NJBPU's Proposed Renewable Portfolio Standards Rule

Analysis and Recommendations

Prepared for:

New Jersey Division of the Ratepayer Advocate

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1. The Scope of This Report

New Jersey's Board of Public Utilities (BPU) proposes to readopt its existing renewable portfolio standard (RPS) rule, with substantive amendments. This is part of a set of rule readoptions and changes in the areas of Energy Competition Standards and Renewable Energy and Energy Efficiency. *See* 37 N.J.R. 3911 ff., October 17, 2005. This report addresses the RPS rule, and in particular the Board's proposal to extend Class I RPS requirements.

The requirements of the RPS rule apply to each electric power supplier or basic generation service provider. For each year of RPS applicability, each supplier/provider must procure, and show that it has procured, renewable resources equal to a stated percentage of the electricity it sells at retail in N.J. in that year.

Existing RPS requirements extend through May 31, 2009. The proposed rule would extend them through May 31, 2021. It would also increase them substantially, so that in the final year, 22.5 percent of electricity sold at retail would need to be attributable to renewable electric energy resources. In the current energy year (June 1, 2005 through May 31, 2006) the RPS requirement is only 3.5 percent. The existing and extended RPS requirements are given in Table A of the proposed rule. *See* 37 N.J.R. 3937.

The existing RPS is rooted in the Electric Discount and Energy Competition Act of 1997 (EDECA), which calls for an RPS. EDECA defines two types of renewable energy sources:

- Class I sources are power from wind, methane gas from landfills, biomass that is sustainably grown and harvested, fuel cells using renewable inputs, geothermal technologies, wave and tidal action, and solar/photovoltaic technologies.
- Class II sources are power from hydroelectric facilities and resource recovery facilities.

The present RPS requires that electricity equivalent to 2.5 percent of electricity sold be generated from Class II resources in each year.[1] The proposed extended RPS would hold this requirement constant at 2.5 percent through 2020/1. Class I resources

[1] The RPS energy year runs from June 1 through May 31. Thus we may refer to an RPS target for a given energy year --say, June 1, 2008, through May 31, 2009-- as the target for "2008" or for "2008/9".

may be used to meet Class II requirements, though as a practical matter Class II resources are sufficiently abundant and inexpensive that it is unlikely this would be done. This report accepts the 2.5 percent requirement for Class II renewables. Our focus is on the Class I requirement.

The present RPS has requirements for two types of Class I resources -- solar energy, and all Class I resources. The requirement for all Class I resources can be met with solar generation that is not employed to meet the specific solar energy requirement, though given the relatively high cost of solar energy this is not likely to occur.[2] The proposed rule maintains and extends the separate requirements for these two sets of Class I renewable resources.

At present Class I RPS requirements are modest -- one percent overall in the current year -- but the proposed rule would increase them to 20 percent. Solar energy requirements in particular would increase dramatically, from 0.017 percent currently to 2.12 percent in the year ending May 31, 2021.

This report assesses the proposal to extend and increase solar energy and other Class I renewable energy requirements, in the light of:

- The State's existing renewable energy policies and goals.
- The economic impact of the RPS on electricity ratepayers.
- Other impacts of the RPS, including environmental benefits and its indirect effects on the state's economy.

To inform its comments on the proposed rule, the RPA commissioned two studies of its impact:

- A study by Dr. David Von Hippel addresses the direct economic impacts of the proposed rule, and its environmental benefits.[3]
- A study by Dr. David Dismukes addresses the direct and indirect economic impacts of the proposed rule.[4]

The assessment presented in this report draws on the results of these studies. This report also presents recommendations concerning the proposed RPS rule.

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[2]Solar power is significantly more costly than wind power and most other Class I resources, and is expected to remain so for many years. Therefore, very little solar power would be used to satisfy an undifferentiated Class I RPS, except to the extent that other policies, such as subsidies from Clean Energy type programs, promote solar energy.

[3]David F. Von Hippel, *Estimate of Rate Impacts of Proposed New Jersey Renewable Portfolio Standard Rules*, December 16, 2005 (Excel spreadsheet; and in "Printouts of Workpapers Used to Prepare Estimates" Word document version). Dr. Von Hippel trained at the University of California at Berkeley's Energy Research Group and has many years' experience as an energy analyst working independently and with such groups as Tellus Institute.

[4]David E. Dismukes, *Economic Impacts of New Jersey's Proposed Renewable Portfolio Standard (*and *Report Schedules* volume). Acadian Consulting Group, December 16, 2005. Dr. Dismukes is a professor at Louisiana State University and associate director of its Center for Energy Studies.

2. The Policy Background

The RPS has its roots in the EDECA. EDECA provides that retail electricity suppliers must obtain minimum percentages of the electricity they sell from qualifying renewable energy resources. *See* N.J.S.A. 48:3-49 *et seq.*

Renewable electricity resources do not consume fossil and nuclear fuel resources. They minimize or avoid entirely the air pollutants and greenhouse gas emissions from conventional fossil fuel based electricity generation. There is growing interest worldwide in the contribution renewable energy resources can make to creating an environmentally sustainable energy future.

Renewable resources cost more than the lowest cost conventional generating resources. Policies toward renewable resources must balance the direct cost premium of renewable resources against their undoubted environmental benefits.

The New Jersey Clean Energy Program (CEP) that was established pursuant to EDECA is supported by the Societal Benefits Charge. The CEP provides substantial monies to promote an increase in the use of renewables in the State -- including $52 million in new funds in 2006, $82 million in 2007, and $102 million in 2008. The incentives in Clean Energy Program are "carrots" helping to grow renewables in New Jersey -- in particular solar energy, which takes up the great bulk of CEP renewables funds.

An RPS policy complements the renewable energy initiatives in the CEP. The purpose of the RPS is to ensure that electricity suppliers contribute to the development of renewable resources by procuring them in an amount equal to a portion the electricity they sell.

The existing RPS grew out of a process of discussion, debate, and deliberation in the Renewable Energy Task Force, a sixteen member group that reported to the Governor in April of 2003. The Task Force recommended policies to "further advance the development of renewable energy in New Jersey and the surrounding region, and ... ensure that New Jersey continues to be a national leader in renewable energy."[5] Among these recommendations was an increase in the RPS so that Class I resources procured would have to equal at least four percent of electricity sales in 2008, and 20 percent of such sales in 2020.

