MID-ATLANTIC SOLAR ENERGY INDUSTRIES ASSOCIATION
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MSEIA COMPARATIVE STUDY OF RATE IMPACTS BY PROGRAM

PRELIMINARY RELEASE
for
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Background

Development of the New Jersey Solar Energy Market

The New Jersey solar energy market is the second-largest in the U.S., and grew to this position in a relatively short period of time – about nine years from the inception of statewide incentives to today.

The first years of this state program to encourage the development of a solar energy market in New Jersey was fueled by an incentive program centered on rebates. The rebates were supported by funds raised through a Societal Benefits Charge (SBC).

In 2003 and 2004, regulations were adopted under the Renewable Portfolio Standard (RPS) of the EDECA law that established requirements for the supply of solar power as a percentage of each energy supplier's electric power sales. This began a transition from a rebate-based incentive program for solar energy to a program based on a tradable commodity called a Solar Renewable Energy Certificate, or SREC.

It soon became apparent that energy suppliers were not willing to, or capable of, offering long-term contracts to solar generators for their SRECs. A study by Summit Blue Associates, commissioned by the Board of Public Utilities, concluded that such long-term contracts, or other long-term instruments, would result in lower rate impacts. Based on this, the Board of Public Utilities approved programs by the Electric Distribution Companies (EDC's) to offer long-term commitments for SRECs.

PSE&G began a program to offer loans to solar generators that would be paid off through their SRECs, with an administratively-set floor price for the full 15-year generation period of the SRECs (the "PSE&G Loan program"). JCP&L, Atlantic City Electric, and Rockland Electric began a program of competitive solicitations for 10-year contracts to buy solar generators' SRECs (the "JCP&L/ACE 10-year Contract program"). Both of these program tracks have ended as of the end of 2011.

In this study the PSE&G Loan program and the JCP&L/ACE 10-year Contract program are referred to collectively as the "EDC Programs", as distinguished from the unstructured market for SRECs.

In 2009 a new schedule of SREC requirements was established by the Solar Advancement and Fair Competition Act (A3520).

At the time of this writing, the SBC-supported rebate program has essentially ended. The Transition Working Group is a stakeholder group consisting of state governmental agencies, solar industry representatives, utility companies, energy suppliers, and other stakeholders. Its purpose is to discuss and compare alternative SREC-based program designs to fulfill the requirements of A3520, or any new requirements that might arise.

Genesis of This Study

This study originated as a cooperative effort among the Board and members of MSEIA to reach a consensus regarding recommendations of minimum SREC prices for "PSE&G Loan III", the anticipated renewal of the PSE&G Loan program.

MSEIA is a solar industry trade organization of solar energy businesses covering New Jersey, Pennsylvania, and Delaware. It has three primary goals as advocates for the solar program in New Jersey:

1. Accelerate the solar market to meet the legislated and regulated targets
2. Deliver solar power at the lowest possible cost to ratepayers.
3. Preserve and enhance diversity in the solar market.(Ensure that market growth includes opportunity for all market segments to grow and for all customer classes to participate)

Comparing experience with the unstructured SREC market, the PSE&G Loan program, and the JCP&L/ACE 10-Year Contract program, MSEIA members believed that the PSE&G Loan program was the most successful at accomplishing each of its three goals. MSEIA was thus motivated to ensure the continuity of the program, and believed that the best way to ensure that continuity was to recommend the lowest possible SREC prices that could be set for the program. It was felt that the lower the SREC prices could be set, the more attractive the program would be to the governmental agencies and policy-makers who would be deciding which program to emphasize in 2012 and ensuing years. On the other hand, if SREC prices were set too low, then solar projects would not be financially viable.

The challenge, then, was to find the lowest possible SREC prices for the PSE&G Loan program that could still support project financing. This would require very careful financial modeling of typical solar projects that would be potential participants in the program. Members of the MSEIA Board, as well as participants in the MSEIA Policy Committee, contributed estimates of typical project construction costs, performance estimates, typical customers' electric power costs, etc. Several members also conducted financial modeling using their own internal methods. The primary responsibility for financial modeling was borne by the author of this study.

MSEIA concluded its efforts to assess the minimum SREC prices for the PSE&G Loan program and reached consensus on recommended prices. It then appeared that a larger effort could be undertaken to assess the minimum SREC price requirements for the JCP&L/ACE 10-Year Contract program and for the unstructured SREC market, using the same methods and similar assumptions. This would allow comparison of the likely costs of the three program designs. Further, it would allow the assessment of rate impacts, and sensitivity analyses, in order to predict future rate impacts and compare risks.

Methodology

The primary economic modeling tool used in this study is based on a proprietary model developed by Advanced Solar Products, Inc. of Flemington, NJ (ASP). Like other models of its sort, it was developed to be an investment decision-making tool for specific solar energy projects. At various times its uses have included aiding decisions regarding whether or not to invest, or at what price to invest, in solar projects on the part of Advanced Solar Products, on the part of its customers, and on the part of financial partners such as banks or PPA companies.

The model measures the net economic benefits that will be generated by a solar power project for its owners. The inputs are costs, performance estimates, financing terms, and key rates and characteristics of the owner and the project. The outputs are several measures of economic success (or lack thereof). The primary measures of success are Project Internal Rate of Return, after tax; and net cash flow by year. It was assumed that all of the modeled projects were completed in 2012.

