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Response of FuelCell Energy, Inc.
to
Request for Information
Clean Energy Resources for Reliability
November 3, 2022
Docket # 21-ESR-01
November 30, 2022

Introduction

The California Energy Commission (CEC) is seeking to identify clean energy resources and characterize their ability to support grid reliability. The CEC is required to conduct an assessment and comparison of clean energy alternatives to support grid reliability and make recommendations to expand their deployment. This Request for Information (RFI) on Clean Energy Resources for Reliability seeks to collect information on the potential resources and attributes for consideration in these analyses.

FuelCell Energy, Inc. (FCE) manufactures and operates stationary fuel cell systems that provide affordable and clean onsite energy at sites including wastewater treatment plants, hospitals, universities, industrial facilities, and serving utilities, including at substations. FCE fuel cells are a clean, reliable distributed energy resource platform that produces power 24/7 and can deliver solutions with additional features such as biogas clean-up, heat recovery for combined heat and power, and vehicle quality hydrogen for zero-emissions fuel. FCE fuel cell platforms are currently deployed throughout the state of California, including at sites located within disadvantaged communities.

FCE appreciates this opportunity to provide initial feedback in response to the CEC's RFI questions. We look forward to working with the CEC and other stakeholders on policy improvements to expand the deployment of clean, reliable fuel cells to support grid reliability throughout the State of California.

FCE Response to Questions for the Public

List of Resource types and Evaluation Attributes

The RFI seeks feedback on the following questions regarding the list of preliminary resources and qualitative and quantitative attributes by which they will be evaluated:

1) Are the categories (indicated in Tables 1, 2 and 3) appropriately representing how the CEC should be evaluating resources?

FCE broadly agrees with the representation of resources across the three tables, but offers in the following answer one suggestion to modify them.

2) Are there resources that should be added to or removed from the preliminary list under each of the categories (shown in Tables 1, 2, and 3)?

Table 1 (Supply Resources) should also include fuel cells fueled by gas or biogas because, when used for power generation, fuel cells are supply resources. Given the recent legislation mandating diversion of organic waste from landfills and federal legislation granting new incentives for biomethane processing equipment, power generation from fuel cells using biomethane should be a Table 1 resource.

FCE also suggests that the Commission include in Table 1 a category for hydrogen storage supplied to fuel cells for power generation. FCE is developing technology that will be able to convert pure hydrogen to electricity at the utility scale. This type of resource should be categorized as a supply resource because it is a one-way power generation system, as compared to the types of resources identified as Supply/Demand Resources in Table 3.

3) Are there other attributes that should be considered, in addition to the ones listed in Table 4? If so, should those be considered for the qualitative and/or quantitative evaluation?

FCE suggests the Distributed Electricity Backup Assets (DEBA) consider the proximity to load, or the potential for the resources to be sited close to load, when evaluating resources. At peak demand time, transmission congestion increases the cost of delivering marginal megawatts of power, often imported from outside the state. Identifying resources that can be deployed, temporarily or permanently, in areas close to demand centers would contribute to mitigating transmission issues and to efficiently and cost-effectively delivering needed electricity. In this vein, the DEBA should be open to solutions using hydrogen production coupled with storage in urban areas in the future as the technology becomes commercially mature. This will provide multiple benefits, especially where resources running on renewable hydrogen could replace diesel generation.

4) How should the attributes be weighted relative to each other? Should some attributes be weighted more than others?

Defining "Cleanliness" as having "Low GHG emissions and low criteria pollutant emissions" is a good starting point but does not establish a baseline standard or framework for evaluation and comparison. To address this, the definition of "Cleanliness" should be modified to use the CARB DG standard. FCE understands the DEBA to have the end goal of creating grid reliability while serving state policy goals. Meeting clean air and performance standards set out under the CARB DG certification program would enable the Commission to confidently evaluate resources that have been vetted. FCE also urges the Commission to move away from the "least cost best fit" model for resource evaluation given that that model has resulted in the current situation.

"Dispatchability" must include load reduction or demand response signals to assets to behind the meter for customers to reduce onsite load. FCE urges the Commission, when assessing resources based on these attributes to recognize that behind the meter demand response resources, including microgrids, can remove load from the grid days, hours, or minutes ahead of an emergency and should be valued more highly than diesel generation from the perspective of dispatchability.

