DOCKETED

Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	246826
Document Title:	Sea Dragon Energy, Inc Comments - Sea Dragon Energy, Inc response to CEC 19-ERDD-01 - RFI
Description:	N/A
Filer:	System
Organization:	Sea Dragon Energy, Inc.
Submitter Role:	Public
Submission Date:	10/26/2022 9:07:14 AM
Docketed Date:	10/26/2022

Comment Received From: Sea Dragon Energy, Inc.
Submitted On: 10/26/2022
Docket Number: 19-ERDD-01

Sea Dragon Energy, Inc response to CEC 19-ERDD-01 - RFI

See attached document.

Additional submitted attachment is included below.

BTM Renewable Backup Power Technologies – RFI

– Docket No. 19-ERDD-01 –

Responses provided by:

Sea Dragon Energy, Inc.
3962 Sorrento Valley Blvd, Suite #100
San Diego, CA 92121

Contact:

Stefan Sillen, President
540-233-1099
stefan.sillen@seadragon.energy

The following are general questions that will help structure solicitations related to this topic:

1. What are key barriers to behind the meter (BTM) zero-emission renewable backup for critical loads? Is the lack of standardized solutions a primary barrier for permitting and interconnection?

   Sea Dragon Energy, Inc. ("SDEI") comments:

   (i) **Cost efficiency of solutions**: The cost of solar integrated backup battery solutions is still around $0.35-$0.40 per kWh. Most people are interested in a reasonable pay-back on investment (5-7 years) and will primarily look at potential load-shifting (to alleviate Time-of-Use ("ToU") tariff peak-time period) and energy arbitrage for quicker pay-back. Increased resilience and back-up during outages are for most considered good to have but for the vast majority, it is not an enough incentive to invest in BTM backup solutions.

   (ii) **Flexibility of solutions**: To support full energy load-shifting under ToU tariff schemes, around 7-10 kWh (corresponds to approx. 30-50% of average daily usage in CA) of energy backup is required for the <u>average</u> California household. However, a 7-10 kWh battery backup can only support a limited number of critical loads for an extended period of time during an outage, or else the battery will deplete within hours. Current hard-wired solutions do not offer any flexibility with regards to what the homeowner can use during an outage and current "smart panel" (panels that allows the user to connect and disconnect circuits in real-time using an app) solutions are generally expensive and not within financial reach for the average household.

(iii) **Scalability of solutions**: Most battery backup systems offered today are a compromise between what a household needs for energy load-shifting / arbitrage and providing backup during an outage. This results in a system that is over-sized for the daily use but still limited when an outage happens. This "one-size-fits-all" approach has hampered the penetration of BTM solutions and is not affordable or economically attractive for the average consumer unless other, more subjective, benefits are considered. Moreover, with increasing electrification energy demand will increase and systems must be scalable over time to accommodate such changes in energy demand. Flexible smart panels will allow for scalable solutions that are affordable where the user can add capacity over time.

(iv) **Integration of solutions**: Pre-approved and standardized integrated solutions can significantly help with permitting burden, which is often time consuming and costly. Standardization is also helping the installer to select the components and eliminates the guess work, allowing for easier installation and a simplified sales process (many installers are still not pro-actively selling energy storage due to lack of experience and adequate sales tools).

2. What are the current opportunities for standardizing design of how BTM backup systems interconnect with the distribution grid while enhancing safety and managing operational constraints?

   SDEI comments:

   The primary opportunity is for true demand response for grid stabilization in real time without negatively affecting the consumer. In many cases curbing energy demand is enough to reduce outages and to reduce the need for stand-by peaker energy. With responsive smart panels that allows the user to monitor the energy consumption, the overall demand can be reduced by being aware how energy is being consumed. More specifically, in times of a need for a utility to curb energy, it can enroll households and businesses in incentive programs to reduce consumption over a [critical] period of time when the grid is experiencing high demand or issues with stability. A smart panel can respond to a signal restricting the energy, but still allowing the user to select which circuits to energize – much as it would in an outage.

