Energy and Economic Assessment of Statewide Energy-Efficiency Programs

New Jersey Clean Energy Collaborative

July 9, 2001

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SECTION 1 -- SUMMARY

The New Jersey Clean Energy Collaborative presents its energy and economic assessment (cost-effectiveness analysis) of seven of the eight residential and all three commercial and industrial energy-efficiency programs approved by the BPU:

Residential Programs	**Non-Residential Programs**
Energy Star Appliances	C&I Construction
Energy Star Lighting	Building O&M
Energy Star Windows	Compressed Air
Residential New Construction	
Residential Electric HVAC	
Residential Gas HVAC	
Low-Income Programs	

An energy and economic assessment was not done for the Residential Retrofit program, because the purpose of the program is to provide information and tools that residential customers can use to make their own decisions about what actions to take to improve energy efficiency in their homes. The effects of these decisions are not directly measurable and are likely to be captured in the market effects of other residential programs.

The cost effectiveness of the Customer-Sited Clean Generation program was not evaluated, because, unlike the efficiency programs analyzed here, this program was not designed or planned to provide cost-effective electricity savings.

With the exception of the low-income program, all the programs analyzed here are explicitly designed to achieve permanent, long-term changes in the respective energy-efficiency markets in which they intervene. This analysis projects the amount and value of electricity, gas and other resource savings expected over the lifetimes of the technologies installed due to the programs, and the utility and customer costs of achieving them. The analysis assesses program cost-effectiveness by comparing expected benefits and costs under multiple perspectives over a multi-year horizon, reflecting permanent changes in market behavior the programs are designed to accomplish.

Section 2 of this report explains the market-oriented cost-effectiveness analysis framework that the Collaborative recommends and applies here. Detailed analysis results are tabulated in Section 3. The final section, Section 4, describes major assumptions used in the analysis.

The Collaborative's cost-effectiveness analysis demonstrates the long-term energy, economic and environmental value these programs will provide to New Jersey and its regulated electric and gas customers. By the end of the third full year of program activity, the programs will generate cumulative annual electric energy savings of 453,600 MWh/year, and summer peak demand reductions of 143 MW (at generation voltage) [Table 3.4]. Cumulative annual gas savings are estimated at 1,402 billion BTU/year [Table 3.2]. These cumulative electricity and gas savings are the product of annual incremental program savings that build up over time as programs mature and gain momentum. First-year savings therefore are generally much less than a third of the three-year cumulative savings.

The total resource benefits of all resource savings after the full eight years of program funding called for in the legislation are projected at $1.90 billion, including reduced societal environmental costs of $455 million. Net of the $1.05 billion in total resource costs incurred by program administrators and participating customers to realize these benefits, the programs provide net savings to New Jersey's economy of $843 million [Table 3.5; the reduced environmental costs are the difference between total benefits reported in Table 3.5 and Table 3.9]. With the exception of the low-income program, all programs are expected to provide benefits well in excess of projected costs. (All future monetary values are discounted to their 2001 present worth at a real discount rate of 5.24 percent)

These net benefits represent the real long-term economic gain to the State's economy from the efficiency programs analyzed. Not counting the programs' avoided environmental costs, the seven residential programs analyzed increase the disposable income available to New Jersey households for spending and saving by $120 million. Another $292 million in net benefits from the commercial and industrial efficiency programs will materialize as improved profitability and competitiveness for New Jersey businesses [Table 3.9].

The analysis also demonstrates that the gas and electric utility expenditures supporting these programs represent an effective use of ratepayer funds. The programs avoid $1.13 billion in electricity supply costs over the full lifetime of technology savings and market effects. After accounting for an estimated $528 million in electric ratepayer funding over the eight-year period covered by the legislation, the programs provide $604 million in net benefits to all electricity customers [Table 3.6]. Gas utility customers will save $282 million in total gas supply costs, based on estimated gas utility funding of $195 million over the eight-year period. On balance, consumers will realize $87 million in net gas supply costs savings [Table 3.7]. (All the foregoing figures exclude avoided environmental externalities).

Based on emission factors provided by the Department of Environmental Protection (NJDEP) for electricity, the following pollution reductions are expected from these energy savings by the end of the third program year: 880 cumulative annual metric tons/year of oxides of nitrogen (NOx): 1,301 metric tons/year of sulfur dioxide (SO2); 330,617 cumulative annual metric tons/year of carbon dioxide (CO2); and 0.006 total metric ton of mercury (Hg) [Table 3.14]. The carbon dioxide emission savings are calculated using average emission factors provided by the NJDEP. Since the carbon dioxide emissions of marginal units are likely to be lower than the average, this may result in an overstatement of the emission reductions that result from program activities. The Collaborative is working with NJDEP to determine whether it is feasible to develop emission factors based on electricity generation at the margin.

