Using Evaluation to Advance Funding For the RPS Program

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Conducting RPS Evaluation to Advance Funding Decisions

The New York Renewable Portfolio Standard (RPS) Program is a ratepayer-funded initiative to help meet a goal of 25% of the State's retail electricity by 2013 generated from renewable resources. A mid-course evaluation is helping policy-makers determine the appropriate level of public investment to make in the RPS Program going forward. The evaluation assessed the RPS Program's impacts on economic development using data provided by developers participating in the Program. Developers reported on expected in-State expenditures to construct and operate renewable energy generation facilities, including: job creation; purchases of goods, services and fuels; payments to municipalities; land leases, and other O&M expenses. A credibility analysis confirmed that this data could be used to forecast the in-State macroeconomic benefits of the RPS Program. The direct benefits and indirect effects induced through the economy were forecasted for three scenarios: RPS projects through 2008; a fully-achieved 25% by 2013 goal; and achievement of a proposed goal -- 30% by 2015. Since policy-makers are interested in weighing the public costs against the potential economic benefits, a cost-effectiveness test was developed which yielded a ratio of 6 to 1, using these measures: *Economic Benefits* -- State Gross State Product from developers' investments;*Energy Markets* -- Wholesale electricity price suppression of adding renewable energy; *Environmental Improvements* – Marketplace values of avoided emissions; and *Program Implementation Cost* -- Administration and RPS incentives. The evaluation will help the State realize the economic potential of a clean energy economy.

Introduction

Thirty-three states have adopted Renewable Portfolio Standards to intentionally increase the portion of renewable energy (RE) in their electric energy portfolios. Many of these initiatives are supported by public benefit funds and during a severe recession, public Programs funded by electricity surcharges may come into question as unfair consumer burdens. This is because electricity is essential to modern living and ratepayer surcharges are not progressively levied. At the same time during a severe recession, policy-makers focus on initiatives that stimulate economic growth, specifically on creating and maintaining well-paying jobs, and in New York, they are likely to look to the RPS to develop local renewable resources and create new job opportunities.[1] However, today's challenging market conditions have left many RE developers struggling to find the necessary capital to initiate or complete projects. Given these concerns, policy-makers will likely be interested in weighing the public benefit costs against the potential economic benefits of RPS initiatives. Evaluation can serve as a tool to determine the appropriate level of public investment for a state to make in a RPS.

New York State's RPS Program is slated to meet 25% of the State's retail electricity requirements from renewable sources by 2013. In the 2004 Order establishing the RPS, the New York State Public Service Commission (the Commission) required a mid-course review in 2009 of the RPS

[1] New York State Renewable Energy Task Force. February 2008. *Clean, Secure Energy and Economic Growth: A Commitment to Renewable Energy and Enhanced Energy Independence*. The First Report of the Renewable Energy Task Force. Albany, NY: New York State.

Program's accomplishments.[2] The Commission is considering decisions about the Program's future in light of two significant changes that have occurred since the State's RPS was established in 2004. One is the adoption in 2008 of a 15% by 2015 Energy Efficiency Portfolio Standard (EEPS), which will reduce the load forecast upon which the original RPS was based and in turn, will reduce the actual amount of new renewable generation in the RPS goal.[3] Second, the Governor is supporting a proposal to increase the RPS, partly in recognition that RE creates jobs and other macroeconomic benefits.[4]

Background

On September 24, 2004, the Commission issued an Order adopting a Renewable Portfolio Standard (2004 RPS Order) with a goal of increasing the percentage of RE used by New York electricity consumers from the then-current 19.3% (existing baseline resources) to at least 25% by the end of 2013. This means the State will have to acquire an additional 10 million MWh annually by 2013 of renewable energy. To accomplish that, the Commission created a centralized RPS Program to procure the vast majority of the incremental RE needed through the purchase of Attributes (which are similar to Renewable Energy Credits or RECs). The 2004 RPS Order designated the New York State Energy Research and Development Authority (NYSERDA) as the central procurement administrator because it assumed that this approach would best facilitate early ventures.[5] In addition to increasing the amount of renewable-generated electricity, the 2004 RPS Order clearly prioritized economic development as an important outcome of the Program. To fund the RPS Program, the Commission directed investor-owned utilities to collect funds from ratepayers, in the amount of $741.5 million through 2013, although the cost analysis done for the RPS in 2003 had specified that it would likely cost approximately twice that amount to fully achieve the RPS goal.[6] The Commission also required a mid-course review in 2009 of the RPS Program's accomplishments, at which time, a review of the Program's implementation and achievements could be done with more certainty about future costs to fully achieve the RPS. To support the Commission's deliberations, comprehensive evaluation reports were provided to support decisions about the RPS Program goal, including if it should be increased given the additional costs.

