Reducing Price Volatility of New Jersey Solar Renewable Energy Credits

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Summary: NJ SREC Prices are Unnecessarily Volatile

Prices of New Jersey solar renewable energy credit (SREC) are volatile. Over short periods of time, NJ SREC prices have both dropped significantly and increased dramatically. For example, one website reported a decrease in the 2012 SREC prices from $400 in July 2011 to less than $200 in August 2011, more than a fifty percent drop. The New Jersey Clean Energy Funding Work Group reported a drop in SREC prices from $400 to $160. This same website reported in both 2011 and 2010 changes in SREC prices from $650 to $450 and then back to over $600.

A major factor causing volatile NJ SREC prices is due to how the policy is structured. The amount of SRECs that load serving entities (LSEs) must buy is stipulated by legislation and these amounts increase each year. For a given year, however, the requirement is fixed, regardless of SREC prices. Economists describe this situation as a vertical demand curve, i.e., a fixed quantity of credits must be purchased.

The properties of vertical demand curves are well understood. Given fixed demand, the supply curve determines price. Any significant change in supply will cause price to change significantly. The result is volatile prices due to the boom-bust cycle and higher investment costs because investors associate price volatility with increased risk. This will also increase the likelihood of the exercise of market power. Fixed demand also creates policy flux. When SREC prices drop, there is an outcry from solar developers to change the rules to buttress prices; when SREC prices jump up, ratepayers and consumer advocates press for changes to lower prices since it is ultimately ratepayers that purchase SRECs. Moreover, volatile SREC prices make it difficult for policymakers to assess what is occurring in the solar market.

Addressing the problems created by a vertical demand curve is straightforward. The SREC annual fixed requirement should be replaced with a downward sloping demand curve: the requirement should be increased within a given year if SREC prices fall and decreased if SREC prices rise. This is how markets for typical goods and services work. When prices rise, people buy less of a good and when prices fall they buy more, all else equal. This exact same situation has occurred in another energy related market, the market for installed capacity, which used to have a fixed requirement similar to the NJ SREC annual requirement. Regulators, policymakers

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5 Some members of Clean Energy Funding Working Group recognized that the current system results in “boom or bust cycles” but did not articulate the specific attributes of the current system that cause this effect. See the Report of the Clean Energy Funding Work Group, October 10, 2011, p. 64.
and stakeholders soon recognized that the vertical demand curve in installed capacity markets should be replaced with a downward sloping one.\textsuperscript{6}

I. An Annual Solar Requirements Results in a Vertical Demand Curve

As part of New Jersey’s solar renewable portfolio standard (RPS), a specified amount of SRECs must be bought by LSEs each energy year.\textsuperscript{7} This requirement, \( R \), increases over time and is measured in gigaWatt-hours (GWh). If LSEs fail to purchase their pro rata share of the total requirement, they must pay a Solar Alternative Compliance Payment (SACP), set substantially higher than the total cost of solar per MWh. NJ SACPs are set for each energy year and decrease over time. For energy year 2012 (EY 2012), which ends on May 31, 2012, the NJ SREC requirement is 442 gigaWatt-hours (GWh) and its SACP is $658 per MWh.\textsuperscript{8}

The decision criteria used by LSEs to purchase SRECs is straightforward. Collectively, they are unlikely to buy more SRECs than required by the annual solar RPS. Although since banking of NJ SRECs is permitted for up to two additional years after the energy year,\textsuperscript{9} they may purchase more in one energy year than needed in that year for future use, for example, if they were to expect a large price increase over the next two years. If the price of SRECs plus the transaction cost of acquiring them exceeds the SACP, LSEs will pay the SACP instead.

For individual developers of solar projects, producing excess SRECs risks incurring costs for SRECs that cannot be sold (although may be banked) and collectively risk substantially reducing the price they can obtain for all of the SRECs that they produce. SREC prices should never be less than the marginal cost of producing a MWh, but the marginal cost for solar is low, if not for all practical purposes zero. Between zero, the current floor, and the SACP, the effective cap, there is a lot of room for prices to roam. This wide range combined with the vertical demand curve results in dramatic SREC price volatility (Figure 1).


\textsuperscript{7} In New Jersey, the energy year starts in June and ends in May. Energy year 2012 is from June 2011 to May 2012.