Tables contained in Section 3 provide details on:

- Electricity and gas resource savings from each program over each of the three years of funding set by BPU order [Tables 3.1-3.4];
- Cost-effectiveness analysis results, counting total resource benefits and costs to New Jersey, expressed with and without environmental externalities, and accounting for costs incurred by and benefits accruing to gas and electricity ratepayers, considered together and separately [Tables 3.5-3.9];
- Avoided costs for electricity, gas, petroleum and water resource savings [Table 3.10];
- Projected gas and electric utility expenditures projected by program by year [Tables 3.11-3.13]; and
- Projected emission reductions by pollutant over the three-year program funding period approved by the BPU [Table 3.14].

Projections of future utility program spending and savings are made strictly for the purpose of assessing and demonstrating the likely cost-effectiveness of the energy-efficiency programs approved by the BPU. They do not represent proposed program budgets or program goals for future years. Program budgets will be established by the BPU annually for each subsequent year as called for by the BPU Order approving these programs and authorizing their funding through 2003. Future projections of energy savings include impacts including market effects for which the collaborative is still developing means of tracking and reporting.

The analysis is predicated on numerous assumptions, all of which were based on data, studies and the collective experience, expertise and judgment of utility staff and collaborative advisors. Among these are the future values for electricity, gas, petroleum, and water supply costs avoided by resource savings generated by the programs. Projected program savings are the product of per-unit technology savings and the increased number of units adopted in the marketplace. The per-unit savings values used to project 2001 savings in the cost-effectiveness analysis are consistent with those contained in the program savings protocols filed concurrently with this analysis. Per-unit savings estimates for most programs are also predicated on baseline efficiency levels that would be expected absent the programs.

Baseline efficiency levels for projecting savings have been updated and increased based on the most recent information available on prevailing efficiencies of equipment and practices. These efficiency baselines have advanced significantly due to market changes over time, due in large part to the success of past programs. Consequently, per-unit savings projected in this analysis are considerably less than they were for the same technologies in the past. Current efficiency programs focus on present and future equipment replacement and new construction markets, whereas earlier programs over the past five to six years were directed toward retrofits of existing equipment. Moreover, past program experience has helped to transform markets by elevating common efficiency practice and mandatory efficiency standards.

SECTION 2 -- COST-EFFECTIVENESS POLICY FRAMEWORK

A. INTRODUCTION

This Cost-Effectiveness Analysis Policy Framework for the New Jersey Statewide Clean Energy Collaborative (the "Collaborative") establishes the purposes, uses and methods for assessing the cost effectiveness and the relative economic value of the energy efficiency and clean energy programs implemented by the utilities as provided for in the New Jersey Comprehensive Resource Analysis (CRA) Board of Public Utilities (BPU, Board) Order, dated March 9, 2001, NJ BPU Docket No. EX 99050347.

1 Historical Perspective On Cost-Effectiveness Tests In New Jersey

Several cost-effectiveness tests have been utilized in the past by the BPU to evaluate the costs and benefits of utility administered energy conservation and demand side management programs. Historically, cost-effectiveness tests have been used to assess program benefits and costs from a variety of perspectives (e.g., utility, program participant, society). For example, the total resource cost test with externalities attempts to measure the total net benefits to society. The participant test attempts to determine the benefits to participating customers while the non-participant test assesses the impacts on customers that do not participate in the programs. Inputs to the analysis, such as avoided energy and capacity costs, have also been used to set prices for utility purchases of energy savings from performance contractors (e.g., PSE&G's Standard Offer Program).

The ultimate decision on how much to spend on energy efficiency programs and how to spend it is not an output of any one of these tests. Rather, budgeting decisions are informed by policy, political and practical considerations (e.g. incremental rate impacts; the distribution of program benefits among customers and customer classes); the recent legislative directives to increase energy efficiency by transforming markets, serving low income customers and capturing lost opportunities for savings; and the existence of relevant regional and national programs.

Consistent with the intent of the energy restructuring legislation, New Jersey, as well as several other states, are beginning the process of transitioning from pay for savings and pay for technology programs to market transformation programs. While cost-effectiveness tests and methodologies for pay for savings and pay for technology programs have been studied and accepted by regulators, cost-effectiveness tests and methodologies for market transformation programs are evolving. The Collaborative has agreed to continue to develop cost-effectiveness models utilized for assessing market transformation programs. In the interim, the Collaborative has agreed to work with the cost-effectiveness framework described below as a starting point for analysis, and as a common statewide yardstick for assessing the relative economic merits of program alternatives within the stipulated overall funding levels.

2 Cost-Effectiveness Analysis for the Statewide Clean Energy Collaborative

The Collaborative is using cost-effectiveness analysis to assess the relative economic value of the programs according to a consistent statewide standard, and to guide program design and implementation. The cost-effectiveness analysis undertaken by the Collaborative is not intended to be utilized for setting total spending levels, for establishing prices to be paid for energy savings or to determine which programs to implement. Spending levels, prices to be paid for energy savings and the program lineup were all determined taking into consideration a number of factors including the restructuring legislation, existing national, regional and utility energy efficiency efforts, environmental impacts and equity issues. Given the limited purpose and use of the cost-effectiveness analysis, the Total Resource Cost (TRC) test with and without externalities will be used.