Significant environmental damage has already been incurred by the high GHG emissions and pollution from diesel generation. Utilities have shifted costs to ratepayers through rate increases, created grid instability by not maintaining a reliable grid, and invested year after year in temporary diesel generation instead of deploying clean firm resources that were available to replace diesel as early as 2018. While we recognize that avoiding cost shifting is a policy goal, it should be superseded when resources meet policy goals pertaining to reliability, emissions standards, and dispatchability.

5) What data/information sources can help inform characterization and evaluation (both qualitative and quantitative) of the different resources?

This is an important question, because distributed technologies are constantly innovating, and using outdated information might result in the CEC inadvertently overlooking new resources and applications. The National Fuel Cell Research Center (NFCRC) is a good source of information that can help inform characterization and evaluation of fuel cell resources.

Resource Characterization

The RFI seeks feedback on the following questions for each potential resource.

1) Please provide a general overview of the resource, including the following:

a. Resource category (e.g., supply, demand) and type (e.g., solar) and scale (e.g., utility, distributed)?

Fuel cells offer baseload generation with very low pollution and high efficiency. Fuel cell systems can be called on for emergency capacity services, whether installed behind-the-meter or in-front-of-the-meter. Fuel cells can peak shave, operate as firm baseload power in microgrids, and provide emergency capacity services to the grid. Fuel cell systems can be interconnected to the grid to provide backup power during grid outages and can be called on to put electricity back on to the grid during capacity shortfalls. FCE's fuel cells are non-combustion generation devices and already meet California's criteria pollutant and toxic air contaminant emissions standards, with no criteria air pollutants harmful to human health when operating using biogas or hydrogen. This is notable, as firm power stationary fuel cell systems are today capable of running on biogas and hydrogen.

2) How does the resource compare to conventional generation in terms of greenhouse gas and priority pollutant emissions?

Fuel cells compare very favorably to conventional generation in terms of greenhouse gas and criteria pollutant emissions. Fuel cells running on biogas emit a measurable quantity of CO2. However, under the GREET model that value is negative. Fuel cells emit minimal SOx

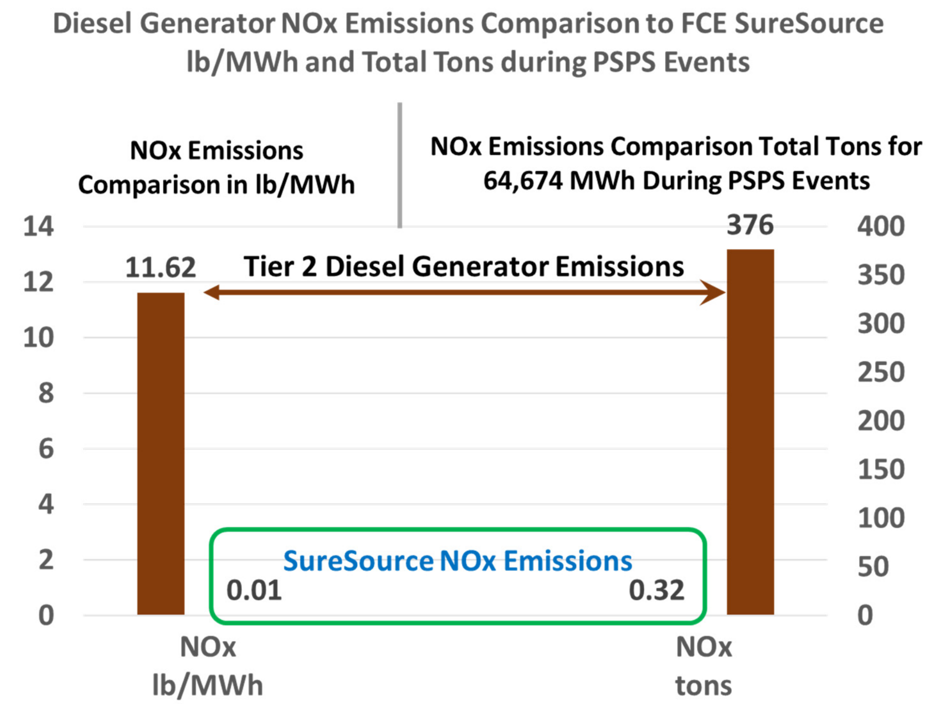
NOx and PM2.5, as illustrated by the CARB DG certification of FCE fuel cells. Fuel cells can run on all renewable fuels, giving them the opportunity to be fully renewable if using biogas (e.g. FCE projects at Riverside, San Bernardino and Tulare). Fuel cells offer reliable baseload power while occupying a small amount of land, potentially within the footprint of existing IOU-owned land (e.g. at substations). FCE's fuel cells can use biogas directly from landfills and wastewater treatment plants in order to create carbon neutral electricity. Additionally, FCE systems are also capable of running on up to 50% hydrogen in the event that a hydrogen supply become available and blended into fuel delivery. FCE fuel cells operate very quietly and efficiently on a small footprint making them ideal for land-constrained urban environments. Because of the how the technology operates (non-combustion electrochemical generation), FCE fuel cells do not require local air permits and do not create noise pollution.

