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| **Project Title:** | 2019 Title 24, Part 6, Building Energy Efficiency Standards Rulemaking |
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| **Document Title:** | BIRAenergy Recommendations for Storage Credit |
| **Description:** | Multiple reasons are given why batteries should not have a compliance credit. An alternative is recommended. |
| **Filer:** | Rob Hammon |
| **Organization:** | BIRAenergy |
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biraenergy

20 March 2018

Commissioner McAllister
California Energy Commission

RE: Docket number: 17-BSTD-02
Recommendation for Change to Storage Option

Commissioner McAllister:

For reasons discussed herein, the **Commission should not adopt a Battery Storage Credit** as currently proposed in the 2019 Energy Efficiency Code update. The proposed Storage Credit targeting batteries is driven by a few different factors, including that California has a mandate to install 1.3 GW of batteries as grid storage by 2020, that Batteries can theoretically help reduce and delay electricity peak demands, and that Storage Credit is desired by the building industry as an alternative to high-performance envelopes. These driving factors are all inappropriate reasons to push batteries into new homes, as discussed in some detail later in this letter. The result of a Storage Credit for Batteries will be a windfall for the battery market, increased costs to homebuyers to buy and maintain the batteries that are of no real value to the home occupants, and another three years delay in a real implementation of high performance envelopes in California.

**The Commission should provide a Storage Credit for High Performance Envelopes with thermal-energy storage.** A compliance credit for High Performance Envelopes would push the new construction market to build High Performance Envelopes. This would benefit builders, homebuyers, homeowners, and all the people of California by reducing energy use, energy bills, and greenhouse gas emissions, while increasing the longevity of the homes' structure and the comfort of the occupants.

While there is data to support the recommendations made, to keep this communication short and at a high level, it is not included here. I would be happy for the opportunity to discuss these recommendations at any convenient time and location.

**Key reasons to not adopt a *Battery* Storage Credit:**

1. 1.3 GW Battery, grid storage goal. Grid storage is the domain of the CPUC and Utilities. Energy storage for the grid should be located within the grid, on the utility-side of the meter where they will belong to and be managed, maintained and controlled by the electric utilities. Batteries are not the same as PVs, and the fact that residential rooftop PVs can be effectively integrated into the grid does not infer nor dictate that batteries can or should be co-located with PVs. Assuming that battery storage will become an important element of the future grid, battery hardware should not be on the consumer-side of the grid because located there it is more expensive, less reliable and more difficult to control and manage. Locating battery storage in homes rather than at transformers or other grid-nodes will require a larger number of smaller, independently controlled systems, resulting in a higher cost per kW, and being the personal property of the homeowners, their connectivity, maintenance and reliability will be uncertain.

2. Title 24 of California Code of Regulations is our Building Standards, of which Part 6 is the California Energy Efficiency Standards for Buildings ("Title 24"). The purpose of these Standards is to regulate

and set a high bar for the energy efficiency of buildings. Batteries are energy consuming devices and, as such they should be summarily rejected for consideration under Title 24 Part 6.

3. The Storage Credit as currently proposed in the draft language for the 2019 Title 24 update allows an energy-consuming device that has no connection to energy-efficiency to be traded for an increase in the efficiency of the walls. Prior to this proposal, trading efficiency features has been done using the "performance approach" which strives to maintain an overall building efficiency to meet overall Title 24 efficiency requirements. This Storage Credit breaks from maintaining the minimum efficiency of buildings by allowing an energy consuming device to trade for energy saving components. This is a dangerous precedent and should not go forward as currently envisioned.

4. A community of homes with batteries should be operated so that they do not all charge or discharge simultaneously, as would happen if they have simple time-clock controls. Such simultaneity would produce very large transients in distribution systems, and the grid with sufficient batteries installed. Solutions to this problem would require either local networking of the battery systems, or utility control to stage charging and discharging. Today's battery systems are sophisticated in their user interfaces, but they lack any ability to avoid mass charges and discharges. They come with factory presets, which are likely all the same. Sophisticated users will likely program their battery system to charge during off-peak hours and discharge during on-peak hours, very likely ending up with the same charge/discharge times. The technology necessary to network battery systems so that they do not act in unison for charging and discharging is not available and may not even be in a planning stage. Utility control is problematic due to consumer concerns regarding privacy and possibly other fears of over-reach that the utility or others might use to extend their reach from outside the consumer's network to inside their network via the direct communication with the battery. The consumer need be very confident that their firewall can identify and isolate the connection of the outside entity that is directly connected to a networked device – the utility connected to the networked battery. Coordinated control of large-scale installations of residential batteries is not available even for test & evaluation studies, not to mention wide-spread network communications between large numbers of battery systems that resulted from volume sales driven by energy code benefits.

5. To manage electricity peak loads, this credit would be much more effective if it targeted high-performance envelopes than if it targets batteries, the current target in the proposed language. High performance envelopes have been shown in numerous studies to reduce and delay the peak, and in some cases eliminate a cooling and/or heating peak altogether. Further, the only control system required is a thermostat, reducing the probability of increased energy use due to improper controller settings. High performance envelopes are less costly and more effective than battery systems at both reducing peak loads and reducing overall energy use.

