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Via Email To:

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Re: Comments on June 7th 2013 DOER Presentation – Post-400MW Policy

0. Introduction

I write to provide my comments on the DOER's plans for the state's 'post-400MW' SREC program, as described at the DOER's June 7th stakeholder meeting.

I urge the DOER to reconsider its current plan to design the new program around SRECs. The SREC approach has shown itself to be substantially flawed in its current incarnation (the 400MW "SREC I" program). The fixes the DOER intends for the upcoming program ("SREC II") are incomplete and risky, with many potentially adverse and unexpected consequences possible.

The current 400MW program (SREC I) has experienced numerous challenges. Overly complex design, volatile SREC prices, and multiple DOER interventions to change the program rules in response to unexpected adverse developments have left few market participants feeling they have much understanding of how the SREC market will develop, and these factors have created a market-wide perception of SREC price risk that has led to heavy discounting of expected subsidy payments. This discounting has led to one of the worst flaws of the program for rate-payers: the wasted expense of as much as \$1B in higher-than-necessary subsidy commitments to get the 400MW of solar installation activity the program promises.

The contemplated new program design includes new features apparently intended to address specific issues that have troubled the current program. But these new features increase complexity and the possibility of unexpected adverse outcomes without removing the inherent flaws of the SREC market that lie at the core of the program. In my estimation the new program tries to 'design around' the flaws of the SREC program, creating a Rube Goldberg-like contraption of off-setting mechanisms that threatens to collapse of its own weight

I believe there are much simpler and more straightforward alternative program designs that are almost guaranteed to spend ratepayer funds more wisely, as well as create a more open, robust, and competitive solar installation market and reduce the bureaucratic drag that 'SREC risk management and trading' activity represents.

However here I'm focusing my comments on critiquing the proposed program design rather than proposing alternatives. I believe at this stage of the process and given the position the DOER has taken (which I read as strongly leaning towards implementing a 'tweaked' version of the current SREC-based program), highlighting the failed features of the current program that may carry over into the new one, and the potential flaws of the proposed new design features, is the best approach.

One of the most frustrating aspects of my own experience as an observer of and commenter on the state's SREC market has been the lack of openness and transparency in the manner in which the DOER designs, implements and makes changes to solar subsidy programs in the state. I believe that lack of openness has had numerous negative market impacts. These include contributing to poor market design, as well as increasing barriers to entry into the state's solar installation and financing market that has depressed competition and contributed to the inefficient market outcomes we see in substantial parts of the market today. I hope the DOER runs the SREC II program design process in a more open manner with substantial analytic detail and open communication with market participants.

My comments follow in two sections:

- 1) **SREC market flaws**
- 2) **Potential adverse impacts of new program features**

(Appendix 1 towards the end of this document describes some of the apparent new features of the new program based on the DOER's June 7th presentation)

1. SREC Market Flaws

The current SREC market (SREC I) implemented in Massachusetts has several features that appear likely to carry over as part of the DOER's proposed SREC II program:

- 1) Annual supply determined by the MWH generated by installed solar PV systems¹
- 2) Annual demand set by a formula designed to drive desired market behavior (e.g. including correction factors determined by previous year market outcomes)
- 3) A hard price cap (set by the ACP)

¹ Forward minting would add to this volume – see section 2.

- 4) A 'soft' price floor created by a clearinghouse auction at a fixed floor price

SREC Prices are Inherently Volatile

These features have created in SREC I a market that has displayed dramatic price swings, with SREC I prices going from near the ACP during a period of substantial undersupply to below the floor price as the market has swung to heavy oversupply.

Note that the compliance obligation formula in the current program has never succeeded in accurately driving the market towards a near-balanced condition, and no analyst that I am aware of who has studied the market expects more than one or two future years (before sunset) to achieve near-balance.

So to this point, and for the projected future, we have seen the SREC I market swing from substantial undersupply to oversupply (with an expected swing back again), and in response SREC prices have swung wildly from \$500+ to \$200, and (according to multiple analysts) are expected under current rules to swing back to \$400+ (near the ACP level) in a few years.

Is there some new feature of the SREC II program design that will mitigate this kind of SREC price volatility behavior or should we expect more of the same?