The TRC test assesses the benefits of the programs over the life of the measures, which in some cases will be more than twenty years. Further, no Board policy exists concerning the value of any of the inputs to the cost-effectiveness test including long term forecasts of energy and capacity prices, avoided transmission and distribution values and externalities. Given the lack of Board policy on the inputs and the inherent uncertainties in forecasting program costs and savings, program cost-effectiveness analysis will be presented with and without externalities to provide a range of expected benefits. To determine individual measure cost-effectiveness for program implementation, the Collaborative will use TRC test results plus externalities.

Areas needing direction from Board Staff for the next cost-effectiveness analysis include clarification of the principles and purposes associated with cost-effectiveness assessments and the setting of future values for externalities and avoided energy, capacity, transmission and distribution costs.

The following spells out in more detail the cost-effectiveness policy framework agreed to by the Collaborative. The projected values for electric and gas savings and externalities that the Collaborative has agreed to use in performing program cost-effectiveness analysis for the July 9, 2001 filing and for program implementation in 2000 and 2001 are shown in Section 3 [Table 3.10].

B. POLICY FRAMEWORK

The Collaborative has reached the following understandings with regard to cost-effectiveness analysis of energy-efficiency and renewable programs:

1 Purposes and uses of cost-effectiveness analysis

1) This policy framework defines the purposes and uses for cost-effectiveness analysis by the Collaborative, as well as unintended and excluded uses of the analysis or its inputs.

2) The CRA Program Compliance Filing of April 9, 2001 states that a cost-effectiveness analysis of statewide energy efficiency programs will be provided to the BPU by July 9, 2001.

3) The intended purposes and uses for cost-effectiveness analysis are to:

a) Inform program planning
b) Demonstrate the relative economic value of programs
c) Assess program results
d) Guide program implementation

4) Cost-effectiveness analysis or its inputs, as utilized by the Collaborative, are not intended for uses beyond those listed above. Specifically excluded by the Collaborative as inappropriate uses for cost-effectiveness analysis or inputs beyond the above-stated purposes are:

a) Setting total spending levels for statewide clean-energy programs;
b) Establishing prices to be paid for energy savings or production;
c) Setting rates for gas or electricity; and
d) Valuing utility assets.

2 Cost-Effectiveness Tests

1) Cost-effectiveness analysis counts all resource costs and savings, which in practice is the Total Resource Cost (TRC) test plus externalities. This is the primary test to assess the relative economic value of the New Jersey Clean Energy Programs.

2) In the TRC test plus externalities:

a) Benefits will include the value of all resource savings to New Jersey (e.g., electricity, natural gas, oil and water); and
b) Costs will include direct program costs and customer contributions toward program measure costs.

3) The test results will be provided to show the net present value of net program benefits as well as the ratio of benefits to costs.

4) Other tests may be appropriate for other purposes beyond those stated above, including effects from program spending and savings on electricity and gas rates (e.g., the rate impact test), on total ratepayer expenditures for electricity and gas service (e.g., the energy system test), and on individual participant's energy bills (e.g., the participant test).

3 Approach to program cost-effectiveness analysis

1) The primary objective of clean energy program planning and implementation is to meet the legislative mandates to transform markets, capture lost opportunities, make energy services more affordable for low income customers, and eliminate subsidies for energy services that can be delivered in the marketplace without utility customer funding. In meeting these mandates, program planning seeks to maximize the economic value from program expenditures. Cost-effectiveness analysis provides information to assist this planning. It also provides information to guide program design and implementation.

2) Program cost-effectiveness analysis recognizes the public purpose and unique characteristics of lost opportunity and market transformation programs, which involve

an approach different from past cost-effectiveness of resource-acquisition programs. Accordingly, the cost-effectiveness analysis of market transformation programs:

a) Encompasses a statewide perspective with some regional interaction;
b) Includes benefits and costs consistent with a market orientation, such as program-induced market effects (including changes in measure costs);
c) Adopts a multi-year analysis horizon;
d) Uses market penetration as the basic unit of analysis;
e) Estimates market baselines to determine current and future standard practice; and
f) Recognizes and manages uncertainty in the analysis (e.g., through scenario analysis).

3) Common tools for program and measure cost-effectiveness analysis will be used by the program teams.

4) Program cost-effectiveness analysis will be conducted by the Collaborative subject to review and final approval by the management team.

4 Inputs for cost-effectiveness analysis:

1) Cost-effectiveness analysis requires two types of inputs:

a) A set of monetary values for resource savings, including avoided energy and non-energy savings, to apply to all cost-effectiveness analysis; and
b) Program-specific estimates of program and measures costs, market size, baseline, and program response, and resource savings.

2) Input values of clean energy program benefits will be reviewed and, as necessary, updated periodically. To support this, the Collaborative has developed avoided cost values including:

a) Avoided electric generation, transmission, and distribution costs, reflecting New Jersey information where available and BPU findings on methodology where applicable
b) Avoided gas costs in conjunction with avoided electric costs
c) Externalities values
d) Values for petroleum and water savings

These projected resource savings values are reported in Section 3, Table 3.10.