Evaluation reports were prepared by two independent contractors using data through June 2008 and were filed with the New York State Department of Public Service (DPS) in March 2009.[7] The contractor evaluation reports addressed the extent of the Program's influence on the development of RE generation in the State (attribution) and the macroeconomic effects of the Program on the State's economy for job creation and revenues.[8] This paper focuses on the macroeconomic benefits and the benefit/cost test that was done to provide a cost-effectiveness metric.[9] It reports on evaluation

[2] Case 03-E-0188. September 24, 2004. "Order Regarding a Retail Renewable Portfolio Standard." *Proceeding on the Motion of the Commission Regarding a Retail Renewable Portfolio Standard.* Albany, NY: New York State Public Service Commission. (2004 RPS Order)

[3] Case 07-M-0548. June 23, 2008. "Order Establishing Energy Efficiency Portfolio Standard and Approving Programs. Proceeding on the Motion of the Commission Regarding an Energy Efficiency Portfolio Standard. Albany, NY: New York State Public Service Commission.

[4] *The First Report of the Renewable Energy Task Force*.

[5] 2004 RPS Order, page 49.

[6] Case 03-E-0188. August 26, 2004. "Order Adopting and Approving Issuance of Final Generic Environmental Impact Statement, Appendix A, Cost Study Report II." *Proceeding on the Motion of the Commission Regarding a Retail Renewable Portfolio Standard*. Albany, NY: New York State Public Service Commission.

[7] KEMA, Inc. March 2009. *New York Main Tier RPS Impact & Process Evaluation.* Albany, NY: New York State Energy Research & Development Authority. Summit Blue Consulting, LLC and Nexus Market Research. February 2009. *New York Renewable Portfolio Standard Market Conditions Assessment*. Albany, NY: New York State Energy Research & Development Authority. These reports can be found at: http://www.nyserda.org/rps/resourcesReports.asp.

[8] Attribution analysis was conducted by Summit Blue Consulting, LLC for the Market Conditions Assessment.

[9] Economic Development Research Group, Inc. conducted the macroeconomic analysis using IMPLAN.

approaches used and significant findings. It references the results of another independent evaluation that forecasted the additional costs needed to fully achieve the RPS Program goals at different levels.[10]

RPS Main Tier Program

The RPS Program consists of two tiers, the Main Tier and the Customer-Sited Tier. The Main Tier accounts for 98% of the RPS Program and is designed to stimulate the development and construction of large-scale renewable generation facilities that sell their electrical output into the wholesale power market administered by the New York Independent System Operator (NYISO), referred to as the New York Control Area. In most other RPS states, a RE percentage target is implemented by requiring the local delivery utilities to supply customers with electricity from renewable resources. However, in New York, NYSERDA is not an utility; consequently, the RPS Program does not procure electricity. Rather, NYSERDA offers a production incentive under long-term contracts for the Attributes created upon the generation of electricity by eligible resources, and may contract for up to 95% of generation for a period not to exceed 10 years. Attributes include any and all reductions in harmful pollutants and emissions, such as carbon dioxide and oxides of sulfur and nitrogen. In exchange for receiving the production incentive, the renewable generator provides NYSERDA all rights and/or claims to the Attributes associated with each MWh of renewable electricity generated and delivered to the New York Control Area. One Attribute is created by the production and delivery into New York's power system of one MWh of electricity by an eligible RPS resource.

From 2005 through 2008 three rounds of competitive solicitations occurred, and as of June 2008, there were a total of 28 in-State facilities capable of producing nearly 3.5 million MWh of RE per year from approximately 1,338 MW of new renewable capacity, *i.e.,* nameplate capacity[11] that did not exist prior to the start of the RPS Program in 2004. In addition, two pre-existing biomass facilities were permitted to participate in the RPS Main Tier Program due to financial hardships and the desire to maintain them as operating facilities.