The study involved first iteratively running the model at different SREC prices under the PSE&G Loan program, until a target IRR was reached. This was done for each of four size categories in the PSE&G program:

Residential
Small Non-Residential (0-150 KWdc)
Large Non-Residential (150-500 KWdc)
Very Large Non-Residential (500-2,000 KWdc)
(for simplicity, the term “Commercial” is used hereinafter in place of “Non-Residential”)

The target IRR was 11.5%.

After the target IRR was reached, net cash flow was examined for each year, and assessed for problems or any obvious unattractive features. One common feature in the net cash flow of New Jersey solar projects is that strongly positive net cash flow occurs during the first few years of the project due to the Federal Investment Tax Credit and the accelerated federal depreciation schedule (Modified Accelerated Cost Recovery System, or MACRS). After that, however, with no depreciation to offset the taxes due on SRECs and electric revenue (or avoided cost), negative net cash flow often ensues for several years until the project loans are paid off.

After SREC prices were established that could produce the target IRR and an investment-worthy project, the resulting model was used as a benchmark for modeling the JCP&L/ACE long-term contract program and the unstructured SREC market program.

The model was run iteratively for the same four system sizes for JCP&L/ACE 10-Year Contract and unstructured SREC market cases, until an SREC price was reached for each case that would produce the same 11.5% IRR as the PSE&G cases.

After identifying the SREC price that would produce the target IRR, the model was run again for each case until an SREC price was reached that would produce the same cumulative net cash flow in the year the loans were paid off. Thus two different results were generated for each case. The two different results were reached using two different measures of investment worthiness, but always using the results for the PSE&G cases as the benchmark.

The same procedure was followed for the unstructured SREC Market cases.

Besides the PSE&G Loan, JCP&L/ACE 10-year contracts, and unstructured SREC market, a fourth, theoretical alternative was also added. Generally the term LCOE, or Levelized Cost Of Energy, is used to describe the "real" cost of electricity from a power plant. It involves calculating revenue at a levelized price, over a period roughly corresponding to the financial life of the plant, to produce a target rate of return. This study was dealing with SRECs (attributes), however, not bundled energy plus attributes, so the term LCOE is not really accurate. Nonetheless, the term LCOE was used loosely to describe the levelized price of SRECs that would be necessary over 20 years to produce the same target IRR as the other programs. This essentially set a likely lower limit to the price of SRECs, one that the other programs could be compared to and should aspire to equal.

The following are the primary inputs to the models, and the sources that were used to create values for them:

<u>Size, Cost and Performance</u>

1. System Size (KW_{dc})
   Representative sizes based on PSE&G Loan II program size categories.
2. Construction cost ($)
   MSEIA Policy Committee consensus
3. Construction interest, closing cost for financing, and similar "soft costs" ($)
   ASP estimate
4. Annual solar power generation (KWH/year/KW_{dc})
   PV:WATTS, Philadelphia station, AC-DC derate = 0.835
5. Annual degradation in power generated (%/year)
   ASP estimate

<u>Financing</u>

1. PSE&G Loan rates (interest, term, and method of calculation) (%, years)
   Based on PSE&G Loan II policies
2. Cash equity input, (% of project cost after PSE&G Loan is subtracted)
   Variable
3. Commercial or homeowner loan Interest rate (%)
   ASP estimate

4. Commercial or homeowner loan term (years)
    Variable

Key Rates

1. Avoided Electric power cost ($/KWH)
    MSEIA Policy Committee consensus
2. Inflation rate of electric power cost (%)
    ASP estimate
3. Inflation rate, general (%)
    ASP estimate
4. Maintenance reserve, percent of construction cost (%/year)
    ASP Estimate
5. Combined tax rate (%)
    ASP estimate

SRECs

1. Initial/contracted SREC price ($/SREC)
    Final product of the model, obtained by iteratively changing the value until the target result is achieved
2. Years of SRECs under contract for SREC Market cases (years)
    Estimate of ASP and NJSREC.com
3. SREC prices after SREC contracts end (for JCP&L/ACE and SREC Market cases) ($/SREC)
    Estimate of ASP and NJSREC.com

Tax Benefits

1. FITC (% of project cost)
    Current law
2. Bonus Depreciation (% of project cost)
    Current law (2012 only)
3. MACRS schedule (% of project cost)
    Current law

The following are the primary outputs of the model:

1. Project rate of return, after tax (IRR) (%)
Compares after tax net income before debt service to the total cost of the project.

This measure of investment worthiness was the primary target result, and the initial SREC price was varied to produce the desired target IRR.

2. Year-by-year cash flow ($)
Net cash flow after tax for each year, after debt service, and after cash equity (downpayment) has been repaid.

Most solar power projects in New Jersey, under the current tax environment, will experience strongly positive net cash flow during the first few years of operation (due to the tax credit and MACRS). The project then will experience several years of negative net cash flow, until the loan(s) are paid off.

The cumulative net cash flow after the years of negative net cash flow – that is to say, cumulative net cash flow for the year the project's loans are paid off – was used as a secondary measure of investment worthiness. The value of this measure from the PSE&G Loan program runs was used as the benchmark, and then the initial SREC price for the other two programs was varied to produce the same value.

