



**Program Cost-benefit Analysis of  
2003 New Jersey Clean Energy Council  
Energy Efficiency Programs**

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THE STATE UNIVERSITY OF NEW JERSEY  
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## **Section 1- Summary**

The Center for Energy, Economic and Environmental Policy (CEEPP) presents in this report its program cost-benefit analysis of the residential and commercial and industrial energy-efficiency programs approved by the New Jersey Board of Public Utilities (BPU) as part of New Jersey's Clean Energy Program. CEEPP, in a report dated October 7, 2004, provided the BPU with its assessment of the benefits of the renewable energy programs.

This report is a follow-up to the 2001 Total Resource Cost-Benefit Analysis prepared by the New Jersey Clean Energy Collaborative that was submitted to the BPU on July 9, 2001. The purpose of this report is to update the 2001 cost-benefit analysis to facilitate comparison between the programs in 2001 and 2003 and not to conduct a study from scratch. As a result, some key assumptions used in the 2001 analysis that did not have readily available updates – transmission and distribution avoided costs, externality costs, discount rate, and natural gas transportation charges – were used in this report. Further below, each major assumption is discussed in detailed along with suggesting that all assumptions be reviewed as part of further work.

The cost-benefit analysis submitted in 2001 utilized the Total Resource Cost (TRC) test. The TRC test requires knowing the incremental cost of specific technologies (measures) as one of its inputs. Since this information was not available for this analysis, CEEPP utilized program costs as the only cost input, which only enables an evaluation of cost effectiveness from a program perspective. The program cost-benefit analysis conducted in this report does not capture the total costs to society that the TRC test does.

CEEPP, in its draft Phase 2 2005 Evaluation and Research Plan, proposed that a contractor be engaged to perform an assessment of the NJ energy efficiency marketplace that would include an assessment of the incremental cost of various energy efficiency measures. Once this information becomes available, which is expected by the end of the year 2005, the analysis herein should be extended by conducting the TRC test that includes the incremental measure costs.

The analysis presented herein is useful as a tool to rank programs from a program perspective and, as noted above, should be expanded to rank program from a societal perspective once incremental measure cost becomes available. The intended purposes and uses for cost-benefit analysis are to:

1. Inform program planning
2. Demonstrate the relative economic value of programs
3. Assess program results
4. Guide program implementation

Cost effectiveness is but one input into the decision as to which programs should be funded. Other factors need to be considered as well. For example, while all of the low-income program's costs exceed its benefits, other public policy considerations must be taken into account that support the continuation of this program.

This report calculates benefits both with and without environmental externalities, as was done in 2001. Environmental externality benefits are the reduction in pollutants that result from avoiding

the consumption of electricity and natural gas due to these conservation programs, which are quantified in dollars. In December 2004, CEEEP conducted a thorough review of the environmental externality literature as part of its *Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard (RPS)*. That assessment concluded that although there are many and substantial health and environmental effects due to air emissions from power plants, quantifying the health and environmental effects for New Jersey requires additional modeling and research. Therefore, the externality values used in the 2001 report were also used in this report. Another important issue regarding environmental externalities that the 2004 CEEEP RPS Economic Assessment report also raised, and is discussed further below, is the interaction between emission reductions due to these energy efficiency programs and existing emission allowance cap-and-trade programs.

This report is organized into the following sections. This section summarizes the findings of the analysis and serves as an executive summary. Section 2 presents in tabular format the program cost-benefit analysis results on a program-by-program basis and where possible reports the 2001 TRC cost-benefit results. Section 2 also provides the emission savings in metric tons and compares the forecasts of electricity and natural gas prices used in this report with those used in the 2001 analysis. Section 3 reviews the major assumptions used in this program cost-benefit analysis. A reference section at the end of this report provides the citations for documents utilized in preparing this report.

