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From:

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Via Email To:

Commissioner Mark Sylvia
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Re: Comments: SREC-II Updated Proposed Design

I write to provide my comments on the DOER's latest proposals with respect to the design of the SREC II solar subsidy program, which they presented in a public meeting on August 12, 2013.

I believe the DOER continues to make critical errors in their proposed SREC II program design. Overly complex design, a lack of detailed scenario testing, and the weaknesses inherent in SREC markets in general combine to make the proposed SREC II market design overly risky for potential investors. Investors will continue to discount projected SREC II payouts (as they have for in SREC I), and this discounting will waste hundreds of millions of dollars in ratepayer funds.

As I detail below, I do not believe that minor or even moderate alterations to the DOER's proposed program design can resolve this situation. Given that the DOER at this stage can't or won't take on making the very substantial changes needed to resolve these issues, I make one overall recommendation related to these issues that does not relate specifically to program design changes. I also make several smaller recommendations that I think are important particularly if my first recommendation is ignored or fails.

List of Recommendations:

1. Bring in private financial players to provide SREC liquidity
2. Reduce or eliminate the extremely generous Forward Minting terms
3. Do not extend Forward Minting to third party-owned systems
4. Consider requiring multiple bids for residential systems to qualify for SREC II
5. Reconsider SREC price floor and ACP levels, which appear too high and do not guide the SREC II market to equilibrium with the REC market by 2020 as previously described

Recommendation #1 – Bring in Private Financial Players to Provide SREC Liquidity

The DOER has implicitly claimed, during both the SREC I and SREC II program design efforts, that it is creating an SREC market mechanism that it expects to function reasonably, with understandable risks.

For SREC I the available evidence strongly suggests that this hasn't been the case. Few stakeholders feel that they understand the program well enough to project with any certainty where SREC prices will be in future years. The few financial players who have entered the market and taken on SREC price risk by lending to or otherwise financing solar projects generally require substantial risk premiums in their investment or loan terms¹. Little secondary market activity has arisen allowing SREC streams to trade hands, largely because there is so much uncertainty about the value of these streams. The DOER's own efforts to include a 'Forward Minting' capability in the SREC II program design is further evidence of the problem – in a robust, well-designed SREC market with understandable risks, this is exactly the kind of product that financial players should be willing to enter the market and offer, particularly given the exploitable inefficiencies currently evident across the state's SREC market.

If the DOER believes the lack of faith in the state's SREC programs is due to improperly perceived risk and not the reality of poor program design and management – that the actual risks are much lower – then they can bring great benefit to many stakeholders in the market by working directly with private financial institutions to bring them into the marketplace as takers of SREC price risk and so providers of market liquidity.

The DOER should take it as a primary part of their mission to identify and bring new financial players into the state's SREC market. They should invite multiple financial institutions to technical sessions focused on the workings of the SREC market, opening up their program design 'books', explaining the program, sharing their (hopefully existent) SREC market models, and offering to engage in discussions leading to possible program design changes that will help private financial players enter the market and take on SREC price risk at reasonable 'prices' (e.g. with much smaller risk premiums that the few financial players active in the market are currently willing to accept).

If the DOER finds that it can't convince financial institutions to enter the market and take on SREC price risk at reasonable risk discounts (or if the DOER believes it has

¹ Examples include the forward SREC prices quoted by firms such as Amerex, which typically range from \$180 to \$220 vs. the \$285 floor price and the expected payout among many analysts of \$300+. My own personal discussions with multiple developers who use outside financing also indicates that the vast majority of projects financed in this way receive financing terms that assume future SREC prices of roughly \$200 or less, with most of the SREC price upside (or downside) going to the financier.

already tried this and failed), then the DOER must accept that they have failed to design a robust market mechanism and by refusing to act to rectify that failure they are simply forcing industry stakeholders and ratepayers to pay an enormous price in terms of hundreds of millions of dollars of subsidy funds wasted on absurd program design-driven risks that provide little or no offsetting benefit.