On the one hand the DOER has suggested they will use a 'managed volume' approach to better control volume growth, which could reduce the volume swings the compliance obligation formulas would have to control for. (Note, though, that the DOER's managed volume policy is projected to only cover roughly one-third of expected installation volume, which may be too little to actually manage volume growth – see comment section 2).

On the other hand new variables are being added to the supply/demand equation that will complicate the design of the compliance obligation formula – forward minting and SREC factors for example. The forward minting feature seems likely to have a particularly significant impact in early years of the program – see comment section 2 for a more detailed discussion.

Perhaps the DOER believes that the balance of the offsetting supply/demand volatility impacts of these new program features, combined with the DOER's experience from managing the SREC I program, means that they will be able to better design the compliance obligation formula to keep the market from continuously swinging from over- to under-supply (if this is even a goal). I look forward to hearing their explanation of this issue and seeing very detailed scenario testing to support it.

But even if they do come up with such a design, is a market near balance an improvement in terms of SREC price volatility? I.e. will SREC prices stabilize, with

fewer and/or less wide price swings from year to year, in an SREC market that remains near balance each year?

That is unclear, for several reasons. First, the market 'in principle' appears to have little elasticity – slight under- or over-balance could strongly swing prices towards ACP or floor extremes depending on the bidding strategies taken on by buyers and sellers². Furthermore, near balance, 'gaming the system' strategies become possible, where, for example, buyers might choose (in a slightly oversupplied market) to pay a small amount of ACP to drive the market into oversupply.

The closest analog we have to how the market might behave in a 'near balance' situation is to look at what the market expects SREC I prices to do during the sunset period – when the lack of installation activity and the form of the TCO formula mean the market will be near balance for years on end. The forward market currently prices SRECs during that period at substantially below the floor price (\$150-\$170 per SREC), apparently partly due to the uncertainty of near balance SREC price dynamics and the 'game-ability' of the system using various bidding strategies.

Again, if the DOER has reason to believe that (a) they will be able to design a compliance obligation formula that reliably keeps the market near balance, and (b) that SREC price dynamics near balance will be stable, then I look forward to hearing their arguments and seeing the results of their detailed analysis.

But absent that evidence from the DOER – and given the performance of prominent SREC programs around the country – wide SREC price swings from year-to-year seem likely³ without a wholesale rethinking of the SREC market structure which has yet to be proposed.

Rate-Payers Substantially Over-Pay when Volatility is Present

What does the market think of SREC price swings? The learnings from SREC I suggest that the market puts little value on SREC price swings above the floor. In fact, even the small but distinct possibility that multiple undersupply years in a row might occur and so (under the current floor price mechanism) lead to failed clearinghouse auctions and a failure of the floor has led to SREC forward prices at \$200 or lower in spite of the \$285/\$300 soft floor.

The program design problem here is the one evident in SREC I: when the market actually plays out, SREC price swings will lead to subsidy commitments from

² Part of the inelasticity comes from the difficulty for sellers of carrying credits over from one year to the next – in SREC I the only way to do so is to pass through the clearinghouse auction. So far no change to this policy has been described for SREC II.

³ Note one obvious pair of counterexamples – the market stuck in permanent over- or under-supply – is discussed in more detail below.

ratepayers that average somewhere between the floor and the ACP, but investors and financiers view SREC price volatility risk as unacceptable and place little or no value in it. Ratepayers end up paying substantially more for a given level of installation activity. In SREC I this reasoning suggests a subsidy overpayment of perhaps \$1B.

SREC Markets Don't Provide True Market Behavior to Offset the Volatility Costs

So all the evidence we have is that SREC price volatility is bad from a ratepayer cost point of view, and yet the program is being designed with a market mechanism that seems to have substantial price volatility built strongly into it. Is there some compensating benefit the SREC price volatility brings that offsets the costs?

In principle there should be: this is supposed to be a market, and price swings in a market are strong signals driving a feedback loop helping control the underlying behavior of buyers and sellers and hopefully driving the market towards a (relatively) stable and efficient equilibrium.