Solar power, while providing the benefit of zero emissions, has significant spatial requirements to provide adequate generation. The Solar Energy Industry Association estimates that "[d]epending on the specific technology, a utility-scale solar power plant may require between 5 and 10 acres per megawatt (MW) of generating capacity. Like fossil fuel power plants, solar plant development requires some grading of land and clearing of vegetation."[1]

When comparing the GHG reduction benefits for each technology, the Commission must set the baseline as diesel generation operating 24 hours per day. The GHG baseline must also consider reductions over a 24-hour period factoring in resources needed to supplement times when the sun is not shining or the wind is not blowing. This baseline must also include criteria air emissions to accurately account for the entire emissions analysis.

As an illustration, the three figures below show FCE's estimates of the clean air emissions and GHG reductions potential of FCE fuel cells compared to the existing fleet of Tier 2 diesel generators. Figure 3 represents the impact of applying FCE's carbon reduction capabilities to our standard fuel cells.

[1] Solar Energy Industry Association, "Siting, Permitting & Land Use for Utility-Scale Solar" https://www.seia.org/initiatives/siting-permitting-land-use-utility-scale-solar.


Diesel Generator NOx Emissions Comparison to FCE SureSource
lb/MWh and Total Tons during PSPS Events
NOx Emissions Comparison in lb/MWh
NOx Emissions Comparison Total Tons for 64,674 MWh During PSPS Events
14
12
10
8
6
4
2
0
400
350
300
250
200
150
100
50
0
11.62
376
Tier 2 Diesel Generator Emissions
SureSource NOx Emissions
0.01
0.32
NOx lb/MWh
