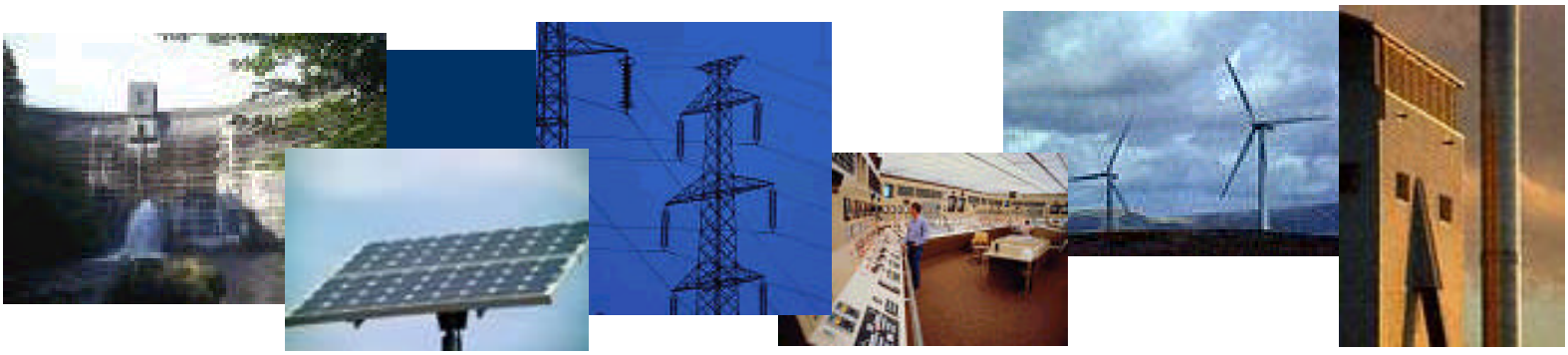
Economic Impacts of New Jersey's Proposed Renewable Portfolio Standard



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Section 1: Introduction

Acadian Consulting Group ("ACG") was engaged by the New Jersey Division of Ratepayer Advocate ("RPA") to examine the impacts associated with the New Jersey Office of Clean Energy ("OCE") proposal to expand the state's existing renewable portfolio standard ("RPS") from 6.5 percent to 20 percent by 2020. This engagement consisted of an analysis of the report prepared by Center for Energy, Economic, and Environmental Policy ("CEEEP") at Rutgers University in 2004, hereafter referred to as the CEEEP Report. After reviewing the CEEEP Report and the proposed rules, ACG developed its own independent set of rate and economic impacts associated with the proposed RPS changes.

In summary, this report has found:

- Under the base case assumptions, the proposed RPS will increase cumulative electricity expenditures for the period 2005-2021 by some $3.3 billion in net present value ("NPV") terms.

- Under the base case scenario, residential customers could see a cumulative total increase in electricity expenditures of some $1.2 billion over the next twenty years on a cumulative NPV basis. Commercial customers could see comparable increases of some $1.6 billion, while industrial customers could see increases of some $475.9 million over the same period.

- Rate increases under the base case scenario in this analysis could cost the New Jersey economy a cumulative NPV decrease in output of some $7.0 billion over the next 20 years if the proposed RPS is adopted. Cumulative employment losses over the same period are estimated to be around 174,130 jobs, while wages could decrease by a cumulative NPV amount of some $2.8 billion.

- Even under a high fossil fuel price scenario, the proposed RPS will still result in significant increases in electricity rates and expenditures. Under the high fossil-fuel price scenario examined in this report, New Jersey customers are estimated to see cumulative NPV electricity expenditure increases of some $2.7 billion.

- The cost effectiveness of renewable energy ("RE") technologies depend heavily on the assumption that costs will continue to decrease along historic, or greater than historic trends. Such assumptions were included in the CEEEP Report. This study has found that if these RE technology cost decrease assumptions do not hold, ratepayers will be liable for some $6.4 billion in increased electricity expenditures in NPV terms over the next twenty years.

- The development of relatively higher-cost RE resources is not the only potential impact on rates for New Jersey customers. The proposed changes in the RPS standard could increase lost revenue requirements for ratepayers, and potentially increased Clean Energy Program ("CEP") rebate program funding requirements. If all three of these costs are considered (proposed RPS, lost revenue recovery, and increased CEP funding) and recovered through rates, electricity expenditures could increase to $3.7 billion on an NPV basis over the next twenty years.

- The CEEEP Report is correct in noting that the development of RE technologies could have a considerable positive economic impact on the New Jersey economy. However, the benefits of this development are critically linked to how much of those RE activities would be within New Jersey, and the foregone benefits associated with traditional power plant development. Taking both of these factors into account significantly reduces the positive benefits found in the CEEEP Report.

- The total "net" economic benefit of the proposed RPS can be calculated by taking the difference between the negative rate impacts of the proposal, the net positive impacts associated with the RPS investments, and the net positive impacts associated with the annual operation and maintenance ("O&M") of the RE technologies used to meet the proposed standards. In all three scenarios examined in this report, the net economic benefits are negative, indicating that the current RPS proposal does not produce positive net economic benefits for New Jersey ratepayers. In other words, the costs outweigh the benefits of the RPS proposal.

- On a total "net" basis, the proposed RPS is estimated to create negative economic impacts on output, employment, and wages in New Jersey. This study estimates that under the base case scenario, the decrease in total economic output over the next twenty years could be as great as $2.1 billion, employment could be reduced by 91,686 jobs, and wages could be reduced by $1.4 billion, on a cumulative NPV basis, if the RPS is adopted.

This report is organized into 6 sections including the introduction. Section 2 explains the assumptions and methodology used to calculate the potential rate impacts of the proposed RPS. A base case and two sensitivities have been considered in this rate impact analysis. Section 3 presents the economic impacts associated with the potential rate impacts in the base case and sensitivity scenarios. Economic impacts are also calculated for: (a) the development and investment of renewable technologies; and (b) the ongoing operation of those technologies.