The Task Force devoted attention to solar energy, stating:

> "The Task Force recommends that a comprehensive set of policies be developed that will enable substantial levels of photovoltaic solar generation capacity to be developed in New Jersey, thereby making New Jersey a leader in photovoltaic solar development. Specifically, the Task Force recommends

[5] *The Renewable Energy Task Force Report.* Submitted to Governor James E. McGreevey, April 24, 2003, page 1.

setting a goal of 120,000 MWhs of new photovoltaic solar generation located within New Jersey by 2008, and developing policies designed to meet that goal."[6]

During Task Force discussions it was believed that the goal of 120,000 MWh of electricity generation in 2008 would require some 90 MW of solar energy capacity in the State.[7] The Task Force considered this goal a substantial one that would place New Jersey in a position of leadership with respect to solar energy development.

In proposing an overall goal of generating 20 percent of electricity from Class I renewables in 2020, the Task Force did not discuss what the solar set-aside within a 20 percent goal might be. The Task Force discussions and report did not suggest that the proportion of solar energy within overall Class I renewable generation should increase after 2008.

The BPU engaged Rutgers University's Center for Energy, Economic, and Environmental Policy (CEEEP) to analyze the economic impact of increasing the Class I RPS. *See* the report *Economic Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard* at the Board's website, <http://www.bpu.state.nj.us/reports/EIAreport.pdf>. For analytical purposes, the CEEEP report assumed that after 2008/9 the solar set-aside would remain the same portion of the Class I RPS requirement as in 2008/9. That would require somewhat over 600 MW of solar capacity in 2020, many times greater than the already significant 90-100 MW required to meet the goal established by the Task Force.

In contrast to the CEEEP analysis, the BPU's proposed rule would require over 1500 MW of solar capacity in 2020/1, based on forecasts of statewide electricity requirements discussed in section 4 below. There is no public record providing a rationale for requiring over 1500 MW of solar energy, well over twice what the CEEEP report assumed, and 15 times the 2008/9 goal. The Board's "Summary" comments accompanying the proposed rule in the N.J.R. are silent with respect to any specific rationale, documentation, or support for the concrete target of over two percent generation from solar energy in 2020/1.

That the Task Force did recommend a goal of 20 percent for Class I renewables does not mean the concrete formulation of the 20 percent measure as a binding rule should be a foregone conclusion. Indeed, the costs and benefits of the proposal should be evaluated to determine whether, for example, a lower or higher overall Class I requirement is warranted. However, the presence of the 20 percent recommendation in the Task Force report does at least mean that there is a public policy touchstone for that aspect of the proposed rule. For the proposed solar set-aside, such a public policy touchstone is lacking. This fact, plus the sheer size of the recommended increase in

[6] *Ibid.,* page 4.
[7] Based on solar output estimates currently used in the Clean Energy Program, it is likely that the 120,000 MWh output goal would require some 100 MW of solar capacity.

solar, means that the costs and benefits of the solar energy proposal need to be especially carefully considered.

The next sections of this report examine:

- The environmental benefits of the proposed rule.
- The direct economic impact of the proposed rule.
- The broader economic and employment implications the rule.

Following consideration of these matters, a recommendation regarding the proposed Class I RPS rule is presented.

3. The Environmental Benefits of the Proposed Rule

As renewable generation resources are brought on-line, they produce certain environmental benefits of an immediate nature. The benefits that "track" with generation are comprised of avoided air emissions from fossil generating resources that would otherwise be employed to meet demand. The air emissions benefits are of two broad types:

- Avoiding a variety air pollutants that are harmful to human health.
- Avoiding emission of carbon dioxide and other greenhouse gases (GHGs) that contribute to global warming.

The CEEEP RPS report cited above reviewed the environmental benefits from an extended Class I RPS. The report stated that:

> "The proposed 20% RPS would ... reduce the emission of many pollutants in the region. The marginal fuel in the region used to generate electricity is primarily natural gas, and a proposed 20% RPS avoids the emission of many major air pollutants from natural gas powered plants."[8]

Dr. Von Hippel's study calculated the impacts of the RPS on emissions of carbon dioxide, the main GHG. He found that the Class I RPS would reduce carbon dioxide emissions associated with meeting New Jersey electricity demand, including:

- A reduction of 1.9 million tons in the last year of the current RPS (2008/9).
- A reduction of 10.9 million tons in the last year of the extended RPS (2020/1).
- A total reduction of 72.8 million tons for the whole period 2004-2020.

Dr. Von Hippel also used PJM emissions factors to calculate the effect of the proposed RPS on emissions of sulfur and nitrogen oxides. He found that the Class I RPS would reduce sulfur dioxide emissions associated with meeting New Jersey electricity demand, including:

- A reduction of 12,700 tons in the last year of the current RPS schedule (2008/9).
- A reduction of 55,800 tons in the last year of the extended RPS (2020/1).
- A total reduction of 401,100 tons for the whole period 2004-2020.

Emissions of nitrogen oxide would be reduced as follows:

- A reduction of 2,500 tons in the last year of the current RPS schedule (2008/9).
- A reduction of 12,800 tons in the last year of the extended RPS (2020/1).
- A total reduction of 91,900 tons for the whole period 2004-2020.

The Regional Distribution of Environmental Benefits

[8]Rutgers University Center for Energy, Economic, and Environmental Policy, *Economic Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard,* December 8, 2004, page 4.

These benefits of reducing air pollution and GHGs from an RPS are not focused in New Jersey. In the case of GHGs, the benefits are global. In the case of harmful air emissions such as SO_x and NO_x, the benefits are spread regionally: these benefits of installing renewable resources will occur wherever air emissions from the fossil-fueled electric generation they displace would have flowed. These air emission benefits would occur primarily within and downwind of the PJM Interconnect (PJM) region. The affected area is many times larger than New Jersey. In a very real sense, New Jersey's RPS will produce air emission benefits that will, for the most part, be realized elsewhere.

From a State policy perspective, an RPS makes sense when viewed as an initiative that is not occurring in a vacuum. Leading by example is a valid policy, provided others follow sooner or later. New Jersey's RPS is complemented by RPS initiatives elsewhere, and may help to encourage the creation of RPS arrangements regionally or nationally.

