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*Via Email To:*

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*Re: Comments – Post-400MW Policy*

## **I. Introduction**

I write to provide my comments on the DOER's plans for the state's 'post-400MW' future – the design of the solar subsidy program that will follow the current 'Solar Carve-Out' (SCO) that started in 2010 and is described in 225 CMR 14.07

With more than 200MW of solar panel capacity installed to date (of the SCO's 400MW cap), and with annualized panel installation activity running well above 100MW per year and possibly accelerating, the state appears to have roughly one to two years to complete the process of designing and implementing the new program.

The current SCO subsidy program has been a major contributor to the explosive growth of solar panel installations in the state since the program was put in place roughly three years ago. By promising roughly \$1.5B in subsidies, the program has driven the state's cumulative solar panel capacity up at least ten-fold since early 2010 (17MW to more than 200MW), and the state's solar installation business activity has grown from roughly \$50M per year to more than \$300M (annual revenue) over the same period.

But in two important ways the current program is only a small first step. First, the state's \$1.5B subsidy commitment is supporting roughly 400MW of solar capacity installation overall, which in a typical year will satisfy about 0.9% of the state's electricity consumption. That is, the current subsidy commitment will make only a small contribution to the state's efforts to develop a more sustainable energy generation infrastructure base.

Second, the solar industry remains far from viable without substantial further subsidies even today, after years of rapidly declining solar installation costs. As an example, consider that larger solar panel installations in the state (e.g. greater than 500 kW in size) typically sell the electricity they generate for roughly \$0.05-\$0.10

per kWh generated. The state's current SCO program today provides roughly \$0.30 in subsidy for every kWh generated during the first ten years the plant operates. This subsidy level corresponds to 3X to 6X the market value of the electricity generated. Adding in the 30% federal tax credit (and accelerated depreciation benefits), the market value of the electricity generated from a solar panel installation in Massachusetts often generates less than 20% of the return from a solar panel installation investment. Even at the smaller subsidy levels I discuss below that are a better reflection of the state of the industry today, subsidies would continue to make up the bulk of the economic return on a solar panel installation investment.

So we are only a small way towards building out solar as a substantial contributor to the state's energy infrastructure, and we appear to still be years away from the state's solar industry being able to operate without significant subsidies.

The successor to the current SCO program needs to address both of these challenges. With efficient use of rate payer funds as a central goal, the DOER should seek to design a successor program that both subsidizes further solar infrastructure construction in the state as cheaply as possible, and one that intelligently supports and guides continued development of the state's solar installation industry towards subsidy-free profitability.

I am writing because I believe the DOER is making a substantial error in framing the current SCO subsidy program as largely a success, and in considering the current program as a solid potential base on which to build the next one. I believe the current program is substantially flawed in its design and has failed in important ways that have wasted hundreds of millions of dollars of state utility rate-payer funds.

In what follows I lay out my evaluation of the success of the current SCO program, highlighting the failures I believe the DOER has not explicitly acknowledged. I then make my own recommendations for what I believe are important features the state's next solar subsidy program should have.

## **II. Evaluation of the Current Solar Carve-Out Program**

The Solar Carve-Out program described in 225 CMR 14.07 and implemented in 2010 sets up a market framework to price and distribute solar subsidy payments from retail electricity suppliers operating in the state to solar panel installation owners.

The program creates a market by, first, requiring retail electricity suppliers to buy a certain amount of 'solar renewable energy certificates' (SRECs) each year; and second, awarding to solar panel installation owners one SREC per MWh of electricity their panels produce. Retail electricity suppliers buy SRECs from solar power plant

owners to satisfy their annual requirement set out by the rules of the regulation, or pay a penalty (an 'alternative compliance payment' or ACP) for each required SREC they fail to buy.

When the supply of SRECs generated by qualified solar installations exceeds the demand (i.e. the retail electricity supplier annual required SREC purchase volume), SRECs will be in oversupply, SREC prices will be low, and so the effective subsidy payment to solar panel installation owners will be low. Conversely if qualified solar panels in the state generate less electricity in a year than mandated by the state regulations, SRECs will be undersupplied, SREC prices will be high, and the effective subsidy payment will be high.