For this mechanism to work, there has to be a clear connection between price, supply, and demand. Before getting into whether the design of SREC markets supports such a connection even in principle, let's look at what has happened in practice: has the behavior of SREC supply and demand in SREC I reacted as expected to the SREC price swings we have seen?

The clear answer to that (at a surface level) is no: SREC prices have dropped dramatically, from \$500+ in 2010/11 to \$200-\$250 in 2012 (and with forward prices averaging well below \$200 for the remaining life of the program) and yet the volume of systems submitted to the program has simply exploded even as prices have declined.

The obvious explanation for this is that, even though SREC prices have dropped, they remain well above the break-even point for investors, and so installation rates continues to expand. That has been one clear, major issue with SREC I.

A further issue with SREC I is that the compliance obligation formula has had the impact of eventually driving the market out of constant oversupply in spite of continuing rapid expansion of installation activity above the desired rate (and the DOER has intervened as well to ensure this). This goes against all basic market logic. Why?

One reason appears to be the design of the floor price mechanism. Although SREC I oversupply should be the outlook for the foreseeable future because of the rapid installation rate increase, in practice that can't be allowed to occur because the floor mechanism would fail – successive years of oversupply eventually lead to no incentive for utilities to buy clearinghouse auctioned SRECs and a substantial

number of them would go unsold. Hence the design of the program – particularly the floor mechanism – blocks the program from remaining in constant oversupply even if the supply/demand/price dynamics would suggest that that should be the case⁴. TCO correction factors are designed to bring the market back toward equilibrium, and if they fail the DOER appears ready to step in to drive the market out of oversupply and ensure auction failure is at best rare.

(Note that the market could in principle sustain continuous undersupply – with SREC prices remaining near the ACP. But with ACP levels set as high as they have been in SREC I, and with the proposed values for SREC II in excess of \$300, there appears no way that installation activity wouldn't grow to drive the market into oversupply unless some other constraint kept this from happening. Such a program design would make no sense except as a very convoluted way to pay out the ACP essentially as a Feed-in-Tariff.)

So we have a market where price, supply, and demand do not, both in practice and partly by design, behave in a market-like way. This is in part due both to the floor price being set too high, and because the design of the floor price mechanism appears to preclude ongoing oversupply in the market over multiple years.

[Note: if the DOER believes that SREC market supply, demand and price dynamics will behave in a valuable, market-like way in a future SREC II program, then by all means I look forward to seeing the detailed analysis. The cursory analysis of this effect done in putting forward the current SREC I program (based on DOER presentations made public in 2009 and 2010 and available on the DOER web site) suggest little thought was put into this. As best I can tell the extent of the logic put into the SREC I program design as it pertains to whether the designed program would actually perform like a market was “it's got supply, its got demand, therefore it surely will behave like a market!” Clearly though, that hasn't been the case.]

Investors Want Floor Price Set at Break-Even

Could we try to adjust at least the first part of the problem – setting the floor substantially lower, below the break-even point for systems, so that SREC prices could swing from year-to-year both above and below the break-even point (rather than get pegged at the floor with ever increasing installation rate pressure)?

⁴ The DOER could (if they wanted) let the SREC market remain oversupplied for multiple years (more than two) and so put many SRECs at risk of never being sold, and call that a standard 'feature' of the program, but both by their communication and by their action (the recent intervention to raise the 2013 TCO) they have communicated at least indirectly to the market that a clearinghouse auction failure is not expected and will be a rare occurrence (if it will be allowed to occur at all). If the DOER intends a different policy in SREC II they should say so; the challenges this would represent with respect to forward minting are discussed in comment section 3.

From one perspective, yes – investors could view their effective SREC price as an average over the 10-year opt-in window, with yearly fluctuations hopefully averaging to an acceptable value. The challenge here is that as described above, market participants have so far shown little willingness to value SREC price fluctuations above the floor – they view the floor price (or below) as the reliable price they can finance with and presumably would push very hard against the idea of a floor price set at or below their break-even price given this outlook. Yet this almost guarantees over-payment by ratepayers.