Project Selection Criteria. The Main Tier Program uses project selection criteria designed to encourage the development of new renewable resources in the State at the least cost. New resources are encouraged through a "vintage' date whereby eligibility is limited to projects generating energy from resources built since 2003. The solicitations employed a "Request for Proposals" that required developers to submit discrete information on their expected in-State economic expenditures to construct and operate RE facilities in New York, shown in Table 1 below. Selection was based on proposals that bid the lowest prices for Attributes and offered the greatest amount of future in-State economic benefits.

Table 1. Expected Economic Benefits of New Renewable Resources in New York

Short-Term Impacts (3 years)	**Long-Term Impacts (20 years)**
Short-term Jobs (construction, engineering, planning)	Long-term (O&M) Jobs and their Duration (job years)
Short-term Municipal Payments & Fees	PILOT or Taxes
Construction Purchases	Fuel Purchases & Land Leases
Payments to Land Abutters	Other O&M

These "direct benefits" to New York were used as the basis for the macroeconomic benefits analysis.

[10] La Capra Associates & Sustainable Energy Advantage, LLC. March 2008. *New York Renewable Portfolio Standard Cost Study Update – Main Tier Target and Resources*. Albany, NY: New York State Energy Research & Development Authority.
[11] The facilities' nameplate capacity was used because it is the construction and maintenance of the entire facility that creates the economic effects being measured and not just the portion producing energy associated with RPS Attributes.

Macroeconomic Benefits Analysis

KEMA and its subcontractor, Economic Development Research Group, analyzed the economic impacts or effects resulting from developers' expenditures on the construction and operations of RE facilities in New York supported by the RPS Main Tier Program. Expenditures covered the facility's construction phase, assumed to last for three years ("short-term"), and the operations phase, assumed to last over the life of the facility for 20 years ("long-term"). The economic effects of these expenditures were analyzed at two levels – 1) the direct benefits to the State's economy were calculated directly from in-State direct expenditures, and 2) the indirect or multiplier effects throughout other sectors of the economy were derived from a model of the total economic effects.[12]

The macroeconomic benefits analysis reported on past Program performance and prospectively on a fully-achieved RPS. Analysis of the prospective direct benefits used a forecast of resources that would likely be procured in a fully-achieved RPS Program and their estimated additional costs.[13] To support Commission decisions about the future goals of the RPS in New York, the analysis was done for existing RPS commitments and two possible RPS goals. Using updated load forecasts adjusted for the EEPS, the Main Tier target for a 25% by 2013 RPS goal was projected to decrease from the original target of 9.8 million MWh to approximately 4.6 million MWh. Counting procurements made through June 2008, this would leave an additional 1.1 million MWh to meet the 25% goal by 2013. The proposal to increase the RPS to 30% by 2015 would more than restore the original amount to be procured (10.1 million MWh) and in turn, restore the potential to realize the level of economic development benefits envisioned in the original Order. Based on the resource forecasts in the RPS Cost Study Update, the macroeconomic effects of the RPS Program were reported for three scenarios: RPS Program solicitations conducted 2005 –2008; a fully-achieved 25% RPS goal by 2013, and a proposed 30% goal RPS goal by 2015. [14] Table 2 below shows the load forecasts, Main Tier targets, and additional costs for the two scenarios.

Table 2: RPS Cost Study Update Load Forecasts and Cost Estimates for RPS Goal Scenarios

	RPS 2004 Order	25% RPS by 2013*	30% RPS by 2015*
Total Load Forecast	182,866,999 MWh	157,215,226 MWh	153,310,190 MWh
Main Tier Total Target	9.8 million MWh	4.6 million MWh	10.1 million MWh
Main Tier Additional Costs Forecasts**	N/A	$206,029,435	$1,418,381,533

*Load forecast adjusted by the Energy Efficiency Portfolio Standard implementation

**Additional costs assume 3.5 m MWh procured in First Three Solicitations

Credibility Assessment[15]

To begin, the evaluation conducted a credibility assessment of the developers' self-reported data, assessing the extent to which the self-reported data were credible sources for estimating the Program's

[12] www.implan.com

[13] 2008 RPS Cost Study Update.

[14] Load forecasts for a fully-achieved RPS were updated and adjusted to reflect implementation of the EEPS.