\textsuperscript{8} See http://www.pjm-eis.com/program-information/new-jersey.aspx. One GWh equals 1,000 megaWatt-hours (MWh).

\textsuperscript{9} http://www.flettexchange.com/pdf/specs/NJ_SPECS.pdf.
SREC prices are high, Pₒ, when the market is short (i.e., supply is tight, Sₒ)

SREC prices are low, P₁, when the market is long (i.e., supply is abundant, S₁)

Annual SREC Requirement, R

**Figure 1: The Vertical Demand Curve for NJ SRECS is Results in Volatile SREC Prices**

When the market for SRECs is short (as some claimed was the case during Energy Year 2011), then SREC prices are high and gravitate near the SACP. When the market for SRECs is long (as some claimed is the case during Energy Year 2012), then SREC prices drop dramatically.

As Figure 1 illustrates, with a vertical demand curve, a small change in the supply of SRECs can dramatically move SREC prices. It also makes the market for SRECs more susceptible to market power. The intuition is straightforward: with a vertical demand curve it only takes a small reduction in supply to drive SREC prices towards the SACP.

A standard formula from economics, called the Lerner index¹⁰, makes this point clear. The Lerner index measures the amount that an actual market price, P, exceed the price that would occur in an efficient market based where price equals the marginal cost of producing the last good, Pₑ. The larger the Lerner index, the higher the market price is above the efficient price. The Lerner Index is proportional to the ratio of the market concentration and the price elasticity of demand¹¹:

\[
\text{Lerner Index} = \frac{(P-Pₑ)}{P} = \frac{\text{(Market Concentration/Price Elasticity of Demand)}}{12}
\]

A concentrated market, i.e., few competitors, results in actual prices being much higher than would occur if the market were competitive. But even if a market has lots of competition, actual prices may be higher than efficient prices due to extremely low price elasticity of demand. With a vertical demand curve, the demand price elasticity is zero, meaning that actual prices would be infinitely higher than the efficient price.


¹¹ The price elasticity of demand is the percent change in the quantity of demand given a one percent change in prices. Since demand almost always decreases with prices, the price elasticity of demand is almost always negative. The exceptions are Giffen and Veblen goods, in which as prices rise demand also rises.

¹² Since the price elasticity of demand is negative, the convention is to drop the negative sign in this formula. The measure of market concentration is the Herfindahl–Hirschman Index (HHI), which is the sum of the square of market shares of each supplier expressed in percentages.
SREC prices are capped by the SACP so they cannot become infinite, but they can certainly be extremely high. In New Jersey, for many months SREC prices have traded close to the SACP but have also dropped substantially as shown in Figure 2. Therefore, increasing the amount of competition and the maturing of SREC markets, although desirable, will not substantially reduce periods of high SREC prices or decrease their volatility because of the characteristics of the vertical demand curve.

New Jersey SREC prices reported by PJM GATS (Figure 2) include SRECs for a given energy year, e.g., energy year 2012, that were sold in months to years prior, e.g., sold in calendar year 2010 and 2011. As a result, SREC prices in PJM GATS may be higher than the current spot price for SRECs when the market has transitioned from shortage to surplus, as is the case now, or lower than the current spot price when the market transitions from shortage to surplus. Ratepayers pay the average price for SRECs not the current spot price.

![Graph showing historical average NJ SREC prices (High, Average, Low) and SACP from December 1st, 2008 through October 10th, 2011.]

*Note: Based upon PJM GATS (accessed on October 20, 2011, 7:20 am)*

**Figure 2: Historical Average NJ SREC Prices (High, Average, Low) and SACP from December 1st, 2008 through October 10th, 2011**

As noted above, numerous analysts have recognized that vertical demand curves result in volatile prices, increased susceptibility to market power, and increased investment costs due to the risks associated with price and therefore revenue volatility. This same situation occurred in wholesale electricity markets with installed capacity and was recognized by the Federal Energy Regulatory Commission (FERC).\(^\text{13}\)

Volatile SREC prices also have adverse public policy consequences. Their price volatility masks the true cost of solar making it difficult for policymakers to evaluate solar policies. When prices spike, there are calls to change solar policies to reduce electricity rate impacts because at the end

\(^{13}\) FERC Docket ER05-1410-001 et al, December 22, 2006.
of the day retail electricity consumers pay for SRECs,¹⁴ and when prices fall, then solar developers and producers insist on changes to push prices back up.¹⁵ The risk is that policy is whiplashed as it tries to chase the most recent spike or drop in SREC prices.