I urge stakeholders in the solar installation industry to lobby the DOER to have such meetings and release detailed notes of the discussions (or release notes from previous discussions if they have occurred). Key questions stakeholders should be asking:

- Have financial institutions been approached by the DOER to participate in the state's SREC market by providing various forms of financing? If not, why not?
- If the DOER has had these meetings (or if has them in the future and they fail), why have the institutions apparently refused to participate in a visible way in terms of providing widely-available financing for SREC-qualified solar projects in the state at reasonable prices?
- In particular, what risks in the SREC market do financial institutions that might consider participating in the market see that make them unwilling to provide SREC-backed financing at reasonable prices?

On the other hand, if the DOER succeeds in helping create widely-available SREC-based financing products that bring liquidity to the industry at reasonable prices, then critics of the program (like me) will gladly celebrate their success.

Ultimately it is critical for the DOER to get at the root of what is causing the very large disconnect between the SREC prices the program has been designed to pay out (somewhere between the floor and ACP level on average), and the SREC prices financiers are willing to build investment or lending terms around (typically well under the average floor price). This gap can easily be over \$100 per SREC, meaning that a large portion of the SREC price is wasted on the absurd risk premium.

It is this gap that is costing ratepayers hundreds of millions of dollars in wasted subsidy funds, and leaving many developers and installers in the state devoting intense effort to financing their projects often at near break-even levels in spite of an extremely generous subsidy environment that is reportedly expected to generate IRR's for many SREC financiers well in excess of 20% p.a. if the SREC market does not collapse due to unexpected developments or further DOER intervention.

Recommendation #2 – Reduce or Eliminate the Extremely Generous Forward Minting Terms

I believe the DOER should not adopt the Forward Minting proposal under any circumstances. It greatly increases the complexity of the program for all participants while bringing benefits to a select few that do not offset the larger cost.

As I mentioned in an earlier comment, 50% or more of the credits for sale in earlier years of the SREC II program may be due to forward minting, allowing a relatively small segment of the market to control SREC market dynamics during critical early years of the program.

If the DOER is successful in bringing in outside financial institutions to take on SREC price risk and provide liquidity to the market, the need for Forward Minting terms written into the program will disappear. Private financial players will provide an equivalent product that will not require adding any complexity to the SREC market mechanism.

If, however, the DOER is set on providing the Forward Minting benefit to residential stakeholders at the expense of others in the market, and can not succeed in bringing in private financial players to offer the service instead, then the DOER should at least reconsider the extremely generous Forward Minting terms in its current program design.

A 10-year pool of Forward Minted credits awarded up front will be worth much more than the equivalent stream of credits handed out over 10 years for the following reasons:

1. The DOER currently has no plans to discount the up-front credit volume due to the time-value of money, which over a ten year period and assuming a reasonable discount rate (e.g. 6% p.a.) is equivalent to a perhaps as much as a 20% benefit
2. The add'l risk of unexpected changes to the program reducing the value of future SRECs might be worth an additional 10% per year or more, or perhaps another 30% benefit
3. Selling SRECs during the first three years when ACP and floor prices are declining is perhaps another 20% benefit relative to a 10-year declining-price SREC stream
4. Being able to select one of three years to sell credits in – waiting for the most undersupplied year – instead of having to take the average price over ten years – is worth another perhaps 10%-20% or more

These factors combine to perhaps double (or more) the value of Forward-Minted credits (as proposed by the DOER in their current program design) relative to a ten-year SREC stream.

The goal of Forward Minting is, according to the DOER, to allow homeowners to more easily finance projects using the value of their SREC streams up front. That can be achieved by including the appropriate level of discounting in calculating the size of the lump sum of SRECs awarded up front. That the value of that lump sum should be so dramatically increased relative to the ten-year stream because of the absence of discounting for the effects described above appears to be an added bonus for residential systems the DOER has not justified. If the DOER wants to privilege residential ownership of solar panels over the third-party-owned model, then this is a way to achieve that goal, but it should be explicitly stated and discussed. Note that

residential systems as a class are already receiving a substantial benefit relative to medium-sized and larger systems due to their much higher SREC factor.