Optional output measures that were not used in this study include Modified IRR (MIRR); Net Present Value of the net cash flow at a selected discount rate; and yearly cash flow with net cash flow from each year re-invested at a selected interest rate.

The results in terms of initial SREC prices were tabulated and compared for the three programs and LCOE.

In order to analyze these results, assumptions were first made regarding the relative percentage of statewide construction occupied by the four size categories. This allowed the calculation of a weighted average SREC price for each of the three existing alternatives.

The results of runs targeting IRR and the results of runs targeting cash flow were slightly different. They are also equally valid, depending on the preferences of the investor examining the project. Therefore, a table was made averaging the results from the IRR runs and results from the Cash Flow runs. These averages from the two methods were used in the next part of the analysis, which involved projections of how the costs of the three programs and LCOE might change relative to each other in future years.

Assumptions

The following assumptions were common to the models that were run for all three programs:

Size, Cost and Performance

1. System Size (KWdc)

Category	Size, KW_{dc}
Residential	9
Small Non-Residential (0-150 KW_{dc})	150
Large Non-Residential (150-500 KW_{dc})	400
Very Large Non-Residential (500-2,000 KW_{dc})	1,175

2. Construction cost ($)

Category	Cost, $/watt$_{dc}$
Residential	$4.20
Small Non-Residential (0-150 KW_{dc})	$3.70
Large Non-Residential (150-500 KW_{dc})	$3.50
Very Large Non-Residential (500-2,000 KW_{dc})	$3.40

3. Construction interest, closing cost for financing, and similar “soft costs” ($)

Category	Cost, $
Residential	$ 4,134
Small Non-Residential (0-150 KW_{dc})	$ 19,650
Large Non-Residential (150-500 KW_{dc})	$ 40,000
Very Large Non-Residential (500-2,000 KW_{dc})	$122,850

4. Annual solar power generation (KWH/year/KW_{dc})
1,241 KWH/year/$KW_{dc,}$ all cases

5. Annual degradation in power generated (%/year)
0.4% per year

Financing

1. PSE&G Loan rate (interest, term, and method of calculation) (%, years)
11.3% interest, 15-year term

3. Commercial or homeowner loan Interest rate (%)

Category	Interest, %
Residential	4.5%
Small Non-Residential (0-150 KW_{dc})	6.0%
Large Non-Residential (150-500 KW_{dc})	6.0%
Very Large Non-Residential (500-2,000 KW_{dc})	6.0%

4. Commercial or homeowner loan term (years)

Category	Term, years
Residential	10 years
Small Non-Residential (0-150 KW_{dc})	15 years
Large Non-Residential (150-500 KW_{dc})	15 years
Very Large Non-Residential (500-2,000 KW_{dc})	15 years

Key Rates

1. Avoided Electric power cost ($/KWH)

Category	Cost, $/KWH
Residential	$0.167
Small Non-Residential (0-150 KW_{dc})	$0.134
Large Non-Residential (150-500 KW_{dc})	$0.132
Very Large Non-Residential (500-2,000 KW_{dc})	$0.120

2. Inflation rate of electric power cost (%)
1.5%

3. Inflation rate, general (%)
1.5%

4. Maintenance reserve, percent of construction cost (%/year)
0.3%

5. Combined tax rate (%)
40%

Tax Benefits

1. FITC (% of project cost)
30%

2. Bonus Depreciation (% of project cost)
50%

3. MACRS schedule (% of project cost)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
20%	32%	19.20%	11.52%	11.52%	5.76%

The following inputs were different for the different programs, due to inherent differences in how they work:

Financing

2. Cash equity input, (% of project cost after PSE&G Loan is subtracted):

PSE&G Loan program	all sizes: 50%
JCP&L/ACE programs	all sizes: 30%
SREC Market program	all sizes: 30%

SRECs

2. Years of SRECs under contract for SREC Market cases (years):
3-year SREC contracts

3. SREC prices after SREC contracts end (for JCP&L/ACE and SREC Market cases) ($/SREC):

JCP&L/ACE programs	$75/SREC in year 11 then declining by 4% per year
SREC Market program	$120/SREC in year 4 $90/SREC in year 5 $75/SREC in year 6 then declining by 4% per year

Results

Results for 2012 projects

The results of the modeling of the four size categories, for the four program alternatives, to find the initial/contracted SREC prices to produce a target IRR is shown in Table 1:

Table 1

SUMMARY OF MODELED 2012 SREC PRICES BY PROGRAM SOLVED FOR TARGET IRR[4]

Segment	Assumed Capacity (% of Total)	PSEG Loan[1]	JCP&L/ACE 10-yr Contract[1,2]	SREC Market (3-yr Contract)[3]	LCOE
Residential	18%	**194**	**235**	**360**	**155**
Small Commercial	15%	**185**	**248**	**387**	**168**
Large Commercial	27%	**166**	**226**	**332**	**151**
Very Large Commercial	40%	**169**	**229**	**342**	**154**
Weighted Average	100.0%	**175**	**232**	**349**	**155**

Notes:
1. Does not include administrative costs
2. Includes $35 cost recovery incentive
3. Does not include transaction costs
4. Prices adjusted to produce the same target Internal Rate of Return

Table 2 presents the results of the modeling of the four size categories, for the four program alternatives, to find the initial/contracted SREC prices to produce a target cumulative net cash flow in the year the project loans are paid off.

