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Enchanted Rock, LLC Comments on Clean Energy Resources for Reliability RFI

Additional submitted attachment is included below.

November 30, 2022

VIA ELECTRONIC FILING

Subject: Comments on Request for Information -- Clean Energy Resources for Reliability

Enchanted Rock appreciates the opportunity to provide comments on the Request for Information (RFI) to help identify clean energy resources and to characterize their ability to support grid reliability.

Enchanted Rock is a microgrid developer, owner, and operator with over 200 MW of capacity under construction in California. Our generation technology meets the ultra-low California Air Resources Board (CARB) Distributed Generation emissions levels, the cleanest reciprocating engine standard in the nation. Through the use of renewable natural gas (RNG), our technology can provide net zero carbon emissions for both resiliency and grid services.

Questions for the Public – Resource Attributes

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)?

Any technology that can effectively compete in the backup power and grid services markets should be included in the preliminary list. Natural gas reciprocating engines should be added to the Supply/Demand Resource category for the following reasons.

Natural gas rich-burn gensets compete effectively with diesel generation on backup power performance and with bulk power peaking generation for system needs during energy emergencies. More specifically:

- Rich burn natural gas reciprocating engines match the fast start, utility grade power requirements of industrial scale backup power.
- Gas reciprocating engines are far cleaner than diesel counterparts on local emissions, and Enchanted Rock's gas microgrids have secured the strict CARB DG certification.
- Gas reciprocating engines can operate indefinitely using robust underground refueling infrastructure and can provide better resiliency than diesel during extended emergencies.
- Gas reciprocating engines can meet the state's zero carbon goals by offsetting fossil gas with renewable natural gas

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- Because reciprocating engine generators take up little space compared to many other alternatives, they work well in a densely built urban or campus setting, as many of today's resiliency applications require.
- Finally, gas reciprocating engines, with ultra clean local emissions and renewable natural gas offsets, can provide effective grid support in the form of demand response or fast ramp dispatchable wholesale generation. These grid services provide true value stacking and make clean back up power more affordable than traditional diesel backup.

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

CEC should balance these criteria flexibly to achieve an optimal solution. For example, the CEC should not use a restrictive attribute prioritization scheme that may rule out essential technologies required to keep the lights on. This has been a pitfall in other programs that are too tightly defined and fail to attract the intended commercial response.

While we support all the Qualitative Attributes found in Table 4, Readiness, Interconnection, Supply Chain (absence of constraints), and Dispatchability should be weighted more heavily to maximize the RFI's focus on supporting grid reliability in the near term.

Resource Characterization

1) General Overview of the Resource

Enchanted Rock's resiliency microgrids using gas reciprocating engines outlined above are clean, dispatchable resources that can increase grid reliability and resiliency by providing backup power during grid outages, and quick-starting, fast-ramping grid services during energy emergencies.

Enchanted Rock's generation technology is CARB DG certified to have ultra-low local emissions and can achieve net zero GHG emissions through the use of renewable natural gas. This technology can be deployed as islanded microgrids either in BTM applications at customer load or in larger scale FTM applications sited at or near utility substations.

As a result, this class of dispatchable generation that uses firm natural gas offset by renewable natural gas must be considered as an essential part of a broader portfolio of CERIP resources that includes solar/wind/storage to economically, reliably, and sustainably replace Diablo Canyon's contributions to grid reliability.

Further, natural gas distribution service is more reliable and exhibits lower outage rates than electricity, as shown in Table 1, below.[1]

Table 1: Summary Energy Distribution Reliability and Outage Rate Results

Metric	Natural Gas Distribution	Electric Distribution
Average Reliability/Availability (Planned and Unplanned)	0.9999957	0.999703
Average Reliability/Availability (Unplanned)	0.9999991	--
Average Outage Rate – Planned and Unplanned (Event Per Customer Per Year)	0.00895	1.017
Estimated Unplanned Outage Rate (Event Per Customer Per Year)	0.00125	--

The natural gas distribution system exhibits higher reliability and lower outage rates for the following reasons:

- The system uses a highly reliable underground pipeline network, whereas electricity is often delivered in above-ground wires and poles that are prone to damage by weather events, vehicular collisions, and more, subjecting customers to more frequent and longer duration outages.
- The system includes inherent storage capacity in the pressurized network of pipes that maintains continuous delivery as compared to liquid fuels requiring over the road refueling.