3) A summary report will be produced each year to document the results of the Collaborative's review of avoided costs and resulting recommendations. This report will be provided to the BPU each year.

4) For program implementation in 2001, and for program planning for 2001, the Collaborative will utilize statewide values for avoided electric energy, capacity, transmission and distribution costs; for avoided gas commodity, pipeline, and distribution costs; externality values, and for commodity values for petroleum and water savings. The collaborative agrees to the following components, detailed in Table 3.10:

a) For electric energy and capacity and natural gas costs, market price estimates developed by Hagler Bailly in 1997 and reviewed by the BPU in assessing utility stranded costs.
b) For avoided transmission and distribution costs, the Collaborative developed projected values based on existing estimates from previous filings with the BPU, which as stated at the outset are considered low by some parties and high by others;
c) To the extent that clean energy programs are targeted to address distribution constraints in specific locations, avoided distribution costs will be assessed for that specific area for the purpose of cost-effectiveness analysis.
d) The Collaborative will use 2 cents per kWh and 95 cents per million BTU (in constant 2000 dollars) as the value of externalities (these values were initially set in the 1991 DSM rulemaking).

SECTION 3 – RESULTS OF ENERGY AND ECONOMIC ANALYSIS

Following are the results of the analysis using the framework explained in Section 2. The tables below present projected impacts in the following order:

A. Energy impacts (gas and electric)
B. Economic impacts (including projections of future expenditures)
C. Environmental impacts

A. ENERGY IMPACTS

Table 3.1

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS GAS SAVINGS PROJECTIONS			
Incremental Annual Billion BTU Gas Saved			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	4.1	6.4	6.8
Energy Star Lighting	-	-	-
Energy Star Windows	8.6	16.3	32.7
Residential New Construction	86.5	104.2	133.6
Residential Electric HVAC	0.1	-	-
Residential Gas HVAC	114.7	135.1	100.7
Low-Income Program	81.8	91.3	96.1
Subtotal residential	**295.8**	**353.4**	**369.9**
Non-Residential Programs			
C&I Construction	10.0	123.9	199.3
Building O&M	3.9	19.5	25.8
Compressed Air	-	-	-
Subtotal non-residential	**13.9**	**143.4**	**225.1**
Total	**309.7**	**496.8**	**595.0**

Table 3.2

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS GAS SAVINGS PROJECTIONS			
Cumulative Annual Billion BTU Gas Saved			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	4.1	10.4	17.2
Energy Star Lighting	-	-	-
Energy Star Windows	8.6	24.9	57.6
Residential New Construction	86.5	190.8	324.4
Residential Electric HVAC	0.1	0.1	0.1
Residential Gas HVAC	114.7	249.9	350.6
Low-Income Program	81.8	173.2	269.3
Subtotal residential	**295.8**	**649.3**	**1,019.2**
Non-Residential Programs			
C&I Construction	10.0	133.9	333.2
Building O&M	3.9	23.4	49.2
Compressed Air	-	-	-
Subtotal non-residential	**13.9**	**157.3**	**382.4**
Total	**309.7**	**806.6**	**1,401.6**

Table 3.3

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS ELECTRICITY SAVINGS PROJECTIONS			
Incremental Annual MWh Saved, Net at Generation			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	1,064	1,677	1,818
Energy Star Lighting	2,477	3,342	4,536
Energy Star Windows	339	643	1,286
Residential New Construction	5,828	7,187	9,192
Residential Electric HVAC	16,180	20,944	21,029
Residential Gas HVAC	2	-	-
Low-Income Program	8,488	10,477	11,549
Subtotal residential	**34,377**	**44,270**	**49,411**
Non-Residential Programs			
C&I Construction	16,664	88,720	132,984
Building O&M	1,710	8,697	11,677
Compressed Air	2,244	22,444	40,400
Subtotal non-residential	**20,618**	**119,861**	**185,061**
Total	**54,996**	**164,132**	**234,472**
Incremental Summer Peak MW Saved, Net at Generation			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	0.31	0.49	0.52
Energy Star Lighting	0.11	0.14	0.19
Energy Star Windows	0.24	0.45	0.89
Residential New Construction	5.86	6.98	8.86
Residential Electric HVAC	12.47	16.19	16.21
Residential Gas HVAC	-	-	-
Low-Income Programs	0.89	1.10	1.22
Subtotal residential	**19.87**	**25.36**	**27.90**
Non-Residential Programs			
C&I New Construction	4.54	17.44	26.12
Building O&M	0.38	1.95	2.62
Compressed Air	0.59	5.87	10.57
Subtotal non-residential	**5.51**	**25.26**	**39.31**
Total	**25.38**	**50.62**	**67.21**

Table 3.4

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS
ELECTRICITY SAVINGS PROJECTIONS

