SOLAR MARKET DEVELOPMENT VOLATILITY

Offered below are comments to the questions that the Solar Energy Industries Association posited as being of importance to calibrate all stakeholders while engaged in formulating recommendations for minimizing solar market volatility in the future. Following these comments is an overview and perspective on the present status and future behavior of the NJ solar market.

Discussion Topics –

1) Definition of Solar Market Development Volatility & Key Indicators

What is market development volatility? What does this include? What is the timeframe over which volatility is viewed?

Volatility connotes frequent, unexpected changes in conditions that influence and impact the development of a market. Factors that impart volatility are those that incentivize, disincentivize, facilitate and govern the behavior of a market's development. Volatility becomes more pronounced in its influence and impact and elevates risk when the magnitude and frequency of changes occur in shorter time periods than completion of a business activity cycle; e.g. period spanning from when a decision to a pursue solar system investment is made to startup of a solar system operation.

What are the key indicators that can be used to measure volatility? How easily available are they? What do they tell us about market development volatility?

It is imperative to understand factors of inclusion that contribute to volatility & impact economic viability of project investments. Each market opportunity is somewhat unique.

Factors Impacting Volatility for the Solar System Market are:

- Financial Incentives – Investment Tax Credit, 1603 Law, SREC Pricing
- Financial Disincentives – SREC Pricing, Delays with Interconnection Permits, Distribution System Upgrade Requirements
- Facilitation – Affordable Financing, Long Term Power Purchase Agreements, Long Term SREC Purchase Agreements
- Governance – NJ Laws, BPU Regulations, Board Orders, Petition Resolutions

For the development of solar generation in NJ, spot market price of SRECs is a lagging indicator relative to making decisions to invest in solar generating capacity while solar capacities of projects being approved for SREC eligibility (pipeline) and those approved for operation may serve as leading indicators. The combination of the potential and actual solar generating capacities tempered by one's interpretation of this data provides a forward perspective on what the supply-demand balance for SRECs may be at some future point and an anchor for investment decision-making.

The manufacturing costs of solar equipment (modules and inverters), introduction of innovative equipment that enhanced solar system performance in terms of kilowatt-hours/kilowatt of capacity and entry of balance of system products that squeezed labor from installation costs were all contributing to more economical outcomes for solar system installations. These increasingly attractive operating margins relative to high alternative compliance payment pricing stimulated the rate of solar capacity adoption. What was

unexpected during this period was the significant actual rate of descent in solar system installed costs that occurred.

2) Discussion of SREC Market Construct

SREC market is created by policy. What are the key attributes of the SREC market construct in NJ that contributes to market development volatility or stability?

Solar generation market experienced an unsteady-state transition from virtually zero capacity a few years ago to nearly 1GW of capacity today. Driving force that contributed to the growth phase of rapid investment and buildup in solar system generation was the economic margin attributable to the alternative compliance payment in a market of SREC scarcity. In an environment of scarcity, the SREC market price floated to the ceiling price, the alternative compliance payment. Magnitude of economic margin impelled a high rate of capital investment. The result was the market overshot the SREC requirements and triggered a rapid decline in SREC pricing as supply exceeded demand. Today, the SREC market price is functioning beyond the initial and growth phases and within a control phase as it zeroes in on a pricing band that continues to attract solar investment for future years but at a more sustainable level.

Were it possible to know with near certainty what the operational solar system capacity would be 6-12 months out at the beginning of the business activity cycle, rational decision makers would have had keener insight into the relative supply-demand balance on SRECs. Lack of experience and relevant information with projecting the scrub rate of projects and inefficiencies in completing the project cycle that delayed the start of operations contributed uncertainty as to what the operational capacity would be 6-12 months forward.

There exists a dramatic contrast in time periods between SREC pricing variability and the business activity cycle; 1 month versus 6-12 months

What are negative effects of market volatility? To ratepayers? To developers? To end-users? To other stakeholders?

Magnitude of volatility is crucial. If market conditions change within a band that would not necessarily alter business decisions, then the volatility becomes inconsequential. Volatility that would influence business decisions creates uncertainty which presents risk to the solar system asset owner. Nature of risk might result in a reversal of the decision to make the investment or compel the asset owner to expect increased cash flows to potentially offset less desirable outcomes.

The scenario that unfolded with the SREC market in NJ is analogous to a process that is being brought under control with a controller whose settings are too low. A controller with settings that are too low will not react quickly or intensely enough to enable the process to reach steady state quickly and with minimal fluctuations (volatility). The process tends to overshoot its steady state point by a considerable amount. The quantity of SRECS available substantially exceeds the demand for SRECS for the next several years. If the SREC market price today at approximately $85/SREC over a 3-year term did not attract new investment (undershot the target), eventually that SREC surplus would evaporate, a shortage in SRECs would emerge and the SREC market price would spike upward. The analogous behavior of the process would display undershooting the steady state point followed by heading toward the desired value. With each cycle of overshooting and undershooting, the variance decreases until the process settles at the steady state value dictated by the controller. The

degree of volatility expressed in the SREC market is dependent on the confidence that the prospective developers/owners have in projecting the SREC supply/balance relationship into the future.

The objective is to install solar capacity that meets or exceeds the RPS with the lowest practical cost borne by ratepayers and with the participation of all willing segments of ratepayers. Large volatility in SREC pricing represents a high degree of uncertainty in solar system cash flows and project economic viability. The response of the developer/owner to this scenario is to demand higher pricing of SRECs, greater financial incentives, etc. to hedge against unfavorable outcomes. One result may be fewer people willing to make the investments, a lower level of solar system capacity installed and failure to reach the RPS. An alternative outcome that satisfies the RPS entails a higher subsidy to the developer/owner to encourage making the investments.

Greater volatility imposes more risk which makes prudent business decision more demanding to secure financial success. The result is that the objective is not achieved and the developer/owner earns a lower rate of return on the investment or the objective is achieved at a higher cost to the ratepayer.

Overview & Perspective of NJ Solar Market

Three factors that created high volatility in the NJ SREC market may no longer be major determinants with influencing SREC pricing going forward. First, the market is no longer in an extreme unsteady-state condition of virtually no SREC availability versus mandated SREC retirements per the RPS. We observe continuing investments in solar which will reduce the probability of returning to a severe SREC-deficient status. The combined operational plus pipeline solar capacity has remained somewhat stable with slight growth. There potentially exists a 3-4 year overhang of SREC's.

Secondly, the availability and quality of data about present and potential future solar generation capacity has improved dramatically. The approach in establishing a systematic procedure for registering and validating solar projects and the collection and dissemination of information has made this possible. This has raised the visibility of market activity which leads to more informed and rational business decisions.

Thirdly, experience in launching solar projects and improved coordination with the utility companies have shaped more efficient timelines from concept to startup. The basic generation system auctions guide LSE's and third party generators into studying 3-year horizons for SREC availability and pricing. Indications of entering into an SREC deficient period would be flagged by increasing SREC price bidding by the LSE's and third party generators for the last or next-to-last years of this 3-year cycle. This cycle is usually longer than the required lead time to produce operational solar system capacity.

It would appear that the underpinnings of the solar market today characterized by quality and timely information and maturity, as represented by the installed capacity and numerous participants, contribute the resiliency that could enable the solar market to perform within modest SREC supply-demand imbalances and reduced volatility.

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