cost Test: The costs of a program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. This test represents the combination of the effects of a program on both the participating and non-participating customers. The benefits are the avoided supply costs, federal tax credits, and the reduction in generation and capacity costs valued at marginal cost for the periods when there is a load reduction. The costs are the program costs paid by the utility and participants plus the increase in supply costs for the periods in which load is increased.

Societal Cost Test: Attempts to quantify the change in the total resource costs to society as a whole rather than only to the utility and its ratepayers. Costs include all consumer, utility and program expenses. Benefits associated with the societal perspective include avoided power supply costs, capacity benefits, avoided transmission and distribution costs, and emissions savings.

C. Cost-Benefit Analysis Assumptions

The key components of the energy efficiency cost-benefit analysis and the data sources and processes for determining these components are discussed in this section. The number of program participants, participant electricity and natural gas savings, and administrative costs were provided by PSE&G (data file dated July 3, 2014). Other key assumptions for analysis have been obtained from the CEEEP's Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions[2], July 1, 2013.

Retail Electricity Prices: Historic 2012 U.S. Energy Information Administration (EIA) New Jersey retail electricity prices were escalated using an annual growth rate derived from the EIA Annual Energy Outlook 2012 for the Mid-Atlantic region. The NJ Clean Energy Programs do not distinguish between commercial and industrial sectors, therefore the commercial and industrial prices were averaged based on historic 2012 New Jersey retail electricity sales.

Wholesale Electricity Prices: Historic 2012 New Jersey wholesale electric prices from PJM were escalated based on the annual percent change in the EIA Annual Energy Outlook Reliability First Corporation/East Electricity Generation Prices. The seasonal peak and off-peak factors were derived using historic 2012 PJM LMP data.

[2] CEEEP, 2013. Draft Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions http://ceeep.rutgers.edu/wp-content/uploads/2013/11/AvoidedCost20131.pdf

Table 1: Retail and Wholesale Electricity

	Retail ($/kWh)		*Wholesale ($/MWh)*				
	Residential	Commercial & Industrial	Average Price	Summer Peak	Summer Off-Peak	Non-Summer Peak	Non-Summer Off-Peak
2012	$0.17	$0.14	$34.36	$43.65	$28.04	$39.67	$31.50
2013	$0.16	$0.13	$36.74	$46.67	$29.98	$42.42	$33.68
2014	$0.17	$0.13	$35.79	$45.46	$29.21	$41.32	$32.81
2015	$0.17	$0.13	$35.99	$45.72	$29.37	$41.56	$33.00
2016	$0.18	$0.14	$35.88	$45.58	$29.28	$41.42	$32.89
2017	$0.18	$0.14	$36.19	$45.98	$29.54	$41.79	$33.18
2018	$0.18	$0.14	$38.37	$48.75	$31.32	$44.30	$35.18
2019	$0.18	$0.15	$40.36	$51.28	$32.94	$46.60	$37.00
2020	$0.18	$0.15	$39.53	$50.21	$32.26	$45.63	$36.24
2021	$0.19	$0.15	$43.34	$55.06	$35.37	$50.04	$39.74
2022	$0.19	$0.15	$45.53	$57.84	$37.15	$52.56	$41.74
2023	$0.19	$0.15	$47.53	$60.38	$38.79	$54.88	$43.58
2024	$0.20	$0.16	$50.03	$63.55	$40.82	$57.76	$45.86
2025	$0.21	$0.16	$52.29	$66.42	$42.67	$60.37	$47.93
2026	$0.21	$0.16	$53.68	$68.19	$43.80	$61.97	$49.21
2027	$0.22	$0.16	$54.73	$69.53	$44.67	$63.19	$50.18
2028	$0.23	$0.17	$56.10	$71.27	$45.78	$64.77	$51.43
2029	$0.23	$0.17	$57.99	$73.67	$47.32	$66.95	$53.16
2030	$0.23	$0.18	$60.08	$76.32	$49.03	$69.37	$55.08
2031	$0.24	$0.18	$61.51	$78.14	$50.19	$71.01	$56.39
2032	$0.25	$0.18	$63.90	$81.18	$52.15	$73.78	$58.59
2033	$0.25	$0.19	$65.53	$83.25	$53.48	$75.66	$60.07
2034	$0.26	$0.20	$68.16	$86.59	$55.62	$78.69	$62.49
2035	$0.27	$0.20	$72.10	$91.60	$58.84	$83.25	$66.10
2036	$0.27	$0.21	$75.97	$96.51	$62.00	$87.71	$69.65

Table 2: Retail and Wholesale Natural Gas ($/MMBtu)