Other states in PJM and elsewhere have adopted and are considering adopting RPS arrangements whose air pollution and GHG reduction benefits will, in part, occur in New Jersey. However, the proposed extended NJ RPS would be the most ambitious one in the country. If the extended RPS is adopted as proposed, NJ ratepayers will shoulder relatively more of the direct cost burden of moving RPS policies forward than will the ratepayers of any other state in or abutting the PJM Interconnection. *See* the discussion of the direct costs of the RPS in the next section of this report.

The Monetary Value of Environmental Benefits

The CEEEP report noted that the environmental benefits we have been discussing can be monetized. That is, indirect methods can be used to estimate the economic costs that are avoided when the emissions of various air pollutants and of GHGs are reduced. The CEEEP report noted that this complex analysis was beyond its scope. However, the CEEEP report did describe previous studies elsewhere that attempted to monetize the environmental impacts of various types of generation resource, making it possible to estimate in monetary terms the benefits of reducing fossil-fired electric generation.

Taking the range of values in the studies reviewed, and focusing on gas-fired generation as the marginal type of generation that would be avoided in PJM, the CEEEP report developed an environmental benefit of $0.0216/kWh (in 2004$) based on the difference between the median externality adder of natural gas fired generation and the median externality adder for generation from solar PV in the studies CEEEP reviewed. Using this "illustrative calculation", the environmental benefit from an extended RPS would be some $110 million in 2010 and $330 million in 2020.[9]

[9]CEEEP, *op.cit.*, page 41. As most of the emissions impacts from the proposed RPS would

The illustrative calculation of environmental benefit in the CEEEP report is important because it reminds us that air emissions (pollutants and GHGs) cause economic harm even though their costs are hidden in health or other environmental effects. Indeed, a higher value of avoided air emissions might be considered than that illustratively employed in the CEEEP report. Nevertheless, based on the direct economic cost estimates discussed in the next section of this report, it is clear that the incremental cost to ratepayers of the proposed RPS is likely to be significantly more than the total illustrative monetary environmental benefit offered in the CEEEP report.

However, changes could be made to the proposed RPS which would reduce its cost to ratepayers, while maintaining its full environmental benefit. The last point arises from the fact that both solar PV power and the major Class I renewable resource, wind power, have low environmental externalities. A 20 percent Class I RPS without a solar set-aside would probably satisfy the foregone solar energy mostly with the most abundant renewable resource in the PJM region, wind power. If this is so, a 20 percent RPS that was satisfied without any solar energy would have virtually the same environmental benefits as one which included a solar requirement.[10]

Put another way, including a solar energy requirement in the proposed RPS may not yield any incremental air emissions benefits, as compared to a 20 percent RPS without a solar requirement. As noted above, the proposed rule would require over 1500 MW of relatively costly solar capacity in 2020/1. It appears that every reduction in the amount of solar energy required would reduce the economic cost of a 20 percent Class I RPS, while retaining the environmental benefits we have been discussing here.

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occur outside New Jersey, so too would most of the monetized benefit attributable to these reductions occur elsewhere. New Jersey realizes a direct economic benefit from its own reduction of air pollutants and GHGs only to the extent that cap and trade systems are established which credit the reduction of emissions to in-state entities or individuals.

[10]According to studies cited in the CEEEP report, the environmental benefits of wind power, per unit of generation, are actually somewhat greater than for solar power. *Ibid.,* page 39.

4. The Direct Economic Impact of the Proposed Rule -- Von Hippel Study

The Ratepayer Advocate (RPA) commissioned an independent assessment of the direct economic impact of the proposed RPS rule. The assessment by Dr. David Von Hippel quantifies the incremental cost of the Class I resources, including solar, that may be required to satisfy RPS requirements. Dr. Von Hippel's analysis accompanies this report. The analysis is fully documented, providing every source and input used. It is submitted to the BPU both in printed and electronic form. The electronic form of the computer workbook tool that Dr. Von Hippel constructed permits the BPU or other parties to efficiently review every one of his calculations, as well as to perform scenario analysis of different input assumptions that may be of interest now or in further proceedings.

Dr. Von Hippel's analysis was conducted on a Statewide basis. Some key findings of this study are summarized in the series of three tables below. These tables are:

- Table 1 -- Ratepayer Costs for Meeting Proposed RPS, 2008/9-2020/1
- Table 2 -- Bill Impacts of Proposed RPS for a Typical Residential, Commercial, and Industrial Customer
- Table 3 -- Rate Impacts of Proposed RPS for a Typical Residential, Commercial, and Industrial Customer

These tables present different ways of understanding the projected economic impact of the proposed RPS. The first table projects the incremental cost of the RPS above the costs of conventional electric generation, in 2004$. The costs are $252 million in 2008/9, the last year of the RPS as presently formulated. They then decline in the next year before increasing again, reaching the level of $502 million in 2020/1.[11] These results are also depicted graphically in Figure 1.

[11]There are several reasons why costs drop in 2009 before resuming their annual increases. One is that the BPU draft rule requires less of an increase in solar resources from 2008 to 2009 than from 2007 to 2008. Another is that Dr. Von Hippel's analysis assumes that CEP subsidies to renewable resources will provide for a smaller share of their cost starting in 2009. His analysis further projects that the portion of solar resources that are in the residential market will fall somewhat in 2009, with the share of less costly non-residential solar higher from that year prospectively. The underlying decreases in the costs of all renewable resources are another factor.