The program has several important features designed to make it run effectively:

- Rules that set the 'minimum standard' amount of SRECs each year that retail electricity suppliers must purchase – the annual SREC demand
- At the heart of those rules, a 'total compliance obligation' (TCO) formula that is designed to push solar panel installation market growth towards ~30% per year as well as correct for major SREC credit imbalances year-to-year
- A 'floor price mechanism' designed to keep SREC prices above \$300 per SREC
- An 'opt-in' term that initially gives solar panel installation owners 10 years of full participation of the program but that gradually decreases if SREC generation substantially exceeds SREC demand each year
- A cumulative program cap that ends entrance into the program once 400MW of cumulative solar panel capacity has been installed

I see the following problems with the current program.

***The SCO fails as a market mechanism and is far too generous with rate-payer funds***

One of the critical functions of the SREC market – if not the critical function – is price discovery: to serve as a mechanism to determine the optimal subsidy level (e.g. SREC price) to pay for the desired solar installation activity the state has decided to incent, where optimal generally means 'cheapest' (see below for further discussion of this complicated issue).

Current data suggests that the program is failing badly in this regard.

The bulk of solar installations being built in the state appear to be being financed under terms which assume a future SREC value of \$130-\$180 per SREC. This is supported both by reports from SREC brokers (e.g. Amerex) as well as from discussions with solar project developers who have stated that due to heavy uncertainty about future SREC prices among lenders and investors the financing terms under which they can build projects require them to assume roughly a \$150 per SREC future value.

This SREC price outlook is down dramatically (as much as 50% lower) from where a similar outlook was 18 months ago. Nevertheless, even as the SREC price outlook has dropped dramatically, installation activity has continued to accelerate in the state, growing as much as 100% over the last year. This is the critical point: in spite of widespread industry sentiment that SRECs will only be worth roughly half of the \$300 floor value the DOER has set, solar panel installation activity has dramatically exceeded DOER projections, has been growing at three times the rate the DOER projected, and is expected to hit the program cap years early.

I contend that with a better-designed program rate-payers could have gotten the same amount of solar installation activity for hundreds of millions of dollars less (perhaps close to a billion dollars less) in subsidy.

Critical to understanding this situation is understanding that, under current program rules, rate-payers will likely pay out an average in excess of \$300 per opt-in-qualified SREC over the course of the program. This is almost certainly true (under the current rules) for the years 2010 through 2017, where careful modeling of the SREC market demonstrates that four years (2010, 2011, 2016, 2017) have been or likely will be undersupplied and have high SREC prices (and in addition ACP payments), while in three of the other four years in this period (2013, 2014, and 2015) if the market is oversupplied there will be strong incentives for retail electricity suppliers to fully participate the clearinghouse auction process that forms the basis of the \$300 SREC price floor (or credits from a failed auction will live long enough to be sold into an undersupplied market). The year 2012 is the exception, but even a complete floor failure in this year would keep average SREC prices over the first eight years of the program at or above \$300 under current rules. (I discuss the post-2017 'sunset' period in more detail below).

Why is market sentiment so pessimistic about future SREC prices (valuing them at \$150 per SREC) if an actual payout averaging above \$300 is likely (under current rules)? Multiple reasons:

- Volatility: The DOER-designed SREC market is showing extremely volatile SREC pricing. As in most markets volatility leads to heavy discounts on value
- Near-term downward surprise: Because the solar panel installation market is growing so much more quickly than the DOER expected, expectations the DOER set about market behavior are failing. For instance, failure of the 2012 clearinghouse auction being a distinct possibility has come as a shock to many state-wide solar panel installation owners, including some number of state homeowners who will be hurt if it occurs. This is creating pessimism about the future of the market
- Complex rules and the likelihood of perverse future market behavior: Determining the outlook for SREC prices requires detailed modeling of industry growth rates in combination with the complex market rules set by the DOER. These rules are going to drive perverse SREC market behavior under the current unexpected conditions – for instance in spite of solar installation growing much more quickly than expected, SREC prices in 2016

and possibly 2017 will likely be very high under current rules because of the odd way the TCO market imbalance correction terms work. Market participants are skeptical of the value of such calculation-heavy and unexpected results.

- Negative DOER intervention, risk of rule change: Market participants fear that the DOER may intervene to change program rules – the DOER is already in the process of making one set of changes and has announced the possibility of further changes in conjunction with the implementation of the current SCO's successor.