The investor perspective does have some underlying logic – solar installations are typically a debt-heavy investment, and so typically require fairly stable cash flows to ensure debt interest payment coverage. If in some years SREC prices may dip below interest payment coverage and so trigger substantial default risk, then of course this is a very large risk for the investor to accept.

Note one way to substantially reduce SREC price volatility in an SREC market is to put the floor and ACP prices close together, so that the dynamic range is fairly low (and design a floor mechanism that has little chance of failure so the market does not price in substantial floor failure risk.) The DOER could take this approach, but the ACP prices they have quoted (in excess of \$300 throughout the program) seem far too high to be near the average payout they intend the program to have. As well, such a tight window essentially removes the ‘price discovery’ benefit that an SREC market is supposed to have.

In Summary:

- The DOER seems insistent on putting an SREC program at the heart of its new solar subsidy program.
- SREC markets are heavily prone to dramatic SREC price swings based on all available evidence, and the DOER has provided no new ideas that suggest their new market design will mitigate this problem (if it is possible outside of a narrow ACP/floor window).
- While SREC price swings add substantial volatility to the market, they do not appear to add any true ‘market-like’ behavioral benefit, at least in the current SREC I design that appears likely to be carried over to SREC II.
- Market participants will push for a floor price at or above their expected breakeven, given the debt-heavy nature of a solar installation investment, and will put little value on the upside of SREC price swings above the floor
- Ratepayers will then end up paying the actual average SREC price – likely well above the floor – while getting only an amount of installation activity that could likely be motivated by a flat subsidy payment equivalent to an SREC price fixed near the floor.

If the DOER does believe they will be able to set floor prices low enough to give true market dynamics a better chance of occurring (and that participants won’t push back on due to financing challenges), then this would be an interesting development.

I would estimate, given the fairly high ACP level that has been proposed (\$300+) that a floor price of \$50-\$100 might lead to an average payout in the \$150 to \$250 range over the life of the program, which based on my rough calculations would still be perhaps too generous a subsidy level (even accounting for a 0.7-0.8 initial SREC Factor as illustratively shown in the DOER June 7th documents for large systems).⁵ Nevertheless even in this situation I believe all available data suggests the SREC program will drive substantial volatility that the market will heavily discount, leading to program uncertainty and poor return on ratepayer subsidy payments.

The Pointlessness and Costs of the Sunset Period

The bulk of the above comments focus on the market dynamics during the installation period, although many of the comments hold into the sunset period as well.

Focusing specifically on the sunset period, there are additional issues with the SREC market as implemented in Massachusetts. Specifically, SREC price dynamics during the sunset period – at least as implemented in SREC I – are not tied to the installation rate behavior the market shows during the installation period. This means that, regardless of whether the market ends up over- or under-supplied during the installation period (when a price signal might have a useful market effect), the SREC prices that occur in the sunset period are truly useless as a market signal.

I described this in an earlier comment and will not go into the issue further here, except to clear up one potential misconception. It is true that, sitting in the installation period, if one were to project forward and expect SREC prices during the sunset period to be higher or lower based on what happens in the market during the installation period, then sunset prices might provide some valuable market-guiding benefit.

But because as currently implemented the SREC price variation in the sunset period has no real tie to what happens during the installation period, the SREC market during this period is, as I described in an earlier comment, a ‘faux’ market as much akin to gambling in Las Vegas as anything else. It provides no economic benefit and yet substantial costs, both due to the volatility that investors discount but ratepayers must pay for, and due to the decade-long administrative costs of the program, costs born both by government administrators and by market participants who end up paying for a whole range of SREC risk management and trading services

⁵ The continuing progress of the Calter bill, even if intended only to cover SREC I, suggests market participants are eyeing a floor price a factor of two higher than it probably should be for an SREC market to have any chance of providing true, market-like dynamics.

(either directly or indirectly) that serve no useful purpose in the larger workings of the market.

2. Potential Adverse Impacts of New Program Features

Although the DOER is proposing to put an SREC market with very similar characteristics to SREC I at the heart of the new solar subsidy program, they are also proposing substantial new features. Here I want to comment on some of the implications of those new features.

[Appendix I provides a brief description of some of the features based on the data the DOER provided in their June 7th presentation.]