Table 1 -- Ratepayer Costs for Meeting Proposed RPS, 2008-2020

Energy Year (June 1 - May 31 of Next Year)	Net Annual Cost for Class I RPS (2004 $)
2008	$ 251,500,000
2009	$ 139,900,000
2010	$ 180,000,000
2011	$ 190,600,000
2012	$ 214,500,000
2013	$ 248,400,000
2014	$ 279,200,000
2015	$ 249,500,000
2016	$ 297,400,000
2017	$ 364,900,000
2018	$ 415,600,000
2019	$ 456,400,000
2020	$ 502,100,000

Figure 1 -- Ratepayer Costs for Meeting Proposed RPS, 2008-2020

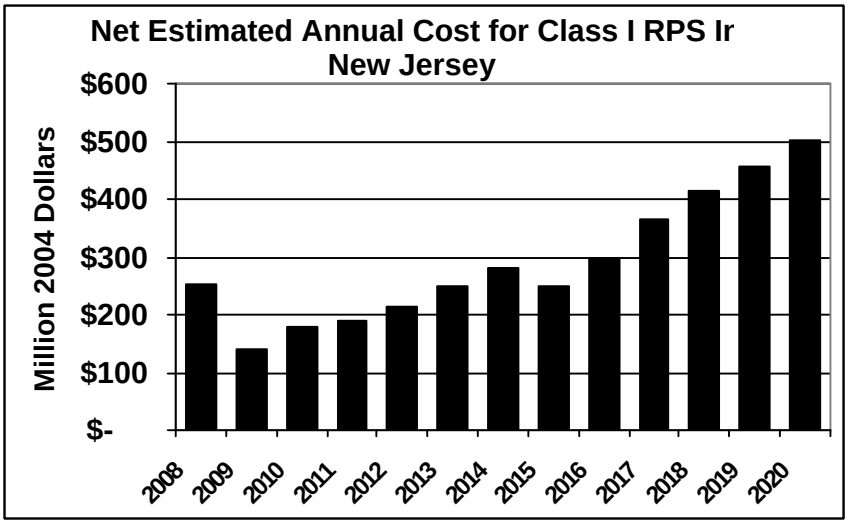


Table 2 -- Bill Impacts of Proposed Class I RPS, 2008-2020
Typical Residential, Commercial, and Industrial Customers

Energy Year	Residential	Commercial	Industrial
2008	$ 28	$ 276	$ 2,610
2009	$ 16	$ 157	$ 1,489

2010	$	20	$	201	$	1,910
2011	$	21	$	214	$	2,031
2012	$	24	$	241	$	2,285
2013	$	27	$	279	$	2,642
2014	$	31	$	314	$	2,968
2015	$	27	$	290	$	2,710
2016	$	32	$	345	$	3,216
2017	$	40	$	420	$	3,912
2018	$	45	$	478	$	4,445
2019	$	49	$	527	$	4,882
2020	$	54	$	580	$	5,363

Table 2 estimates the bill impacts on three major types of customer. The residential bill impact would rise from $16 per customer in 2009 to $54 per customer in 2020. The commercial and industrial bill impacts show the same increasing pattern.

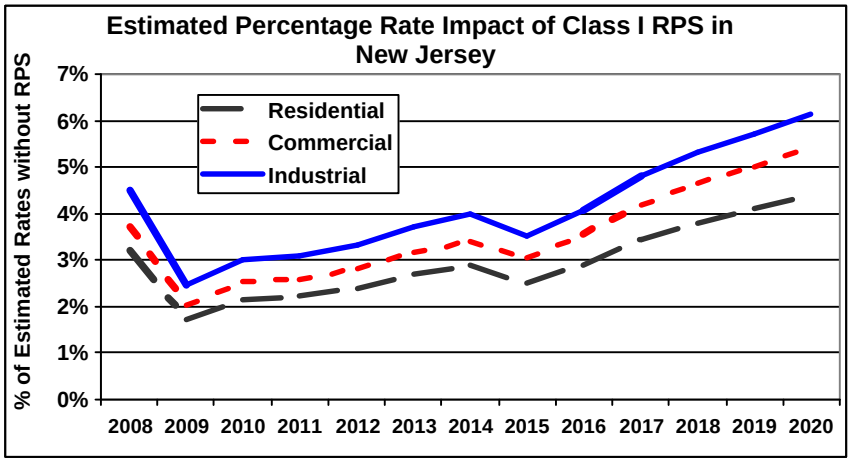
Table 3 and Figure 2 show estimated rate impacts. The table shows the rate impacts in both dollar and percentage terms, and the figure shows them in percentage terms.

Table 3 shows that for the residential class, the rate impact in 2009 is 1.7 percent, increasing to 4.4 percent in 2020. The commercial and industrial rate impacts are somewhat higher in percentage terms, and show the same general increase pattern.

Table 3 -- Rate Impacts of Proposed RPS
Typical Residential, Commercial, and Industrial Customers

Energy Year	Residential	Commercial	Industrial	Residential	Commercial	Industrial
2008	$ 0.00320	$ 0.00319	$ 0.00317	3.20%	3.70%	4.48%
2009	$ 0.00179	$ 0.00181	$ 0.00181	1.73%	2.04%	2.46%
2010	$ 0.00228	$ 0.00232	$ 0.00231	2.15%	2.52%	3.03%
2011	$ 0.00242	$ 0.00246	$ 0.00246	2.21%	2.60%	3.09%
2012	$ 0.00271	$ 0.00277	$ 0.00276	2.40%	2.82%	3.34%
2013	$ 0.00313	$ 0.00320	$ 0.00319	2.68%	3.15%	3.70%
2014	$ 0.00351	$ 0.00359	$ 0.00359	2.91%	3.42%	3.99%
2015	$ 0.00307	$ 0.00327	$ 0.00323	2.52%	3.07%	3.53%
2016	$ 0.00359	$ 0.00383	$ 0.00378	2.91%	3.55%	4.07%
2017	$ 0.00431	$ 0.00460	$ 0.00454	3.45%	4.20%	4.82%
2018	$ 0.00482	$ 0.00516	$ 0.00509	3.81%	4.65%	5.32%
2019	$ 0.00524	$ 0.00564	$ 0.00555	4.09%	5.02%	5.72%
2020	$ 0.00571	$ 0.00617	$ 0.00607	4.40%	5.41%	6.15%

Figure 2 -- Rate Impacts of Proposed RPS



Economic Impact of the Solar Component

The costs of required solar generation are the greater portion of all costs and impacts shown in the preceding three tables. The costs of the solar portion of the RPS as a percentage of its total incremental costs (from Table 1) are shown in Table 4 following.

Table 4 -- Portion of RPS Cost Due to Proposed Solar Set-Aside

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
85%	82%	87%	88%	89%	91%	92%	92%	93%	89%	90%	92%	92%

The costs of solar energy dominate the proposed Class I RPS. Even though Dr. Von Hippel's economic analysis assumed that the costs of solar energy decline each year, solar energy accounts for about nine tenths of the cost of the proposed extended Class I RPS.