Section 4 considers the rate and economic impacts that could be created from lost revenue recovery requirements and increased CEP funding requirements needed to maintain current support levels for the proposed RPS. Section 5 examines the potential change in fossil fuel use resulting from the proposed

RPS. Section 6 provides the total net economic benefit estimates of the proposed RPS.

Section 2: Cost of Electricity under the Proposed RPS

The addition of generation resources, whether from renewable resources or traditional fossil fuels, will have ratepayer impacts. To estimate these impacts, a model was developed to calculate the cost of adding the additional amounts of renewable capacity that have been proposed by the OCE in its most recent rulemaking announcement. Under this proposal, renewable energy shares will increase from their current level of 6.5 percent of total generation by 2008, to 20 percent by 2021. Wind and solar energy will be the primary RE technologies used to meet the proposed RPS changes. The new proposal also guarantees a considerable set-aside for solar energy. By 2021, solar energy will account for two percent of total sales, while wind energy and other Class 1 resources will account for roughly 18 percent.

The rate impact model included in this report calculates a levelized cost for electricity that is generated from the proposed annual renewable energy shares. An avoided cost was also estimated in order to determine the levelized cost of traditional resources displaced by the RPS proposal. The difference between the RE levelized cost, and the levelized avoided generation costs, will indicate the "cost effectiveness" of the RE proposal. If the difference is positive (i.e., levelized RE generation costs are greater than levelized avoided costs), then rates will increase. Rates are expected to decrease if the difference is negative.

2.1 RPS Assumptions

2.1.1 Study Period, Customer and Sales Forecast

The study period for the rate impact model includes the period under consideration in the proposed rule (2005-2021). All data used in the rate impact model, as well as other models included in this report, come from publicly available information. The baseline customer and sales data used in the analysis is from the U.S. Department of Energy, Energy Information Administration

("DOE/EIA"), and is specific to New Jersey. Sales and customer data are collected and tabulated on a per customer class basis (i.e., residential, commercial, industrial). Forecasts of both customer counts and sales information are developed for the entire twenty year period. Customers and sales are assumed to increase by 1 percent per year over the forecast period.

The forecast amounts of customers and sales have been provided in Schedule 1. Demand side management ("DSM") impacts on sales have been included in the base case RPS rate impact model. The current base case model used in this analysis assumes that DSM will reduce forecasted electricity usage in New Jersey by 0.5 percent per year and that program benefits in any given year will last for a total of 10 years. Accounting for DSM ensures that the model does not over-forecast the RE technology investment needed to meet the RPS goals. While the model includes DSM impacts, these impacts can easily be reduced or eliminated for sensitivity purposes if needed.

2.1.2 Generation Technologies, Units Costs, and Operating Costs

A considerable number of assumptions have to be made in order to make a rate impact model for RE technologies operational. These include assumptions about the share of generation coming from RE technologies; the costs of installing as well as operating these technologies; and the costs and operating characteristics of the avoided technologies. Where appropriate, most all unit cost and operating assumptions associated with the RPS rate impact model come from the Navigant Study[1] performed on the behalf of the CEEEP in 2004. When certain operating assumptions were unavailable, or not clearly provided by the Navigant Study, information included in the study of the proposed RPS in Pennsylvania,

[1] *Economic Impact Analysis of New Jersey's Proposed 20% Renewable Portfolio Standard*. Prepared by The Center for Energy, Economic and Environmental Policy, Funded by New Jersey Board of Public Utilities, Office of Clean Energy, December 8, 2004.

conducted by Black & Veatch[2], were used. In some instances, alternative estimates and assumptions may have been developed to either update information, incorporate a greater degree of realism, or were subjected to sensitivities. A table listing all of the assumptions used in the base case RPS rate impact model has been provided in Schedule 2.

Overall RE generation shares used in the rate impact model are the same as those in the current rulemaking proposal. Renewable energy generation shares were assumed to increase in a linear fashion until 2021. Some assumptions on the break-outs within each type of RE technology, however, have been made for modeling purposes. For instance, solar PV installations are assumed to be divided between residential, commercial, industrial, and merchant/utility applications. Also, the base case rate impact model assumes that 40 percent of the Class 1 resources will come from offshore wind energy, the source of significant economic benefits in the CEEEP Report. The balance of the Class 1 resources are allocated between onshore wind and biomass.

The next step in the RPS rate impact analysis is to convert RE generation amounts into capacity requirements based upon the capacity factor and operational assumptions for each type of RE technology type. Schedule 3 provides a table with the RE generation shares and amounts by technology type, while Schedule 4 provides the estimated capacities for each of these technologies.

As noted earlier, Schedule 2 lists the unit cost and operational assumptions for each RE technology modeled in this study. This report will not discuss each assumption, but some deserve special recognition given their importance in the estimation of the RPS costs.

[2] *Economic Impact of Renewable Energy in Pennsylvania. P*repared by Black & Veatch Corporation, Prepared for the Heinz Endowments and Community Foundation for the Alleghenies, March 2004.

- ***Unit Installed Cost per kW:*** These drivers determine the overall capital costs for RE technologies. Installed costs are developed for each technology type, and in the case of solar, by various types of developers (i.e., residential, commercial, industrial, merchant/utility).

- ***Achievable Capacity Factor:*** Most RE technologies are intermittent and operate at relatively lower annual average capacity factors. The lower the annual average capacity factor, the lower the overall annual generation, and the higher the per unit cost of development, holding other factors constant.

- ***Annual Installed Cost Decrease:*** One of the core premises of the adopting an RPS is that greater RE development will facilitate lower installed costs of each respective RE technology. The higher the assumed annual cost decreases, the more cost-effective RE technologies become over time.

- ***Carrying factor:*** This is used to develop a levelized fixed charge amount that converts the required annual capital payments to a fixed per kWh charge. The carrying factor accounts for depreciation, return on investment, and taxes. A key component in determining this carrying factor is the weighted average cost of capital for each type of entity developing a particular renewable resource. This includes utility-type development as well as merchant, and in the case of on-site distributed resources like PV, industrial, commercial and residential cost of capital estimates. Schedule 5 provides the assumptions regarding the capital structure and costs for these various types of RE technology developers.

