

July 11, 2017

Judith Judson, Commissioner
Massachusetts Department of Energy Resources
100 Cambridge Street 10th Floor, Boston, MA 02116

cc: Michael Judge, Director, Renewable and Alternative Energy Division
Massachusetts Department of Energy Resources
100 Cambridge Street 10th Floor, Boston, MA 02116

RE: Solar Massachusetts Renewable Target (SMART), 225 CMR 20.00

Dear Commissioner Judson:

The undersigned write to express our concern regarding the impact on the residential solar market of the Solar Massachusetts Renewable Target (SMART) program as put forth in the emergency regulations filed with the Secretary of State on June 5, 2017.

Compensation for the under 25kW sector in SMART is inadequate, inequitable and important for the solar market to flourish in Massachusetts.

Compensation for residential projects is inadequate:

As a consumer product, residential PV is sensitive to customer risk aversion. Homeowners will rarely make a solar investment if their payback is 8-10 years, and adoption declines precipitously at 10 years and beyond. This makes sense from the consumer perspective: any payback that exceeds the length of the state's own compensation program is a non-starter for middle-class homeowners. Additionally, most residential solar lending products are 10 years and SMART must provide value to service debt before it ends. In the Massachusetts residential market, a 10 year payback is an adoption cliff.

The median Massachusetts residential homeowner-owned PV system is 8 kW in size and costs \$4 per watt, as shown by Mass Solar Loan data (figure 1). Under SMART, assuming *the highest possible initial procurement clearing price of \$.15/kWh*, that 8 kW residential system participating in blocks one through three would expect a 9 year payback, with blocks four through eight being 10 years or longer.

Additionally, in almost every scenario other than maximum clearing price, paybacks reach 10 years well before SMART ends. If the initial procurement price is a more realistic \$.13/kWh, that median system projects a 9 year payback under blocks one and two and 10 thereafter. Or, if that system has even a slightly below average site efficiency of 75% (a quality level still acceptable for Mass Solar Loan participation) payback is 9 years under block one and in excess of 10 years by block two. If that system is smaller than the 8 kW average but still a common 5 kW size, again payback is 9 years under block one and 10 thereafter. See figure 2 for a detailed residential payback analysis matrix.

As currently designed, SMART compensation levels are wholly inadequate to support a healthy and diverse residential solar market for the next 1600 MW of deployment.

Compensation for residential projects is inequitable:

The DOER's "Developing a Post-1,600 MW Solar Incentive Program" study from October 2016 reported that typical system costs for under 25kW rooftop solar ranged from \$3.48 to \$4.66 per watt, an average of \$4.07 per watt, while the 1MW typical system cost ranged from \$1.99 to \$2.61, an average of \$2.30 per watt (figure 3). On average, it costs nearly twice as much to deploy on the residential scale as it does on the megawatt scale.

The majority of cost in the residential sector is "soft": administration, permitting, engineering and labor. In Massachusetts, labor and permitting costs are increasing, not decreasing, offsetting the industry-wide decrease in "hard" costs for panels, inverters, and racking. A reduction in panel cost of 20 cents per watt on a MW project that costs \$2.00/watt to deploy represents a 10% cost decrease. That 20 cent decrease on a residential project that costs \$4.00/watt to deploy is just 5%. Meanwhile cost of living increases push the cost labor, the most impactful soft cost, upward.

Yet despite that the cost to deploy in the under 25 kW sector is more than 175% of the MW sector, both systems *receive the same base level compensation* under SMART. The 1 MW project developer receives 100% of base over 20 years for 200 total units of compensation. The homeowner with an 8 kW system gets 200% of base over 10 years for 200 total units of compensation. While there is relative benefit to receiving compensation in 10 rather than 20 years, that benefit is offset by other internal and external disparities, such as the residential sector being locked out of all location and off-taker based adders under SMART, and the commercial sector's ability to employ accelerated depreciation to speed return on investment.

As currently designed, SMART dramatically favors the large-scale photovoltaic projects of corporations and developers at the expense of homeowners.

Compensation for residential projects is important:

Of all sectors defined under SMART, the under 25 kW market is the most impactful. Forty-two percent of all capacity registered in the Mass CEC's Production Tracking System in 2015 & 2016 came from projects under 25kW in size, the largest percentage of any SMART sector.