We strongly recommend that microgrids deployed in this program be required to use low emission fuels and generation technology that meets the air emissions threshold set out by the CARB DG regulation.

- For too long diesel generation has been the "go to" technology. Its use has skyrocketed in recent years due to PSPS events, all while producing harmful air quality for some of the most vulnerable communities throughout California.[2]
- Diesel use is patently incompatible with state's air quality goals.

3) How does resource support reliability?
As a supply resource, microgrids with reciprocating engines can be deployed as BTM or FTM resources.

Enchanted Rock's natural gas or renewable natural gas fired reciprocating gensets, financially supported by resiliency customer fees, can be quickly dispatched to boost reliability of intermittent renewable distributed resources, at significantly less cost.

[1] This report highlights that natural gas and electric distribution service are both reliable in an absolute sense, with superior attributes for natural gas distribution systems. See https://www.gti.energy/wp-content/uploads/2018/11/Assessment-of-Natural-Gas-Electric-Distribution-Service-Reliability-TopicalReport-Jul2018.pdf

[2] M.Cubed Study on Diesel Backup Generator Population Growth

Conversely, supply shortages can occur from variable energy production, or from extended power outages where batteries do not have adequate duration. The Commission's own supply analysis indicates a potential shortfall of 600Mw to 5200Mw during summer months when the state may be faced with a heat emergency or other climate related event.[3] These extended outages events could be caused, for example, by PSPS events or weather-related power outages. It should be noted that in 2020 a PSPS event averaged between twenty and forty-five hours in length[4], well in excess of the capacity of currently commercially available battery storage solutions.

In recognition that batteries/energy storage have duration limitations, we refer to PG&E's recent comments on the Lead Commissioner's Workshop on Clean Energy Alternatives for Reliability (Docket Number 21-ESR-01, that "*while energy storage can serve as a clean energy alternative to (Diablo Canyon) for some periods of time, it is critical that energy storage be paired with a generating resource of sufficient size and with a suitable generating profile, both across a single day and across seasons, to ensure the storage provides energy both at the time of need and for the duration of the need for grid reliability. The CPUC took a similar view in establishing procurement targets in the Integrated Resource Plan (IRP) proceeding."*[5]

Enchanted Rock's technology supports wind/solar generation and battery storage by providing the long-duration, on demand energy needed to fill in the gaps in the supply stack. The technology can be co-optimized on site with renewables and storage which allow these technologies to be deployed in a cost-effective, reliable manner with the added resiliency benefit of locally sited, firm, dispatchable supply. With the appropriate distribution system investments, this technology can be used as a community/substation-level microgrid to island entire communities for long duration upstream outage events.

Standalone solar-plus-storage is extremely constrained as a solution for providing 100% reliability as a microgrid. In a study that looked at the energy needs of a prototypical 10 MW substation load over just a four-day period that provides 100% reliability, a solar-plus-storage facility would require more than 20 MW of solar PV capacity and a battery with storage capability of around 90 MW and 350 MWh. Such a project would require over 90 acres of land.[6] The report stated that, "As such, the conditions under which standalone, community-scale solar-plus-storage could provide 100% reliability as a distribution microgrid are, at best, extremely highly constrained."[7]

As a supply/demand resource, Enchanted Rock's generation technology can also be deployed BTM as microgrids with the following attributes:

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[3] "California Energy Commission Preliminary 2022 Summer Supply Stack Analysis"

[4] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/safety-and-enforcement-division/documents/psps-docs-unsorted/cpuc-psps-event-data-oct-2013-through-oct-20211232021.xlsx

[5] 2 See CPUC Decision 21-06-035

[6] **Decarbonized Resilience:** Assessing Alternatives to Diesel Backup Power, prepared by the Brattle Group, for Enchanted Rock, 2020, page 11

[7] Ibid, page 12

- The generators are fully dispatchable with 10 second start up and load following capabilities that can match the performance of the diesel backup generation standard for backup power applications.
- They can quickly ramp up to satisfy demand spikes (or backfill tripped generation) on the grid and can quickly ramp down to increase access for renewable overgeneration.
- They provide firm capacity by exporting energy and/or reducing demand on the grid. By means of intelligent controls, switching, and predictive technologies, they quickly respond to dispatch signals and grid needs on-demand.

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?*

Enchanted Rock's generator and related components supply chain uses commercially available parts and materials that are high volume inputs and can support the company's current production of several hundred MW annually. Additional production lines can be added with no constraints on rare earth minerals, or competition for inputs needed for electrification of transportation.

a. How is that different if used incrementally as an emergency asset during an extreme heat event?