2.2 Avoided Cost Calculations

The proposed changes to the New Jersey RPS need to be evaluated relative to their opportunity cost. If the proposed RPS is not developed, then the state's

generation resource requirements will more than likely be met by some combination of traditional fossil fuel technologies like coal or natural gas. The electricity generated from these traditional technologies is what is "avoided" or displaced by RE development. The cost of this avoided fossil fuel generation needs to be compared to the RPS cost on comparable terms. Therefore, some type of levelized cost estimate for these avoided technologies will need to be estimated in order to make an "apples-to-apples" comparison to the RE portfolio. If the difference between the levelized RPS costs and the levelized avoided costs are positive, then the cost of the RE portfolio is higher and rates will be relatively higher. The inverse would be true if the difference were negative (i.e., rates would be relatively lower with the development of the RE portfolio).

There are a number of cost differences between fossil fuel generation and generation from resources included in an RPS. These include avoided fossil fuel purchases (i.e., coal and natural gas), as well as certain operation and maintenance costs ("O&M"). In addition, capacity costs also need to be considered to the extent that actual capacity development, as opposed to energy, is avoided by RE technologies.

The problem with RE technologies is that they are intermittent in nature and have little, if any capacity value. There is a counter position, however, that would suggest that some capacity value should be considered even if these RE technologies only avoid a small amount of capacity. [3] The estimate of avoided costs included in the base case RPS rate impact model does attribute value for the deferred capacity associated with RE technologies. Generally, capacity credits have been given to each RE technology based on either a recognized level, like the 20 percent level used by the PJM Interconnection for wind energy, or the ratio of each technology's capacity factor to that of a baseload fossil resource (i.e., coal). [4]

[3] Black & Veatch, E-9.
[4] Black & Veatch, E-9.

Lastly, in order to determine the avoided capacity benefit of the proposed RPS, some assumed fossil technology fuel mix needs to be determined. For purposes of the avoided cost calculation, a 50-40-10 (percent) fuel mix has been assumed representing the shares from a coal steam generator, natural gas combined cycle ("CC") unit, and a natural gas combustion turbine ("CT"), respectively. Unit cost and operational assumptions for these avoided technologies have been provided in Schedule 6.

One of the more important assumptions associated with these avoided technologies is the fuel costs for fossil fuel generation. These fuel cost assumptions are based upon long-run forecasted energy prices included in the most recent Department of Energy *Annual Energy Outlook*.[5] Later in this report, sensitivities to these fuel price assumptions will be considered.

2.3 Potential Rate and Bill Impacts

Three different rate impact scenarios have been considered: a base case; a high fossil fuel price case; and a zero RE technology cost decrease case. The two sensitivities will be discussed in a later section of this report. The base case will be examined here and serves as the reference point for the remaining analysis.

The base case assumptions are favorable to the analysis of the proposed changes in the RPS and RE development in general. While these assumptions have been outlined on Schedule 2, a number need to be highlighted:

- ***Assumed Annual RE Cost Decreases:*** A very important assumption included in the base case scenario is that historic cost decrease of some 5.0 percent per year for solar, and 2.5 percent per year for wind energy, are included. This is an important assumption and creates favorable

[5] Energy Information Administration. *Annual Energy Outlook 2005 with Projections to 2025*. (Washington, DC: U.S. Department of Energy, January 2005).

future opportunities for RE development. As will be seen later in this report, without these cost decreases, the impact of the RPS on ratepayers is explosive.

- The installed cost per kW assumptions are reasonable and not at the upper end of the range observed during the course of research for this report.
- The operating characteristics for RE technologies are also positive and not at overly penalizing levels that would unnecessarily discourage RE development.
- Federal tax incentives have been included and have been assumed to be returned to ratepayers (through lower costs and not higher profits to developers) although there is no requirement that this occur.

Schedule 7 through Schedule 9 present a number of different tables showing the conclusions from the base case RPS rate impact analysis of the proposed RPS. These schedules provide the following information:

- Schedule 7: provides the rate impacts of the proposed RPS in $/kWh and percentage terms.

- Schedule 8: shows the annual average bill impacts on a per customer class basis in total dollars.

- Schedule 9: presents the total annual impacts of the proposed RPS in 2005 dollars.

As seen in each of the schedules, the impacts of the proposed RPS increase considerably over time as the shares dedicated to renewable resources increase. In 2005, the average annual rate impact of the proposed RPS is only $0.000373 per kWh. For a typical residential customer in 2005, this would be a $3.09

increase in their annual bill. Statewide, electricity expenditures would increase by some $28.9 million per year.

By 2021, however, the proposed RPS is estimated to result in a typical annual rate increase of some $0.009684 per kWh or about an 8.4 percent increase for residential customers. Residential customers could see annual bill increases of $3.09 per customer in 2005 increasing to $76.54 per customer by 2021. Statewide, estimated electricity expenditures could increase dramatically from $28.9 million per year in 2005, to $838.4 million per year in 2021. In NPV terms, this could be a $3.3 billion cumulative increase in estimated electricity expenditures over and beyond what New Jersey ratepayers would have paid if the proposed RPS were not adopted.

2.4 Rate Impact – Sensitivity of Results

The results of the RPS rate impact model are dependent upon a number of assumptions – some of which can have significant impacts on the end result. While there are an unlimited number of scenarios that can be examined in this type of analysis, two were determined to be the most important in examining the outer range of potential outcomes (both positive and negative) from implementing the proposed RPS.