The residential sector installs more projects than any other. Of all projects registered in the Production Tracking System in 2016, 99% - more than 23,000 individual projects - were under 25 kW.

The residential sector employs significantly more workers than any other. The Solar Foundation's Jobs Census 2016 shows that in Massachusetts, 75% of solar worker's time is spent on residential, with 16% on commercial and 10% on utility-scale projects.

As currently designed, SMART injects widespread instability to the residential market, risking thousands of solar jobs across Massachusetts.

In order for the residential market to survive under SMART, program designers must make three key modifications.

1. The under 25 kW sector's current 200% base capacity factor needs to be revised to 300%.

A 300% capacity factor partially closes the gap between the homeowner's 8 kW investment return and that of the 1 MW project owner. Receiving 50% more than the 1-2 MW sector's base compensation partially recovers the homeowner's 75% higher installation cost.

2. The under 25 kW sector must be allowed to participate in adders, and a Small Scale System Owner adder of at least \$0.04/ for systems 10 kW AC or smaller should be created.

As designed, SMART creates an extremely fragile market for projects under 25kW. The sector's entire compensation is based on a one-time procurement event, with none of the stability provided by adders. A scenario in which a \$0.12/watt initial procurement price clears results in an all-in value for a homeowner of just \$0.24/watt, immediately pushing typical residential system paybacks under every reasonable scenario to 10 years or greater from program outset, and making all current 10 year residential solar loan products cash flow negative from day one of SMART implementation.

Under 25 kW must be allowed to participate in adders in order to stabilize the sector. A \$0.04 or greater per-watt adder must be applied to small system owners to help recover higher fixed deployment cost.

3. Adders should not decline for the under 25 kW sector. In fact, a thoughtfully designed adder system should allow for non-declining adders program-wide.

In the SMART program, adders address costs that are above the base case. In the residential sector the majority of those costs are not equipment but instead are "soft" deployment costs. The largest, labor, is increasing with the cost of living rather than decreasing like many hard costs. A healthy residential market requires stable compensation levels that reflect real-world cost projections over the years to come.

Thank you for your time and consideration of our comments and recommendations. Supporting figures follow signatures below.

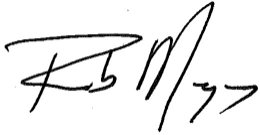
Yours Sincerely,



Ben Mayer,
Vice President Residential Projects,
SunBug Solar



William Stillinger
President, PV Squared Solar and Chairman,
Solar Energy Business Association of New
England (SEBANE)

A handwritten signature in black ink, appearing to read 'Rob Meyers'.

Rob Meyers,
Energy Services Manager,
South Mountain Company

A handwritten signature in black ink, appearing to read 'Mark Durrenberger'.

Mark Durrenberger,
President, New England Clean Energy

Russell Aney, CEO
Avid Solar LLC

Emily Rochon, Esq.
Director of Energy and Environmental Policy
Boston Community Capital

Figure 1: Cost and size data, all Mass Solar Loan projects as of July 6, 2017:

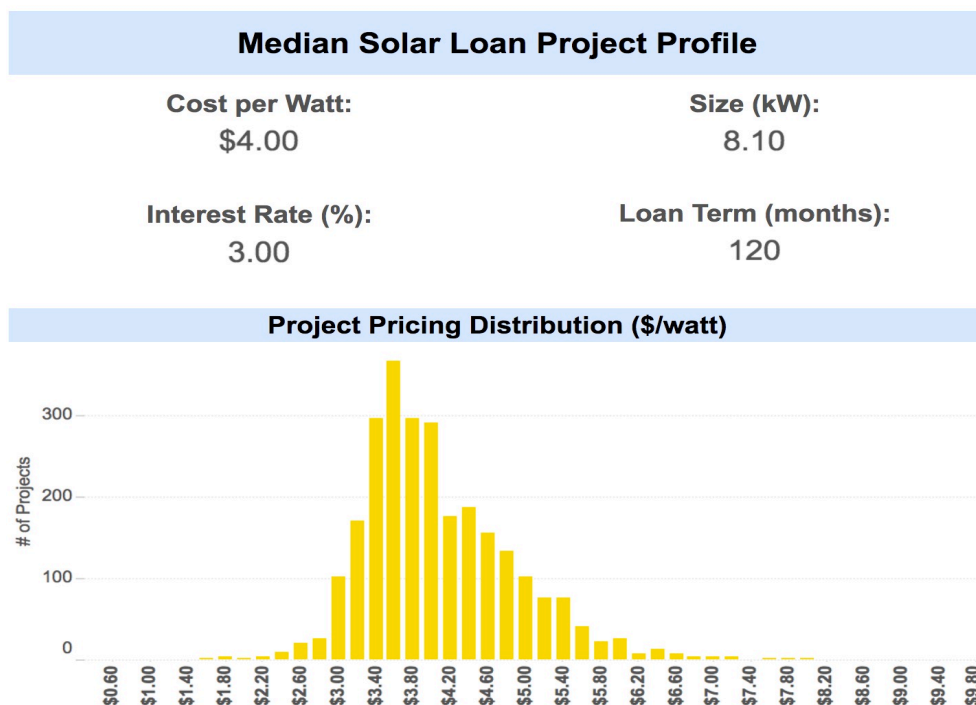


Figure 2: Typical residential system paybacks under SMART as released on June 5, 2017:

	5 kW Residential System				8 kW Residential System				10 kW Residential System			
\$0.11 Initial Procurement	Block	1	4	8	Block	1	4	8	Block	1	4	8
	Payback (Yrs)	>10	>10	>10	Payback (Yrs)	10	>10	>10	Payback (Yrs)	9	10	>10
\$0.13 Initial Procurement	Block	1	4	8	Block	1	4	8	Block	1	4	8
	Payback (Yrs)	10	>10	>10	Payback (Yrs)	9	10	>10	Payback (Yrs)	8	9	>10
\$0.15 Initial Procurement	Block	1	4	8	Block	1	4	8	Block	1	4	8
	Payback (Yrs)	9	10	>10	Payback (Yrs)	8	9	>10	Payback (Yrs)	8	8	>10
PV System Assumptions				SMART Assumptions				Utility Rate Assumptions				
• 8kW system cost of \$4.00/watt				• 200% compensation rate factor				• Starting rate of \$0.18/kWh				
• 5kW system cost of \$4.50/watt				• 4% / block compensation rate decline				• 3% utility rate inflation per year				
• 10kW system cost of \$3.75/watt				• <25 kW projects are adder ineligible				Other Assumptions				
• Install cost declines 2% per block				• 2 blocks consumed per year				• Homeowner has tax credit capacity				
• Average site quality of 1:1.1				• First block opens mid-2018				• Combined Marginal Tax Rate of 28%				
(1 kW DC = 1100 kWh, ≈ 80% TSRF)								• ITC decline from 2018 to 2022 included				

Figure 3: System Installed Costs (section 3.1.3.1, table 8) from “Developing a Post-1,600 MW Solar Incentive Program: Evaluating Needed Incentive Levels and Potential Policy Alternatives,” October 11, 2016:

<i>Market Sector</i>	Table 8 –System Installed Cost Responses – Host-Owned							
	<i>< 25 kW</i>		<i>25 -250 kW</i>		<i>250 kW - 1 MW</i>		<i>> 1 MW</i>	
	<i>Low End of Range</i>	<i>High End of Range</i>	<i>Low End of Range</i>	<i>High End of Range</i>	<i>Low End of Range</i>	<i>High End of Range</i>	<i>Low End of Range</i>	<i>High End of Range</i>
Ground-Mount Solar	\$4.34	\$5.83	\$3.58	\$4.64	\$2.45	\$3.02	\$2.13	\$2.63
Brownfield Solar					\$2.58	\$3.17	\$2.60	\$3.21
Community Shared Solar			\$3.52	\$4.97	\$2.51	\$3.24	\$2.24	\$2.89
Landfill Solar					\$2.55	\$3.18	\$2.61	\$3.20
Solar Canopy	\$5.50	\$7.00	\$3.98	\$5.35	\$3.20	\$3.84	\$3.05	\$3.61
Rooftop Solar	\$3.48	\$4.66	\$2.73	\$3.74	\$2.29	\$2.97	\$1.99	\$2.61
Affordable Housing Solar	\$3.78	\$4.92	\$2.88	\$4.50	\$2.23	\$3.15	\$2.12	\$3.15