During an extreme heat event, and our technology is operating in grid synchronous mode, there is a derate of -12.4% for every 10 degrees Fahrenheit over 113 degrees Fahrenheit air inlet temperature.

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

Levelized costs of energy are not the most relevant metric for low run-hour resources that serve to "fill the gap" on a broader portfolio of solar/wind generation. Rather, levelized cost analyses are more applicable when comparing high run hour baseload power solutions against each other. However, based on comparable capacity cost calculations, the install costs for our technology are between $900-1200/kW with the range representing the typical electrical and gas interconnection costs associated with our reciprocating engine technology. Heat rate of these systems is approximately 12,000 kbtu/MWh

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.)*

Enchanted Rock's microgrids are typically operational in approximately 50 weeks from when the purchase order is finalized.

Even though the technology is CARB DG compliant and produces ultra-low emissions, securing environmental permitting in a timely manner is one such condition that must be met before the technology can be deployed. Supply shortages of transformers and other electrical equipment are recovering from pandemic-related bottlenecks and can now be procured to support a generating technology that is otherwise readily available and domestically produced.

In addition, if located BTM at commercial and industrial sites, there is no applicable interconnection queue or study needed for offsetting customer demand, allowing for more rapid deployment scenarios.

Input on Distributed Electricity Backup Assets (DEBA) Program Design

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

The program should focus on applications that achieve the most dispatchable capacity per program dollar of incentive and administrative costs. These applications are generally larger sites where economies of scale can be achieved. Enchanted Rock's experience has found that projects of at least 1MW yield cost effective alternatives to traditional diesel backup generation. Also, our modular, high power density technology can scale to much larger project sizes up to 100MW.

For example, this past summer Microsoft and Enchanted Rock announced California's largest microgrid fully supported by renewable natural gas. The microgrid will provide backup power at Microsoft's San Jose, CA data center and serve as a reliability demand response resource in PG&E's Base Interruptible Program (BIP). The first phase is 60MW.

20-40 MW front of the meter (FTM) community microgrids are also achievable.
Customer types include commercial and data centers, industrial facilities, health care, distribution centers, critical infrastructure, and municipal utilities/water treatment systems.

2) Incentive Structures and Amounts

The DEBA program should be additive to Demand Side Grid Support (DSGS) and investor-owned utility reliability demand response programs like BIP and Emergency Load Reduction Program. Considering the amount of diesel backup generation that is being deployed across the state,[8] the DEBA program should be structured to help a broad range of sectors pivot towards clean, dispatchable alternatives to diesel. These customers require backup generation that provides quick start times, fast ramping, long duration run times, and the ability to manage block load changes.

Incentive Structure:

- The DEBA program should provide an up-front incentive of $500/kW to attract investment in incremental dispatchable capacity. Current program design and revenues are most likely just to draw existing backup assets for use as Demand Response. The

[8] M.Cubed Study on Diesel Backup Generator Population Growth throughout California.

new DEBA incentive, as proposed, would fund roughly 1GW of new distributed capacity to support system reliability. $500/kW would be sufficient to cover the balance of costs in excess of what customers would pay for diesel generation.

Further, as noted in Resource Characterization section question 5, above, installation costs are typically higher for reciprocating engine backup assets relative to diesel generation. The proposed incentive structure would lower the net cost of the asset and encourage widespread adoption of a technology that bolsters grid reliability and resiliency with lower emissions than diesel generation.

3) What types of conditionalities needed to ensure funded resources participate and deliver during emergency events?
By making DEBA additive to existing programs, new resource performance measurement and verification rules do not need to be developed. That is, a qualified DEBA project participating in BIP, for example, will already be subject to all the regulations and procedures associated with participation in BIP.

As such, DEBA conditionalities should supplement existing CPUC Demand Response policies by offering the incentive program to qualifying projects that:

- are operational as of the effective date of the new DEBA program
- can be installed and operational within 12 months of being awarded the DEBA incentive
- are sized to deliver a minimum 5-hour duration with the awarded capacity
- meet CARB Distributed Generation air emissions thresholds
- are committed to provide services under Reliability Demand Response Resource or DSGS programs

Enchanted Rock applauds the Commission for its efforts to identify and expand clean energy resources that support grid reliability and looks forward to continued engagement with the CEC on these critical matters.

Thank you for your consideration of our comments.

Sincerely,

/s/
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