[15] KEMA, Inc. *Impact & Process Evaluation, Appendix B.*

economic benefits. Key data sources for this analysis included: original proposals from winning bidders in response to solicitations, internal Program tracking, earlier NYSERDA surveys of bidders responding to the first two solicitations, in-depth interviews with participating and nonparticipating developers conducted by the RPS evaluation contractors, follow up discussions with select developers, municipalities and land owners conducted by the RPS evaluator; and two relevant economic impact analyses previously issued on the RPS Program.[16] The bidders' surveys and in-depth interviews confirmed that winning and losing proposers understood the RFP instructions on how to report on the short- and long-term benefits. KEMA also reviewed relevant secondary research on RE technology including industry association and advocacy groups for comparison. The projects considered in the credibility assessment included: three biomass with a total capacity of 49 MW producing 7,162,900 MWh over the 20-year life of the facilities; fourteen hydropower with a total capacity of 27 MW and 20-year production of 1,997,840 MWh, and eleven wind with a total capacity of 937 MW and a 20-year production of 50,713,660 MWh.

First, all of the self-reported short-term and long-term economic benefits of RPS projects were grouped by resource type (biomass, hydropower, and wind). Second, the projects' total capacity and forecasted energy production were calculated by resource type and an average MW and annual MWh were determined. For each resource type, the average benefits were calculated on a MW and MWh basis. Third, the estimated short and long-term average economic benefits by MW and MWh were compared to specific projects' benefits by MW and MWh to determine the projects' deviation from the average. Finally, using that assessment, other project specific data and secondary references, the credibility of the self-reported data was determined on a project-by-project basis. The credibility assessment concluded that the self-reported economic benefits were a reasonable foundation for further impact analyses. For wind projects, which accounted for nearly 83% the energy contracted, there was an ample base upon which to use benchmarks. The reported benefits through secondary sources and follow-up interviews revealed that the average economic benefits from the RPS wind projects were reasonably consistent with values provided by other sources. For hydropower and biofuels, the lack of a broad base of projects made benchmarking comparisons difficult; however, hydropower accounted for only 3% and biofuels 14% of the RPS Attribute totals.

Total Economic Impacts

The in-State expenditures to build or upgrade, operate, and maintain a mix of RE generation facilities as reported by the project developers were used as the foundation for the economic benefits analysis. These in-State expenditures are the direct benefits for existing RPS projects. For future resources likely to be added to fully achieve the RPS goal, as were forecasted in the RPS Cost Study Update 2008, the direct benefits were estimated based on the existing RPS projects. An IMPLAN[17] model calibrated for New York with 2006 data forecasted the total economic impacts throughout New York's economy using the direct benefits data, and the direct benefits were subtracted from the total impacts to derive the indirect effects. Indirect effects are based on multipliers that capture the effects of household wage re-spending, business-to-business transactions, and government transfers.[18] The direct,

[16] *2008 RPS Cost Study Update*; and Hale, Kevin. 2005. *Major Economic Impacts of Utility-Scale Wind Projects in New York*. Albany, NY: New York Energy Research and Development Authority.
[17] KEMA, Inc. *Impact & Process Evaluation, Appendix A*.
[18] The multiplier effects reflect the stimulus to local businesses and the associated jobs created as a result of this public investment in RE technologies. The multiplier analyses tracked the input-output relationships whereby the facility construction and annual operations activities create requirements for goods and services in other industries, and earnings for facility workers become disposable income for use elsewhere in the community. When the sequence is completed, the total impact is identified as number of jobs, dollar value of labor income, and sales or value-added.

indirect, and total economic benefits were determined for the short-and long-term phases of the projects, and according to technology types.[19] Table 3 below shows how the direct benefits of Main Tier projects have indirect effects throughout New York's economy.

Table 3. General Assignments of "Direct Project Benefits" under the RPS Main Tier

***Direct* Benefit Concept**	**Stimulates NYS Economy through……**
Payroll (short-term or Long-term)	Household spending from take-home pay
Construction spending (non-labor)	Increase sales from select NYS industries
PILOT Payments (one-time or long-term)	State & Local government spending (50% Education; 50% other S/L spending)
Fuel Purchases (biofuels)*	Increase sales from NYS logging & forestry operations
O&M *Other* expenses	Increase demand from select NYS industries
No further impact considered	
Land lease payments	*wealth transfer*
One-time abutter payments	*compensatory transfer for value of abutter property, aesthetics & noise deterioration*

*Landfill gas was treated as a PILOT payment.
Source: KEMA and EDRG. Impact and Process Evaluation. A-4.