The specific 2003 programs reviewed are the following<sup>1</sup>:

**TABLE 1.1 – PROGRAMS REVIEWED**

<b>Residential Programs</b>	<b>Non-Residential Programs</b>
Residential Gas and Electric HVAC	Commercial/Industrial Construction
Residential New Construction	<ul style="list-style-type: none"> <li>• <i>C&amp;I New Construction</i></li> </ul>
Energy Star Products	<ul style="list-style-type: none"> <li>• <i>C&amp;I Retrofit</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Lighting</i></li> <li>• <i>Room Air Conditioning</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>New School Construction &amp; Retrofit</i></li> </ul>
Residential Low Income	
<ul style="list-style-type: none"> <li>• <i>Comfort Partners Low Income</i></li> <li>• <i>Senior Weatherization Pilot</i></li> </ul>	

For programs such as Residential New Construction and Residential HVAC that include both gas and electric components, the program cost-benefit analysis assesses the costs and the benefits of the gas and electric components separately.

Market transformation programs, such as the Energy Star Products Program, are intended to increase the penetration of energy efficiency products. Other programs, such as the Residential HVAC Program have both direct benefits that result from customers participating in the program, and market transformation benefits that result when energy efficient products and services becoming standard practice.

<sup>1</sup> The Appliance Cycling program was not reviewed in this report because a separate review by CEEEP is being conducted. The Cool Cities program and the Energy Star Maintenance and Home Energy Audit programs were not reviewed here because no savings were reported for these programs in the year 2003.

Energy savings from market transformation programs are measured by developing baselines and determining increased penetration levels that result from the programs. However, the evaluations needed to determine the impact of New Jersey’s market transformation programs have not been performed and therefore no savings have been reported for the market transformation programs. The recommended market assessment evaluation to be conducted by year-end 2005 noted above would also measure the changes in the marketplace that are needed to determine the savings generated from the market transformation programs. These savings will increase the benefits of the programs and, to the extent available, should be utilized in any updated cost-benefit analysis.

Since the price of electricity and natural gas vary throughout the year, time period factors are needed to allocate the energy savings by season, and in the case of electricity, by off-peak and on-peak hours in order to calculate the dollar value of these savings. For this analysis CEEEP either utilized allocation factors included in the New Jersey Clean Energy Program Protocols to Measure Resource Savings (2004) or were provided allocation factors based on discussions with the program managers.

Several programs that were analyzed in the 2001 TRC analysis were merged into other programs. For example, the Energy Star Appliances, Energy Star Windows, and Energy Star Lighting Programs were merged into the Energy Star Products Program. The Building Operations and Maintenance (O&M) Program and the Compressed Air Program were incorporated into the C&I Construction Program. Certain programs, such as the Energy Star Products Program and the C&I Construction Program consist of several program components. Where feasible, a program cost-benefit analysis was performed for each component. Table 1.2 compares which programs were in place in 2001 and in 2003.

**TABLE 1.2 – PROGRAM COMPARISONS**

<b>2001 PROGRAMS</b>	<b>2003 PROGRAMS</b>
<b>RESIDENTIAL PROGRAMS</b>	
Residential Electric HVAC	Residential Gas and Electric HVAC
Residential Gas HVAC	
Residential New Construction	Residential New Construction
Energy Star Appliances	Energy Star Products <ul style="list-style-type: none"> <li>• <i>Maintenance</i></li> <li>• <i>Lighting</i></li> <li>• <i>Room Air Conditioning</i></li> <li>• <i>Home Energy Audit</i></li> </ul>
Energy Star Lighting	
Energy Star Windows	
Low-Income Program	Residential Low Income <ul style="list-style-type: none"> <li>• <i>Comfort Partners Low Income</i></li> <li>• <i>Senior Weatherization Pilot</i></li> </ul>
<b>NON-RESIDENTIAL PROGRAMS</b>	
C&I Construction	Commercial/Industrial Construction <ul style="list-style-type: none"> <li>• <i>C&amp;I New Construction</i></li> <li>• <i>C&amp;I Retrofit</i></li> <li>• <i>New School Construction &amp; Retrofit</i></li> </ul>
Building O&M	
Compressed Air	

The programs analyzed herein are, for the most part, explicitly designed to achieve permanent, long-term changes in the respective energy-efficiency markets in which they intervene. This analysis projects the quantity and value of electricity, gas and other resource savings expected over the lifetimes of the technologies installed due to the programs, and the program costs of

achieving the savings. The analysis assesses program cost-effectiveness by comparing the 2003 program costs to the expected benefits over a multi-year horizon.