Table 2

SUMMARY OF MODELED 2012 SREC PRICES BY PROGRAM SOLVED FOR TARGET CASH FLOW[4]					
Segment	**Assumed Capacity (% of Total)**	**PSEG Loan[1]**	**JCP&L/ACE 10-yr Contract[1,2]**	**SREC Market (3-yr Contract)[3]**	**LCOE**
Residential	18%	**194**	**216**	**410**	**181**
Small Commercial	15%	**185**	**210**	**378**	**133**
Large Commercial	27%	**166**	**192**	**318**	**121**
Very Large Commercial	40%	**169**	**194**	**323**	**122**
Weighted Average		**175**	**200**	**346**	**134**

Notes:
1. Does not include administrative costs
2. Includes $35 cost recovery incentive
3. Does not include transaction costs
4. Prices adjusted to produce the same cumulative net cash flow in the year loan is paid off.

The average of the modeled results solved for IRR and the results solved for cash flow are shown in Table 3:

Table 3

SUMMARY OF MODELED 2012 SREC PRICES BY PROGRAM AVERAGE OF IRR AND CASH FLOW METHODS[4]					
Segment	**Assumed Capacity (% of Total)**	**PSEG Loan[1]**	**JCP&L/ACE 10-yr Contract[1,2]**	**SREC Market (3-yr Contract)[3]**	**LCOE**
Residential	18%	**194**	**226**	**385**	**168**
Small Commercial	15%	**185**	**229**	**383**	**151**
Large Commercial	27%	**166**	**209**	**325**	**136**
Very Large Commercial	40%	**169**	**212**	**333**	**138**
Weighted Average		**175**	**216**	**347**	**145**

Notes:
1. Does not include administrative costs
2. Includes $35 cost recovery incentive
3. Does not include transaction costs
4. Prices averaged between those determined by IRR and those determined by cash flow

As noted, the SREC prices for the PSE&G do not include administrative costs. They do include PSE&G's rate of return, since that is built in to the loan structure.

Similarly, the SREC prices for the JCP&L/ACE 10-year contract program do not include administrative costs. They do include the cost recovery incentive, since that is paid separately to the utilities.

For the SREC market program, transaction costs were not included.

The weighted average figures in Table 3 (in blue type) are the primary results of the study for projects completed in the year 2012. They represent the predicted SREC prices, across the three program alternatives, that are necessary to produce equivalent economic attractiveness.

The results show that the PSE&G Loan program can be expected to produce results with lower SREC prices than the JCP&L/ACE 10-year contract programs (23% higher than the PSE&G required price) or the SREC Market program (98% higher than the PSE&G required price). The PSE&G price was 21% higher than the LCOE.

Change in Results for Future Years

In order to assess whether the three programs' SREC price advantages and disadvantages presented above would remain true in future years, it was necessary to assess the effects of anticipated declines in the cost of solar power relative to fossil fuels. In other words, the required price for SRECs can be expected to decline over time, and this could have more of an effect on one program or another. For instance, it can be expected that the decline in required SREC prices would not result in the average SREC cost declining as fast for the PSE&G Loan program as for the SREC Market. This is because older systems built under the PSE&G Loan program will continue to get the SREC price that was set in the year they were built for 15 years, thus holding up the decline in weighted average SREC price in any given year, relative to the SREC Market program in which the SREC price for older projects will start to decline after only 3 years.

In order to calculate the results of this effect and predict rate impacts for the three programs into the future, a matrix had to be constructed showing SREC prices for each year, for projects of each vintage year, with a given rate of decline. These figures could then be combined into a weighted average SREC price for each year.

The weighted average SREC price for a given year was calculated by summing the SREC price paid in that year for projects of each vintage year multiplied by the total amount of solar power built in the year of vintage, divided by the total solar power built in all the years through that given year. A sample formula for this calculation is shown below for the third year (2014):

Weighted Average SREC Price, yr.3 =
[(SREC Price in yr.3 for projects built in yr.1 x MW built, yr.1)
plus (SREC Price in yr.3 for projects built in yr.2 x MW built, yr.2)
plus (SREC Price in yr.3 for projects built in yr.3 x MW built, yr.3)]
Divided by (Total MW built, yrs.1-3)

The weighted averages for each year allow a comparison of the rate impacts of each program for each year, on a per SREC basis. In order to calculate the impact for each program one at a time, it was assumed that all of the solar projects were built under that program.

The matrix of SREC prices and weighted averages by year for each program and for the LCOE, for a 6% per year decline in SREC costs, are shown in Tables 4, 5, 6, and 7 on the following pages.