6. The rationale behind promoting energy storage, specifically battery storage as an efficiency option in the 2019 update of Title 24, is based on a continued emphasis on features that address peak electricity demands, in particular features that can shift the peak demand to later in the day and/or reduce the size of the peak. Batteries theoretically can impact daily electricity load shapes by strategically managing charging and discharging of the batteries, both in terms of the time of day and the depth of charge or discharge. However, a recent study was performed on a 20-home

community of ZNE homes[1], all of which were ZNE with roof-top PVs, and half of them had batteries with current, nominal, control capabilities and half did not have batteries. The two sets of homes, one group with and one group without batteries, were each connected to the grid via the same distribution transformer. The study found that the impacts of residential rooftop PVs on the distribution system, measured at the distribution-transformer level, was typical of homes with PVs, and was the same for all the homes with PVs whether they had batteries or not. The study concluded that the batteries, as they are installed and configured today, have no impact on the grid. The impact the batteries did have was to predictably add to the energy use of the homes, increasing the electricity bills for the homes with batteries compared with those without batteries, and providing no benefit to the occupants of the homes with the batteries, nor to the utility.

7. Based on research to date, for batteries in individual homes to be useful to the management of distribution systems and the grid in general, they will likely need to be installed in a large percentage of homes, they will likely need the capability to communicate with each other as a network of similar devices. That storage network will need to be managed and controlled by a utility or a grid-operator or third-party local distribution system operator that is coordinated with the grid operator to control and manage energy in and out of storage and the grid. However, existing control systems do not have the intelligence nor capacity to form a network-control system. Such communications will be needed to regulate charging and discharging over a population of batteries to ensure that they do not all function in unison, which would be very disruptive to the grid. Assuming the Storage Credit produced a significant market for batteries in residences, there would be an immediate need for battery controls that worked across homes, communities, and manufacturers. That network would also need to be addressable and battery functions manipulatable by the electric utilities or some surrogate; this would require that the utility be able to "reach through" the meter to the consumer-side and likely override consumer settings. Such sophisticated controls and communications simply do not exist in the market today. Making the assumption that research and development of advanced control systems are both well along compared to control systems installed today, it seems reasonable to assume that third-party testing and evaluation will be required before any large-scale installations should be made. However, they are not currently available for testing and evaluation, and without adequate testing, they will not be ready for "prime time" on 1 January 2020.

   Exacerbating this situation, the networking of batteries would require communications standards and non-proprietary controls systems that have been thoroughly tested and proven functionally solid, and, as mentioned, these communications would need to allow and provide for utility control of a consumer device. The needed networking and communications capabilities would likely elicit privacy concerns. For reference, the difficulties in making a broad-based system that seems likely to be needed for the system to work are clearly demonstrated in the lack of broad adoption for and very limited success of Demand Response (DR) systems – despite thirty-plus years of working to make DR a major player in managing distribution and grid loads, it is still holds a low market adoption and even lower market function. It is totally unrealistic to assume that the market actors would spend the time and resources on their own to develop an open or cooperative network

[1] California Solar Initiative funded project to evaluate the impacts on the grid of deep market penetration of PVs and of PVs with storage.

architecture or other network controller architecture that would be market ready, tested and evaluated to operate correctly, and that would openly and effectively allow the electric utility to manage and optimize battery function across a large number of homes and their owners, to simultaneously optimize the combination of flattening the demands on the distribution systems and grid while lowering utility costs to the consumer. Given the numerous market barriers, it seems very unlikely that this sort of networked control system could be developed, tested and approved between now and a January 2020 implementation date.

8. As proposed, the storage credit will likely produce the unintended consequences of becoming an unprecedented gift to battery manufacturers, and that "gift", if implemented as is, i.e., without communications and controls discussed previously, will likely produce unprecedented disturbances to distribution systems and the grid.

9. Either or both of the above mentioned unintended consequences would likely be a highly unfortunate publicity disaster for the Commission and the Lead Commissioner, both of which would be bad at any time, but this could be an especially bad time for negative public opinion just as our industry is striving to reach the unprecedented feat of a code-level implementation of Zero Net Energy (ZNE) Homes.

There is an alternative superior to batteries for a Storage Option that would circumvent all of the problems inherent in the battery storage option, and that is a thermal-energy storage option. This option would provide extra energy "credit" to buildings that combine a very good envelope with thermal mass. There are many approaches to thermal mass and "High Performance" envelopes (HP Envelope), and they necessarily include walls, attics, and floors with some sort of integrated mass. Short- and long-term monitoring and evaluations have been performed that clearly show that HP Envelopes lower, shift and/or eliminate electricity peaks that normally occur due to space cooling and/or heating. Further, HP Envelopes cost less and last much longer than batteries and will use less energy for space conditioning than similar homes built to the minimum code, especially any that might be designed using the proposed Storage Credit with batteries. Unlike batteries, HP Envelopes actually save energy while also providing the less tangible benefits of improved comfort and envelope longevity.

Adoption of the PV Credit in the 2016 Title 24 update has, as predicted, limited any adoption of HP Walls to near zero. The Storage Credit proposed for adoption in the 2019 update is designed to further push off real improvement in the thermal properties of the building envelope, particularly the walls. It is still possible and reverse this trend and instead, <u>adopt a Storage Credit that does not recognize batteries, but rather focuses on improving the overall envelope, and add thermal-energy storage such that the end-product HP Envelope will out-perform and out-last standard construction, with a much lower incremental cost than batteries.</u>

Respectfully submitted,

Rob Hammon, Ph.D.
President