More on this last point: the DOER seems to realize that the current SCO program is under heavy pressure and announced a potential rule change to relieve some of the current SREC oversupply. The impact of that change will be complex and not necessarily positive overall on average SREC prices, although the DOER has generally portrayed it (with too much certainty, in my opinion) as a positive for solar panel installation owners. In addition to that change, however, the DOER slipped in a substantially more impactful change to the rules about how the program ends which will have a substantial negative impact on average SREC prices. Fear of future changes of this sort increases skepticism about the market and cause participants to heavily discount the value of promised subsidy payments.

Rate-payers are implicitly being left with two bad options: follow the rules and pay much higher subsidies than the market really needs, or change the rules of the program, breaking the original commitment and hurting not just large developers but also homeowners who have been led to believe they will get at least \$300 per SREC for systems they invested tens of thousands of dollars in.

Note that the beneficiaries of the likely \$300+ SREC average payout may include a large number of investors and speculators rather than developers.

As a final point: the issue here in the design of the program is not just that the floor was set too high (and/or the floor mechanism was made too firm). Even were the floor set lower, poor forecasting by the DOER and perverse behavior driven by the complex TCO rules is driving four of the first eight years of the program into undersupply (and so high SREC prices) in spite of the fact that overall solar installation activity in the state is dramatically higher than the DOER planned for. The rules even beyond the floor are simply not working as designed.

Based on my calculations a program designed to pay out roughly \$390 per opt-in-qualified SREC if the market grew at the projected 30% per year will actually end up paying roughly \$350 per SREC on average, only 10% lower, in spite of dramatically faster growth. The correct subsidy level would have been closer to \$150 per SREC for the bulk of the solar installations to date, and perhaps dropping to \$125 per SREC or lower over the next one to two years. This would have saved rate-payers as much as one billion dollars in promised subsidy payments.

(The 2-year drop in the opt-in term expected in July of this year will have only a mild downward effect on SREC payouts as (a) the final years of the program in the sunset period are already substantially discounted for risk by market participants, and (b) removing the last two years of a ten year payout obviously has a 20% impact on total payout undiscounted, but only a 5-10% impact when the time value of money is accounted for, and SREC streams need something like a 50% reduction in value to reach reasonable levels.)

***The SCO has a pointlessly complex and volatile sunset period***

The period after the program cap is reached – once 400MW of solar panel capacity has been installed under the program – has been called the ‘sunset period’ of the program. Here I use the term sunset to refer to program years 2018 and later – although the cap will likely be reached in 2014 or 2015, the years 2016 and 2017 may still be affected by TCO correction terms that will make their annual SREC markets behave differently than other sunset year markets. The overall program end appears likely to occur in 2023, so I use ‘sunset period’ to refer to the years 2018-2023.

What happens during this six year sunset period? There is officially an SREC market – panels installed under the 400MW cap are awarded SRECs and retail electricity suppliers are required to buy a certain amount every year in a complex process requiring substantial bureaucratic resources.

But notice that the outcome of this market has zero bearing on any actual real-world economic decisions: the plants are already built and operating, retail electricity suppliers have an SREC purchase requirement set by rule, and whether SREC prices are high or low depends on the vagaries of weather and small changes in state electricity demand. The actual investment decisions have all already been made and the outcome of these yearly ‘markets’ won’t change the actions participants take in the real world.

A critical issue here is that the marginal cost of electricity from a solar power plant is low – much lower than the subsidy, generally lower than the actual value of the electricity generated. (In fact, most solar power plant operators have uncertain and wildly varying estimates of how much it will cost to maintain and operate their plants – perhaps 2 or 4 cents per kWh – partly because that figure is relatively inconsequential to important decisions like whether to continue operating – they will continue almost no matter what.)

A plant once built will continue to produce independent of whether the subsidy is even paid.

Hence the sunset ‘market’ is really just a game – an expensive, uncertain, and bureaucratically expensive faux-market in which the players are forced to participate for years to determine how much they will actually get paid or have to

pay for economic decisions made years earlier. This is uncertainty that rate-payers have to pay for: they risk paying (and will likely pay) a much higher average SREC payment during this period than market participants are willing to value as they make their solar panel installation investment and building plans in the early years of the program.

Note that solar's low marginal costs differentiate it from some other renewable technologies sometimes subsidized in REC markets – for instance biomass plants. Plants which require fuel and so have substantial operating costs (e.g. substantial marginal costs) and a wide range of effective utilization rates may turn on/off and so can participate effectively in a true market post installation.

