DOCKETED	
Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	247137
Document Title:	Connect California LLC Comments on Behind-the-Meter Renewable Backup Power Technologies – Request for Information
Description:	N/A
Filer:	System
Organization:	Connect California LLC
Submitter Role:	Public
Submission Date:	10/31/2022 1:28:50 PM
Docketed Date:	10/31/2022

Comment Received From: Connect California LLC
Submitted On: 10/31/2022
Docket Number: 19-ERDD-01

Comments of Connect California LLC on Behind-the-Meter Renewable Backup Power Technologies â€“ Request for Information

Additional submitted attachment is included below.

October 28, 2022
California Energy Commission Docket Unit, MS-4
Docket No. 19-ERDD-01
715 P Street
Sacramento, CA 95814
VIA ELECTRONIC FILING

Subject: Comments on the Behind-the-Meter Zero-Emission Backup Power Technologies – Request for Information

Intro

Connect California is a California-based company focused on leveraging existing clean BTM assets for backing up critical loads – preferably the entire premise. We have partnered with ConnectDER[1] to enable their product set to safely island from the grid during an outage leveraging meter socket adapters with microgrid technology. While the focus of that solution is to unleash the value of energy storage within an EV, it is also a safe low-cost method of connecting any energy supply, such as BTM stand-alone energy storage.

Our responses to the RFI are below:

General:

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?**

RESPONSE: Key barriers to BTM ZE backup for critical loads include the availability, energy density and cost advantages of fossil-fueled small generators.

The lack of standardized solutions, in particular Underwriters' Laboratories (UL) testing and listing for solutions including electric vehicle (EV) batteries used as

[1] https://connectder.com/

energy storage system (ESS) and grid interface devices, are a primary barrier for permitting and interconnection.

CA IOUs don't yet allow meter collars that function as low cost electrical isolation devices, but we have a ready path through R.19-09-009 Track 2 process and funding.

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?**

RESPONSE: Numerous opportunities exist for improvements and innovations in equipment used to interface BTM energy systems with the distribution grid, including but not limited to transfer switches, remotely operable circuit breakers and panels, meter sockets, and microgrid interconnection devices (MID). One opportunity would be working with a utility to develop templates for notification-only backup systems where standardizing information provided to utilities while avoiding distribution interconnection will enable the clean BTM backup power market to grow while enhancing safety, managing operational constraints, and avoiding ratepayer cross-subsidies.

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?**

RESPONSE: there should be a carve out for piloting / demonstrating "low cost electrical isolation devices" as defined in the Microgrid Track 2 decision[2] and Resolution E-5194[3] as that allocated utility funding for their internal evaluation but

[2] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M361/K442/361442167.PDF
[3] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M489/K665/489665658.PDF

the Resolution approving the advice letters resulted in a requirement for pilot funding. Without directing funding towards those technologies there would be stranded ratepayer costs and missed customer benefits. We are not aware of other technologies in this situation where the CPUC has already built a record and allocated funding for utility evaluations.

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.**

RESPONSE: We recommend option (a), grouping by ARD and TDD, with a strong emphasis of funding on TDD for mature technologies. A subgroup should be established for the technologies identified by the CPUC in R.19-09-009 Track 2 Decision and subsequent advice letters and resolutions.

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

What would be the highest-impact demonstration use cases for which advanced meter collar functionality could be validated in the field?

RESPONSE: 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?

The TRL for meter socket adapters (MSAs) varies by vendor and application/DER type. Consider this to be a generalized overview based on publicly available information.

For solar interconnection, the TRL is 9. Several vendors are producing devices which are UL certified and commercially available today.

For EVSE and other loads interconnection, the TRL of at least one product is currently at TRL 7. Commercial availability is anticipated in early 2023. For additional details see ConnectDER and Siemens press release: https://new.siemens.com/us/en/company/press/press-releases/smart-infrastructure/siemens-and-connectder-partner-on-home-ev-charging.html

For energy storage whole house isolation, the TRL is 9. At least one UL certified device is commercially available today.

a. What research is needed to advance the TRL of this technology towards commercialization?

From a hardware product development perspective, little to no research is required. Research into electrification trends, incentives, consumer behavior, and load growth would better inform how MSAs could be optimized to defray infrastructure and service panel upgrades.

From a regulatory perspective, there are large barriers to MSA deployment. Research into how MSAs could be incorporated into a regularized and scalable approval process for approving the technologies and the associated installation processes would be helpful for enabling market adoption of these cost-saving technologies.

b. How broad is the market – are multiple technology vendors developing this technology?