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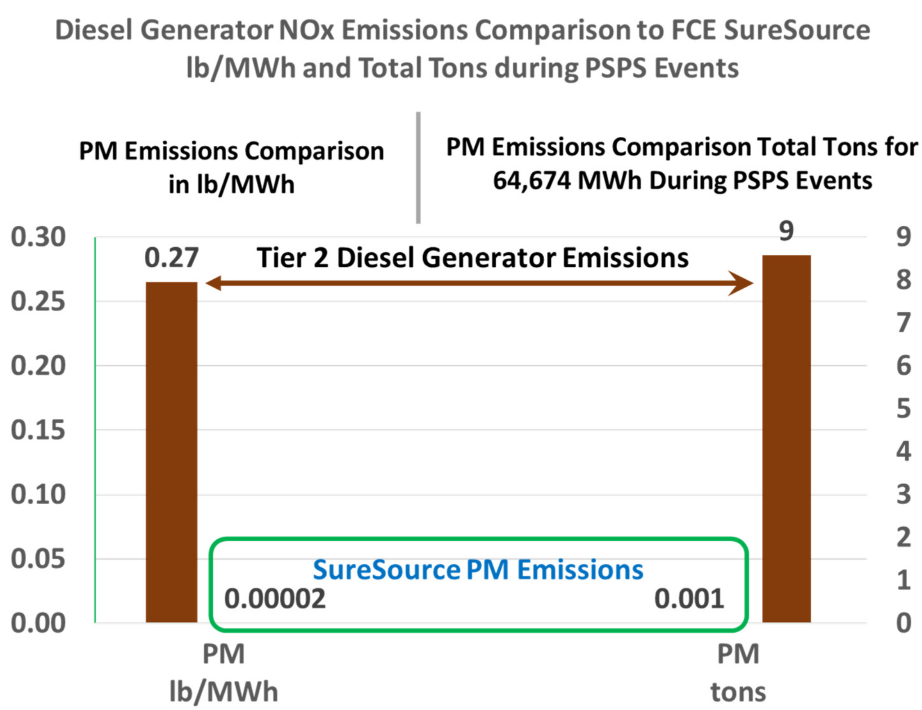
Diesel Generator NOx Emissions Comparison to FCE SureSource
lb/MWh and Total Tons during PSPS Events
PM Emissions Comparison in lb/MWh
PM Emissions Comparison Total Tons for 64,674 MWh During PSPS Events
0.30
0.25
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0.15
0.10
0.05
0.00
9
8
7
6
5
4
3
2
1
0
0.27
9
Tier 2 Diesel Generator Emissions
SureSource PM Emissions
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0.001
PM lb/MWh
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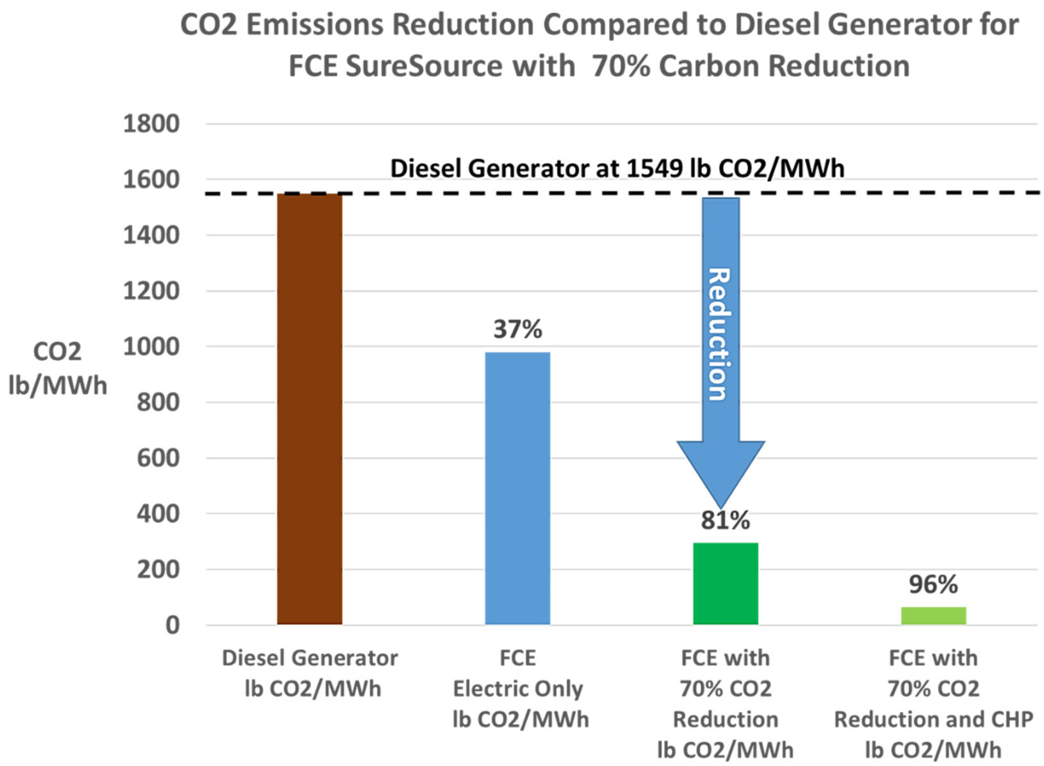

3) How does the resource support reliability (e.g., supply, permanent load reduction, net peak reduction, or emergency asset?) (List all that apply.)

a. How can the resource be used as an incremental on-call resource during emergencies?

FCE fuel cell systems support reliability by providing a reliable source of supply and permanent load reduction when deployed behind the meter. FCE fuel cell systems can also provide net peak reduction and function as an emergency asset. Fuel cells generate continuous power without combustion, criteria pollutants, and air toxics emissions, and help maintain the resiliency and reliability of local grid operation. Fuel cell systems should be a critical and preferred resource for California to address power shutoffs and grid unreliability both in front of and behind the meter and as microgrid resources. Additionally, it is important to note the disproportionate negative impact that criteria air pollution, power shutoffs, and emissions from diesel generators have on disadvantaged communities in this state—all harms that fuel cells can directly mitigate.