Table 4

WEIGHTED AVERAGE PRICES BY YEAR - PSEG LOAN
DECLINE IN SOLAR COSTS PER YEAR = 6%

Energy Year	Proposed A4226 Requirement	Increment GWH	MW New Constr.	PSEG Price 2012	PSEG Price 2013	PSEG Price 2014	PSEG Price 2015	PSEG Price 2016	PSEG Price 2017	PSEG Price 2018	PSEG Price 2019	PSEG Price 2020	PSEG Price 2021	PSEG Price 2022	PSEG Price 2023	PSEG Price 2024	PSEG Price 2025	PSEG Price 2026	Weighted Avg. Price by year
2011	306																		
2012	442	136	118	175															175
2013	896	454	395	175	165														167
2014	1,072	176	153	175	165	155													164
2015	1,315	243	211	175	165	155	145												160
2016	1,550	235	204	175	165	155	145	137											155
2017	1,757	207	180	175	165	155	145	137	128										151
2018	1,916	159	138	175	165	155	145	137	128	121									148
2019	2,158	242	210	175	165	155	145	137	128	121	114								144
2020	2,344	186	162	175	165	155	145	137	128	121	114	107							141
2021	2,518	174	151	175	165	155	145	137	128	121	114	107	100						137
2022	2,773	255	222	175	165	155	145	137	128	121	114	107	100	94					133
2023	3,123	350	304	175	165	155	145	137	128	121	114	107	100	94	89				127
2024	3,499	376	327	175	165	155	145	137	128	121	114	107	100	94	89	83			122
2025	3,910	411	357	175	165	155	145	137	128	121	114	107	100	94	89	83	78		117
2026	4,416	506	440	175	165	155	145	137	128	121	114	107	100	94	89	83	78	74	112

Table 5

WEIGHTED AVERAGE PRICES BY YEAR- JCP&L/ACE 10-YR. CONTRACT
DECLINE IN SOLAR COSTS PER YEAR = 6%

Energy Year	A3520 Requirement GWH	A3520 increment GWH	MW New Constr.	JCP&L/ACE Price 2012	JCP&L/ ACE Price 2013	JCP&L/ ACE Price 2014	JCP&L/ ACE Price 2015	JCP&L/ ACE Price 2016	JCP&L/ ACE Price 2017	JCP&L/ ACE Price 2018	JCP&L/ ACE Price 2019	JCP&L/ ACE Price 2020	JCP&L/ ACE Price 2021	JCP&L/ ACE Price 2022	JCP&L/ ACE Price 2023	JCP&L/ ACE Price 2024	JCP&L/ ACE Price 2025	JCP&L/ ACE Price 2026	Weighted Avg. Price by year
2011	306																		
2012	442	136	118	216															216
2013	896	454	395	216	203														206
2014	1,072	176	153	216	203	191													203
2015	1,315	243	211	216	203	191	179												197
2016	1,550	235	204	216	203	191	179	169											192
2017	1,757	207	180	216	203	191	179	169	159										187
2018	1,916	159	138	216	203	191	179	169	159	149									183
2019	2,158	242	210	216	203	191	179	169	159	149	140								178
2020	2,344	186	162	216	203	191	179	169	159	149	140	132							173
2021	2,518	174	151	216	203	191	179	169	159	149	140	132	124						169
2022	2,773	255	222	116	203	191	179	169	159	149	140	132	124	116					158
2023	3,123	350	304	109	109	191	179	169	159	149	140	132	124	116	109				137
2024	3,499	376	327	103	103	103	179	169	159	149	140	132	124	116	109	103			127
2025	3,910	411	357	97	97	97	179	169	159	149	140	132	124	116	109	103	97		122
2026	4,416	506	440	91	91	91	179	169	159	149	140	132	124	116	109	103	97	91	117

Table 6

WEIGHTED AVERAGE PRICES BY YEAR- SREC MARKET (3-YR. CONTRACT) DECLINE IN SOLAR COSTS PER YEAR = 6%																			
Energy Year	A3520 Requirement GWH	A3520 increment GWH	MW New Constr.	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	SREC Market 3-Yr Price	Weighted Avg. Price
				2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	by year
2011	306																		
2012	442	136	118	347															347
2013	896	454	395	347	327														331
2014	1,072	176	153	347	327	307													326
2015	1,315	243	211	289	327	307	289												309
2016	1,550	235	204	271	271	307	289	271											280
2017	1,757	207	180	255	255	255	289	271	255										263
2018	1,916	159	138	240	240	240	240	271	255	240									246
2019	2,158	242	210	225	225	225	225	225	255	240	225								230
2020	2,344	186	162	212	212	212	212	212	212	240	225	212							216
2021	2,518	174	151	199	199	199	199	199	199	199	225	212	199						203
2022	2,773	255	222	187	187	187	187	187	187	187	187	212	199	187					190
2023	3,123	350	304	176	176	176	176	176	176	176	176	176	199	187	176				178
2024	3,499	376	327	165	165	165	165	165	165	165	165	165	165	187	176	165			168
2025	3,910	411	357	155	155	155	155	155	155	155	155	155	155	155	176	165	155		158
2026	4,416	506	440	146	146	146	146	146	146	146	146	146	146	146	146	165	155	146	149