Cumulative Annual MWh Saved, Net at Generation			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	1,064	2,741	4,559
Energy Star Lighting	2,477	5,819	10,355
Energy Star Windows	339	982	2,268
Residential New Construction	5,828	13,015	22,207
Residential Electric HVAC	16,180	37,124	58,153
Residential Gas HVAC	2	2	2
Low-Income Programs	8,488	18,965	30,514
Subtotal residential	**34,377**	**78,648**	**128,059**
Non-Residential Programs			
C&I Construction	16,664	105,384	238,368
Building O&M	1,710	10,407	22,084
Compressed Air	2,244	24,689	65,089
Subtotal non-residential	**20,618**	**140,480**	**325,541**
Total	**54,996**	**219,127**	**453,600**

Cumulative Summer Peak MW Saved, Net at Generation			
PROGRAM	**Year 1**	**Year 2**	**Year 3**
Residential Programs			
Energy Star Appliances	0.31	0.80	1.32
Energy Star Lighting	0.11	0.25	0.44
Energy Star Windows	0.24	0.68	1.57
Residential New Construction	5.86	12.84	21.71
Residential Electric HVAC	12.47	28.66	44.87
Residential Gas HVAC	-	-	-
Low-Income Programs	0.89	1.99	3.21
Subtotal residential	**19.87**	**45.23**	**73.13**
Non-Residential Programs			
C&I Construction	4.54	21.98	48.10
Building O&M	0.38	2.33	4.95
Compressed Air	0.59	6.46	17.02
Subtotal non-residential	**5.51**	**30.77**	**70.08**
Total	**25.38**	**76.00**	**143.21**

B. ECONOMIC IMPACTS

Table 3.5

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS ECONOMIC IMPACTS				
Total Resource Benefits and Costs, with Externalities				
	Present Worth in 2001 Dollars			
PROGRAM	**Benefits**	**Costs**	**Net Benefits**	**Benefit/Cost**
Residential Programs				
Energy Star Appliances	$ 22,206,392	$ 11,214,694	$ 10,991,697	1.98
Energy Star Lighting	11,340,002	6,164,839	5,175,163	1.84
Energy Star Windows	25,415,214	16,261,432	9,153,781	1.56
Residential New Construction	258,795,154	163,200,956	95,594,198	1.59
Residential Electric HVAC	291,535,732	167,233,471	124,302,262	1.74
Residential Gas HVAC	101,772,228	69,855,625	31,916,602	1.46
Low-Income Programs	55,692,261	71,844,435	(16,152,174)	0.78
Subtotal residential	**$ 766,756,981**	**$ 505,775,452**	**$ 260,981,529**	**1.52**
Non-Residential Programs				
C&I Construction	$ 1,039,760,460	$ 524,161,477	$ 515,598,982	1.98
Building O&M	28,949,849	9,449,655	19,500,194	3.06
Compressed Air	61,946,926	14,817,783	47,129,143	4.18
Subtotal non-residential	**$ 1,130,657,234**	**$ 548,428,915**	**$ 582,228,320**	**2.06**
Total	**$ 1,897,414,216**	**$ 1,054,204,367**	**$ 843,209,849**	**1.80**
Benefits include the value of electric, fossil fuel, and water savings				
Costs include program expenditures plus customer contribution toward efficiency technology costs				

Table 3.6

Electric Utility Impacts				
PROGRAM	**Present Worth to 2001 Dollars**			**Benefit/Cost Ratio**
	Benefits	**Costs**	**Net Benefits**	
Residential Programs				
Energy Star Appliances	$ 5,237,165	$ 3,185,612	$ 2,051,553	1.64
Energy Star Lighting	7,198,185	7,371,686	(173,500)	0.98
Energy Star Windows	5,570,600	3,037,070	2,533,530	1.83
Residential New Construction	122,216,819	82,311,227	39,905,592	1.48
Residential Electric HVAC	236,747,342	104,803,931	131,943,411	2.26
Residential Gas HVAC	948	-	948	
Low-Income Programs	14,924,733	60,840,971	(45,916,238)	0.25
Subtotal residential	**$ 391,895,792**	**$ 261,550,497**	**$ 130,345,296**	**1.50**
Non-Residential Programs				
C&I Construction	$ 677,645,379	$ 254,961,962	$ 422,683,417	2.66
Building O&M	17,590,492	5,630,649	11,959,843	3.12
Compressed Air	44,683,247	5,826,424	38,856,824	7.67
Subtotal non-residential	**$ 739,919,118**	**$ 266,419,034**	**$ 473,500,084**	**2.78**
Total	**$ 1,131,814,910**	**$ 527,969,531**	**$ 603,845,380**	**2.14**
Benefits include value of electricity savings only, without externalities.				
Costs include program expenditures only, without customer contributions toward efficiency				