The program cap is partly responsible for this situation: by setting out the specific total amount of solar capacity that will be operating under the program in the sunset period, and by switching to a simpler steady-state version of the TCO formula, the SREC supply uncertainty and complex TCO-driven behavior that dominated SREC market dynamics in early years of the program is largely removed.

Although the spread between the ACP and the clearinghouse floor will have decreased substantially by the time the sunset period begins, because the floor is not seen as firm or reliable particularly in the sunset period, the market's view of the potential range of SREC price swings during the sunset period is much wider than the \$300 floor to the roughly \$350 to \$400 ACP level that will hold during at that time – analysts have reported projected sunset period prices as low as \$150 under current rules and market sentiment as reflected in forward contract prices and typical project financing terms are similar. Hence the potential SREC price volatility the market sees for the sunset period is quite high.

Notice again that the price swings in the sunset period are not driven by the installation rate that occurred during the pre-sunset period: the SREC price volatility in the sunset period does not in any way provide an incentive correlated to pre-sunset installation activity trends.

To summarize: for nearly half of the life of the program, the so-called SREC 'market' serves little economic purpose, adds huge uncertainty to the critical investment decision (what the ultimate payout will be) – uncertainty which costs rate payers money as market participants discount the likely payout due to volatility– and requires substantial bureaucratic resources to operate. Further, the presentation that this is a 'market' with all the economic benefit that implies is misleading. Mischaracterization of this sort can lead to frustration and fatigue among a public that has goodwill towards investing in and subsidizing new technologies but does not react well when seeing stories of 'markets' that provide little market benefit.

### ***SCO prices are too volatile, which drives up investment costs***

As described above, expectations in SREC price volatility have caused market participants to severely discount the value of promised subsidy payments. What I've referred to loosely above as SREC price volatility can be roughly divided into two types: year-to-year price volatility, and overall average volatility (e.g. outcome volatility).

Over the first eight years of the program (if the current rules hold) there is, perversely, little actual outcome volatility: as described above, in spite of the program being designed to correct for very rapid (or very slow) growth with lower (or higher) subsidy levels, in practice this design has not been effective and the average SREC payout under current rules would be roughly \$390 per SREC if the DOER's projected growth had been followed and \$350 under the current path where installation growth has been much more rapid than expected. This isn't terribly volatile. I've highlighted that the rules actually drive too small a range of SREC payouts in response to potential market growth trends in the first part of the program (and, in contrast, there is much more SREC price outcome uncertainty during the sunset period in spite of the fact that this is too late in the program to provide any economically useful incentive.)

Year-to-year volatility has been occurring though, and that is what has been affecting market participants. SREC prices in 2010 and 2011 were well above \$500 but have dropped to \$200 in 2012; they may jump to \$300 or even \$450 in the next few years (through 2017). And in the sunset period analysts suggest prices anywhere from \$100 to \$400 are possible.

This year-to-year volatility is not due solely to any specific feature unique to the Massachusetts SREC program, but seems to be a part of all SREC programs. Partly one can attribute this to inelasticity in the market – demand is fixed with limited variation with SREC price in any year, so if supply ends up just slightly over or under demand there can be wide price swings. This would happen even in a market growing near the DOER's original 30% projections.

The potential for wide price swings, particularly in a market with complex rules where the long-term outlook is hard to determine and where government intervention is always a possibility, drives market participants to again discount the average future outcome in favor of something closer to the lowest relatively certain payment the market will provide.

Hence the inherent year-to-year volatility in SREC pricing is a significant negative factor in considering the suitability and effectiveness of SREC markets as the basis for solar subsidy markets. Careful consideration and design of rules by which SRECs can be used across multiple years may be effective in reducing inelastic behavior and so year-to-year price volatility. It may be the case, though, that the Massachusetts program's use of a 'hard-stop' clearinghouse auction forcing all



credits to sell in a year (or face a failed auction and not sell) provides on the one hand a floor mechanism but on the other hand more challenging inelasticity behavior.

***The SCO is not charting a clear path towards market sustainability – what is the state trying to accomplish?***

As described above the SCO sets out a subsidy level (averaging roughly \$350-\$390 per SREC during the first 8 years and then more uncertain during the following sunset period) roughly corresponding to a \$1.5B subsidy commitment over the life of the program, and in return has gotten significantly more rapid expansion of solar installation activity than expected. Ignoring the fact that the subsidy price paid per MW was much higher than needed, is the fact that the solar industry has expanded more quickly a good thing?