Table 7

WEIGHTED AVERAGE PRICES BY YEAR - LCOE
DECLINE IN SOLAR COSTS PER YEAR = 6%

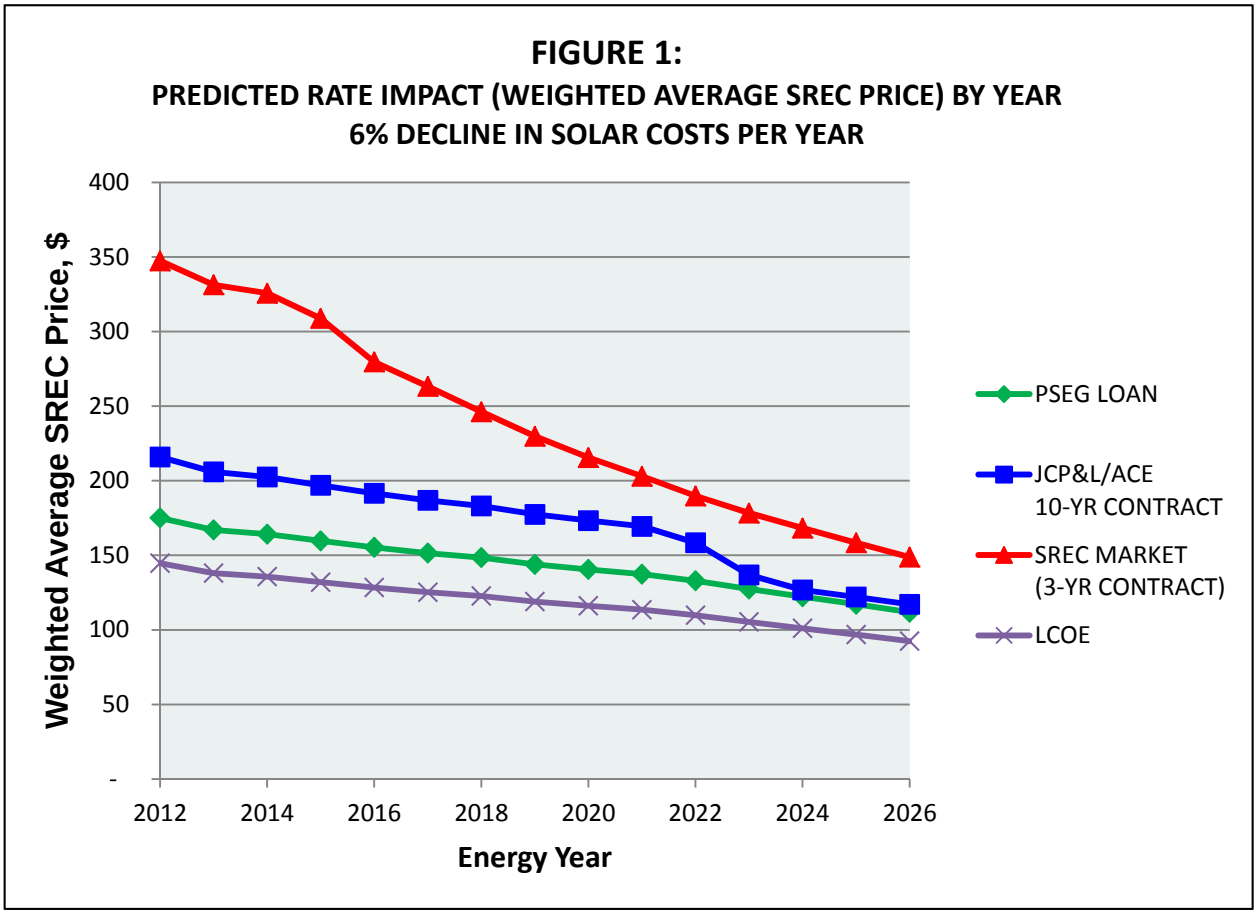
Energy Year	Proposed A4226 Requirement	Increment GWH	MW New Constr.	LCOE Price 2012	LCOE Price 2013	LCOE Price 2014	LCOE Price 2015	LCOE Price 2016	LCOE Price 2017	LCOE Price 2018	LCOE Price 2019	LCOE Price 2020	LCOE Price 2021	LCOE Price 2022	LCOE Price 2023	LCOE Price 2024	LCOE Price 2025	LCOE Price 2026	Weighted Avg. Price by year
2011	306																		
2012	442	136	118	145															145
2013	896	454	395	145	136														138
2014	1,072	176	153	145	136	128													136
2015	1,315	243	211	145	136	128	120												132
2016	1,550	235	204	145	136	128	120	113											128
2017	1,757	207	180	145	136	128	120	113	106										125
2018	1,916	159	138	145	136	128	120	113	106	100									123
2019	2,158	242	210	145	136	128	120	113	106	100	94								119
2020	2,344	186	162	145	136	128	120	113	106	100	94	88							116
2021	2,518	174	151	145	136	128	120	113	106	100	94	88	83						114
2022	2,773	255	222	145	136	128	120	113	106	100	94	88	83	78					110
2023	3,123	350	304	145	136	128	120	113	106	100	94	88	83	78	73				105
2024	3,499	376	327	145	136	128	120	113	106	100	94	88	83	78	73	69			101
2025	3,910	411	357	145	136	128	120	113	106	100	94	88	83	78	73	69	65		97
2026	4,416	506	440	145	136	128	120	113	106	100	94	88	83	78	73	69	65	61	92

The following Table 8 combines the predictions for weighted average SREC prices over future years for the three alternative programs and LCOE:

Table 8

PREDICTED RATE IMPACT BY YEAR AND BY PROGRAM (MODELED WEIGHTED AVERAGE SREC PRICES) 6% DECLINE IN SOLAR COSTS PER YEAR				
YEAR	PSEG LOAN	JCP&L/ACE 10-YR CONTRACT	SREC MARKET (3-YR CONTRACT)	LCOE
2012	175	216	347	145
2013	167	206	331	138
2014	164	203	326	136
2015	160	197	309	132
2016	155	192	280	128
2017	151	187	263	125
2018	148	183	246	123
2019	144	178	230	119
2020	141	173	216	116
2021	137	169	203	114
2022	133	158	190	110
2023	127	137	178	105
2024	122	127	168	101
2025	117	122	158	97
2026	112	117	149	92

And Figure 1 shows these results in graphical form:



Figures 2 and 3 show the results of sensitivity studies for a 4% decline and an 8% decline in required SREC prices per year:

FIGURE 2
PREDICTED RATE IMPACT (WEIGHTED AVERAGE SREC PRICE) BY YEAR
4% DECLINE IN SOLAR COSTS PER YEAR

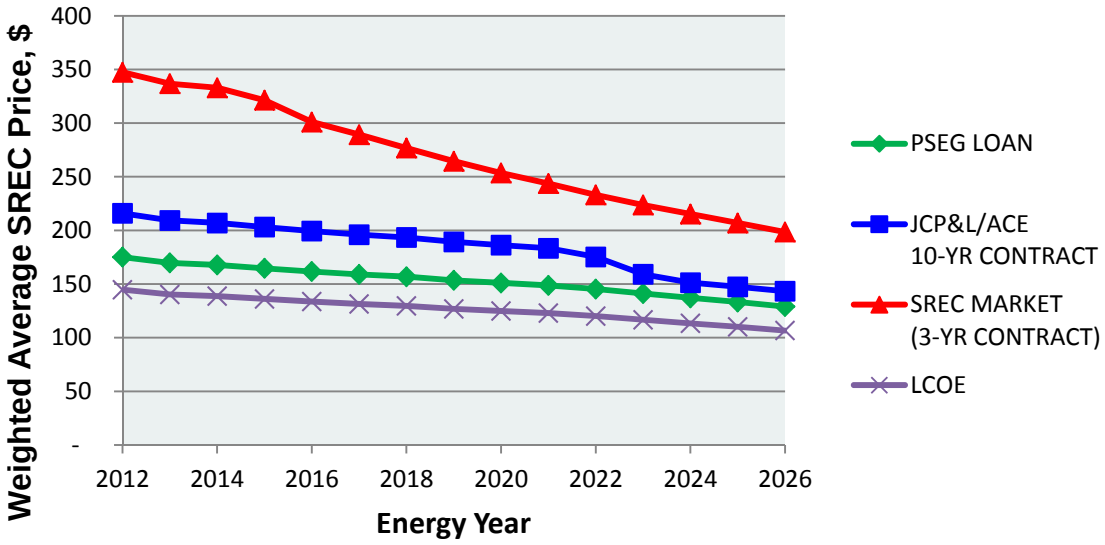
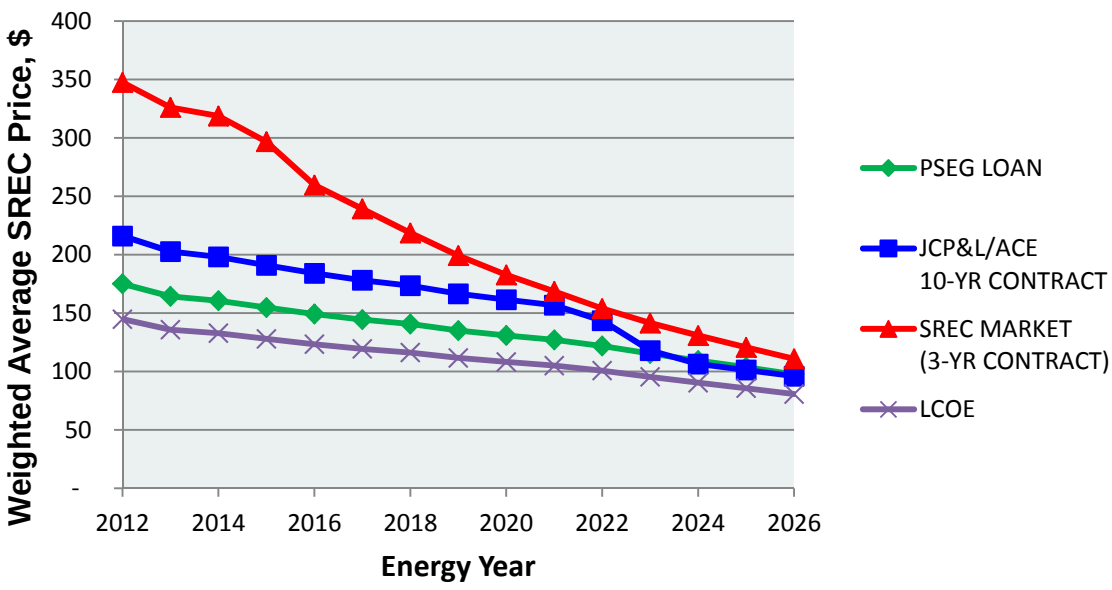
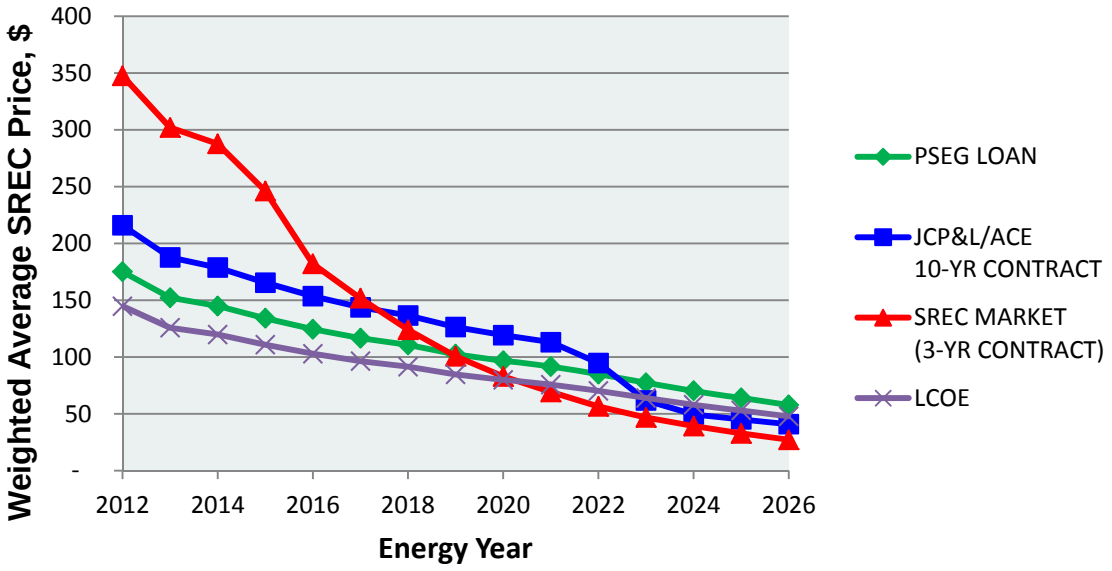