FCE also suggests microgrids be considered as resources for this program. Microgrids address and can solve many of the reliability issues this RFI is focused on. Microgrids can be on-call and supply power through onsite load reductions and power export, or through advanced planning for grid isolation and load reduction from the broader utility grid.

A microgrid with baseload and flexible power generation that operates fully islanded from the broader electric grid serves load that will not rely on the broader grid for service, except in an outage. As a result, microgrids provide utilities a service by reducing the demand for grid resources under normal circumstances, but especially in times of crisis and grid transmission constraint. A microgrid operating fully islanded from the grid during a crisis or time of high demand is providing the utility value at a rate of whatever the cost of providing instantaneous power to that microgrid's load would be.

Microgrids could be notified in advance of a crisis or period of high demand, perhaps one or two days in advance based on forecasting, that the microgrid will need to island during a specific period. Deployed in this manner, utilities would be able to call on microgrids as a form of demand response. However, microgrids should not be assessed solely in their capacity for instantaneous load reduction or as a potential planning liability to utilities. A fully island-able microgrid with baseload power would be able to island in advance of a grid event and continue islanding well after the crisis has passed. Because of this capability, microgrids could then be compensated by utilities for providing this service reliably and when called on.

4) How many new MWs and MWhs can the resource provide per year, taking into account resource characteristics and known barriers between now and 2035?

This answer depends on how the resource is to be procured and deployed. With proper financing and guarantees of purchase from the state, hundreds of megawatts could be deployed in the next few years. If the state issues a procurement plan for an amount of capacity, companies can plan out how to successfully bid to provide the needed resources. Solicitations would need to differentiate between intermittent renewable resources and firm baseload resources. This would create competition among potential bidding companies that would likely drive prices down. Alternatively, uncertainty in the program's implementation or changes in program participation from year to year could have a significant chilling effect on technology developers' willingness to participate in the program.

5) What is the levelized cost for the resource in $/MW-yr. and $/MWh-yr. from 2023 to 2035?

FCE does not have an answer to offer at this time. Resource cost depends on many variables.

6) What is the average length of time from ordering or purchasing the resource to operation? How long does that typically take in today's market? What conditions must be met to deploy the technology rapidly? (e.g., transmission interconnection, building electrification or upgrades, etc.)

These questions are not easily answered without context. Without certainty about the procurement of resources under this plan we cannot offer a timeline. The state needs to commit to a procurement plan or a plan to meet the goals of this program before asking developers to offer timelines to delivery. This plan would need to include some certainty for developers to have confidence that common obstacles likes interconnection cost and delay would be mitigated, and that the interconnecting utility would be required to cooperate and work with the project developer to address issues and ensure timely deployment.

FCE recommends that the CEC consider enabling the CCAs to participate in this program and be able to monetize the reliability and emergency response. If the CCAs own the assets, they can dispatch them when the grid needs them.

7) For an emerging technology, when will it be ready for deployment, and at what scale?

If an emerging technology is willing to participate as a commercial product offering, then it should not be considered on a separate timeline, given that "emerging technology" is not a well-defined concept. Additionally, the immediate problem facing the state, i.e. potential supply shortfalls at peak times in the summer, exists on a near-term timeframe that is requires immediate solutions, regardless of specific technologies' maturity. Thus, emerging technologies should be able to participate, but it will be the customers that will weigh the commercial risk associated with procuring them. These assets, like the non-emerging technologies, will be evaluated by their attributes and ability to resolve grid supply problems just like traditional assets and along similar timelines.

8) Is the target customer primarily residential, commercial, agricultural or industrial?

Overall, the most common target customer will likely be primarily commercial and industrial – i.e. a customer with large and consistent load. However, the target customer will vary according to what problem is intended to be solved. CCAs and utilities will have to solve this problem for residential customers and their other large customers. If microgrids are permitted, large commercial or industrial customers would be able to self-procure behind-the-meter assets to form microgrids that can reduce grid demand. There is no specific target customer or preferred clean resource when the issue is the reliability of electric supply across the entire California grid.

9) What are the key non-financial barriers to the development and implementation of this resource (including, but not limited to, permitting, interconnection, supply chain, customer acceptance, and alignment with policy goals)?