The net program benefits of all resource savings for the full lifetimes of the energy efficiency measures installed in 2003 are projected at \$213.0 million and \$140.8 million with and without environmental externality benefits, respectively. Program costs of \$80.9 million were incurred to realize these benefits. The resultant overall benefit/cost ratio is 3.6 including externality benefits and 2.7 without. Benefits exceed costs when the benefit/cost ratio exceeds one.

Based on data from the 2003 Clean Energy Program Report, the following annual pollution reductions resulted from these energy savings in 2003: 380 metric tons of oxides of nitrogen (NO<sub>x</sub>); 843 metric tons of sulfur dioxide (SO<sub>2</sub>); 219,050 metric tons of carbon dioxide (CO<sub>2</sub>); and 0.0046 total metric ton of mercury (Hg). These reductions were confirmed through calculations with emission reduction factors (in pounds) from the 2003 Clean Energy Program Report.

The production of two major air emissions, sulfur dioxide and nitrogen oxide, are capped under existing cap-and-trade programs. As a result, reductions in these emissions from these clean energy programs free up allowances that would have been used but for these clean energy programs. These allowances can be sold to entities that can use them to emit the associated pollutant. If there were sufficient demand for allowances beyond the reduction due to these clean energy programs, then a RPS would not lower the emission of SO<sub>2</sub> and NO<sub>x</sub> but only the price of the allowances.<sup>2</sup>

Electric prices used in this analysis were based upon projections prepared by Navigant Consulting, Inc., in its New Jersey Renewable Energy Market Assessment report dated August 2, 2004.<sup>3</sup> Gas prices were based on Energy Information Administration projections. Gas and electric price projections used in the analysis were compared to the 2001 price projections, inflated to 2003 dollars with the historic Gross Domestic Product (GDP) deflator inflation index. The forecasted natural gas and electricity prices used in this study are significantly higher than forecasts from the 2001 TRC analysis. Higher forecasts of future electricity and natural gas prices, which are a major uncertainty, increase the benefits of these energy efficiency programs relative to their costs.

For the purposes of this report, the environmental benefits of reducing electricity and natural gas assumptions were monetized using the same assumptions used in the 2001 study, which are \$0.95 per MMBTU and \$0.02 per kWh, although, as mentioned above, additional research is needed to determine New Jersey specific values. As discussed above, the production of two major air emissions, sulfur dioxide and nitrogen oxide, are capped under existing cap-and-trade programs. As a result, the externality costs of these emissions are already “internalized” in the costs of consuming electricity and natural gas. Thus, there is some double counting in applying the externality values from the 2001 study.

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<sup>2</sup> See the *Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard*, December 2004, prepared by the Center for Energy, Economic & Environmental Policy for a similar discussion regarding a renewable portfolio standard, pp. 41-42

<sup>3</sup> This report can be found on the CEEEP webpage, <http://policy.rutgers.edu/ceep/events.html>.

## Section 2- Cost-benefit Analysis Results

The following tables present the results of the analysis. Table 2.1 includes the 2003 emission savings in metric tons due to each of these programs. Environmental impacts are based directly upon 2003 Clean Energy Program Report data, which were checked for internal consistency with other data that were available.

	<b>TABLE 2.1 - 2003 Emission Savings (metric tons)</b>					
	<b>ELECTRIC</b>				<b>GAS</b>	
	<b>CO2</b>	<b>NOx</b>	<b>SO2</b>	<b>Hg</b>	<b>CO2</b>	<b>NOx</b>
<b>Residential HVAC</b>	10,102	19	43	0.00020	6,323	5
<b>Residential New Construction</b>	3,298	6	14	0.00010	7,281	6
<b>Energy Star Room AC</b>	989	2	4	0.00000	0	0
<b>Energy Star Lighting</b>	42,581	78	182	0.00100	0	0
<b>Low Income Comfort Partners</b>	3,746	7	16	0.00010	3,459	3
<b>Low Income Monroe Township</b>	243	0	1	0.00000	0	0
<b>C&amp;I Construction</b>	8,125	15	35	0.00020	439	0
<b>C&amp;I Retrofit</b>	124,142	229	531	0.00290	3,737	3
<b>C&amp;I Schools</b>	4,082	8	17	0.00010	504	0
<b>SUBTOTAL</b>	<b>197,307</b>	<b>363</b>	<b>844</b>	<b>0.00460</b>	<b>21,744</b>	<b>17</b>
<b>TOTAL (electric and gas)</b>	<b>219,050</b>	<b>381</b>	<b>844</b>	<b>0.00460</b>		