3. If the CEC issues a solicitation in this research space, should there be carve outs for specific technologies or technology bundles targeting specific performance metrics (e.g., separate groups each targeting a technology such as critical load panels, switchgears, and multi-mode inverters)? How should technologies be bundled, and what metrics should be targeted?
4. If the solicitation included multiple groups, how should those groups be structured? Some examples below:
   a. Multiple-group solicitation:
      i. One group for Applied Research and Development (ARD) projects that would pilot emerging technology in a controlled environment and engage with stakeholders, including CBOs and municipalities.
      ii. Another group for Technology Deployment and Demonstration (TDD) projects that would roll-out and implement technology mature enough to seek rapid-deployment for near-term benefits.
   b. Multiple-group solicitation in which each group is defined by a particular site characteristic or use case. Examples could include: urban and rural, residential and commercial, various climate zones.

SDEI comments: Alternative (b) would allow for targeted measurement of specific use-cases, and is preferable.

The following will help target specific technology advancement research:

5. EPIC 4 Initiative 15 mentions specific potential research areas for BTM backup technologies, listed below. What is the current state of the each technology, and what research and design considerations are required to advance the technology and market readiness of each?

a. Customary electrical equipment, such as critical load panels and meters, that are integrated with multi-mode inverters with enhanced islanding functions.

SDEI comments:

Most smart panel solutions require a panel replacement (i.e. expensive) or is a smart *sub-panel* with little more flexibility than a regular critical loads panel (i.e. low value). It is essential to have a solution that is affordable and that uses the existing panel and infrastructure, to minimize cost. Furthermore, to allow the user to manage the total energy consumption, the existing panel and all the circuits must be controllable. Most smart panel [of replacement type] solutions are designed for new installations and retrofitting is expensive and require total rewiring of the panel. To rapidly roll-out smart panel solutions, the ability to retrofitting in an existing panel is important.

Importantly, current smart panels (aka smart load centers) focus almost entirely on the homeowner's ability to manage loads [internally] and provide the user with consumption data to shift behavior. This is important but SDEI believes the true potential lies in the interface between the consumers and the producer, to better balance the demand and supply to reduce system cost, which will potentially benefit the consumer in lower overall prices, higher grid stability and less frequent abruptions. The communication between smart panels and utilities is an important research area.

b. Standardized switchgears and/or integrated power centers that can be rapidly deployed at several locations with minimal alterations.

SDEI comments: Same as above (a).

c. Multi-mode or hybrid inverters with built-in battery storage backup system capabilities.

6. What is the current Technology Readiness Level (TRL), or state of technology, for meter collars (i.e., electrical equipment that plug-in directly between a meter and its meter socket) that streamline the integration of solar PV, battery energy storage, electric vehicle charging, and other DERs?

    a. What research is needed to advance the TRL of this technology towards commercialization?
    b. How broad is the market – are multiple technology vendors developing this technology?
    c. What design considerations and advanced functionality may be useful enhancements to this technology going forward?
    d. What would be the highest-impact demonstration use cases for which advanced meter collar functionality could be validated in the field?
7. Would integrating multi-mode inverters and islanding functions into critical load panels increase system reliability and ease installation while reducing overall system costs and complexity? What design considerations, technology development, and performance metrics are necessary to achieve this?
8. What would be the most strategic form of implementation for the next generation of critical/smart load panels?
    a. Specifically designed to power essential loads and/or small devices during a grid outage?
    b. Built-in switchgear to facilitate islanding of a mini-microgrid?
    c. Facilitate ease of retrofitting existing, older buildings that have outdated/legacy electrical panels?
    d. Other potential areas not covered above?