Recommendation #3 – Do Not Extend Forward Minting to TPO Systems

The DOER should absolutely NOT offer Forward Minting to leased / third-party owned (TPO) systems. The TPO product is primarily (if not exclusively) offered by large companies who have the resources, capabilities and expertise to take on SREC price risk as well as (if not better than) many of the developers who build medium-sized and larger systems. Giving TPO-focused companies access to Forward Minting – particularly under the current (absurdly generous) proposed terms – simply provides these companies with a huge benefit over and above that already built into the SREC factor, and allows them to push onto everyone else in the market their share of the SREC price risk that they would otherwise have to carry themselves.

There is perhaps logic to allowing Forward Minting for homeowners who lack the deep industry knowledge and expertise to take 10-year SREC price risk; but there is no similar logic for allowing TPO-focused companies to do the same. If the DOER seeks to more heavily subsidize residential systems over medium-sized and larger systems it can do that directly and more transparently through SREC factors.

Even beyond my involvement in and interest in the efficient workings of the state's solar installation industry, as a citizen of the state I am particular concerned that in discussions with stakeholders in the state I have repeatedly been told that large TPO-focused firms are heavily lobbying the DOER to qualify for Forward Minting even though there seems to be little or no rational basis for it. Absent a clear and reasonable explanation for the action from the DOER (which is so far not in evidence), if Forward Minting is allowed for TPO-focused firms, particularly under the current extremely generous terms, the DOER and those firms can expect a vigorous public campaign denouncing that action as an unjustified give-away of ratepayer funds.

Recommendation #4 – Consider Requiring Multiple Bids for Residential Systems to Qualify for SREC II

There has been a huge explosion in TPO residential system in the since the advent of the SREC I program. I have spent time with multiple homeowners in the state considering getting solar installed on their homes and through that have had the opportunity to talk to a number of solar sales representatives; that has given me a perspective on this trend.

One common theme, particularly from sales representatives from TPO-focused firms, was that they regularly sold customers a TPO product immediately on their

first or second visit, without that customer having solicited bids from any other company.

One possible reason given to me was as follows: TPO-focused companies come in and offer to put solar panels up for nearly free (or often a payment of a few hundred or a thousand dollars vs. the tens of thousands of dollars an installed system actually costs). Coupled with that these firms then offer to sell the panel-generated electricity back to the homeowner at an initially slight discount to the local utility's rates, and with a locked-in annual electricity price growth rate that might lead to a larger price advantage in the future if utility prices climb more quickly.

Homeowners are often only vaguely aware of the strong subsidy environment for solar installations in the state, or even if they are informed of it, they are generally not in the mindset to do the math that shows that a 30% ITC plus SREC payments worth potentially multiples of the value of the electricity per MWh add up to a very substantial return opportunity. They simply hear 'nearly free solar panels' for something they may have heard typically costs tens of thousands of dollars, and they regularly sign up right away, whereas before the advent of TPO products the homeowner's decision involved possible financing of a tens of thousands of dollar outlay and so some more in-depth thinking and possibly more motivation to get additional bids.

Because the state is providing substantial SREC subsidies, the state has an interest in making sure that adequate competition is occurring within the residential solar installation market. Particularly because there are at least anecdotal signs that the complexity of the SREC subsidy program is contributing to a homeowner knowledge gap and possibly depressing competition, I believe the state should consider requiring residences that plan to have a system installed on their home (whether through a TPO program or direct ownership) to submit evidence in their SREC program application of having solicited multiple bids, perhaps two or three². This will ensure homeowners get at least two perspectives on the market, and that the complexity of the subsidy program does not unfairly drive further penetration of the TPO model because of its surface attractiveness when the direct-ownership model has attractions of its own.

This could be considered a twin to the bidding process now being required of managed-growth systems.