A significant non-financial barrier to development and implementation is the lack of certainty in program guidance, administration, and eligibility requirements. Over the past several years, fuel cells have been hampered by uncertainty in state programs like the fuel cell net energy metering tariff and the BioMAT program. When program rules change or are never implemented, this pauses project development.

The Commission should consider how the DEBA program can be rolled out expeditiously such that developers can also take advantage of federal tax incentives. Federally, the Investment Tax Credit under Section 48 of the Internal Revenue Code is only available to fuel cells whose construction begins prior to 2025. The ability to leverage federal credits, by project developers or the state, would bring down project costs and also the levelized cost of electricity. However, without clear guidance from the state in the next year about how to bid into these programs and develop projects, those federal credits will be unavailable, projects will be less likely to move forward, and fewer non-diesel generation alternatives will be deployed.

Another non-financial barrier could be the CEQA analysis associated with a resource or project. However, this is less of a concern for many fuel cell projects, including projects aimed at addressing near-term reliability issues. Given that FCE fuel cells have been certified by CARB as having de minimis air emissions, FCE's installations undergo a relatively simple CEQA permitting process. A typical 2.8 MW fuel cell system from FCE requires only 6,500 square feet of land for operation. This likely fits within the confines of existing IOU property around substations or in areas served by substations needing backup power. CEQA analysis is performed routinely by utilities for substation siting, and includes the local impacts of noise, storm water, air pollution and other environmental factors on the local community. Utilities could identify projects that could be sited with a straightforward mitigated negative declaration and coordination with the air district and other local authority having jurisdiction.

10) What are the key financial barriers to the development and implementation of this resource?

The main financial barrier is regulatory uncertainty. If the DEBA program intends to deploy resources using public money, through grant funding or outright public ownership, there needs to be long-term certainty with respect to the funding program's compliance standards. A lack of clear implementation guidelines will result in uncertainty that will have a chilling effect on project financiers and insurers, leading to higher costs or an unwillingness to finance projects.

11) What types of benefits or impacts is the resource anticipated to have on low income and disadvantaged communities, and tribes, if any in terms of development and deployment?

Fuel cells, whether running on biogas or natural gas, emit very few pollutants as compared to combustion generation technologies, particularly diesel, which the state has permitted to operate for years. Replacing emergency diesel generators with clean fuel cell systems will significantly reduce these carcinogenic emissions, which will benefit all Californians, but particularly the low income and disadvantaged communities that often bear the brunt of toxic pollutant emissions in California.

Please refer to the figures provided in a previous answer for data on how FCE's fuel cells compare to Tier 2 diesel engines.

Input on Distributed Electricity Backup Assets Program Design

The Distributed Electricity Backup Assets program can provide incentives for two main categories of projects:

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- Efficiency upgrades, maintenance, and capacity additions to existing power generators.
- Deployment of new zero- or low-emission technologies, including, but not limited to, fuel cells or energy storage, at existing or new facilities.

The statute also requires that all funding recipients participate as on-call emergency resources for the state during extreme events.

The RFI seeks feedback on the following questions, in addition to the information requested in the questions above, to help inform the design of the Distributed Electricity Backup Assets program and its phased development and launch:

1) What size of resource and what types of customers should the program target?

FCE suggests the resources be larger than 1 MW for non-residential customers. FCE also encourages the DEBA program to consider including microgrids of any size as resources.

2) What types of incentive structures and amounts are needed to accelerate the development and deployment of this resource?

The net metering program for fuel cells is a good model: reduce onsite load to export more power to the grid and be compensated, or power generation onsite to prevent added load on the grid. This structure make sense financially because of the waiver from standby charges for the customer enrolled in the tariff.

3) What types of conditionalities and measurement and verification requirements should the program include to ensure funded resources participate and deliver during emergency events?

FCE suggests the DEBA program use the current best practices that the industry and the utilities have used for metering, microgrid development, energy storage, and demand response.

4) In general, please provide any specific proposal or recommendation on the design and implementation of the DEBA program.

We suggest the CEC review the filings in the CPUC's microgrid proceeding (R.19-09-009). Many parties in that proceeding have proposed solutions to challenges of grid reliability and distributed generation. We urge the Commission to review that proceeding and become acquainted with how developers and the distributed generation industry would approach solving a problem aligned with the purposed of the DEBA.

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Dated: November 28, 2022

Respectfully submitted,

By: ___/s/___________

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