The serviceable market in California is not very broad because California utilities have been reluctant to adopt MSA solutions which have proven effective in the rest of the country. However, the total addressable market is significant, estimated to up to 50% of meter access points.

Each California IOU offers at least one MSA which they developed internally.

PG&E has two solutions, the Green Meter Adapter (GMA) and Backup Power Transfer Meter (BPTM). The GMA is a solar interconnection device, and the BPTM is used to backfeed an emergency generator during a PSPS event.

SCE offers a Generation Meter Adapter (GMA) which is a solar interconnection device very similar in construction to the PG&E GMA.

SDG&E offers a Renewable Meter Adapter (RMA) also for solar interconnection. It contains a circuit breaker, and is provided with a disconnect switch.

Each of the above products has design limitations which restrict service ratings and flexibility on deployment models.

The ConnectDER solar MSA product has been available since 2014. It is currently approved by utilities in 18 states, including some in California. Approximately 15,000 ConnectDER solar MSA devices have been deployed to date. ConnectDER has MSAs for additional applications such as general purpose loads (i.e., EVSE, Heat Pumps, kitchen appliances) under development.

The Tesla Backup Switch is not a load or distributed generation interconnection device. Rather, it provides safe whole-home backup from a battery energy storage via an integrated, automated disconnect switch.

A statewide process for evaluating and approving MSAs would give consumers options to reduce DERs interconnection hard and soft costs by reducing required on-site equipment needed, limiting need for service panel upgrades, streamlining designand permitting, reducing inspection failures, and limiting truck rolls.

c. What design considerations and advanced functionality may be useful enhancements to this technology going forward?

Work is underway to bring an MSA to market in early 2023 that is optimized for L2 (40-60Amps) EVSE interconnection. Battery energy storage interconnection/control and support for electrification while avoiding service upgrades are additional near-term capabilities.

d. What would be the highest-impact demonstration use cases for which advanced meter collar functionality could be validated in the field?

MSAs are proven technology. As noted above, the CA IOUs all permit their own variants which they’ve developed in house.

From a mechanical hardware perspective, CA IOUs MSAs lack latest advancements in thermal performance, but are otherwise remarkably similar to the products offered by Tesla or ConnectDER. These similarities should ameliorate utility concerns about safety and reliability.

The highest impact initially would be for the existing commercially available Tesla and ConnectDER solar MSA products to be authorized for widespread use in California – including the associated installation processes at each utility. In addition, the demonstration of use cases for the forthcoming ConnectDER MSA for EVSE and other loads.

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?**

RESPONSE: No comment other than it must not be at the expense of safety, which we think is highest with meter collars that are typically installed outdoors or in fire separated areas (where load panels are often indoors). IslandDER technology was developed specifically to cut cost, complexity and time required to connect to virtually any (backup) ZE energy source in response to such concerns.

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?**

RESPONSE: We advocate for a technology neutral approach to addressing these issues. Safety must be a primary focus.

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?**

RESPONSE: Market is moving quickly but energy density remains a problem. Larger split phase 240V systems capable of whole house backup are still $15K++, out of reach for a majority of CA households even with state funding support. Microgrids with EVs are better than portable storage systems alone, as there is ~10x energy capacity available in the typical EV, and can be moved and recharged elsewhere.

A) Systems must be able to self- or black start, confirm the grid outage and disconnection, then grid form by setting frequency and voltage. Once it does that it must be able to serve connected loads and starts until a grid-following generator such as a PV system with anti-islanding is able to return to service.

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)?**

RESPONSE: Single premise microgrids integrating EVs into islanded configurations are ready now (Ford Intelligent Backup Power system is commercially available) but have many limitations and currently have high costs.

Our family of grid-integrated meter socket adapters are solutions is mature enough to move from ARD to TDD. Island-capable whole premise backup systems may need additional ARD.

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.**

RESPONSE: These are all important use cases that should be targeted. They are not mutually exclusive.

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?**

RESPONSE: Safe, inexpensive batteries and integration technologies. Under-resourced communities should not be stuck using less safe batteries or charging practices (see: scooter and e-bike battery fires / deaths).

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.**

RESPONSE: EV backfeed of premise wiring using bidirectional equipment and MID should be an option for these properties.

Thank you for your consideration of our comments on this matter.

Sincerely,

/s/

Josh Gerber
CEO, Connect California LLC
Josh@ConnCA.com