At a high level, one initial comment. The DOER is suggesting a number of complicating new features – the SREC factor, managed growth, and forward minting among them. These features will substantially increase the complexity of the program. Although the DOER has repeatedly described this increase in complexity as ‘just math’, in fact I fear that the additional complexity will make the market even harder to model than SREC I, and potentially lead to new adverse consequences that will negatively impact the market, cost rate-payers large sums of money, and/or require ongoing unexpected DOER intervention that will continue to sap the confidence of market participants and hence the effectiveness of the market.

If the DOER believes otherwise I look forward again to seeing both their very detailed scenario testing to demonstrate the robustness of their market design, and as well how they plan to effectively communicate the details of this more complex market to a stakeholder group that has been overwhelmed by the complexity of the current, less complex market.

I look forward to seeing the DOER’s more detailed explanations for the new features as they begin to further flesh out the market design.

One quick comment about the SREC factor – this is a major new element to the program with an important function for ratepayers: controlling ratepayer costs. Getting it to work, however, depends on the DOER setting up a mechanism that accurately takes into account solar installation cost declines over time. As I understand the proposal right now, the DOER intends for the to be formula-driven. I look forward to seeing the details; my initial reaction is concern that a good formula can be developed that will account for such a hard-to-predict market uncertainty over most of a decade.

In the remainder of this section are preliminary comments on some of the details the DOER has provided around the (1) forward minting and (2) managed growth features being contemplated for the new program.

Forward Minting

Forward minting appears to refer to the ability of small (primarily residential) systems to receive all of the credits they are expected to generate over their ten year opt-in term up front (presumably discounted by some amount for time-value). This feature is designed to allow, for example, homeowners to better finance their rooftop installations by allowing them to receive the subsidy payment soon after installation, not spread over ten years.

As described in Appendix I the DOER appears to be thinking that forward minting may represent perhaps 15% of the installation capacity each year.

This sounds like an interesting idea, but it appears to have a number of complex, possibly worrisome, side effects.

Particularly in the early years of the program, much of the SREC volume for sale in each year would potentially come from forward minting. Consider a rough calculation for 2014: the DOER expects roughly 145MW to be installed under the new program in that year, and we can estimate that about 22MW of that will be forward minted (all of these estimates are drawn from the DOER's presentation as described in Appendix I).

The 22MW forward-minted would have generated 250K SRECs over their ten year opt-in period⁶; assume a time-value discount of 50% is applied⁷ so that instead they are given 125K of forward-minted in SRECs to sell over an accelerated period (presumably in the year their system is installed; this is what the DOER presentation seems to suggest).

The 123MW of non-forward minted systems would generate roughly 70K SRECs in the year⁸, a relatively low amount since this is the first year of the program.

Hence in 2014, under these assumptions 195K SRECs would be for sale, roughly two-thirds from homeowners (or other small system owners) who represent 15% of the market by MW, and one-third from the other 85% of the market. This ratio

⁶ Assume 1138 MWH per MW per year and a 10 year term; $22 \times 1138 \times 10 = 250K$

⁷ A 50% discount over ten years corresponds to roughly a 15-20% annual discount rate. Although this sounds high as a value of money discount factor, declining ACP levels and other market risk factors may make it appropriate. In any case I have chosen to use a conservative figure in terms of estimating the share of SRECs for sale that come from forward minting in the early years of the program.

⁸ Assume 1138 MWH per MW per year, and that systems are installed evenly through the year (and hence generate power for, on average, half a year). Then $123MW \times 1138 \text{ MWH per MW} \times 0.5 \text{ average portion of year active} = 70K \text{ SRECs}$

would shift in favor of the non-forward minting portion of the market as subsequent years of the program roll through.

Why might this be a problem?:

First, from the perspective of the forward-minters: they are selling their entire subsidy stake in one year, in a program that will likely have wide year-to-year SREC price swings. What if they happen to install their system and receive their forward-minting allotment in a year when SREC prices are down? And their neighbors receive them in a year when SREC prices are high? Neighbors might receive a 2X difference in subsidy payment purely due to timing.