Table 3.7

Gas Utility Impacts				
PROGRAM	**Present Worth to 2001 Dollars**			**Benefit/Cost Ratio**
	Benefits	**Costs**	**Net Benefits**	
Residential Programs				
Energy Star Appliances	$ 1,454,207	$ -	$ 1,454,207	
Energy Star Lighting	-	-	-	
Energy Star Windows	8,705,413	1,335,995	7,369,418	6.52
Residential New Construction	83,560,151	45,300,792	38,259,359	1.84
Residential Electric HVAC	4,321	-	4,321	
Residential Gas HVAC	84,102,888	33,809,370	50,293,519	2.49
Low-Income Programs	26,564,475	44,261,734	(17,697,259)	0.60
Subtotal residential	**$ 204,391,455**	**$ 124,707,891**	**$ 79,683,564**	**1.64**
Non-Residential Programs				
C&I Construction	$ 74,041,321	$ 69,509,274	$ 4,532,047	1.07
Building O&M	3,084,083	404,149	2,679,934	7.63
Compressed Air	-	-	-	
Subtotal non-residential	**$ 77,125,404**	**$ 69,913,423**	**$ 7,211,981**	**1.10**
Total	**$ 281,516,859**	**$ 194,621,315**	**$ 86,895,545**	**1.45**
Benefits include value of gas savings only, without externalities.				
Costs include program expenditures only, without customer contributions toward efficiency technologies.				

Table 3.8

Combined Electric & Gas Utility Impacts				
PROGRAM	**Present Worth to 2001 Dollars**			**Benefit/Cost Ratio**
	Benefits	**Costs**	**Net Benefits**	
Residential Programs				
Energy Star Appliances	$ 6,691,372	$ 3,185,612	$ 3,505,759	2.10
Energy Star Lighting	7,198,185	7,371,686	(173,500)	0.98
Energy Star Windows	14,276,012	4,373,065	9,902,948	3.26
Residential New Construction	205,776,971	127,612,020	78,164,951	1.61
Residential Electric HVAC	236,751,663	104,803,931	131,947,732	2.26
Residential Gas HVAC	84,103,836	33,809,370	50,294,466	2.49
Low-Income Programs	41,489,208	105,102,705	(63,613,497)	0.39
Subtotal residential	**$ 596,287,248**	**$ 386,258,388**	**$ 210,028,859**	**1.54**
Non-Residential Programs				
C&I Construction	$ 751,686,700	$ 324,471,236	$ 427,215,464	2.32
Building O&M	20,674,575	6,034,798	14,639,777	3.43
Compressed Air	44,683,247	5,826,424	38,856,824	7.67
Subtotal non-residential	**$ 817,044,522**	**$ 336,332,457**	**$ 480,712,065**	**2.43**
Total	**$ 1,413,331,770**	**$ 722,590,845**	**$ 690,740,924**	**1.96**
Benefits include value of electricity savings only, without externalities.				
Costs include program expenditures only, without customer contributions toward efficiency				

Table 3.9

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS ECONOMIC IMPACTS				
Total Resource Benefits and Costs, without Externalities				
PROGRAM	**Present Worth in 2001 Dollars**			**Benefit/Cost Ratio**
	Benefits	**Costs**	**Net Benefits**	
Residential Programs				
Energy Star Appliances	$ 19,777,574	$ 11,214,694	$ 8,562,880	1.76
Energy Star Lighting	7,198,185	6,164,839	1,033,347	1.17
Energy Star Windows	20,597,137	16,261,432	4,335,705	1.27
Residential New Construction	215,378,851	163,200,956	52,177,895	1.32
Residential Electric HVAC	236,751,663	167,233,471	69,518,193	1.42
Residential Gas HVAC	84,103,836	69,855,625	14,248,211	1.20
Low-Income Programs	41,489,208	71,844,435	(30,355,227)	0.58
Subtotal residential	**$ 625,296,455**	**$ 505,775,452**	**$ 119,521,003**	**1.24**
Non-Residential Programs				
C&I Construction	$ 751,686,700	$ 501,175,733	$ 250,510,967	1.50
Building O&M	20,674,575	9,449,655	11,224,920	2.19
Compressed Air	44,683,247	14,817,783	29,865,465	3.02
Subtotal non-residential	**$ 817,044,522**	**$ 525,443,170**	**$ 291,601,352**	**1.55**
Total	**$ 1,442,340,977**	**$ 1,031,218,623**	**$ 411,122,354**	**1.40**
Benefits include the value of electric, fossil fuel, and water savings				
Costs include program expenditures plus customer contribution toward efficiency technology				

Table 3.10 New Jersey Clean Energy Collaborative – Projected Avoided Resource Costs