Obviously this increases the burden on installers – although for the most part only to the degree that there is currently a lack of competition in the market. If homeowners are already for the most part soliciting multiple bids, then having them submit evidence of one or two other bids should not be an undue burden. If on the other hand the anecdotal evidence is correct and homeowners are often not

² Note I am not suggesting there be any requirement that the homeowner choose the lowest cost bid, or have any other constraint on the bid they eventually select.

soliciting more than one bid, then the additional burden is more than worth the benefit given the state is effectively paying a substantial share of the cost of the system through its subsidy program and so has an interest in ensuring a competitive market.

Recommendation #5 – Reconsider SREC Price Floor and ACP Level, which appear too high and do not guide the SREC II market to equilibrium with the REC market by 2020 as previous described

The initial SREC price levels (i.e. the price floor and ACP) proposed by the DOER appear too high in some cases, and do not (as the DOER has previously stated) bring the market to equilibrium with the REC subsidy market by the end of the SREC II program in 2020. In particular, the DOER appears to be assuming that solar installation costs will decline at only a 3%-4% per year rate during the SREC II program, and so will end 2020 (the final year of SREC II program qualification) still well above RPS Class-I (REC) subsidy levels in spite of DOER policy statements that subsidy level parity between the two programs was a central objective.

The DOER has stated that they will release the assumptions and calculations underlying their floor and ACP proposal soon. I look forward to seeing those results and commenting in more detail then. In the absence of that information, I will provide some initial comments on the data the DOER has provided.

I focus primarily on residential forward-minted returns because that allows a simpler return calculation (avoiding discount rate assumptions). The two issues I am concerned about – too high floor and ACP levels and too-gradual decline in subsidy levels over time – are evident in that analysis but apply more generally to the subsidy levels as a whole.

Residential Subsidy Levels in 2014 to 2016 – With Forward Minting

First, consider what the potential return looks like for residential systems that use Forward Minting.

Such a system will receive 10 years of SRECs (roughly 11.5 SRECs per kWp installed) up front.

Assuming the system is installed in 2014, the SRECs will be sellable in 2014 to 2016 with a floor value (accounting for the 0.9 residential SREC factor) of \$256 and an ACP value of \$315 to \$337. Hence the overall SREC cash value will be roughly in the range of $11.5 * \$256$ to $\$337 = \$2.9K$ to $\$3.9K^3$.

³ Note that I make the perhaps technically incorrect calculation of applying the SREC factor to the ACP and floor prices rather than to the SREC volume. For the purposes of the return calculations here (and the SREC price vs. REC price comparisons later) the end result is not affected.

Gross system prices these days, all-in, range perhaps from \$4K to \$5K per kWp (except in outlier cases) including the profit margin for the installer. Accounting for the 30% ITC, net system prices average perhaps \$2.8K to \$3.5K.

Hence the Forward Minted SREC payout to a first approximation essentially covers the net cost of the system (albeit with an obvious delay of months to a few years as the ITC benefit is redeemed and the Forward Minted SREC pool is sold).

Very rough (essentially back-of-the-envelope) IRR calculations assuming a \$4.5K per kWp all-in gross price, an SREC sales price halfway between floor and ACP (roughly \$300 per SREC), a \$150 per MWh electricity sales price and a one to two year collection delay on the ITC benefit and the SREC cash yields an IRR in the 15%+ to 24%+ p.a. range. Note that this excludes the profit margin on the installation itself. If that runs 20% (so the gross cost to the installer absent profit is roughly \$3.60) and then the IRR jumps to 25%+ to 45%+.

Note that these are averages: for instance if SRECs are sold into an oversupplied market (at the floor) the return would be lower, and if they are sold into an undersupplied market near the ACP, the return would be higher. Because Forward Minted credits can be sold in any of three years at the owner's choosing, the chance to sell into an undersupplied market (at a high price) appears strong.