II. Implementing a Downward Sloping Demand Curve for SRECs is Preferable to Other Solutions

As noted above, when volatile and uncompetitive prices occurred in installed capacity markets, regulators replace the vertical demand curve with one that had some slope to it. The same approach can be used for New Jersey’s annual solar requirement. Instead of having a single requirement in each energy year, a sliding scale or sloping demand curve should be established.

If over the course of an energy year, the amount of SRECs produced exceeds the annual requirement, R, then LSEs would have to purchase more SRECs, but the SACP would be reduced. Figure 3 provides one such possible way of doing this by keeping the maximum amount that ratepayers would pay constant, and therefore the maximum amount of revenues the industry could possibly earn, the same. For instance, if 50% more SRECs are produced than the energy year requirement, R, then LSEs must purchase these additional SRECs but the SACP decreases by 50%.¹⁶ Of course, actual SREC prices may be below the reduced SACP.

![Figure 3: Implementing a Sloping Demand Curve for NJ SRECs](image)

*Note: Figure not drawn to scale.*

**Figure 3: Implementing a Sloping Demand Curve for NJ SRECs**

There have been other proposed fixes to address the volatility in New Jersey of SREC prices. One alternative is to set a floor price for SREC prices that is above the current floor of zero.¹⁷ Doing so, however, will not reduce the volatility but only limit the movement of SREC prices

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¹⁵ Report of the Clean Energy Funding Work Group, October 10, 2011, pp. 60-67. This group was unable to reach agreement regarding many of the issues relevant to the current New Jersey solar market (p. 61).
¹⁶ To achieve the objective of ensuring that ratepayers would never potentially pay more than under the situation with a vertical demand curve for all possible outcomes, a decaying exponential demand curve is needed as illustrated in Figure 2. This implies a price elasticity of -1, holding total revenue (price times quantity) is constant over the range of the demand curve. Linear demand curves could be used if this payment constraint is relaxed.
between the SACP and the proposed floor as Figure 4 illustrates. A floor price also does not reduce the SREC market susceptibility to market power. Another problem with setting a non-zero price floor for SRECs is that in the future, if solar costs continue to decrease such that the cost of solar is below the floor, then ratepayers are paying for SRECs at the higher floor price.

Figure 4: A SREC Price Floor Only Reduces the Range of SREC Price Movements but Not Their Volatility

Another proposal is to increase the demand for SRECs when prices drop.\(^\text{18}\) Once again, this does not result in reducing the volatility, only driving SREC prices towards the cap as illustrated in Figure 5. As the SREC requirement is increased from \(R_0\) to \(R_1\) under this proposal, SREC prices would increase dramatically when the amount of SRECs becomes less than \(R_1\). Increasing demand but still retaining the vertical demand curve does not solve the problem; it just restores SREC prices to near SACP levels. Further, the higher level of \(R\) and the return of higher prices will induce more supply leading to a sharp drop in price bringing the boom-bust cycle back again.

Figure 5: Increasing the SREC Requirement Will Increase SREC Prices but Not Reduce SREC Price Volatility

One way to think about having a downward sloping demand curve is that it is a sliding scale version of either establishing an SREC price floor or increasing demand. A downward demand curve solves the problem that both of these alternatives are trying to address, which is avoiding drastic drops in SREC prices without introducing the problems discussed above that the two alternatives have.

III. Conclusion

New Jersey has determined that it should significantly increase the amount of solar generation in the state using a solar carve-out as part of its renewable portfolio standard. A fixed annual requirement (even if it increases over time) results in a vertical demand curve. The outcome is volatile SREC prices and the potential for SREC prices to trade near the SACP for periods of time as well as to drop substantially. To reduce this volatility and to make the SREC market similar to that of typical goods and services, a downward sloping demand curve should be introduced. This technical fix has successfully worked in other energy-requirement markets to address the very same issues that are now occurring in New Jersey’s SREC market.

Reducing SREC price volatility would help reduce investment costs, provide more stable prices that benefit both buyers and sellers, mitigate market power, and enable policymakers to evaluate the market without substantial pressure from one group or another to constantly change the rules as SREC prices whipsaw between low levels and the SACP.