Table 2.2 presents the results of the cost-benefit analysis of each of the programs excluding the environmental externality benefits. The dollar values are presented in 2003 dollars. In addition, the TRC benefit/cost ratios from the 2001 analysis are also provided, where available. Excluding the environmental externality benefits, the two major program categories, residential and non-residential, have benefits that exceed their program costs, although there are some specific programs where this is not the case. The overall program benefit/cost ratio for the programs analyzed, excluding externality benefits, is 2.7.

The overall benefit/cost ratios for the residential and commercial programs are greater in than the ratios determined in the 2001 TRC analysis. An “apples to apples” comparison cannot be made because some specific programs changed between those years, and the 2001 analysis included total incremental measure costs while this analysis only includes program costs. A major cause for the increase in the benefit/cost ratios is the higher forecasted prices for electricity and natural gas.

Table 2.3 presents the same information as Table 2.2 but includes the environmental externality benefits. By including this additional benefit, the benefit/cost ratios are greater than those presented in Table 2.2. The overall benefit/cost ratio for the programs analyzed, including externality benefits, is 3.6.

Finally, Table 2.4 compares the forecasted prices of electricity and natural gas in constant year 2003 dollars used in the 2001 report and in this analysis. Electricity prices are in dollar per Mega-Watt-hours (\$/MWh) and natural gas prices are reported in dollar per million BTU (\$/mmBTU). Table 2.4 also presents the absolute and percentage difference between annual forecasts of prices for each fuel. The price forecasts used in this analysis are substantially higher than those used in the 2001 analysis.

TABLE 2.2 - NJ Statewide Energy-Efficiency Programs Economic Impacts					
Total Resource Benefits and Costs, without Externalities					
PROGRAM	Present Worth in 2003 Dollars			2003 Program B/C Ratio	2001 Total B/C Ratio
	Benefits	Costs	Net Benefits		
<b><i>Residential Programs</i></b>					
Energy Star Room AC	\$1,672,016.45	(\$872,000.00)	\$800,016.45	1.92	
Energy Star Lighting	\$41,018,382.27	(\$4,219,000.00)	\$36,799,382.27	9.72	1.17
Residential New Construction Electric	\$8,411,678.84	(\$7,733,500.00)	\$678,178.84	1.09	
Residential New Construction Gas	\$8,967,091.50	(\$7,631,500.00)	\$1,335,591.50	1.18	
<b>Residential New Construction Total</b>	<b>\$17,378,770.34</b>	<b>(\$15,365,000.00)</b>	<b>\$2,013,770.34</b>	<b>1.13</b>	<b>1.32</b>
Residential HVAC Electric	\$15,281,267.99	(\$10,152,500.00)	\$5,128,767.99	1.51	1.42
Residential HVAC Gas	\$8,400,241.23	(\$4,291,500.00)	\$4,108,741.23	1.96	1.20
<b>Residential HVAC Total</b>	<b>\$23,681,509.22</b>	<b>(\$14,444,000.00)</b>	<b>\$9,237,509.22</b>	<b>1.64</b>	
Low Income Comfort Partners Electric	\$3,174,378.60	(\$8,797,000.00)	(\$5,622,621.40)	0.36	
Low Income Comfort Partners Gas	\$4,583,068.16	(\$5,959,000.00)	(\$1,375,931.84)	0.77	
Low Income Monroe Township	\$238,569.86	(\$679,000.00)	(\$440,430.14)	0.35	
<b>Low Income Total</b>	<b>\$7,996,016.63</b>	<b>(\$15,435,000.00)</b>	<b>(\$7,438,983.37)</b>	<b>0.52</b>	<b>0.58</b>
<b>Subtotal Residential</b>	<b>\$91,746,694.91</b>	<b>(\$50,335,000.00)</b>	<b>\$41,411,694.91</b>	<b>1.82</b>	<b>1.24</b>
<b><i>Non-Residential Programs</i></b>					
C&I New Construction Electric	\$7,222,720.02	(\$1,900,000.00)	\$5,322,720.02	3.80	
C&I New Construction Gas	\$540,066.29	(\$1,932,000.00)	(\$1,391,933.71)	0.28	
C&I Retrofit Electric	\$113,030,362.58	(\$24,315,500.00)	\$88,714,862.58	4.65	
C&I Retrofit Gas	\$4,602,745.44	(\$779,500.00)	\$3,823,245.44	5.90	
C&I Schools Electric	\$3,937,850.47	(\$1,445,000.00)	\$2,492,850.47	2.73	
C&I Schools Gas	\$621,017.29	(\$183,000.00)	\$438,017.29	3.39	
<b>Subtotal non-Residential</b>	<b>\$129,954,762.09</b>	<b>(\$30,555,000.00)</b>	<b>\$99,399,762.09</b>	<b>4.25</b>	<b>1.55</b>
<b>Total</b>	<b>\$221,701,456.99</b>	<b>(\$80,890,000.00)</b>	<b>\$140,811,456.99</b>	<b>2.74</b>	<b>1.40</b>