2000 dollars, before losses

	Electricity				Gas			Fuel Oil		
	Generation		Transmission & Distribution	Externalities	Commodity	Transport	Externalities	Residential	Externalities	
Year	Energy cents/kWh	Capacity $/kW-yr	Capacity $/kW-yr	Energy cents/kWh	$/MMBTU	$/MMBTU	$/MMBTU	$/MMBTU	$/MMBTU	Water $/gal
2000	3.06	35.57	24.73	2.00	2.30	1.42	0.95	6.81	1.51	0.0075
2001	2.98	37.69	23.12	2.00	2.32	1.42	0.95	6.80	1.51	0.0075
2002	3.00	39.43	23.29	2.00	2.33	1.42	0.95	6.79	1.51	0.0075
2003	3.05	37.40	23.46	2.00	2.38	1.42	0.95	6.78	1.51	0.0075
2004	3.09	32.75	23.61	2.00	2.40	1.42	0.95	6.76	1.51	0.0075
2005	3.15	27.68	23.76	2.00	2.43	1.42	0.95	6.74	1.51	0.0075
2006	3.22	23.06	23.93	2.00	2.46	1.42	0.95	6.73	1.51	0.0075
2007	3.27	20.44	24.07	2.00	2.48	1.42	0.95	6.72	1.51	0.0075
2008	3.28	17.62	24.21	2.00	2.49	1.42	0.95	6.71	1.51	0.0075
2009	3.34	14.22	24.36	2.00	2.51	1.42	0.95	6.69	1.51	0.0075
2010	3.42	14.65	24.49	2.00	2.50	1.42	0.95	6.68	1.51	0.0075
2011	3.50	16.04	24.63	2.00	2.52	1.42	0.95	6.66	1.51	0.0075
2012	3.44	25.02	24.76	2.00	2.54	1.42	0.95	6.65	1.51	0.0075
2013	3.47	30.16	24.89	2.00	2.55	1.42	0.95	6.64	1.51	0.0075
2014	3.30	30.80	25.02	2.00	2.62	1.42	0.95	6.63	1.51	0.0075
2015	3.35	30.83	25.14	2.00	2.67	1.42	0.95	6.62	1.51	0.0075
2016	3.51	21.56	25.25	2.00	2.69	1.42	0.95	6.60	1.51	0.0075

Delivery Losses Elect. 11% Gas 0%

Real Discount Rate 5.24%

Table 3.11

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS Projected Program Expenditures				
Electric Utilities				
PROGRAM	**Year 1**	**Year 2**	**Year 3**	**Total**
Residential Programs				
Energy Star Appliances	$ 1,210,000	$ 1,110,000	$ 1,020,000	$ 3,340,000
Energy Star Lighting	1,590,229	1,989,863	2,081,330	5,661,421
Energy Star Windows	690,000	659,200	652,320	2,001,520
Residential New Construction	9,938,400	11,425,872	12,954,870	34,319,142
Residential Electric HVAC	11,782,701	14,586,152	12,162,306	38,531,159
Residential Gas HVAC	–	–	–	–
Residential Retrofit	822,000	447,552	418,534	1688,086
Low-Income Program	9,071,502	10,097,082	10,581,602	29,750,186
Subtotal residential	**$ 35,104,831**	**$ 40,315,721**	**$ 39,870,961**	**$ 115,291,514**
Non-Residential Programs				
C&I Construction	$ 11,025,617	$ 25,637,175	$ 38,404,234	$ 75,067,025
Building O&M	924,000	593,000	700,000	2,217,000
Compressed Air	445,000	1,121,861	1,488,350	3,055,211
Subtotal non-residential	**$ 12,394,617**	**$ 27,352,036**	**$ 40,592,584**	**$ 80,339,236**
Total	**$ 47,499,448**	**67,667,757**	**$ 80,463,545**	**$ 195,630,750**

Table 3.12

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS Projected Program Expenditures				
Gas Utilities				
PROGRAM	**Year 1**	**Year 2**	**Year 3**	**Total**
Residential Programs				
Energy Star Appliances	$ -	$ -	$ -	$ -
Energy Star Lighting	-	-	-	-
Energy Star Windows	319,000	287,000	287,000	893,000
Residential New Construction	5,055,146	6,557,239	7,493,320	19,105,704
Residential Electric HVAC	-	-	-	-
Residential Gas HVAC	5,543,096	4,986,974	3,389,666	13,919,735
Residential Retrofit	651,000	354,448	331,466	1,336,914
Low-Income Program	6,152,508	6,818,704	7,091,450	20,062,662
Subtotal residential	**$ 17,720,749**	**$ 19,004,365**	**$ 18,592,902**	**$ 55,318,016**
Non-Residential Programs				
C&I Construction	$ 2,231,534	$ 6,117,410	$ 9,360,541	$ 17,709,484
Building O&M	60,000	60,000	60,000	180,000
Compressed Air	-	-	-	-
Subtotal non-residential	**$ 2,291,534**	**$ 6,177,410**	**$ 9,420,541**	**$ 17,889,484**
Total	**$ 20,012,283**	**$ 25,181,775**	**$ 28,013,442**	**$ 73,207,500**

Table 3.13

PROPOSED NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS Program Budgets				
Total Electric & Gas Utilities				
PROGRAM	**Year 1**	**Year 2**	**Year 3**	**Total**
Residential Programs				
Energy Star Appliances	$ 1,210,000	$ 1,110,000	$ 1,020,000	$ 3,340,000
Energy Star Lighting	1,590,229	1,989,863	2,081,330	5,661,421
Energy Star Windows	1,009,000	946,200	939,320	2,894,520
Residential New Construction	14,993,545	17,983,111	20,448,189	53,424,846
Residential Electric HVAC	11,782,701	14,586,152	12,162,306	38,531,159
Residential Gas HVAC	5,543,096	4,986,974	3,389,666	13,919,735
Residential Retrofit	1,473,000	802,000	750,000	3,025,000
Low-Income Program	15,224,010	16,915,786	17,673,052	49,812,848
Subtotal residential	**$ 52,825,581**	**$ 59,320,086**	**$ 58,463,863**	**$ 170,609,530**
Non-Residential Programs				
C&I Construction	$ 13,257,150	$ 31,754,585	$ 47,764,774	$ 92,776,509
Building O&M	984,000	653,000	760,000	2,397,000
Compressed Air	445,000	1,121,861	1,488,350	3,055,211
Subtotal non-residential	**$ 14,686,150**	**$ 33,529,446**	**$ 50,013,124**	**$ 98,228,720**
Total	**$ 67,511,731**	**$ 92,849,532**	**$ 108,476,987**	**$ 268,838,250**