Direct Economic Benefits of Current RPS Commitments from First Three Solicitations

The evaluation estimated the economic benefits resulting from the three competitive Main Tier solicitations, based on the construction and operation of 30 in-State facilities capable of producing four million MWh per year from approximately 1,340 MW of nameplate capacity[20] that were under contract or had contracts pending with NYSERDA as of June 2008. The facilities included three traditional fossil fuel plants using biomass as a fuel source, one landfill methane generator, 13 hydroelectric station upgrades, and 13 wind farms. Table 4 below shows the monetary value of the total direct benefits associated with the nameplate capacity of the facilities by resource type and shows the comparison value in terms of a MWh of RE.

[19] Since the facilities come online in a staggered fashion based on contracting and construction dates, the IMPLAN model was performed over varying time intervals that incorporated the assumed 20 year average life of these facilities, beginning with the construction phase in 2006 through 2014, to an end-period which ranged from 2028 for the 25% by 2013 goal to 2034 for the 30% by 2015 goal.

[20] "New renewable capacity" generally refers to nameplate capacity at facilities under contract in the RPS that did not exist prior to the start of the RPS Program, including any portion not under contract with NYSERDA.

Table 4. Direct Benefits of Current RPS Projects ($ and $-per MWh, 2006 Basis)

Resource	New RE Production (MWh/yr)*	Total Direct $ (from Construction to end of facility life)	Total Direct $ per MWh
Biofuel	486,145	$377,097,675	$38.78
Hydro	75,986	$22,098,225	$11.06
Wind	3,480,516	$1,665,425,393	$23.92
Total	4,066,553	$2,064,621,293	$25.39

Source: KEMA, Impact and Process Evaluation.

The direct benefits were estimated at nearly $2.1 billion, with biofuels creating the most economic benefit per MWh and wind yielding the most monetary benefits overall. For every MWh of new RE production associated with the nameplate capacity of in-State facilities supported in the three solicitations, the total direct benefits were valued at an average of $25.39 per MWh. This value was compared with the average price per Attribute expected to be paid in the Main Tier Program. One Attribute is created from one MWh of RE produced and the average price (as of June 2008) was approximately $15. So, for every $15 of RPS payments, the direct benefits to the State's economy are estimated at $25.39, yielding a net economic gain to the State's economy of over $10 per MWh.

Total Economic Benefits

The total economic benefits attributable to the RPS Main Tier Program were modeled for all three RPS scenarios. The methodology extrapolated the total benefits for each year (by technology type) and multiplied the estimated RPS capacity additions by the estimated per-MWh economic benefits from current RPS-funded projects. Table 5 below shows the direct benefits, indirect benefits, and total economic benefits under three scenarios. In all scenarios, the addition of indirect benefits to direct benefits essentially doubles the estimate of benefits to New York's economy. Table 5 also shows the Direct Benefits per MWh among the 3 scenarios for comparison, with the 30% scenario yielding the most direct benefits per MWh of renewable energy production.

Table 5. New York State Total Economic Benefits (in m$)

Scenario	Direct Project Benefits (m$)	Total Direct Benefit Per MWh	Indirect Benefits (m$)	Total Benefits (m$)
First 3 Solicitations	$2,065	$25.39	$2,183	$4,248
25% by 2013	$2,627	$24.94	$2,796	$5,423
30% by 2015	$6,006	$27.32	$6,567	$12,574

*Updated EEPS load forecast

The total economic effects associated with the expected production from the nameplate capacity of the in-State facilities for a fully-achieved RPS at two different goal levels are shown in Table 6 below.[21] The associated additional costs and MWhs needed to achieve the goals are also shown.

Table 6. RPS Main Tier Total Economic Impacts and Costs to Achieve Potential Future Scenarios

Scenario	Direct Project Benefits ($m)[b]	Indirect Benefits (m$)[b]	Total Benefits (m$)[b]	Additional RPS Cost (m$)[b]	Total Goal MWh
25% by 2013 [a]	$2,627	$2,796	$5,423	$206	4.5 million
30% by 2015 [a]	$6,007	$6,567	$12,574	$1,418	10.1 million

Table Notes: [a] **Uses** EEPS Load Forecast. [b] (m$) is 2006 dollars.
Sources: Impact and Process Evaluation, p 5-9. RPS Cost Study Update 2008, Tables 3 and 5, Executive Summary.