And what if the year is so oversupplied that the clearinghouse auction fails? Will some homeowners actually be allowed to see their entire subsidy allotment fall through a failed auction, given the protests that have occurred when the possibility of even a single year auction failing (2012) has been discussed as a possibility? Or – is the DOER going to explicitly ensure (as some suggest they have implicitly ensured) that auctions can't fail, in which case we have a hard floor price in all but name?

Or perhaps forward minters will be given a year or two of flexibility in when they can exercise their forward minting rights, or when they sell their forward-minted credits? This has at least three problems: first, it somewhat defeats the intended purpose of the new feature to give homeowners rapid access to subsidy payments; second, it throws homeowners into making perhaps \$10-\$20K personal finance decisions in a market most will not be equipped to understand (perhaps paying an expert to advise them – yet more program design-induced waste); and third, it adds a huge amount of uncertainty to overall SREC market dynamics which all other participants will have to bear.

From the perspective of everyone else in the market (the non-forward minters), they may see a market whose dynamics are dominated in early years by relatively unsophisticated forward minters who make up only a small percentage of the market in terms of capacity but dominate SREC trading in early years and whose behavior may be hard to predict. Will this cause substantial uncertainty and volatility? Who knows – it depends on the rules.

And that's the problem – implementing this provision apparently is either going to require a smaller set of rules but heavy risk born by homeowners, or a much more complicated set of rules to protect homeowners from the volatility of the market but then likely substantial market and regulatory uncertainty born by the rest of the market. In any case even the basic set of rules required to implement this is likely to add substantial uncertainty to the market.

Or perhaps the DOER will design and manage the market to keep both groups happy by trying to ensure the early years of the program are undersupplied and SREC

prices are high – then only the ratepayers will pay, to the tune of tens or hundred of millions of dollars.

Whether the DOER feels they can theoretically design a set of rules around all of these issues or not is only part of the question – just the fact that this new, untested wrinkle is being added to a system that has already experienced multiple adverse unexpected effects due to complexity represents a big new risk if the DOER continues down this path.

Managed Volume

Briefly, on managed volume: the DOER has described a policy by which, for a certain segment of solar installs, they will directly intervene in the market to control installation volumes annually. This appears to be a critical new feature as it is one of the main ones by which the DOER intends to reduce annual installation growth rates from the 100%+ the market has experienced for several years down to the roughly 10% the DOER would like to see going forward.

Without more detail it is hard to comment specifically about how this might work. One clear outstanding issue, though, appears to be the fact that the DOER expects the portion of the market to be affected by the managed growth policy to represent about one-third of installs (based on my reading of page 26 of their presentation), with the other two-thirds of the market growing without such a policy and hence only controlled by perhaps declining SREC prices.

If my reading is correct, this suggests a significant issue.

What if the unmanaged two-thirds portion of the market grows at 20%-30%? Then there is little or no room for any growth in the managed portion. What if the unmanaged portion grows at 50%-70%? Then there is little or no room for any installation activity at all in the managed portion of the market.

Directly managing growth on only 1/3 of the market, and targeting an overall industry growth rate an order of magnitude lower than the market has been experience for years, seems unlikely to work. This means the only other control mechanism on growth will be SREC prices, and as we have seen that mechanism has failed spectacularly in this regard during SREC I. The risk here is a repeat of the SREC I experience – too rapid growth, a compliance obligation unable to handle it, the market entering a period of oversupply, SREC prices crashing, the DOER being pressured to intervene, and the need for yet another solar subsidy program years early because the current one was exhausted much more quickly than expected.

Appendix I – Discussion of the Apparent New Features of the New Program

The DOER released a description of the latest version of the contemplated new SREC program (SREC II) in a June 7th stakeholder meeting. A number of new program features were described. Here I focus on some of the details of the DOER's presentation (particularly page 26 of the DOER's June 7th presentation document). Studying this material in detail provides further insight into the DOER's current thinking about the design of the new program as described below.

[Throughout what follows, the numbers used in this analysis are derived either from estimating by eye bar sizes or point positions on the DOER's page 26 chart, or from calculations with those figures. Hence the figures here are rough estimates. Furthermore, note that the DOER has clearly stated that their analysis at this point is preliminary and the numbers they have presented are only illustrative. Nevertheless, detailed analysis provides substantial insight into the DOER's thinking as I outline below.]

