

July 27, 2018

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

**Re: Solar Massachusetts Renewable Target (“SMART”), Updated Draft Energy Storage Guideline and SQ Reservation Period Guideline Draft**

Dear Commissioner Judson:

Stem, Inc. respectfully submits these comments on the updated draft Energy Storage Guideline. Stem greatly appreciates the open dialogue with you and your staff throughout this process and looks forward to working with DOER to ensure the SMART program is implemented quickly and in a smooth and efficient matter.

**Energy Storage Guideline**

Stem thanks Department staff for engaging in robust stakeholder discussions throughout the development and refinement of the updated Energy Storage guideline. We appreciate that DOER has endeavored to identify reasonable baseline requirements that will provide assurance of beneficial operations while preserving storage operator flexibility to optimize behavior for multiple market/price signals available to them.

In the following sections, the Stem offers input and recommendations on selected provisions of the updated storage guidelines.

***“How is round trip efficiency calculated?”***

Stem has had the most experience of any developer in the country with the use of round trip efficiency (RTE) as an eligibility threshold for an energy storage incentive. To avoid extremely detrimental program complications, Stem recommends that the Guideline specify that RTE compliance is based solely on manufacturer specifications.

RTE as listed by the energy storage system manufacturer is typically measured by the single cycle loss from AC to AC of storing and later discharging the energy. i.e. when

running one full charge and discharge, the ratio is (AC KWh discharged) / (AC KWh charged). This has been termed “single-cycle RTE”.

When measuring RTE from interval data, the calculation first needs to establish the time period over which the measurement is made because the storage system will almost never do a full discharge after a full charge in real operations. In the past, this time period has been set at one month or over an entire year, and the calculation becomes [Total AC KWh discharged over Time Period] / [Total AC KWh charged over Time Period]. This has been termed “time-based RTE”,

The resulting calculation of time-based RTE will **almost always** produce an RTE number lower than the manufacturer’s single-cycle RTE because the time period is unlikely to line up precisely with a full-cycle equivalent of activity. E.g. The charge and discharge measurements could represent 5.75 cycles instead of a full 6 so the system would appear to lose more energy than reality. This error is minimized with longer time periods.

More critically, the methodology for calculating RTE over time should remove the energy consumed in “parasitic losses”. Parasitic losses are KWh consumed by the Energy Storage System while the system is idle, neither charging or discharging. Inclusion of parasitic losses artificially increases the denominator of the ratio, producing artificially low RTE results. Direct experience has shown that this type of RTE calculation, time-based including parasitic losses, results in unintended consequences and detrimental behavior. Case in point, this RTE requirement as implemented in California was intended to have storage systems reduce GHG emissions, but was shown to result in operational behavior that increased GHG emissions in many cases<sup>1</sup>.

Assuming that the intention of the SMART program’s round trip efficiency requirement is to set a minimum technical efficiency threshold for incentivized storage systems, Stem recommends that compliance be based solely on the manufacturer’s specification. This requirement would be significantly less costly and complicated to administer and avoids the abovementioned unintended consequences.

Alternatively, if the “interval data review” is retained, Stem recommends the calculation methodology time period to be set at one year and that parasitic losses be explicitly excluded from the calculation.

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<sup>1</sup> Rather than a public document, these results were shown in modeling based on real operational data. Stem would be happy to confidentially share this data as evidence of the potential program risks

Option #1 for ESS co-located with standalone STGUs:

The updated Guideline states that

“The Energy Storage System may fulfill the operational requirements by dispatching the Energy Storage System during the summer peak hours or winter peak hours. Energy Storage System Owners may choose when to cycle during any hours included during this window.”

Stem notes that this requirement is unclear in specifying how much of the Energy Storage System dispatch must occur during the indicated hours. As written, Option #1 could be interpreted to mean any of:

- A) At least 52-cycle equivalents must occur within the indicated hours and any additional dispatch beyond 52-cycles is unrestricted in timing
- B) During the indicated Business Days, dispatch can only occur within the indicated hours
- C) All dispatch of the Energy Storage System across the entire year is restricted to the indicated hours

Stem recommends that the Department adopts Interpretation A for the Guideline on Energy Storage as this would achieve the desired grid benefits without unreasonably restricting the Storage System’s ability to provide other services.

Operational Requirements: 52 complete cycle equivalents

Acknowledging that 225 CMR 20.06 has established the 52 complete cycle equivalents requirement, Stem recommends here that that provision of the regulation be re-visited as soon as is practical if the additional operational requirements are adopted in the Energy Storage Guidelines.

Again, Stem’s experience with cycling requirements in storage programs has shown that such requirements can be counterproductive, causing negative outcomes without achieving their core objective. Presumably, the objective of a cycling requirement is to ensure that the incentive storage system is doing some minimal amount of useful work and not just sitting idle.

However, because storage has a large variety of beneficial uses, it is impossible to establish a single minimum number of cycles that applies to all scenarios. In other

words, the program cannot guarantee that every cycle that is required of the storage system is providing beneficial value. Using the California example again, one of the primary uses of customer sited energy storage is for demand charge management. The most economically efficient operation of the battery is to cycle far fewer times than California's incentive program requirements (currently 130 cycle equivalents). Thus, to meet the requirements, incentive funded storage systems are cycling needlessly, reducing the useful life of the asset and increasing GHG emissions because the needless cycles are not always aligned with optimal GHG performance.

Stem contends that the additional operational requirements proposed in the latest draft of the Energy Storage Guideline for Standalone and Behind the Meter systems are sufficient to meet the objective that incentivized storage systems are not sitting idle. Using the interval data to verify one of these options would meet the objective and thus the 52 cycle requirement would become unnecessary.

## **Conclusion**

Stem appreciates the revisions by the DOER on the SMART guideline for energy storage systems and believes the above recommendations will contribute to the ultimate success of the program. We look forward to continuing to work with the DOER to ensure that Massachusetts can realize full potential of energy storage to benefit the state.

Sincerely,



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