In one obvious sense it is not: the state has invested in solar infrastructure at a time when prices are still high relative to where they will be in a few years. And the state now finds itself with a larger than expected solar installation industry which still needs substantial subsidy support and so must have the successor to the current SCO subsidy program put in place years earlier than expected.

On the other hand, the rapid expansion of solar installation activity may have driven faster solar installation price declines in the state (although much of the measured decline (perhaps as much as \$2 per watt) has come from panel and equipment cost declines that would have happened anyway.) This issue should receive close analysis – perhaps by the DOER. The central question: are the state's subsidy programs helping drive down state-specific installation costs (excluding cost declines in things like equipment that are not affected by activities in the state)? If there is clear evidence this is occurring at a rapid rate (my cursory analysis shows a only a mild state-specific effect) then a more rapid approach to expanding the solar industry in the state may make sense.

(Note that the rapid expansion of solar installation activity that has occurred (100%+ growth in some years vs. the DOER's projected 30% annual rate) has had two additional, offsetting effects not discussed in detail elsewhere in this memo. First, the total annual subsidy payment each year has grown much more quickly than expected due to faster installation and more SREC generated, and during a period when ACP levels are high. During the course of the first eight years of the program I estimate cumulative subsidy payments will be more than \$200M more than they would have had installation activity exactly matched the DOER's projections. On the other hand, due to decreasing opt-in terms and a shorter sunset period, the number of SRECs purchased under the program – both opt-in qualified and not – will be substantially smaller due to the more rapid expansion of the program. In undiscounted terms, I estimate the overall subsidy level of the actual

program will be roughly \$1.5M (heavily front-loaded in the first eight years) while under the 'ideal' scenarios implicit in the program's 30% growth formulas the undiscounted figure would be closer to \$1.65M. Taking into account the time value of money at a 6% annual rate, and the costs are comparable at \$1B total.)

In any case, figuring out the optimal path to support the industry is a question of both setting subsidy size and some kind installation volume goals. I believe the DOER took this approach in 2009/2010 as they put together the current SCO. They seemingly intended to have both subsidy price levels and installation volume levels set in tandem – the current SCO targets specific installation volumes (30MW in 2010 growing 30% per year) and then tries (unfortunately with little success) to adjust the subsidy level up or down to get that level of installation activity each year.

The point here is that the current SCO has failed both to pay the correct subsidy level – committing to \$300+ per SREC when \$150 per SREC was more appropriate – and to create the desired level of solar installation activity. The much larger amount of installation activity may be justified if state-specific cost declines have been particularly rapid (again, I see only limited evidence of this), otherwise that larger industry represents an implicit demand for continued heavy subsidy payments until, years in the future, the industry finally approaches true profit self-sufficiency.

Hence in considering a successor to the current SCO, the focus should not just be on better setting subsidy levels, but also on having some plan for, and better mechanisms to guide the path of, increasing solar installation activity in the state.

Further, the DOER should add to its mission statement a much more close tracking and reporting on the development of the solar industry in the state, with metrics specifically tracking the development of installation cost declines particularly as they are impacted by the subsidy program. The state's \$1.5B subsidy commitment is large enough that a detailed evaluation of its impact beyond the top-line 'we have installed this much solar' is called for.

### **III. Some Suggestions on What To Do**

A summary list of the challenges the current SCO has, in my opinion, faced includes:

- Weak subsidy price discovery leading to too high subsidy levels
- Complex TCO formula driving perverse SREC price swings and a lack of confidence on the program
- Volatile and pointless sunset 'market' period causing great uncertainty among market participants
- Overall program complexity and year-to-year volatility causing huge discounting of likely subsidy levels among market participants

- Weak volume controls leading to much more rapid expansion of the market than expected (possibly with some positive benefits)
- The need for periodic DOER intervention to fix the program dramatically reducing confidence in the reliability of the program rules
- Heavy reliance in program design on initial forecasts that needed to hold for years for the program to have a chance to work effectively