- ***Changes in Fuel Price Assumptions for Avoided Technologies:*** The past year has seen considerable increases fossil fuel prices, particularly natural gas. Increased natural gas demand (primarily driven by power generation requirements) and unanticipated supply short-falls created by the past tropical season in the Gulf of Mexico, has resulted in considerable natural gas price increases in 2005. While it is doubtful that these increases will be permanent (and the baseline assumption is that they will not), a scenario examining a higher level of natural gas and coal prices seems reasonable and warranted. Thus, the natural gas price escalation factor has been increased to a 3.5 percent per year level, while

the coal price escalation factor was increased to 2.5 percent per year during the analysis period. The increased natural gas escalation factor would result in 2021 natural gas prices of close to $9.00 per MMBtu on an annual average basis by the end of the study period.

- ***Changes in Assumptions about RE Technology Cost Decreases:*** Little attention is given to the possibility that historic cost decreases for RE technologies may not continue over time. It is possible that incremental technological and cost reduction gains could wane (i.e., diminishing returns). Some sensitivity on this assumption seems equally warranted. Thus, this study has also examined a case where there are no changes in the installed cost per kW of renewable technologies. This assumption, while potentially unlikely, is important because it highlights the outer range of risk that New Jersey ratepayers may bear if these cost decreases do not materialize.

2.4.1 Results from Fuel Price Sensitivity

Schedule 10 shows the potential annual increase in rates, and average annual per class percent changes in rates, associated with the proposed RPS under a high fossil fuel price escalation scenario. In 2005, the annual average rate impact of the proposed RPS under higher fuel prices is $0.000365 per kWh. This rate impact actually decreases relative to the base case over time as the impacts of higher fuel price escalation increase fossil fuel generation costs. Schedule 10 shows, however, that despite high fossil fuel prices, the proposed RPS is estimated to result in an increase in rates relative to avoided fossil fuel investments.

Schedule 11 shows the estimated annual typical bill increases associated with the proposed RPS under a high fossil fuel escalation scenario. A typical residential customer could see a $3.03 increase in his or her annual bill in 2005 under the high fossil fuel price escalation assumption. These residential typical

bill impacts continue to increase, albeit at a slower rate, under the high fossil fuel price escalation, as the study period moves out into 2021. By that year, a typical residential customer could see an increase of some $48.94 in their bill by the adoption of the proposed RPS even though fossil fuel prices are considerably higher than the base case assumptions.

Schedule 12 presents the estimated total annual New Jersey increases in electricity expenditures resulting from the proposed RPS under a high fossil fuel price escalation factor assumption. In 2005, New Jersey as a whole could see electricity expenditures increase by some $28.3 million per year– somewhat lower than the typical expenditure increase estimated in the base case rate impact model. These total expenditures increase to an annual average level of $536 million in 2021, much lower than the base case estimate of $838.4 million in that same year.

On a cumulative NPV basis, it is estimated that New Jersey could see electricity expenditure increases of some $2.7 billion under a high fossil fuel price scenario. This compares favorably to the base case increase of $3.3 billion, but is still positive, indicating that ratepayers are still paying more through the proposed RE portfolio than developing traditional power generation technologies.

2.4.2 Results from Eliminating the RE Technology Cost Decrease Assumption

Annual average rate impacts, and percent changes in rates for the zero RE cost reduction case, have been provided in Schedule 13. In 2005, the estimated average annual rate impact of the proposed RPS (with no RE cost decreases) is $0.00394 per kWh. For residential customers, this would represent a 0.3 percent annual increase in rates. By 2021, residential ratepayers could expect to see an annual increase in their rates of some 24 percent per year, while commercial and industrial customers could see annual increases of 27 and almost 30 percent, respectively.

Schedule 14 presents the typical bill impacts under the zero RE cost decrease sensitivity. A typical residential customer could see a $3.27 annual increase in his or her annual bill if RE cost decreases fail to materialize in 2005. This amount is not very significant since most of the impacts occur in later years as the RE deployments increase. By 2021, residential customers could see an annual increase of some $216.30 in their typical annual bills or almost 182 percent higher than the base case increase estimated in Schedule 8.

Schedule 15 shows the estimated annual average increase in electricity expenditures that would result from the proposed RPS if RE technologies do not see cost decreases over time. In 2005, New Jersey electricity expenditures could increase by some $30.5 million per year. By 2021, the state could see an annual increase in electricity expenditures of some $2.4 billion. Overall, if the assumption about RE cost decreases fails to materialize, New Jersey ratepayers could pay an estimated $6.4 billion in NPV cumulative expenditures.

Section 3: Economic Impacts

A number of economic or "ripple effects," both positive and negative, could be created by the proposed RPS. As noted earlier, the change in rates associated with the RPS is one such type of economic impact. A reduction in rates could result in increased disposable income for households and businesses, holding other factors constant. An increase in rates, however, will reduce household and business expenditures in other goods and services, which could have significant negative ripple effects throughout the New Jersey economy.

Power generation investments, whether they are in traditional or RE technologies, represent a series of considerable capital investments and can have significant positive impacts on local and regional economies. When a generation facility is developed, there are a number of direct expenditures that are made to develop the project. Local crafts and trade employees are hired to develop the project, which creates additional employment and income opportunities. The economic impacts of these development opportunities tend to be short lived, and are primarily associated with construction and development. Over the long run, the expenditures on O&M, have the more relevant year-to-year impacts on regional economies by power generation investments.

The development of most energy infrastructure tends to be capital intensive. This means that the really big economic impacts associated with facility development are early and upfront in the development of the project. Given the capital intensive nature of these projects, they are not usually significant "job creators" although the quality of the jobs tend to be much higher than average.

Generally, economists and regional scientists refer to three different types of economic impacts: direct; indirect; and induced. Direct economic impacts are defined as the changes in regional economic activity resulting from an increase in project expenditures. In the case of a power generation investment, the direct

economic impacts are created by the construction expenditures associated with the development of the project, or installation if it is a small residential PV project. The indirect economic impacts are defined as the secondary activities stimulated by the project's direct investment and expenditures, and could include the purchase of other goods, contractor services, or project equipment and rentals. The induced economic impacts are those increases in economic activity associated with the new disposable income created by the increase in direct and indirect economic activity.