C. ENVIRONMENTAL IMPACTS (METRIC TONS)

Table 3.14

NEW JERSEY STATEWIDE ENERGY-EFFICIENCY PROGRAMS Environmental Impacts			
	Pollution Reduction After Years		
		3	
Pollutant Reduction	Emission Factor (tons/MWh)	Cumulative Annual Tons/Year	Total Tons
From Electricity Savings			
NO_x	0.0018	814	NA
SO_2	0.0028	1,300	NA
CO_2	0.5500	253,504	412,320
Hg	0.000000014	0.00634	0.0103
From Gas Savings	(tons/Billion BTU)		
NO_x	0.0475	67	NA
SO_x	0.0003	0.42	NA
CO_2	55.0000	77,113	138,694
From Electricity and Gas Savings Combined			
NO_x		880	NA
SO_x		1,301	NA
CO_2		330,617	551,015
Hg		0.00634	0.0103

SECTION 4 -- COST-EFFECTIVENESS ANALYSIS ASSUMPTIONS

All future program costs and benefits are discounted to 2001 dollars using a real discount rate of 5.24 percent. All costs were expressed in real 2000 dollars; any future cost figures expressed in nominal terms were deflated by an estimated general inflation rate of 3.0 percent.

All electricity savings were derived at the customer meter voltage level. These savings were converted to generation voltages by multiplying by 1.11 to account for losses. Losses of zero were used for gas.

The residential retrofit program was not subjected to program cost-effectiveness analysis. Savings were deemed to be too speculative to project. No cost-effectiveness analysis was conducted for any renewable programs.

The BPU order approved three years of spending for each regulated gas and electric utility. The April 9, 2001 compliance filings provided individual program budgets for 2001. To reasonably represent long-term program impacts and cost-effectiveness, it was necessary to project continued program spending and activity levels beyond the three years of electric and gas utility funding authorized in the BPU's order. To make the cost-effectiveness analysis as consistent as possible with both activity and spending levels, the analysis matches program spending to the 2001-2003 *cumulative* funding level, getting as close as possible to the *individual* years' funding levels. The sum of all program expenditures over the period 2001-03 equals the three-year spending level for efficiency programs approved by the BPU for gas and electric utilities considered separately. (The residential retrofit program's spending is listed for information only because, as explained above, it was not analyzed for cost-effectiveness.)

To demonstrate the economic performance of the programs over their entire effective lives, the analysis assumes that programs continue operating as long as deemed appropriate, up to the full eight years of minimum funding authorized by the legislation. In most cases, this was the full eight years; several programs were expected either to phase out or to change so substantially that no program activity was projected beyond three to six years.

While the BPU approved total spending only through 2003, spending and savings were projected beyond the initial three-year period for cost-effectiveness analysis. Since the legislation calls for an eight-year plan, it would not make sense to assume these programs end after three years. Moreover, all but one of the programs screened are designed to permanently transform markets, the effects of which the cost-effectiveness analysis captures through higher post-program market penetration than would have obtained absent the programs. In most if not all cases, three years of program operation would be insufficient to generate the substantial market effects currently reflected in the analysis.

Consequently, the analysis set total program spending after 2003 through 2008 to comply with the minimum requirements of the legislation, which calls for not less than $140 million annually by 2008. To reflect this, annual spending was linearly interpolated between the total spending approved by the BPU for 2003 and 75% of $140 million in 2008.

The April 9, 2001 compliance filing contained program budgets and performance goals for 2001. In some cases (e.g., the commercial and industrial construction program), the April 9 filing reported both spending and electricity and gas savings. Because of the way the cost-effectiveness analysis was structured, however, it was not possible to match both spending and savings without breaking the link between technology costs and savings. Hence, we decided to match 2001 performance outcomes reported in the compliance filing to the cost-effectiveness analysis when faced with a choice between matching the 2001 budget or 2001 results.

Performance incentives for program administrators were not included in the cost-effectiveness analysis. If the BPU approves the award of performance incentives for successful program administration, then such outlays would be included in program budgets presented annually for BPU review.

All costs and savings are captured in the year they are obligated.

NJDEP provided emission factors applicable to electricity savings; the Collaborative used the assumptions for gas emission factors at the end use reported in Table 3.14.

To develop the many program-specific inputs for costs, market penetration, and technology savings, the best available information was used, including professional judgment.