Dr. Von Hippel's economic analysis of RPS impacts permits exploration of alternative RPS scenarios. Here we explore two, which differ from the BPU proposal only in terms of the amount of solar energy required. In one, solar energy remains at four percent of the overall Class I RPS requirement, the level assumed for analytical purposes in the CEEEP report (the "CEEEP scenario").[12] In the other, the solar energy requirement remains at the 0.16 percent level that it attains in 2008/9 in the present RPS (the "constant solar" scenario). The results are shown in the next set of tables:

- Table 5 -- Incremental Costs for Meeting RPS, 2008/9-2020/1, "CEEEP" and "Constant Solar" Scenarios
- Table 6 -- Bill Impacts of RPS for a Typical Residential Customer, "CEEEP" and "Constant Solar" Scenarios
- Table 7 -- Percent Rate Impacts of Proposed RPS for a Typical Residential Customer, "CEEEP" and "Constant Solar" Scenarios.

Table 5 shows the total ratepayer cost of a Class I RPS with alternative solar set-asides. In the "CEEEP scenario" the solar set-aside is four percent of the overall Class I requirement as that requirement grows from 2008 through 2020. In the "constant solar" scenario the costs for solar are limited to the small increases required to maintain solar at 0.16% of a slowly growing level of total electricity sales. It is important to note that given underlying sales growth, this is not a *de minimus* amount of solar -- about one-quarter of the cost of the Class I RPS from 2010-2020 would still be due to solar energy in the constant solar scenario. The maximum annual post-2008 RPS impact of $502 million under the rule as drafted (shown in Table 1) is reduced to $210 million under the CEEEP scenario and to $68.5 million under the constant solar scenario.

[12]Note that the pattern of increase to 20 percent in the draft rule as proposed by the NJBPU is somewhat different from the annual pattern of increase assumed in the CEEEP study.

Table 5 -- Ratepayer Costs for Meeting Proposed Class I RPS Alternative Scenarios

Energy Year (June 1 - May 31)	Net Annual Cost for Class I RPS (2004 $)	
	CEEEP Solar Scenario	With Constant Solar
2008	$120,300,000	$56,700,000
2009	$68,400,000	$33,800,000
2010	$82,300,000	$34,900,000
2011	$86,400,000	$35,900,000
2012	$95,000,000	$37,000,000
2013	$107,400,000	$39,100,000
2014	$118,500,000	$40,600,000
2015	$106,400,000	$37,100,000
2016	$124,000,000	$40,000,000
2017	$160,700,000	$61,700,000
2018	$179,700,000	$65,300,000
2019	$193,500,000	$66,000,000
2020	$210,100,000	$68,500,000

The next pair of tables shows the residential bill impact and the residential rate impact predicted from the two alternative solar scenarios. Comparing Table 6 with Table 2, it can be seen that the year 2020 residential bill impact of $54 per year calculated from the draft rule as proposed is reduced to $23 under the CEEEP scenario and to $7 under the constant solar scenario. Comparing table 7 with Table 3, it can be seen that the peak residential rate impact of 4.4 percent per year estimated from the draft rule as proposed is reduced to 1.8 percent under the CEEEP scenario and 0.6 percent under the constant solar scenario.

Tables 5-7 demonstrate the dramatic reduction in RPS costs with two alternative, lower levels of solar requirement. It is important to recall that the main near term environmental benefits of the Class I RPS -- reduced emissions of harmful air pollutants and GHGs -- are not likely reduced in either of the two lower-solar scenarios presented in Tables 5 through 7. These results require revisiting the assumption that solar energy requires special support, a matter taken up in section 7 of this report.

Table 6 -- Bill Impacts of Proposed Class I RPS, 2008-2020
Typical Residential Customers

Energy Year	Annual Bill Increase for Class I RPS (2004 $)	
	CEEEP Solar Scenario	With Constant Solar
2008	$13	$6
2009	$8	$4
2010	$9	$4
2011	$10	$4
2012	$11	$4
2013	$12	$4
2014	$13	$4
2015	$12	$4
2016	$14	$4
2017	$17	$7
2018	$19	$7
2019	$21	$7
2020	$23	$7

Table 7 -- Rate Impacts of Proposed Class I RPS, 2008-2020
Typical Residential Customers

Energy Year	Annual Rate Increase for Class I RPS	
	CEEEP Solar Scenario	With Constant Solar
2008	1.54%	0.74%
2009	0.85%	0.43%
2010	0.99%	0.42%
2011	1.00%	0.42%
2012	1.07%	0.42%
2013	1.16%	0.42%
2014	1.23%	0.42%
2015	1.07%	0.37%
2016	1.21%	0.39%
2017	1.51%	0.57%
2018	1.64%	0.58%
2019	1.72%	0.57%
2020	1.83%	0.58%

The economic cost results described above are based on an extensive analysis conducted by Dr. Von Hippel. Table 8 describes some of the main types of analytical assumptions that were employed. Dr. Von Hippel's full analysis is presented in his technical report, which also documents all of his calculations of environmental impacts.

Table 8 -- Key Elements of RPS Economic Analysis

- Independent forecast of statewide electricity sales growth based on U.S. Energy Information Agency projections, with energy efficiency initiatives assumed to reduce annual load growth by half.
- Avoided conventional generation costs are based on basic generation service (BGS) prices, escalated at one percent per year.
- RPS supported by renewable energy certificates (RECs) and CEP rebates, with the rebate share of costs declining after 2008.
- Renewable generation costs and output based on review of a wide range of available sources including the Navigant Study conducted in 2004 for the OCE.
- Costs of solar and other Class I resources decline in each year of the analysis period.
- Lost distribution revenues from on-site solar installations recovered through residential, commercial, and industrial distribution rates (due to net metering).
- Solar energy credited with estimated transmission and distribution and ancillary service cost reductions (due to its peak related generation pattern).
- Solar energy capacity per major sector after 2008 based on residential, commercial, and industrial sales.
- These and all other input assumptions are transparently documented in the Von Hippel study report and workpapers.