This report has used the Implan Economic Impact Assessment Model ("Implan"), with New Jersey-specific input data, to estimate the economic impacts of the proposed RPS. The Implan model is a widely used economic input-output ("I-O") model used by industry, academia, and several state and federal agencies for impact analysis purposes.[6] The model was originally developed in the mid-1980s for the economic impact analysis of land use policies of the U.S. Forestry Service. Since that time, the modeling system has been used for a variety of different infrastructure and policy analyses. A number of different analyses examining impacts in the energy industry have also used the Implan system.

Generally, there are three types of economic impacts that will be created by proposed RPS:

(1) ***Economic Impacts from Proposed Changes in Rates:*** The rate impact analysis presented earlier has shown that the proposed RPS is very likely to result in rate increases for New Jersey customers in all three scenarios. Thus, the economic impact will be negative because, other things being equal, rate increases will

[6]Numerous federal and state government agencies, as well as academic institutions use the Implan model, including the Bureau of Economic Analysis, the Environmental Protection Agency, the Federal Reserve Bank, and the New Jersey Commerce Commission. A client list can be found at http://www.implan.com/references.html.

reduce the disposable income households and businesses have to spend on other goods and services in the New Jersey economy.

(2) ***Net Economic Impacts from the Investment in RE Technologies:*** The magnitude of the proposed RPS is considerable and will result in new expenditures and investments in the state's economy. However, like the rate impacts, these benefits have to be compared to their opportunity costs – namely, the benefits foregone from avoided technologies. If the difference between the impacts from the RE investments and the avoided investments is positive, it can be said that RE investments will have a positive net impact on the New Jersey economy.

(3) ***Net Economic Impacts from the O&M Expenditures Associated with RE Technologies:*** RE technologies can also have positive year-to-year impacts on the economy through the changes in expenditures created by their O&M. Like RE investments, however, these O&M impacts need to be "netted" against the avoided O&M impacts that could have been made if not for the RE investments. (i.e., avoided generation)

3.1 Economic Impacts from RPS-Created Increase in Rates

As noted earlier, the increases in electricity expenditures associated with the proposed RPS are considerable. These impacts could be felt throughout the New Jersey economy as households, businesses, and industry divert expenditures from goods, products, and services to pay for the increased cost associated with renewable energy. These impacts can reduce economic output, employment, wages, and other value added components of the New Jersey economy.

Schedule 16 presents a summary of the economic impacts associated with the increase in rates by 2021. The estimated annual reduction in direct economic output ranges from $26.9 million in 2005, to $778.8 million by 2021. However, as noted earlier, the reduction in these direct output effects do not stop here. There are a number of “ripple” impacts (or multiplier impacts) that run through the New Jersey economy reducing trade and income in other sectors.

Indirect and induced output is estimated to be reduced by a total of $987.0 million per year in 2021. In total, estimated economic output in New Jersey is reduced by $1.8 billion per year by 2021 due to the economic contraction created by the proposed RPS. This results in an estimated NPV cumulative reduction in total New Jersey output of some $7.0 billion over the 20 year period.

Schedule 17 presents a summary of the reduced employment created by the base case rate impacts of the proposed RPS. The estimated annual reduction in direct employment is some 9,607 jobs in 2021. Indirect and induced employment opportunities that are estimated to be reduced due to the proposed RPS are 8,724 Overall, by 2021, a total of some 18,331 jobs could be lost due to the increases in the proposed RPS. While some of these losses could be overlapping in any given year, on a cumulative basis, the losses add up to some 174,130 employment opportunities lost due to RPS-created increases in rates (in the base case scenario).

Schedule 18 highlights the estimated reductions in wages associated with the employment losses presented in Schedule 17. By 2021, it is estimated that the proposed RPS could result in $712.9 million annual losses in wages (direct, indirect, and induced). On a cumulative NPV basis, this would represent a loss of some $2.8 billion in wages.

The economic impacts associated with each of the two rate sensitivities (i.e., high fossil fuel and zero RE cost reductions) were also estimated. The results of the

economic impacts of these sensitivities has been provided in Schedule 19 through Schedule 24. Generally:

- As noted earlier, high fossil prices reduce the rate impacts associated with the proposed RPS. In a high fossil fuel price environment, the proposed RPS could have a negative total annual economic output impact of $1.1 billion in 2021. Total estimated annual employment could be reduced by 11,720 in 2021. Estimated annual losses in wages could be $455.8 million by 2021.

- Under the high fossil price assumption, and on a cumulative period NPV basis, the total economic output reduction could be $5.8 billion. Some 140,446 jobs are estimated to be lost and wages could be reduced by $2.3 billion.

- If the historic RE cost reducing assumptions do not occur, the economic impacts on the state could be significant. Total annual economic output could be reduced by as much as $5.0 billion in 2021, annual employment losses could amount to 51,802 jobs, and annual wages would be reduced by $2.0 billion.

- Under the zero RE cost reduction scenario, on a cumulative period basis, the NPV reduction in total direct economic output would be $13.5 billion. Some 361,183 jobs are estimated to be lost, and wages could be reduced by $5.5 billion.

3.2 Economic Impacts from New RPS Investments

The CEEEP Report noted that there were considerable economic benefits associated with the development of renewable resources. The proposed rule indicated that these benefits would more than overcome any negative implications associated with the rate increases resulting from the proposed RPS.

These benefits come from the construction, installation and development activities associated with the wide range of potential RE resources that could be developed under the proposed RPS.

While it is true that a number of positive economic impacts could accrue from the increased RE development in the proposed RPS, these benefits have to be tempered for the potential leakages associated with the investments as well as foregone economic benefits that could have been created by avoided technologies (i.e., coal and gas-fired technologies). Here, leakages are those expenditures on RE technologies that are made from imported goods and services. Thus, some share of total RE investments "leak" from the New Jersey economy. In some ways, these leakages can be thought of as exports of RE benefits to other states and regions.