TABLE 2.3 - NJ Statewide Energy-Efficiency Programs Economic Impacts					
Total Resource Benefits and Costs, with Externalities					
PROGRAM	Present Worth in 2003 Dollars			2003 Program B/C Ratio	2001 Total B/C Ratio
	Benefits	Costs	Net Benefits		
<b><i>Residential Programs</i></b>					
Energy Star Room AC	\$1,996,701.52	(\$872,000.00)	\$1,124,701.52	2.29	
Energy Star Lighting	\$57,727,303.93	(\$4,219,000.00)	\$53,508,303.93	13.68	1.84
Residential New Construction Electric	\$9,493,886.83	(\$7,733,500.00)	\$1,760,386.83	1.23	
Residential New Construction Gas	\$10,555,545.87	(\$7,631,500.00)	\$2,924,045.87	1.38	
<b>Residential New Construction Total</b>	<b>\$20,049,432.70</b>	<b>(\$15,365,000.00)</b>	<b>\$4,684,432.70</b>	<b>1.30</b>	<b>1.59</b>
Residential HVAC Electric	\$18,596,366.05	(\$10,152,500.00)	\$8,443,866.05	1.83	1.74
Residential HVAC Gas	\$9,779,700.05	(\$4,291,500.00)	\$5,488,200.05	2.28	1.46
<b>Residential HVAC Total</b>	<b>\$28,376,066.10</b>	<b>(\$14,444,000.00)</b>	<b>\$13,932,066.10</b>	<b>1.96</b>	
Low Income Comfort Partners Electric	\$4,403,737.86	(\$8,797,000.00)	(\$4,393,262.14)	0.50	
Low Income Comfort Partners Gas	\$5,337,593.85	(\$5,959,000.00)	(\$621,406.15)	0.90	
Low Income Monroe Township	\$318,380.71	(\$679,000.00)	(\$360,619.29)	0.47	
<b>Low Income Total</b>	<b>\$10,059,712.43</b>	<b>(\$15,435,000.00)</b>	<b>(\$5,375,287.57)</b>	<b>0.65</b>	<b>0.78</b>
<b>Subtotal Residential</b>	<b>\$118,209,216.68</b>	<b>(\$50,335,000.00)</b>	<b>\$67,874,216.68</b>	<b>2.35</b>	<b>1.52</b>
<b><i>Non-Residential Programs</i></b>					
C&I New Construction Electric	\$9,889,128.14	(\$1,900,000.00)	\$7,989,128.14	5.20	
C&I New Construction Gas	\$635,735.07	(\$1,932,000.00)	(\$1,296,264.93)	0.33	
C&I Retrofit Electric	\$153,769,949.79	(\$24,315,500.00)	\$129,454,449.79	6.32	
C&I Retrofit Gas	\$5,418,087.98	(\$779,500.00)	\$4,638,587.98	6.95	
C&I Schools Electric	\$5,277,403.12	(\$1,445,000.00)	\$3,832,403.12	3.65	
C&I Schools Gas	\$731,025.94	(\$183,000.00)	\$548,025.94	3.99	
<b>Subtotal non-Residential</b>	<b>\$175,721,330.04</b>	<b>(\$30,555,000.00)</b>	<b>\$145,166,330.04</b>	<b>5.75</b>	<b>2.06</b>
<b>Total</b>	<b>\$293,930,546.72</b>	<b>(\$80,890,000.00)</b>	<b>\$213,040,546.72</b>	<b>3.63</b>	<b>1.80</b>