5. The Direct Economic Impact of the Proposed Rule -- Dismukes Study

Though Dr. Von Hippel and Dr. Dismukes exchanged draft research and findings, their two studies were done independently of one another. This provides the Ratepayer Advocate and the Board with two separate analyses of the draft RPS rule.

The Dismukes study projects a higher direct economic impact of the RPS from that projected by Dr. Von Hippel. Where Von Hippel's analysis projects a total cost rising from $140 million in 2009 to $502 million in 2020, Dismukes projects a total cost rising from $184 million in 2009 to $838 million in 2020.[13]

The Dismukes study projected a total net present value (NPV) cost to ratepayers of the proposed Class I RPS for the 17 years through energy year 2020. That estimated NPV cost is $3.3 billion. The comparable NPV of the Class I RPS as estimated by Dr. Von Hippel is $1.8 billion.

Only a small amount of the difference between Dismukes' results and Von Hippel's is due to the Von Hippel study being done in 2004 dollars, while the Dismukes study is done in 2005 dollars. More important are Dismukes' other assumptions, including his projections of the costs of the renewable resources that would be installed and financed pursuant to the draft rule, and his assumptions about the electricity generation costs that renewables would likely avoid. Dr. Dismukes has a number of input assumptions

[13]Dismukes, *op.cit..,* Schedule 9.

that differ somewhat from Dr. Von Hippel's. The methods used in this study are described in Dismukes' report.

The Dismukes study projects the average bill impacts of the draft RPS. Where Von Hippel's analysis projects an annual residential bill impact rising from $16 in 2009 to $54 in 2020, Dismukes projects an annual cost rising from $19 in 2009 to $77 in 2020. Commercial and industrial bill impacts would increase correspondingly.[14]

The Dismukes study also projects the rate impacts of the draft RPS. Where Dr. Von Hippel's analysis projects an annual residential rate impact rising from 1.7% in 2009 to 4.4% in 2020, Dr. Dismukes projects an annual rate impact rising from 2% in 2009 to 8.4% in 2020. Again, commercial and industrial rate impacts would increase correspondingly.[15]

[14] *Ibid.,* Schedule 8
[15] *Ibid.,* Schedule 7.

6. Indirect Economic Impacts of the Proposed Rule

The CEEEP report describes the results of an analysis of increasing the State's Class I RPS to 20 percent. The CEEEP assessed the incremental impacts of increasing the RPS beyond the level it is currently scheduled to attain in 2008/9. The analysis used econometric and input-output modeling to estimate aggregate impacts on such factors as gross state product and total annual income in the State, and total annual employment in the State.

The CEEEP study did not separately report the economic impacts of the solar set-aside versus the rest of the Class I renewables requirement. In a total economic framework, the benefits of the much lower costs of the non-solar energy renewables would help to offset the much higher costs of solar. The CEEEP integrated report format packages the higher-cost and lower-cost types of renewable resources together and thus masks the trade-offs between them. This is an analytic and reporting choice the CEEEP authors were entitled to make; but it also renders the CEEEP report's economic impact estimates useless as guides to the RPS rule proposed by the Board. The Board's proposal is for much more than twice the amount of costly solar energy than was assumed in the CEEEP studies and report. Thus, the CEEEP economic impact estimates are simply inapplicable to the rule as proposed. Despite this fundamental limitation, the Board in its "Summary" of the proposed RPS cites the CEEEP report as its source of economic impact and employment impact estimates.

The net impacts of policies on employment are always of particular interest to policy makers. However, to estimate net employment impacts is very difficult. Among other things, it requires a complex comparison of the loss of jobs when consumers have to pay more for energy (as they would to support the RPS) and thus have less to spend on other goods and services in the local economy, on the one hand, versus the addition of jobs related to the installation of renewable energy systems in the State, on the other. The CEEEP report estimated that by 2020 (presumably 2020/1), some 2700 annual net new jobs would exist in the State as a result of the RPS. This would increase all employment by less than one-tenth of one percent.

However, even this very small net jobs number is not applicable to the Board's proposal. Compared with the amount of solar energy the CEEEP assumed, the Board's actual proposal would depress employment to the extent that consumer disposable income for non-energy purchases is reduced on account of higher RPS costs from the greatly increased solar expenditures required.

Unfortunately the Board's "Summary" does not even emphasize the 2,700 jobs figure, but focuses more on higher employment figures that would be inapplicable even if the solar energy in its proposed rule did equate to that in the CEEEP report. According to the CEEEP, if the State developed initiatives to cause all of the manufacturing, operations, and maintenance facilities and employees needed to support the solar PV and off-shore wind infrastructure to be located in the State, then in

2020/1 11,500 to 11,700 net new jobs would be added.[16] The BPU "Summary" of the proposed RPS cites the figures of 11,500 and 11,700 new jobs in two places, but only in one of these does it properly explain that this estimate assumes new state initiatives to bring renewable manufacturing into the State.[17] Yet the costs of the financial incentives that would be required to bring manufacturing into N.J. -- which surely would be significant -- were not quantified or counted in any way as RPS costs in the CEEEP analysis. The omission of those incentive costs renders the 11,500-11,700 jobs estimate invalid even for an RPS with the amount of solar the CEEEP assumed.

Findings of the Dismukes Study

As noted above, the RPA commissioned an independent economic impact assessment by Dr. David Dismukes. This study was intended to yield an economic impact assessment that would be applicable to the RPS as actually proposed by the BPU. Dismukes found that the indirect economic impacts of the RPS as proposed would be negative. His report states:

> "On a total 'net' basis, the negative economic impacts of adopting the proposed RPS considerably outweigh their purported benefits. The results of this study have found that the proposed RPS will have a negative impact on [State] economic output, employment, and wages. This study estimates that total economic output over the next twenty years will be reduced by $2.1 billion, employment reduced by 91,686 jobs, and wages reduced by $1.4 billion, on a cumulative NPV basis, if the RPS is adopted."[18]

While Dismukes studied a different RPS from that analyzed in the CEEEP report, he also had a number of substantive criticisms of the CEEEP report methodology. For example, Dismukes points out that while new gas-fired generation is being and likely will be built in New Jersey, the CEEEP analysts assumed that all such projects (and their attendant economic benefits) would occur out-of-state.[19] This implies that Dismukes would have had different results from CEEEP even had he analyzed the same RPS proposal that CEEEP did; but that analysis is not before us. Based on what is before us at this point, it is clear that the following summary points about the indirect economic impacts of the proposed RPS rule can be made:

- The CEEEP study applies to a very different and much less costly RPS than that actually proposed by the Board.
- The Board's "Summary" comments on the economic impact of the proposed rule misapply the findings of the CEEEP report.
- The Dismukes study of the RPS actually proposed by the Board finds that it will significantly reduce economic output and net employment in the State.