The suggested potential benefits of the RPS both overestimates the potential in-state expenditure amounts (particularly in their aggressive in-state investment scenario) and fails to recognize the avoided benefits associated with the fossil fuel resources which could replace RE technologies. These omissions result in overestimates of the economic benefits of the proposed RPS.

Schedule 25 presents the estimated economic benefits from the new RE technology investments created by the proposed RPS. The estimated output benefits presented in the schedule are considerable. For instance, the estimated direct output effects in 2021 associated with the new investments stimulated by the proposed RPS are some $815.4 million. The indirect and induced impacts with RE installation are estimated to be around $872.7 million. Total economic output impacts associated with the development of RE technologies in 2021 are $1.7 billion. On a NPV basis, the cumulative economic output associated with RE investments created by the proposed RPS is $7.4 billion.

As noted in the CEEEP study, there are also considerable employment impacts associated with the development of an RE portfolio. The total estimated annual employment opportunities created by the proposed RE portfolio in 2021 is 13,325. These impacts have been presented in Schedule 26. On a cumulative basis, some 137,159 jobs could be created by the development of the proposed RE portfolio.

Total estimated annual wages created by the proposed RE portfolio in 2021 are $460.7 million and have been provided in Schedule 27. On a cumulative NPV basis, the total RE-created wages are some $2 billion.

3.3 Avoided Fossil Fuel Economic Impacts

The RPS rate impact analyses conducted earlier recognized that there are a number of traditional fossil fuel-fired resources that are avoided as a result of the development of the proposed RPS. Economic impacts from these deferred resources also need to be considered since they would have also created positive economic benefits if developed. Capacity values that were estimated to have been avoided in the rate impact analysis were used to estimate the potential economic impacts that would have been created if these fossil fuel resources were developed instead of the proposed RPS.

Appendix A of the CEEEP Report assumes that the avoided generation in New Jersey will be strictly gas-fired and that it will be developed out of state, thereby removing any need to net-out avoided benefits from the RE technology investments. However, Schedule 28, in fact, shows that according to the most recent EIA data, New Jersey has 1,186 MW of fossil generation under construction (all natural gas), 1,391 MW that is planned (all natural gas except 7 MW of wind and 14 MW of wood/biomass), and 2,421 MW of indefinitely postponed capacity (all natural gas). Clearly there has been, and continues to

be precedent for the development of generation resources close to loads in New Jersey. Thus, these avoided benefits need to be considered.

Schedule 29 presents the direct, indirect, and induced output impacts associated with the deferred fossil fuel portfolio. In 2021, the estimated annual total output impacts are around $1.1 billion. On a cumulative NPV basis, the total output impacts of the avoided portfolio are $3.1 billion - considerably lower than the RE portfolio, but large enough to dampen the "gross" benefits associated with the RE development that would be created by the proposed RPS.

The output impacts of the avoided generation portfolio (as well as other economic impact variables) are much lower than those associated with the RE portfolio. There are two reasons for these lower estimates. First, the total expenditures associated with the deferred fossil portfolio are much lower since the capacities associated with the RE portfolio are greater (i.e., there are more renewable MW than there are fossil MW). Second, generally the overall unit costs for most of the RE technologies are higher than those for traditional fossil technologies for a good part of the analysis period. Thus, the per kW investment impacts are much higher for one MW of renewable energy than they are for one MW of fossil energy.

A number of schedules have been provided that examine the employment and wage impacts that are created by the deferred portfolio. To summarize:

- Total annual employment impacts associated with the deferred portfolio in 2021 are estimated to be around 8,506. On a cumulative basis, there are some 59,734 jobs created by this limited portfolio. These results are provided in Schedule 30.

- Total annual wage impacts in 2021 are estimated to be around $269.6 million. On a cumulative NPV basis, these wage impacts over the period

amount to some $769.2 million. These results have been provided in Schedule 31.

3.4 Net Economic Impacts of Proposed RPS Investments

In order to estimate the total net impact of the proposed RPS, total avoided generation impacts from the fossil portfolio need to be subtracted from the positive economic impacts created by the RPS. Thus, the total positive economic benefit that has been created by the RPS can be considered relative to its opportunity cost (i.e., the avoided portfolio).

Schedule 32 through Schedule 34 present the different analyses estimating the net benefits created by the proposed RPS. In summary:

- The total net annual economic output impacts associated with the RPS in 2021 is $603.7 million. The total output impacts on a cumulative NPV basis are estimated to be $4.3 billion. These estimated impacts have been provided on Schedule 32.

- The annual total net employment impacts associated with the RPS in 2021 is 4,818 and is provided in Schedule 33. Total net employment impacts over the period are 77,425 jobs.

- The total annual net wage impacts associated with the RPS in 2021 is only $191.1 million and is provided in Schedule 34. The NPV cumulative total (net wage impact) is $1.2 billion.

3.5 Net Ongoing Economic Impacts of the Proposed RPS

In addition to investment impacts, there are a number of annual impacts associated with the RPS that are related to O&M expenditures. Likewise, there are similar expenditures that would be made for the avoided fossil technologies. The net RPS O&M expenditure impacts are calculated by subtracting the RPS-

created expenditure impacts from the estimated expenditure impacts that would have resulted from the avoided generation portfolio.

Schedule 35 through Schedule 37 present a series of tables that estimate the net O&M impacts of the proposed RPS. Total annual O&M expenditures estimated in the rate impact model discussed earlier in this report, for both the RE and the avoided technology portfolios, were used as the basis for the annual influences on the New Jersey economy.

The results of this analysis can be summarized as follows:

- The total net annual economic output impact associated with the O&M expenditures of the proposed RPS in 2021 is only $282.5 million and are provided in Schedule 35. The total cumulative NPV economic output benefits are $597.4 million.

- The total annual net employment impacts associated with the annual O&M expenditures supporting the proposed RPS in 2021 are 1,157 jobs (see Schedule 36). On a cumulative basis, the net O&M employment benefits with the proposed RPS portfolio are 5,019 jobs.