FIGURE 3
PREDICTED RATE IMPACT (WEIGHTED AVERAGE SREC PRICE) BY YEAR
8% DECLINE IN SOLAR COSTS PER YEAR



Finally, Figure 4 shows the results of sensitivity study based on a 10% decline in required SREC prices per year:

FIGURE 4
PREDICTED RATE IMPACT (WEIGHTED AVERAGE SREC PRICE) BY YEAR
10% DECLINE IN SOLAR COSTS PER YEAR



Discussion and Conclusions

This study was undertaken in order to provide quantitative analysis to support a policy choice being considered by the Transition Working Group, and in particular by the Board of Public Utilities with advice from the Office of the Rate Counsel. The choice may come down to two paths: one which places more emphasis on the EDC programs (PSE&G Loan, JCP&L/ACE 10-year contracts), or one which places more emphasis on the unstructured SREC market. One of these paths, over time, will produce lower SREC prices than the other.

Risk from the point of view of the ratepayer consists essentially of choosing the path that results in higher SREC prices over time, instead of the one which produces lower prices. The task of minimizing that risk can best be accomplished by utilizing all available data and analysis to *choose the path <u>most likely</u> to produce the lowest SREC prices over time.*

The results of the financial medeling and the analysis undertaken by MSEIA indicates that, based on the assumptions believed by MSEIA to fairly represent the solar market, the lowest SREC prices over time will be produced by the EDC programs – the PSE&G

Loan program and the JCP&L/ACE 10-year contract program. The graphs presented above indicate that on average over the period covered by the RPS law, the unstructured SREC market can be expected to require substantially higher SREC prices to produce the same results. This remains true over a range of assumptions regarding the rate of decline of the cost of solar power.

There are confounding factors which could affect this conclusion.

At very high rates of decline in the relative cost of solar power, the unstructured SREC market could drop below the SREC price required by the EDC programs in later years. However, even at rates of decline so high that MSEIA believes them to be unlikely, the average price of SRECs over the whole period remains higher for the unstructured SREC market.

In addition, the models assume rational behavior on the part of investors in solar projects, as well as competitive behavior of the market as a whole. If the market is chronically oversupplied, and at the same time investors are willing to take unusual risks on projects out of desperation (or for whatever reason), then the unstructured SREC market could perform better than predicted relative to the EDC programs. On the other hand, if the market for SRECs is short or otherwise not intensely competitive, the unsturctured SREC market could remain above the minimum requirements calculated in this study. Likewise, if the solicitations in the 10-year contract program are not highly competitive, those prices could be higher than the minimum requirements calculated in this study.

The foregoing confounding factors constitute the real risk factors related to the decision about which of the two paths to emphasize. These confounding factors could pull the conclusions of this study in either direction. However, the analysis showed a wide difference in rate impacts between the two paths, and the difference appeared to persist through a broad range of change in the most sensitive assumptions.

MSEIA therefore believes that the probability is very high that the EDC programs will produce substantially lower rate impacts over the period covered by the RPS.