[16]CEEEP, *op.cit.*, page 28.
[17]37 N.J.R. 3917 and 3921.
[18]Dismukes, *op.cit.,* page 4.
[19]*Ibid.,* page 21.

7. The RPS Rule: Recommendations

Overall Recommendation for Class I RPS Requirements

The Governor's Renewable Energy Task Force set out the goal of providing for renewable energy equal to 20 percent of the state's electricity requirements in 2020. The Board has set out a schedule of Class I requirements that moves along a trajectory that attains that goal.

It is clear that there are substantial risks as well as opportunities in adopting an aggressive, extended RPS. A reasonable course is to move forward to obtain the environmental and diversity benefits of renewable energy resources, while at the same time managing those risks. Instead of adopting a rule which applies through 2020, a rule for the five years subsequent to the expiration of the impending rule adoption is recommended. In this way progress toward the twenty percent goal can continue, while at the same time the question of whether and how the RPS can promote this progress would be addressed for a period of five years.

The Governor's Task Force did recommend that the Board should proceed to specifying the Class I RPS for all years through 2020. However, the more modular approach suggested here would avoid setting out regulations that would in any case have to be included in a new rule adoption, subsequent to the five-year period of applicability of any rule adopted now. At the same time, movement toward 20 percent would be maintained. Since the new rule will go to January 2011, a rule that goes through the energy year 2010 is suggested. The total Class I requirement in each year of the rule would be the same as in the draft rule. Toward the end of this period, the Board would investigate the appropriate rule to adopt for 2011 onward, taking account of experience with the rule and of relevant new information then available.

Solar Energy

It is clear that the solar component of the draft rule as proposed by the BPU would be costly. Therefore, it is recommended that the solar set-aside within the overall Class I RPS be maintained constant at the four percent level it will attain in 2008, rather than being increased thereafter. Should the Board choose to adopt a rule for years after 2010, the solar component should be changed to four percent of the total Class I requirement in all years after 2008.

There is a limit to the portion of power supply that can be provided by any single renewable resource. Wind power, for example, is intermittent, being available when and as the wind blows. Solar power is intermittent too, but in a different time pattern from wind power, as it is based on insolation. But so far, solar power has provided only a tiny fraction of the generating capacity than wind power has, and there is a need to further develop the solar contribution.

The production of electricity from solar cells holds great promise as a significant source of power in the future. Solar power can be generated right at the location of its use, as well as transmitted into the power grid. In converting sunlight directly into electricity, photovoltaic (PV) cells avoid a number of environmental harms associated with other power sources, such as:

- The air emissions from fuels that are combusted to drive generators.
- The radioactive waste disposal issues associated with nuclear power.
- Most of the land use and siting issues associated with wind and hydro-power.

Cost has been the principal obstacle to more widespread use of solar power. Despite having declined very substantially over the past decades, the cost of generation from PVs nevertheless remains high. Solar power alone could never displace all conventional generation, because it is produced only when and as the sun shines. But if its costs can continue to decline substantially, it could come to comprise a much greater portion of electricity supply in the U.S. than the tiny fraction it currently supplies, with attendant environmental and resource conservation benefits.

State solar energy policy must be viewed as an effort to help promote continued technical refinement and cost reductions in solar power by directly supporting more extensive use of the technology. Because solar is so costly at present, supporting it now is not a cost-effective near-term environmental strategy; air emission benefits can be obtained much more cheaply from wind power. Rather, supporting solar energy is an investment in our mid to long-term environmental future.

The State should play its part in lending support to a technology that can, perhaps by the middle of the present century, be an important part of our energy solutions. Indeed, the State has chosen to play a leadership role, such that currently no state supports solar energy more vigorously than New Jersey. The question presented to us by the proposed RPS rule is how much to expect electricity consumers to pay during the coming years in support of a policy of leadership on solar energy. A question such as this admits of no objective answers, and essentially poses a question of policy judgment.

The proposed RPS rule is so aggressive with regard to the solar component that it may simply ask too much of New Jersey ratepayers. If instead of growing to some ten percent of Class I supply, the solar component of the Class I RPS is maintained at four percent of the growing total of Class I resources required by its RPS, New Jersey's solar energy goal will stand out as one of aggressive national leadership. Even though it will still entail significant additional cost to ratepayers, we recommend that the final RPS rule should maintain the solar energy requirement at four percent of the Class I total in each energy year from 2008 onward. The table of RPS requirements would then be as shown in Attachment A.

The Need for a Circuit Breaker

The CEEEP authors concluded that if the costs of renewable technologies failed to continue to fall, the economic impact of the RPS that they assumed would be adverse. For example, the price of electricity in 2020/1 could be 24 percent higher than without the RPS.[20] According to the Dismukes study, the risks of higher costs are even greater than this. Most likely, the prices of renewable resources will continue to fall. However, ratepayers should have protection against the risk that the actual price trajectory of renewable resources could further drive up the cost of the RPS.

The existing alternative compliance payment (ACP) that electricity suppliers can make provides a degree of ratepayer protection. The ACP is set annually by the Board to be significantly higher than expected REC prices. If REC prices approach ACP levels, electricity suppliers will simply make ACPs rather than securing RECs, and the resulting ACP revenue will flow into the CEP fund for renewables. There is nothing in the current RPS rule to prevent electricity suppliers making costly ACP payments in growing amounts if underlying renewables costs are simply too high.

Additional protection of ratepayers against the risks of a much more costly RPS must be built into the rule at the point of its adoption. During discussions in the Clean Energy Council's renewable energy committee in 2005, a proposal for a "circuit breaker" or "safety valve" was put forward. That proposal is appended (Attachment B). Essentially, the proposal provides that in a year in which electricity suppliers subject to the RPS did not, in the aggregate, meet at least 80 percent of their RPS requirement through procurement of RECs, the scheduled increase in the next year's RPS requirement would be subject to deferral by the Board.