The Table shows for an additional $1.2 billion investment, the State could realize $7 billion more in total economic impacts and twice as much RE.

Job Creation

For policy-makers, job creation is an important RPS outcome. The IMPLAN model estimated the total job creation associated with the three scenarios and in all scenarios, job creation was significant. Jobs were expressed in number of short-term and long-term direct jobs, in job years (a measure of job duration), and as payroll or labor income. Table 7 below shows both the short and long-term direct annual jobs, and the direct and indirect job years created. The analysis indicates that a 30% RPS by 2015 would create more than double the number of jobs and job years than a 25% by 2013 goal.

Table 7. Job Creation**:** Annual Jobs and Job Years in New York State from RPS Main Tier

	First Three solicitations	25% by 2013	30% by 2015
Short-term Jobs	677	857	1,764
Long-term Jobs	223	279	600
Total Direct Annual Jobs	**900**	**1136**	**2,364**
Total Direct Job Years	6,492	8,298	19,607
Total Indirect Job years	16,184	20,230	45,201
Total Job Years	**22,676**	**28,528**	**64,808**

The jobs created directly to build and operate the RE facilities will pay average annual salaries in the mid-$70,000 range compared to the average in-State employee compensation of $62,797.[22] Direct payroll benefits from current RPS Program commitments are anticipated to be more than $500 million over the life of the facilities. For a fully-achieved 25% RPS, direct payroll would increase by $100

[21] The economic impacts of technologies in the customer-sited tier are not included in the analysis; so the total impacts reported here do not represent impacts resulting from the entire RPS Program.
[22] As modeled by IMPLAN for 2006.

million, as compared to nearly tripling for a 30% RPS goal at $1.48 billion. Indirect jobs are not as well-paying, reflecting in part that household spending by RE facility workers spending their wages in New York tends to purchase goods and services from lower-wage sectors, such as retail. Table 10 shows the average yearly compensation per job for each scenario based on the direct and indirect jobs.

Table 9. RPS Main Tier Impacts on Average Annual Worker Compensation

Over Facility Life	**First Three solicitations**	***25% by 2013***	***30% by 2015***
Direct Job Years	6,492	8,298	19,607
Direct Payroll	$501,788,643	$635,533,210	$1,481,422,272
Avg. Compensation per Job	$77,293	$76,589	$75,556
Indirect Job Year Impact	16,184	20,230	45,201
Indirect Payroll Impact	$860,000,000	$1,070,000,000	$2,331,000,000
Avg. Compensation per Job	$53,139	$52,892	$51,570
Total Job Years	22,676	28,528	64,808
Total Payroll Impact	$1,361,708,643	$1,705,533,210	$3,812,422,272

For the 30% RPS, the additional Program cost of $1,418 million borne by ratepayers nearly equals the total direct payroll growth of $1,481 million.

RPS as an Economic Stimulus.

For all scenarios, about 30% of the total economic benefits are realized in the short-term. A 30% RPS the greatest positive economic impacts would come from in-State spending on fuel purchases for biofuels, thereby stimulating activity in other sectors traditionally important to New York's economy -- forestry and agriculture. Municipalities also benefit from the RPS stimulus, as long-term PILOTs or taxes trigger the largest portion of total long-term economic impacts, as shown in Table 10 below.

Table 10. Short and Long-Term Spending and Long-Term Spending Outputs

	Short-Term	Long-Term	Long-Term Spending Outputs ($) by Role (%)				
	Spending		Payroll	PILOTS	Fuel Purchases	Land Leases	Other O&M
3 Solicitations	$1,377	$2,871	20%	32%	23%	7%	18%
25% by 2013	$1,671	$3,752	20%	29%	25%	7%	19%
30% by 2015	$3,455	$9,119		25%	33%	5%	17%

Cost Effectiveness

The macroeconomic benefits, including job creation, claimed for the RPS Program were placed within a cost effectiveness context. Based on a literature search, KEMA determined that standard methodologies do not exist for estimating the benefits and costs of RPS Programs, so an original methodology was necessary.[23] Given it was charting new ground, KEMA chose a conservative approach for the benefit-cost analysis, limited to the direct benefits associated with the current RPS commitments since that scenario had more certainty. The analysis focused on the direct macroeconomic benefits, energy market competitiveness (expressed in price suppression terms), and environmental improvement effects associated with the current RPS commitments, and compared those benefits to the RPS Main Tier Program costs. Program costs included contractual expenditure commitments to purchase Attributes and Main Tier Program administration costs. The specific measures[24] used were:

Gross State Product (GSP*)*. GSP was selected as the measure of economic output from the first three solicitations for the 2005 to 2028 period, and included wage and spending effects as well as the direct investment of the project developers.[25] GSP equates to "the value added of industry production"[26] which is the difference between an industry's gross output (sales) and the cost of its intermediate inputs. (goods and services purchased) from other industries or imported*).*[27] The GSP was considered the relevant dollar concept for the direct economic benefit input in the numerator because it represents the net change in the State's income, the portion of the revenues from the industry output that the State gets to keep given the public expenditure that triggered that increase in the first place. The added value in present value terms to New York's economy was expressed in GSP, from 2005 through 2028, as over $803 million ($2006).

Electricity Price Suppression from Adding New Renewable Electricity Supply. Electricity price suppression represents a potential added incremental benefit to the RPS investment and was included in the numerator of the benefit/cost ratio. An analysis done by Summit Blue for the RPS evaluation[28] found that as a result of increasing supply of a resource with variable fuel costs at or near zero, the increased electricity generation from renewable sources could suppress the wholesale price of electricity. The analysis expected that suppression rates would be higher in the near-term, because the initial RPS investments will displace the highest cost resources on the supply curve first. The study found that the reduction in wholesale electricity prices in the year 2010 is likely to be approximately $2/MWh. This resulted in a total price suppression estimate of about $323 million in electricity savings in 2010.[29] It was further estimated that for each MWh of RE added, the savings effect of the RPS ratepayer surcharge would lower electricity costs by approximately $100 per MWh of added RE, which is significantly more than the $15 or more paid per MWh for the added RE. Price suppression was calculated for 2010 because it was assumed to be the first year in which resources from all three RPS Main Tier solicitations would be operational and the expected energy output was known. KEMA then made assumptions about the price suppression effects during the ramp-up period as projects started to

[23] Chen, Cliff, at al., March 2007. *Weighing the Costs and Benefits of State Renewable Portfolio Standards: A Comparative Analysis of State-level Policy Impact Projects*." (LBNL-61580)
[24] KEMA, *Impact and Process Evaluation*. 5-15.
[25] The period includes a project development period for each solicitation and an assumed operating life of 20 years, staggered according to the solicitation schedule.
[26] IMPLAN Glossary (www.implan.com), accessed January 23, 2009.
[27] Ibid.
[28] Stern, Frank and Nicole Wobus, Summit Blue Consulting. *Analysis of the Renewable Portfolio Standard's Price Effect on Natural Gas and Electricity*." Draft Final Report Nov. 5, 2008. Albany, NY: NYSERDA.
[29] This assumed a total load of 168,435,000 MWh in 2010, excluding new RE resources.

come on-line and ten years out when load growth might need more supply from conventional sources to meet demand. In present value terms, price suppression was estimated at $2 billion ($2006) over a 17 year period (inclusive from 2006 through 2022).

Avoided Air Pollution Emissions from Conventional Generation. The RPS Program makes claims about the avoided emissions of key air pollutants (NOx, SO_2, and CO_2) associated with conventional electricity generation. Since these pollutants are traded on markets throughout the world as part of regulatory cap and trade mechanisms, KEMA used the market values of pollutants as a proxy of the per ton benefit to New York for the avoided emissions. Accordingly, KEMA's analysis of the economic benefits of avoided air pollution included the following:

Future values ($ per ton for December 2009) on the New York Mercantile Exchange as of February 4, 2009 ($3.95 per ton of CO_2, $3,250 per ton of NO_x, and $122 per ton of SO_2);[30]

Most recent annual New York State emission factors (pounds per MWh in 2005) from EGRID for each of the three pollutants -- 828.33 lbs per MWh for CO_2, 0.8867 lbs per MWh for NOx, and 2.4531 lbs/MWh for SO_2);[31] and

RE generation from 2006 to 2028 based on project commitments stated in the 2008 RPS Annual Performance Report for the first three solicitations.

KEMA concluded that the total benefit to New York State is nearly $129,000 in present value terms for the 2006 -- 2028 time period. This underestimates the value of these avoided emissions because the value of avoided natural resource damages (e.g., acid deposition) or avoided health care costs (e.g., asthma attacks) were not calculated.