**Table 2.4 – Electricity and Natural Gas Price Forecast Comparison<sup>4</sup>**  
(all values in 2003 dollars)

Year	Electricity (\$/MWh)				Natural Gas (\$/mmBTU)			
	2001 report	Current	Difference	% increase	2001 report	Current	Difference	% increase
2000	\$35.85				\$2.51			
2001	\$35.27				\$2.53			
2002	\$35.68				\$2.54			
2003	\$35.96	\$42.59	\$6.62	18.42%	\$2.59	\$4.98	\$2.38	91.75%
2004	\$35.83	\$45.15	\$9.32	26.02%	\$2.62	\$3.94	\$1.32	50.57%
2005	\$35.85	\$47.71	\$11.86	33.10%	\$2.65	\$3.59	\$0.95	35.68%
2006	\$36.03	\$47.30	\$11.27	31.29%	\$2.68	\$3.53	\$0.85	31.76%
2007	\$36.23	\$48.10	\$11.86	32.74%	\$2.70	\$3.58	\$0.88	32.57%
2008	\$36.01	\$46.16	\$10.15	28.20%	\$2.71	\$3.70	\$0.98	36.15%
2009	\$36.22	\$45.84	\$9.61	26.54%	\$2.74	\$3.52	\$0.79	28.76%
2010	\$37.10	\$45.81	\$8.70	23.46%	\$2.73	\$3.45	\$0.73	26.67%
2011	\$38.09	\$45.75	\$7.65	20.09%	\$2.75	\$3.61	\$0.87	31.58%
2012	\$38.53	\$45.78	\$7.25	18.81%	\$2.77	\$3.81	\$1.04	37.51%
2013	\$39.45	\$48.51	\$9.05	22.95%	\$2.78	\$3.99	\$1.21	43.54%
2014	\$37.77	\$51.91	\$14.14	37.44%	\$2.86	\$4.07	\$1.22	42.55%
2015	\$38.29	\$55.77	\$17.48	45.66%	\$2.91	\$4.25	\$1.34	46.16%
2016	\$38.85	\$56.83	\$17.98	46.28%	\$2.93	\$4.29	\$1.35	46.11%
2017		\$57.80				\$4.30		
2018		\$58.69				\$4.23		
2019		\$59.50				\$4.19		
2020		\$60.23				\$4.35		
2021						\$4.52		
2022						\$4.49		

<sup>4</sup> For the comparison of prices used in this analysis to those used in the 2001 analysis, projected time period prices were averaged for each year.

### **Section 3- Cost-Benefit Analysis Assumptions**

This section discusses the assumptions used in the cost-benefit analysis.

- **Measure Lives** – Measures lives were based upon those set out in the Protocols to Measure Resource Savings and should be reviewed along with the rest of the Protocols as part of the year-end 2005 program impact evaluation.
- **Electricity Prices** - 2003 electricity prices were based upon actual 2003 hourly PJM price data for zones AECO, JCP&L, and PSE&G. Projected electricity prices for 2005-2020 were based upon forecasts included in the New Jersey Renewable Energy Market Assessment report prepared by Navigant Consulting, Inc., dated August 2, 2004. Electricity prices in the year 2004 are calculated by averaging 2003 and 2005 prices because 2004 electricity prices for the full year were not available when the analysis was being conducted. An 11% electricity line loss factor is assumed based upon the 2001 study. Electricity avoided transmission and distribution costs were determined using the 2001 avoided cost estimates, escalated to reflect inflation<sup>5</sup>.
- **Natural Gas Prices** - Natural gas prices for 2003 through 2022 are based upon monthly wellhead projections from the EIA. Natural Gas avoided transportation costs were determined using the 2001 avoided cost estimates, escalated to reflect inflation.
- **Environmental Externality Benefits** - Emissions savings of \$0.95 per MMBTU and \$0.02 per kWh (kilowatt-hour) were used. As explained above, the estimates are based upon previous BPU regulations and were used in the 2001 study but New Jersey specific numbers should be developed
- **Discount Rate** - A real discount rate of 5.24 percent taken from the 2001 Total Resource Cost-Benefit Analysis. The historic GDP Deflator Inflation Index is used to calculate all costs and benefits in 2003 dollars. Although an updated analysis of this real discount rate has not been conducted as part of this study, this discount rate is consistent with information provided to CEEEP as part of its recent review of New Jersey's Appliance Cycling Program.
- **Time Period Allocation Factors** - Time period allocation factors set out in the Protocols to Measure Resource Savings were utilized where available. The Protocols do not include allocation factors for the LED<sup>6</sup> and Custom components of the C&I Program. Based on conversations with the program managers, the LED and electric Custom measures were allocated to all hours in the year. The Custom measures for the natural gas program were allocated 66.5% to the winter period and 33.5% to the summer period based on conversations with program managers