Also, as well there are residential systems that likely are more expensive than the range assumed here, or that produce at less than the 13% capacity factor assumed here due to shading or other effects. One could argue that these economically marginal systems should be skipped until solar installation costs decline further.

Still, using these estimated assumptions yields unlevered IRRs – particularly when direct costs to the installer are estimated by removing the estimated profit margin – that are extremely high.

I look forward to seeing the DOER's own calculations for comparison.

Residential Subsidy Levels at the End of the Program (2020) – With Forward Minting

The \$300 average value per Forward Minted SREC in the early years of the program⁴ drops by 2020 to ~\$235 per average Forward Minted SREC⁵. Two comments about this drop:

First, this is roughly a 20% drop in average (nominal) SREC price by the end of the program. Because the electricity revenue stream might be expected to increase over time due to electricity price inflation, solar panel installation costs can drop less

⁴ Based on a floor at \$285 and the ACP at \$350 to \$375 and adjusted using the 0.9 SREC factor

⁵ Floor in the \$210-\$232 range and ACP in the \$285 to \$316 range

than 20% overall during the 2014 to 2020 period and still keep the return opportunity constant. A 20% overall decline over six years is equivalent to a 3%-4% price drop per year.

Hence the DOER appears to be assuming that solar installation costs will drop fairly slowly going forward. The rationale for this is unclear. It seems to contradict one of the DOER's main underlying assumptions justifying the entire SREC program – that solar is approaching grid parity. If solar installation costs are only going to drop 3-4% per year going forward and we are far from grid parity now (hence the need for SREC subsidies that are larger than the value of the electricity generated itself), then the DOER has a substantial gap in its thinking that should be explained.

(Note that the DOER has said these SREC price levels should be interpreted assuming the ITC remains at 30% through the end of the program, and that they will adjust the SREC factor up to account for any decline in the ITC.)

Second: The DOER has said that it expects SREC II to bring the state's solar industry into equilibrium with the REC program. Yet because of the very-gradual decline in ACP and floor levels in the DOER's current proposal this obviously does not occur. REC prices right now are roughly in the \$60 range and increasing with inflation. Assuming 2.5% p.a. inflation going forward, REC prices will increase perhaps \$10 by 2020 and perhaps another \$10 in the 5 years after.

But the SREC II program will be paying out in excess of \$200 per credit for residential systems that qualify in 2020, a much higher subsidy level than the REC program offers.

What happens in 2021, after SREC II qualification officially closes? Unless the residential solar installation segment is prepared for a sudden and precipitous drop in subsidy levels, the state's own projections seem to imply yet another subsidy program will be necessary in the years after 2020, in spite of the DOER's policy statements seemingly suggesting otherwise⁶.

Of course projecting that far ahead is a terribly difficult business, and it is difficult or impossible to tell whether the industry will see cost declines sufficient to subsist on only REC-sized subsidies by 2020.

Unfortunately, though, the DOER is building into its program design a fairly hard-wired set of subsidy levels stretching out into 2024 that appears to assume a poor outlook for solar cost declines (and an expensive one for ratepayers). The DOER has left itself the option of reducing SREC factors if needed, but I have understood the

⁶ From the DOER's March 22nd presentation, page 9: "[SREC II] Policy Development – Objectives: [...] If possible, establish a program now that will drive the market towards and until the technology reaches parity with RPS Class I"

primary message from the DOER to be that they are much more likely to raise SREC factors (perhaps in response to a decline in the ITC level) than to decrease them.

Residential Subsidy Levels Absent Forward Minting

Absent Forward Minting, the proposed subsidy levels for residential systems appear somewhat more reasonable, although the exact assumptions one makes concerning system installation costs, profit margins and such become quite important if one is to differentiate between, for example, an 8-10% return opportunity (perhaps reasonable) and a 15%-17% return opportunity (quite high). Again, I look forward to the DOER's data and calculations to understand their logic in more detail.

Note, though, that the assumed slow decline in solar install costs (as reflected in the slow decline in subsidy levels) essentially remains even when Forward Minting is disregarded.