I do not believe the DOER should build the successor solar subsidy program on the current SCO/SREC foundation. I believe the flaws listed above are severe and must not be present in the successor program. I believe these flaws cannot be easily fixed, and the efficacy of attempted fixes can't be certain. Repairing the current SCO/SREC approach requires believing that the DOER, having not had success the first time in designing an effective program due to a combination of incorrect forecasting, small inaccuracies in calculations, and what seems to be less than extensive modeling and consideration of a wide enough range of possible outcomes, can build a new version of the SREC program that fixes the current flaws and with reasonable certainty won't develop new, unexpected negative behaviors. Even if the DOER can do so, the lack of faith in the current program will likely still transition to the new, similar one. And the poor performance of the current program will therefore lead to heavy discounting of promised subsidy payments in the new program and so some level of overpayment by rate-payers to support the desired level of solar installation activity. The program will still be complex (more complex than the current one if the various new elements the DOER has proposed are added) and poorly understood by market participants, it will still be heavily susceptible to small inaccuracies in DOER forecasting, etc.

I believe a better approach should do the following:

- Fix subsidy levels (to be paid out over some number of years) at the time of installation
- Have a specific mechanism for gradually reducing subsidy levels over time in roughly quarterly increments (certainly less than yearly)
- Have specific mechanisms for responding to increases or decreases in installation activity over time on a roughly quarterly basis (certainly less than a year).

The Massachusetts Clean Energy Center's Commonwealth Solar II program has some of these features and provides a rough idea. Each quarter a subsidy quota and subsidy level is set intended to hit that quota. If install activity is slower or faster than expected in the quarter, the next quarter's subsidy level can be adjusted accordingly.

For a successor to the SCO, one could envision guaranteeing all qualifying projects each quarter a payment per MWh generated for a fixed length of time from the date they are qualified or operational (say 10 years). The specific payment level would be published a month before each quarter (and perhaps initial guidance on the next quarter's subsidy level could be released as well, giving market participants at least

6 months visibility at future subsidy levels). In December for example, the DOER would say: "From January to March, we will pay a 10-year \$125 per MWh subsidy to all projects that qualify during the period, up to a 30MW cap (for the quarter). And we expect in April to June to reduce the subsidy payment to \$120 and keep the total quota size to at 30MW." Projects then submit paperwork during the quarter, get qualification and so have their subsidy level set. If the quota is hit before the end of the quarter the DOER can announce an extension, or roll projects into the next quarter's quota – the critical feature being that the DOER gives the market guidance on the volume it is expecting and that it will substantially reduce subsidy levels if volume growth continues.

The advantage to projects is, in developing financing, they will have 100% certainty that whatever the subsidy level is when they qualify will be fixed for the life of the subsidy – much better for lenders and other investors to decide whether to make an investment in a project under these terms. They will also have substantial certainty around the actual subsidy level new projects will receive as far as 6 months out, and because subsidy levels are unlikely to decline in unpredictable jumps, they will be able to make their own rough estimate about where subsidy levels might be in 9 months or a year as well (they will certainly have as much certainty as exists in the current system.)

The advantage for the DOER is the ability to continuously intervene in an expected and moderate way in the market on a quarterly basis to control subsidy levels and volumes and keep them in line with market developments. The DOER will also have substantial incoming information in terms of new project applications to have a good near real-time view of how conditions in the market are developing and what appropriate subsidy price and quota levels to set.

Although regular 'DOER intervention' in place of what has been described as the 'SREC market' might seem like anti-market heresy, I believe the new approach I describe will perform much better than the current approach, which is a market in name only. Any approach will at heart be a government intervention; I believe a fixed and declining 10 year per-MWh payment qualified for quarterly, with a straightforward quarterly DOER target setting process, will be much better than the current attempts to design a market that have foundered on the challenge of designing something both self-contained and self-correcting and yet without perverse, unexpected consequences.

One concern might be industry influence on the DOER to hold subsidies abnormally high during each quarterly adjustment; I believe that type of pressure is already occurring in the current program in discussions of what an SREC price floor might be. I think that instead the quarterly volume targets in the proposed approach would provide clear public signals about whether subsidy levels have been set too high or low and ensure the DOER's quarterly subsidy level setting process was done transparently.

If one wants more market features, one can imagine a more complicated version of this approach that, particularly for larger projects, holds something like a quarterly capacity auction where projects must bid for subsidies within some range and the lowest 10% or 20% of bids are rejected (and pushed in the next quarter's cycle). Whether the additional time and effort this would require would be offset by an even better subsidy price discovery mechanism is unclear; further exploration needed. There is substantial literature and real-world examples of these types of capacity auctions to study as examples.