- The total net annual wage impacts associated with the RPS O&M expenditures in 2021 amount to $85.9 million. (see Schedule 37). Cumulative O&M wages created by the proposed change in the RPS are estimated to be $181.7 million.

Section 4: Other Potential Rate and Economic Impacts Created by the Proposed RPS

There are a number of indirect impacts that the RPS could have on rates, as well as generating their own unique economic impacts on New Jersey's economy. Increases in the share of solar energy, for instance, could increase the potential lost transmission and distribution ("T&D") revenues to the state's utilities as households and business move to a greater share of on-site supplied electricity. Further, the CEP rebate program could see considerable increases in expenditures if the current policies regarding the underwriting of renewable energy technologies are maintained. It is highly likely that all of these increases would have to be funded by ratepayers if the current program goals are maintained.

This section of the report examines the rate and economic impact implications of these potential rate changes. This includes the cumulative impacts of: (a) the base case RPS impacts; (b) the lost revenues recovery amounts; and (c) the increases in CEP rebate expenditures – all of which could be recovered in rates from New Jersey ratepayers.

4.1 Rate Impacts of Potential Lost Revenues

Lost revenue impacts were estimated by taking the total generation associated with residential, commercial, and industrial on-site PV installations, and multiplying by the delivery rates for each of the respective classes. Delivery rates for residential and commercial customers would be based upon both transmission and distribution charges, while only lost transmission charges would be considered for industrial applications. T&D charges were taken as the average from the four largest New Jersey investor-owned utilities ("IOUs").

The assumed PV generation shares for each class are included in the assumptions table provided in Schedule 2. The rates used to estimate lost

delivery revenues comes from an average of the current investor-owned utility tariffed delivery rates. Schedule 38 provides a graph showing the potential lost revenue amounts over the analysis period.

Schedule 39 shows the rate impacts, per customer class on an annual basis, if the proposed changes to the state's RPS are adopted, along with the potential lost revenues recovery that could be required from each customer class. Lost revenues are estimated, and assigned, to each class in which the losses incurred. So, lost residential revenues are recovered completely from the residential customer class, commercial lost revenues from the commercial class, and industrial lost revenues from the industrial class.

Schedule 40 shows that the combined impact (base case RPS and lost revenue recovery) could impact residential rates by an annual increase of 0.3 percent in 2005 to as much as an annual increase of 9.2 percent in 2021. For commercial customers, rates are estimated to increase by 0.4 percent per year in 2005, and by as much as 9.7 percent per year by 2021. Industrial customers are estimated to see a near term increase of 0.4 percent in 2005, and by as much as 10.7 percent per year in 2021.

Schedule 41 shows the changes in average bills for each customer class while Schedule 42 shows the annual changes in total electricity expenditures associated with the proposed RPS and lost revenue recovery requirements. NPV cumulative totals have been provided at the bottom of Schedule 42. In total, the base case NPV cumulative increase to New Jersey customers, from the proposed base case RPS and lost revenue recovery requirements created by these changes, is some $3.5 billion – or some $120 million higher than the base case RPS rate impact alone.

4.2 Rate Impacts of Potential Increases in CEP Funding

Increased CEP funding requirements were estimated through a number of calculations. First, installed capacity amounts were taken from the assumptions for the proposed RE portfolio. Then, these capacity amounts were multiplied by the estimated capital costs for each technology type. Capital costs were assumed to decrease every year by the historic average rate that was included in the baseline analysis, and outlined in the assumptions table of Schedule 2. The CEP funding shares as a percent of installed renewable costs (as outlined by technology in Schedule 2) were then taken from these annual investment amounts to estimate the total annual CEP rebate requirements. These have been graphed in Schedule 43. These amounts, in turn, are included in the estimated rate impacts to arrive at cumulative rate impact of: (a) the base case RPS impact; (b) lost revenue recovery requirements; and (c) increased CEP funding requirements.

Schedule 44 shows the rate impacts of the CEP funding. Schedule 45 combines this rate impact with that of the base case RPS impact and lost revenue recovery impact. When all of these factors are considered, rates could increase by as much as 0.8 percent per year in 2005 for residential customers and by as much as 6.6 percent per year in 2021 for these customers. For commercial customers, the combined rate impact could be as large as 0.9 percent per year by 2005, and as large as 6.7 percent per year by 2021. For industrial customers, rate impacts could be as large as 1.0 percent per year in 2005 and 7.4 percent per year by 2021. All of these rate impact estimates, however, assume that the cost reductions created by the CEP rebate program (which significant RE capacity costs) are passed along to ratepayers in the form of lower overall RE costs. If this assumption is not valid, the rate impacts could be higher.

Schedule 46 shows the changes in average bills for each customer class while Schedule 47 shows the annual changes in total energy expenditures associated with the proposed RPS and lost revenues. NPV cumulative totals have been

provided at the bottom of Schedule 47. In total, the base case NPV cumulative increase to New Jersey customers, from the proposed RPS, lost revenues, and increased CEP funding created by these changes, is some $3.7 billion.

4.3 Economic Impacts of Lost Revenue Increases

Increases in rates associated with lost revenues will have an equally negative impact on the New Jersey economy. There are no unique aspects to this decreased activity other than lost revenues will result in an additional increases in rates, which in turn, will result in decreased economic activity.

Schedule 48 provides a summary of the output impacts associated with increases in rates created by both the base case RPS and potential lost revenue recovery requirements. By 2021, the reduction in annual direct economic output is some $823.8 million. Indirect and induced annual output is reduced by a total of $1.0 billion. In total, economic output in New Jersey, is reduced by $1.9 billion per year in 2021 due to the combined rate impacts associated with the increase in RPS shares and the recovery of lost revenues in rates. The total output impacts sum to a total of $7.2 billion on an NPV basis for the period.