SDEI comments:

Smart panels should utilize the entire existing circuit breaker panel, automatically turning off loads that are not critical in case of an outage. The smart panel should facilitate whole-house energy and allow the user to turn on/off circuits dependent on needs and available energy. A smart panel should also allow the user to monitor the consumption pattern and with AI/machine learning prompt the user to reduce energy consumption to optimize the utilization of energy storage. A smart panel can also detect unusual consumption based on historical data and prompt the user to investigate the cause. With the integration to IOT enabled appliances, the user can get a detailed overview of the energy expenditure and take actions to optimize the usage for ToU or overall energy conservation.

Smart panels should be the de facto standard. Today's solutions are inflexible and expensive or limited to smart essential loads panel. The latter does not provide the benefit of total energy management, which will be important in an ever-increasing electrification of the society and increasing costs. The smart panel needs to be affordable and easy to integrate with existing solutions and able to communicate with the grid operator for demand response and load management. Points (b) and (c) are the most important.

9. What is the current state of technology for portable battery storage systems that can serve as a direct replacement for portable diesel generators?
    a. What design considerations or modifications are necessary to allow the portable battery storage system to charge directly from the rooftop solar PV during a local grid outage with plug-and-play functionality?
10. What are some examples of emerging technology solutions not previously mentioned in this RFI that could streamline interconnection and permitting for BTM solar-paired energy storage or other zero-emission backup power? To what extent have these technologies been validated in the field?
11. What BTM renewable backup power technology is mature enough to move forward from pilot-scale (ARD) to technology demonstration-scale (TDD)?

The following will help identify high-impact use cases for this research to target:

12. What applications or use cases might be the best fit or highest priority for achieving easily replicable solutions with maximum impact? For example:
    a. Multifamily housing and community centers.
    b. Emergency facilities in wildfire-prone areas.
    c. Manufactured homes.
    d. Critical loads in common areas affected by Public Safety Power Shutoffs.

e. Homes in under-resourced communities with outages higher than the utility average and/or that are subject to extreme heat conditions.

SDEI comments:

For smart panels points (d) and (e) are the most critical environments to try out solutions with the goal to (i) reduce the occurrence of outages, and (ii) increase resilience among the population. Secondarily, balancing the demand within a community and utilizing each home as a potential backup for the community, may provide significant balancing opportunities to stabilize the community grid service.

13. What are the most significant barriers (technical, cost, design, permitting, etc.) to integrating BTM backup power in the various sectors (e.g., residential, rural) and use cases mentioned above? What unknowns can be illuminated through research? Please be as specific and concise as possible in your response.

14. What factors need to be considered when deploying BTM generation at different climate zones and environments? How might technology solutions vary depending on the climate zones in which they are sited? What research is needed for modular, standardized BTM generation equipment to address the unique needs of California's various climate zones?

15. What are the most significant barriers to integrating BTM zero-emission backup power in under-resourced communities (low-income, disadvantaged, tribal)? What technology solutions or research areas could overcome these barriers?

SDEI comments:

Cost is critical. Smart panels (that allow the user to use the existing panel), provides value for smaller backup systems that can be scaled up over time. Systems cannot easily be scaled up with a critical loads panel as it is hardwired, whereas a smart panel (using the existing panel) is highly scalable and works with small (<5 kWh) and large (>20 kWh) systems, and anything in between. Some potential research areas include:

(i) Optimal mix of central (i.e. community) vs distributed (i.e. individual homes) storage

(ii) Community-wide load management for optimal balancing and reducing dependency on the distribution grid (i.e. external to the community)
(iii) Energy efficiency and savings by deploying AI enabled smart panels to manage energy usage
(iv) Increased grid resilience through deployments of smart panels and its effect on outages and household resilience during an outage

16. How can BTM generation (with optionally paired storage and additional DERs) be designed and streamlined to be more effectively deployed at multitenant rental properties?

    a. What ownership structure mechanisms would need to be put in place and how would this ensure that tenants receive benefits?

    b. Please list any examples of real-world implementations, including both good examples worth replicating and cautionary tales worth learning from.