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<sup>5</sup> A GDP Deflator Inflation Index was used to convert all prices into 2003 dollars. 2001 dollars were inflated to 2003 dollars using an index of 1.0343. 2000 dollars were inflated to 2003 dollars using an index of 1.059. 2004 dollars were deflated to 2003 dollars using an index of 0.987.

<sup>6</sup> LED: Light Emitting Diode

- **BPU Office of Clean Energy Costs** – These program costs were allocated equally between electric and gas programs for programs that spanned both fuels.

The remainder of this section documents in detail the data assumptions.

The first step in the cost-benefit analysis was to compare the programs listed in the 2001 study with the programs listed in 2003 Clean Energy Program Report. The 2001 study listed the Residential Electric HVAC program separately from the Residential Gas HVAC program, whereas all other programs combined natural gas and electric measures. For the purposes of this analysis, all 2003 listed programs were divided into separate natural gas and electric components where applicable. The Energy Star Lighting, Energy Star Room AC, and Low Income Monroe Township Weatherization Pilot programs do not have gas components.

The protocols for each program were reviewed to determine the time period allocation factors. Natural gas programs had summer and winter time periods, and electric programs had summer on-peak, summer off-peak, winter on-peak and winter off-peak periods. Time period allocation factors for the Residential New Construction Electric program were based upon discussions with program managers.

The Residential HVAC program components (electric and natural gas) and the three Commercial and Industrial program components (electric and natural gas for all three) had various program measures, all of which represented a percentage of the funding allocated for those programs. The Commercial and Industrial programs included LED and “custom” measures that had no corresponding time period allocation factors in the protocols. The LED and “custom” measures for the electric programs accounted for 10% of the total program funds. For these two measures, electricity savings were equally distributed over all hours of the year. LEDs generally operate at all hours, and the same was assumed for “custom” measures. The “custom” measures for the natural gas programs accounted for 98.5% of the total program funds, and we used a summer allocation factor of 33.5% and a winter allocation factor of 66.5% for these measures<sup>7</sup>.

The 2003 Clean Energy Program Report included installed, committed and total savings for all of the programs. For the purposes of the cost-benefit analysis, only the installed savings were used. The 2003 Clean Energy Program Report natural gas energy savings were given in MMBTU, and the natural gas wellhead prices from the EIA were given in dollars per MCF. In order to calculate the dollars saved MMBTU were converted into MCF.

2003 electricity prices were computed from PJM data, for AECO, JCP&L and PSE&G. Hourly price data was compiled to determine the average summer and winter prices, for both on-peak and off-peak times. Summer months included May, June, July, August and September. Winter months included January, February, March, April, October, November and December. On-peak times were from 9:00 am to 8:59 pm on weekdays; off-peak hours were from 9:00 pm to 8:59 am on weekdays, as well as all weekends and national holidays. Holidays included New Year’s Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

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<sup>7</sup> 80% of natural gas “custom” measures were distributed evenly over all hours of the year, and 20% were distributed in the winter hours.

Electric energy and capacity prices for the years 2005 through 2020 were based upon projections prepared by Navigant Consulting, Inc., in its New Jersey Renewable Energy Market Assessment report dated August 2, 2004. Gas prices were based on EIA projections. 2004 electricity prices were calculated by averaging the real 2003 prices with the 2005 price projections from the Navigant report.

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