Schedule 49 presents a summary of the reduced employment associated with the increase in rates created by the RPS and the potential lost revenue recovery requirement. The reduction in direct annual employment in 2021 is some 10,233 jobs. Indirect and induced annual employment opportunities that are estimated to be reduced due to the proposed RPS is 9,228. Overall, in 2021, a total of some 19,461 jobs per year could be lost due to the increases in the proposed RPS. The total employment impacts sum to a total of 181,783 jobs lost over the period.

Schedule 50 highlights the estimated reductions in annual wages associated with the employment losses that are estimated to be created by the increased RPS and the potential lost revenue recovery requirements. A total of some $753.8

million in wages (direct, indirect, and induced) are estimated to be lost by the end of the study period. The total wage losses sum to a total of $2.9 billion on an NPV basis for the period.

4.4 Economic Impacts of CEP Funding Changes

The increases in rates created by the combined effect of the base case RPS, the recovery of lost revenues, and the increases in CEP funding requirements, will have a negative impact on the New Jersey economy. Schedule 51 through Schedule 53 shows the annual decreases in output, employment, and wages, respectively, that will be created by the combined rate increase associated with the proposed RPS, lost revenue recovery, and CEP-created increases in rates.

In total, the combined effect of all three rate-increasing elements of the proposed rule will reduce economic output by as much as $7.8 billion on a cumulative NPV basis. Cumulative lost employment is estimated to be comprised of some 179,353 jobs, and wages are anticipated to decrease by $3.2 billion on a cumulative NPV basis.

SECTION 5: Impact of RPS on Fossil Fuel Supply and Prices

One of the conclusions reached in the CEEEP Report was that increasing the current RPS to 20 percent by 2021 would have positive impacts on reducing fossil fuel consumption and prices. This seems very unlikely given the very small amount of fuel that would be deferred even under an aggressive 20 percent standard. Generally, New Jersey's **total** fossil fuel consumption for power generation, while large in the absolute, is a very small share of total U.S. demand. Further, not all of this demand will be deferred by the proposed RPS, only some smaller portion. If the deferred fossil fuel amounts associated with the proposed RPS are considered relative to the U.S. market, it is very unlikely that New Jersey's actions alone will have any meaningful impact on domestic fossil fuel prices or supplies.

5.1 New Jersey Natural Gas – Avoided Consumption

Schedule 54 puts New Jersey's total natural gas consumption associated with power generation into perspective with the total U.S. market. Today, New Jersey's **total** power generation-related natural gas consumption accounts for less than one percent of total U.S. natural gas demand. A simple extrapolation of New Jersey's usage over the forecast period shows that even if the RPS is not changed, New Jersey's natural gas consumption will continue to be a small share of forecasted U.S. consumption. Thus, even if **total** New Jersey power generation natural gas demand were removed, it would have a close to immeasurable impact on total U.S. natural gas demand.

The more appropriate analysis, however, is to examine the specific natural gas consumption deferred by the proposed RPS and how it compares to total U.S. natural gas consumption. Deferred natural gas consumption created by the RPS was estimated in the rate impact analysis. Using those estimates, and comparing them to total forecasted U.S. natural gas consumption, shows that the proposed New Jersey RPS will have exceptionally small impacts on natural gas

markets. In fact, the deferred gas generation associated with the proposed RPS amounts to considerably less than one percent of total U.S. natural gas consumption in 2004, let alone 2021 where DOE estimates total annual U.S. gas demand resting between 28 to 31 trillion cubic feet ("TCF").

The CEEEP Report cites a study that notes that "…each one percent reduction in national demand of natural gas leads to a long-term reduction in average natural gas wellhead prices of 0.75 percent to 2.5 percent and some studies predict even larger reductions."[7] Schedule 55 takes this relationship, and estimates the potential reductions in U.S. natural gas demand created by New Jersey's proposed RPS. The schedule shows that natural gas prices would be reduced by 0.0015 percent to 0.0049 percent in 2021. In fact, eliminating New Jersey's **total** power generation natural gas demand would reduce rates by only 0.0042 percent to 0.0140 percent in 2021.

5.2 New Jersey Coal -- Avoided Consumption

New Jersey's power generation-related share of total U.S. coal consumption is also small relative to the total U.S. market. Currently, New Jersey accounts for less than 0.5 percent of the total U.S. market. If power generation related trends continue, those shares will continue to be small over the forecast period as seen in Schedule 56. The most appropriate comparison, however, is to examine the amounts of coal consumption that would be deferred by the RPS, relative to total U.S. consumption, as an indicator of how significant the RPS could be in taking a large share of coal demand off the market. Schedule 56 shows that the RPS will comprise a relatively small share of the market. Thus, the proposed RPS is very unlikely to reduce U.S. coal demand, and thereby shift coal prices lower in any measurable way.

[7] CEEEP Report, 29.

Section 6: Conclusions

6.1 Total Net Economic Impacts of the Proposed RPS

The total economic impact associated with the RPS can be estimated by taking the total rate impact and adding the net RPS investment benefit and the net RPS O&M benefit on a year-to-year basis. Schedule 57 shows the estimated cumulative NPV benefit of the proposed RPS. Output, employment, and wage impacts have been provided. Overall, customers will see a net $879.5 million reduction in output in 2021 as a result of the proposed RPS under the base case scenario. Employment will be reduced by 12,355, and employee compensation (wages) will be reduced by $435.8 million at the end of the analysis period. Schedule 58 and Schedule 59 provide the net economic benefits under the other two scenarios.

Under all scenarios, the proposed RPS will cost New Jersey ratepayers considerably in terms of higher rates and decreased economic activity. What is most dramatic are the potential impacts associated with the proposed RPS if the speculation that exceptional RE cost reduction opportunities do not materialize. Ratepayers will bear the entire risk of this miscalculation. This report estimates that cumulative total net economic output will be reduced by $8.6 billion, employment by 278,740 jobs, and wages reduced by $4.0 billion. The results of this have been provided in Schedule 59. Clearly, this is an exceptionally risky policy proposal for New Jersey ratepayers and one that should be entered into with considerable analysis and caution.