Program Implementation Cost. The analysis narrowly defined costs in terms of Main Tier Program administration (excluded evaluation costs, for example) and the contractual commitments for Attributes. The total cost from 2005 through 2019 was approximately $442 million in present value terms.[32]

Benefit-Cost Ratio. To estimate a benefit-cost ratio, an industry standard approach was used to estimate the net present value of those costs and benefits for the time horizon of the renewable technologies.[33] The total present value of the benefits across 2005-2028 estimated at $2.8 billion was compared with Program implementation costs of $442 million. This represents slightly more than a 6-to-1 benefit-cost ratio over the estimated life of the facilities in the Program.

Key Findings for Policy-Makers

Key findings can be drawn from the macroeconomic analyses and cost-effectiveness test that can assist the Commission in its assessment of the benefits of the RPS Program at different goal levels.

Technology affects the economic benefits of the RPS. Wind yields the most economic benefits because it dominates proportionately in the RPS Program to date. However, in terms of benefits per unit of energy produced, biofuels lead largely because of the purchase of in-State fuels from agriculture or forestry sectors and long-term facility operations jobs. Hydropower upgrades yield the least economic benefits and the practical potential has been largely tapped. Consequently, as the on-shore wind resource potential is realized in the near-term, biomass will become the largest source of future economic benefits in the RPS Program, a good reason to continue the RPS Program into the future.

[30] http://nymex.greenfutures.com/markets/ Accessed February 4, 2009.
[31] http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007V1_1_year05_SummaryTables.pdf February 9, 2009.
[32] Assume a 5% discount rate from 2005.
[33] See the California Public Utilities Commission, "California Standard Practice Manual, Economic Analysis of Demand-Side Programs and Projects," 2001.

The State is leveraging more economic value from the RPS than it costs. For every $15 paid for Attributes per MWh of new RE production supported in the Main Tier Program so far, the total direct economic benefits are valued at $25.39 per MWh of production associated with nameplate capacity, a positive economic benefit gain to the State's economy of over $10 per MWh. Moreover, electricity price suppression from current RPS commitments will be significant and the savings effect of the electricity price suppression is forecasted to be $100 for every MWh of RE added in year 2010, an amount exceeding the average $15 per MWh paid for the Attributes.

Direct job creation is significant. Current RPS facilities will create 900 total jobs (short and long-term), increasing to 1136 for a fully-achieved RPS at 25% by 2013, and 2,364 for a 30% RPS by 2015. Most of the direct jobs are well-paying, average compensation would exceed the Statewide average.

While it would cost an additional $206 million to achieve the 25% RPS by 2013 goal and an additional $1.4 billion to achieve the 30% RPS by 2015 goal, a cost difference of $1.2 billion,[34] the State would realize an additional $7 billion in total economic benefits. And, the amount of renewable energy procured would double, thereby advancing the State's energy independence and environmental goals.

The $1.4 billion cost, additional to the current RPS contracts, to achieve a 30% RPS is less than the predicted growth in direct payroll ($2.3 billion) and indirect payroll ($2.3 billion). A 30% by 2015 RPS goal could more than double the total (direct and indirect) job years and total payroll impact of a 25% by 2013 goal in the EEPS load forecast. The total job years would go from 28,500 to 64,800 and total payroll would jump from $1.7 billion to $3.8 billion.

New RE projects provide nearly 30% of their economic benefits upfront in the first three years, and their long-term economic impacts will benefit municipalities, as well as agriculture and forestry.

Conclusions

It is more informative to consider cost estimates and economic benefits comprehensively. By doing so, the costs and benefits of future RPS commitments can be weighed for different goal scenarios. Although the benefit/cost analyses did not take into account "total resource cost", *i.e.,* the impact on ratepayers who would have made household expenditures elsewhere in the economy with the RPS surcharge money, using electricity price suppression and payroll impacts can help determine if the RPS cost is warranted. Further analysis could determine the extent to which the public expenditures of RPS funds have produced more economic benefits to the State than if the same total amount of money was spent by millions of ratepayer households individually.

References

KEMA, Inc. and Economic Development Research Group, Inc. "NYSERDA Main Tier RPS Impact & Process Evaluation." *New York State Energy Research and Development Authority*, March 2009

[34] RPS Cost Study Update. Executive Summary. 7.