	Retail Prices			*Henry Hub Wholesale Prices*		
	Residential	Commercial	Industrial	Average Price	Summer	Winter
2012	$12.35	$8.75	$7.35	$2.66	$2.57	$2.76
2013	$12.51	$9.35	$7.91	$3.36	$3.25	$3.48
2014	$12.51	$9.21	$7.82	$3.28	$3.16	$3.39
2015	$12.51	$9.20	$7.96	$3.32	$3.21	$3.44
2016	$13.18	$9.76	$8.56	$3.86	$3.72	$3.99
2017	$13.63	$10.08	$8.86	$4.06	$3.92	$4.20
2018	$14.23	$10.56	$9.35	$4.42	$4.26	$4.57
2019	$14.65	$10.85	$9.64	$4.59	$4.43	$4.75
2020	$15.07	$11.15	$9.92	$4.77	$4.60	$4.93
2021	$15.46	$11.41	$10.15	$5.00	$4.82	$5.17
2022	$16.02	$11.83	$10.58	$5.35	$5.16	$5.53
2023	$16.54	$12.22	$10.97	$5.68	$5.49	$5.88
2024	$17.03	$12.57	$11.33	$5.93	$5.72	$6.13
2025	$17.48	$12.88	$11.62	$6.14	$5.92	$6.35
2026	$18.17	$13.41	$12.20	$6.44	$6.22	$6.67
2027	$18.60	$13.68	$12.44	$6.65	$6.42	$6.89
2028	$19.14	$14.06	$12.82	$6.94	$6.70	$7.19
2029	$19.69	$14.44	$13.19	$7.18	$6.93	$7.43
2030	$20.24	$14.82	$13.57	$7.45	$7.19	$7.71
2031	$20.89	$15.29	$14.05	$7.78	$7.51	$8.05
2032	$21.48	$15.69	$14.44	$8.06	$7.78	$8.34
2033	$22.15	$16.17	$14.91	$8.41	$8.12	$8.71
2034	$22.94	$16.77	$15.54	$8.96	$8.65	$9.27
2035	$23.78	$17.40	$16.20	$9.55	$9.22	$9.89
2036	$24.80	$18.22	$17.09	$10.30	$9.94	$10.66

Retail Natural Gas Prices: Historic 2012 EIA New Jersey retail natural gas prices were escalated using an annual growth rate derived from the Mid-Atlantic Region EIA Annual Energy Outlook 2013 natural gas price forecasts.

Wholesale (Henry Hub) Natural Gas Prices: Wholesale natural gas prices were taken from the EIA Annual Energy Outlook 2012.

Capacity Prices: 2010 to 2016 PJM Reliability Pricing Model (RPM) prices were weighted by historic 2012 peak load and forecasted based on the annual change in U.S. GDP Chain-type Price Index.

Emissions Permit Prices: Values for the Social Cost of Carbon were taken from the Interagency Working Group on Social Cost of Carbon. Values were reported in 2007$/metric ton, and were converted to nominal dollars using the EIA projected U.S. GDP Price Index.

The emissions price for SO_2 and NO_x was obtained from the National Research Council's 2010 study - Hidden Costs of Energy[3].

Table 3: SO_2 and NO_x Emissions Allowance Prices

From Coal-fired Power Plants	Unit	2007 $
SO_2	$/Short Ton	5,800
NO_x	$/Short Ton	1,600
From Gas-fired Power Plants	**Unit**	**2007 $**
SO_2	$/Short Ton	13,000
NO_x	$/Short Ton	2,200

Discount Rate: Discount rates are used to convert future economic values into present pay dollars. A nominal discount rate of 8% is used.[4]

Avoided Electric and Natural Gas Losses: Avoided average electric transmission and distribution losses are assumed to be 7.6% and avoided natural gas losses are assumed to be 1.4% based on CEEEP, Draft Energy Efficiency Cost-Benefit Analysis Avoided Cost Assumptions, July 1, 2013.

Avoided Electric and Natural Gas Transmission and Distribution (T&D): EnerNOC Utility Solutions[5] has recommended that CEEEP use an Avoided Electric T&D cost of $30/kW-yr.

Federal tax credits are not included.

[3] National Research Council. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*. Washington DC: The National Academies Press, 2010.

[4] Levitan & Associates, Inc. Long-term Capacity Agreement Pilot Program (March 2011).

[5] EnerNOC Utility Solutions performed the calculations as part of the 2012 Energy Efficiency Market Potential Study for the New Jersey Clean Energy Program.

D. Cost-Benefit Analysis Results

The cost-benefit analysis results for PSE&G's 2014 prospective energy efficiency programs are presented in table 4 below.

Table 4: Cost-Benefit Analysis Results

Results	Residential Multi-Family	Direct Install	Hospital Efficiency
Participant Cost Test	$27,997,516	$23,799,945	$30,046,905
Participant Cost Test Ratio	6.87	5.65	5.13
Program Administrator Cost Test	$6,454,786	$29,572,939	$22,102,406
Program Administrator Cost Test Ratio	1.31	2.62	1.87
Ratepayer Impact Measure Test	$(3,940,748)	$15,953,832	$8,261,489
Ratepayer Impact Measure Test Ratio	0.87	1.50	1.21
Total Resource Cost Test	$1,688,361	$24,453,410	$14,823,514
Total Resource Cost Test Ratio	1.07	2.05	1.45
Societal Cost Test	$31,552,625	$57,745,762	$58,174,113
Societal Cost Test Ratio	4.87	7.22	6.72

The above test results are extremely sensitive to some of the program level assumptions as provided by PSE&G, which are the load factor assumptions and energy reduction assumptions. In order to increase the accuracy of the cost-benefit analyses, CEEEP suggests that the utility should provide a more detailed measure-level and incremental cost data. This would mean an assessment of exactly which (and how many) measures are proposed under a given program and details of incremental costs for purchasing an energy efficient product instead of a standard product of the full cost of weatherization and insulation products.