A circuit breaker would function to facilitate a temporary halt in a scheduled RPS increase, until the supply of renewables available in the market has caught up with requirements. The circuit breaker would apply separately to the solar component and the non-solar component of the Class I RPS.

Note that although it is structured around a supply shortfall rather than around unexpectedly high prices *per se*, the circuit breaker can provide protection against undue price increases as well as against unexpected supply shortfalls. If renewable resource costs go so high as to approach ACP levels, then less renewable capacity will be developed and the number of available RECs will decline, triggering the circuit breaker procedure. Thus, this reasonable "circuit breaker" provision should be incorporated as an integral part of the extended RPS rule. It would first be applied to the year ended May 31, 2007.

[20] CEEEP, *op.cit.*, page 25.

Attachment A

Proposed Percentage Of Energy Supplied That Must Be Renewable Energy

Reporting Year	Solar Electric Generation	Other Class I Renewable Energy	Class II Renewable Energy	Total Renewable Energy
June 1, 2004 – May 31, 2005	0.01%	.74%	2.5%	3.25%
June 1, 2005 – May 31, 2006	0.017%	0.983%	2.5%	3.5%
June 1, 2006 – May 31, 2007	0.0393%	2.037%	2.5%	4.5763%
June 1, 2007 – May 31, 2008	0.0817%	2.924%	2.5%	5.5057%
June 1, 2008 – May 31, 2009	0.16%	3.84%	2.5%	6.5%
June 1, 2009 – May 31, 2010	0.20%	4.71%	2.50%	7.406%
June 1, 2010 – May 31, 2011	0.23%	5.57%	2.50%	8.297%

Note that in all years in the above table, the total Class I requirement (the sum of “Solar” plus “Other Class I”) is the same as in the proposed rule as published in the NJR.

Attachment B

Supply-Side Circuit Breaker Proposal

[Distributed July 18, 2005, by James C. Hough, Environmental Policy Analyst, PSEG Services Corporation, (973) 430-8666, James.Hough@pseg.com]

Purpose

The Alternative Compliance Payment (ACP) provides some measure of protection against high REC prices in a short market. These payments can then be redirected back into renewable energy projects, to help bring supply into alignment with demand. The ACP system is a useful tool for preventing a small shortage from "breaking" the market. But what happens if the market is chronically short?

New Jersey's Renewable Portfolio Standard rule is one of the most aggressive in the nation. While these aggressive targets have positioned NJ as a leader in renewable energy development, some market participants are concerned about the ability of market to meet continually growing targets. For example, wind turbine shortages have delayed construction of a wind farm in Pennsylvania.[21] Photovoltaic prices have risen over the past year as worldwide demand continues to outstrip supply, resulting in a "continued pattern of significant backorder positions for solar module orders".[22] Additionally, both Pennsylvania and Maryland have passed their own RPS legislation. Connecticiut is considering allowing PJM RECs to count for compliance towards their own RPS. The U.S. Senate recently passed a national RPS measure. These emerging issues are in addition to existing challenges, such as siting new projects.

Risks of a Significantly Short Market without a Circuit Breaker

- Customers will pay expensive ACP payments, without getting full RE benefit
- If targets are viewed as unrealistic, the marketplace will not respond – high regulatory risk – projects will not get built
- REC prices will be pegged at ACP over longer term, LSE's may rely on ACP rather than dealing with risks associated with contracts.
- Rule will need to be reopened and targets adjusted, leading to marketplace uncertainly (what criteria, when, how, what will the new targets be?)
- Investors will not participate in an uncertain marketplace

Benefits of a Circuit Breaker

- Greater market certainty – Market participants know exactly what happens in advance if there is a significant shortage in the marketplace – Creates stable market
- No need to reopen rule and potentially and introduce uncertainly to the marketplace
- Higher probability of long-term success of the RPS
- Customers not paying for renewable energy they don't receive
- Targets met at more reasonable cost

[21] "Turbine Shortage Delays PA Wind Farm". Associated Press. May 22, 2005
[22] http://www.solarbuzz.com/moduleprices.htm

Methodology
Beginning with the RPS period ending May 31, 2007, the Board shall conduct an annual feasibility review of the Class I and Solar RPS percentage requirements.

The review shall be conducted following the submittal of the annual RPS compliance reports on September 1st of each year. The Board shall issue a determination as to whether "sufficient supply" exists to justify a continued increase in the RPS percentage requirements for Solar and Class I renewable energy.

Determination of Sufficient Supply
"Sufficient supply" shall exist when at least 80% of the RPS requirement for a given class of renewable energy has been met, or was capable of being met, through direct supply renewable energy or eligible RECs. This shall be determined as follows:

Step 1

- Add total load served by all LSEs required to comply with RPS requirements and multiply this by the required RPS percentage for the reporting period.

Step 2

- Add total RECs and direct-supplied renewable energy submitted for compliance by the LSEs in the September report.
- Add any unsold eligible RECs to the amount reported above

Step 3

- Divide the total from Step 2 by the total from Step

Example		
Step 1		
Total Load	*75,000,000*	*MWh*
Class I %	*4%*	
Class I MWh	***3,000,000***	*MWh*
Step 2		
Direct Class I	*1,000,000*	*MWh*
Class I RECs	*1,000,000*	*MWh*
Unsold Class I	*500,000*	*MWh*
Total Availible	***2,500,000***	*MWh*
Step 3		1
Step 2 / Step 1	**83%**	

Annual Determination
By December 31st of each year, the Board shall issue a determination of "sufficient supply" for Class I and solar energy, using the procedure described above. If sufficient supply exists (Step 3 >= 80%), the percentage requirements increase per the schedule in the RPS rule for the next reporting period. If sufficient supply does not exist (Step 3 < 80%), the circuit breaker is triggered.

Circuit Breaker
If the circuit breaker is triggered for Class I and/or solar energy, the RPS shall be maintained at the current level for the next compliance period. This will give supply an opportunity to "catch-up" with demand. The following year, the procedure will be repeated. If the market is deemed to have sufficient supply, the ramp-up will resume. If not, the circuit breaker will remain in effect.

Circuit Breaker Flowchart