The bar chart on the DOER's page 26 shows the cumulative solar capacity installed under the program growing from roughly 145MW in 2014 to the program cap of 1200MW in 2020. Black points on the chart appear to show each year's 'targeted compliance obligation', which peaks in 2020 at roughly 780K SRECs and then gradually declines, reaching zero in 2031.

Apparent Features of the New Program:

- 1) **An installation period spanning 7 years and a sunset phase spanning 10 years:** Following standard terminology, the program divides into an 'installation' phase for 2014-2020 when the 1200MW are installed, and a sunset phase 2021-2030 when installation is finished but the SREC market continues until all opt-in periods have expired.
- 2) **Forward minting for roughly 15% of installed capacity:** The DOER expects installations that qualify for forward minting to represent roughly 180MW (15%) of the 1200MW cap (averaging ~25MW per year).
- 3) **Forward minting will be the dominant contribution to the volume of SRECs for sale particularly in early program years:** The decline in the compliance obligation from 2020 to 2021 (just as the market enters sunset) of roughly 100K SRECs appears to be due largely to the end of forward minting effects and is one measure of their impact. In 2020, this logic suggests 10%-15% of SRECs for sale might be from forward minting. Playing this logic backwards, in early years of the program forward-minted SRECs could represent two-thirds or more of the SRECs for sale in a given year (more on this in comment section 2).
- 4) **Managed Growth Provisions cover roughly 1/3 of the installation volume:** The portion of installed capacity the DOER expects to be subject to 'managed growth' controls is roughly 380MW, or 32% (i.e. about one-third of installed capacity)

- 5) **An average SREC factor of ~0.58 over the life of the program:** We can use the 2021 targeted compliance obligation (roughly 675K SRECs; we use this instead of 2020 to eliminate forward minting effects) to estimate the 'average' SREC factor the program might have under the DOER's current thinking: a rough calculation⁹ suggests ~0.58. This suggests the program will lead to the generation of roughly 8MM SRECs¹⁰ during its course, with an overall subsidy payout of perhaps \$0.8-\$1.6B assuming SREC II prices average somewhere in the \$100 to \$200 range. (Note this excludes the value of REC credits awarded to these systems.)
- 6) **A new approach to the compliance obligation in the sunset period:** The declining targeted compliance obligation the DOER shows during the 2024-2030 period indicates that the DOER currently intends to take a very different approach to setting SREC demand during the sunset period than under the current 400MW (SREC I) program. Under the current program (SREC I) the sunset-period compliance obligation is set at a cap of roughly 455,520 and only declines as installed systems gradually lose efficiency. Systems in the SREC I program which lose opt-in eligibility nevertheless still generate SRECs and the compliance obligation in sunset period years is intended to take their SRECs into account; most of these opt-in unqualified SRECs likely will be sold in the SREC I market each year. In the contemplated new program (SREC II) it appears that the compliance obligation will be ratcheted downward as opt-in periods expire. Presumably an additional feature of the new program is that, post opt-in expiration, systems in SREC II will no longer be able to sell opt-in expired SRECs.

⁹ By 2021, 1200MW will be installed, roughly 180MW of which will have been subject to forward minting. Hence, in 2021 the SREC market will come from ~1020MW of SREC generating capacity, and the DOER's proposed target compliance obligation is roughly 675K SRECs. Assuming 1020MW would generate (at a 13% capacity factor, or 1,138MWH per year per MW) 1.16 million MWH but only ~675K SRECs in 2021, this suggests an average SREC factor over the program of $(0.675/1.16) = \sim 0.58$. Note that residential systems have been described by the DOER as likely to have higher than average SREC factors and this calculation excludes their impact on the average. Also note that this is an average over the entire installation phase; systems installed in early years will on average (across system types) have higher factors and systems installed in later years will have substantially lower factors.

¹⁰ $1200\text{MW} * 1138 \text{ MWH per year} * 10 \text{ years} * 0.58 \text{ SREC per MWH} = \sim 8\text{MM SRECs}$