DOCKETED	
Docket Number:	21-ESR-01
Project Title:	Energy System Reliability
TN #:	247399
Document Title:	Mainspring Energy Comments on the October 28th Lead Commissioner Workshop on Clean Energy Alternatives for Reliability
Description:	N/A
Filer:	System
Organization:	Mainspring Energy
Submitter Role:	Public
Submission Date:	11/10/2022 4:00:02 PM
Docketed Date:	11/10/2022

Comment Received From: Mainspring Energy
Submitted On: 11/10/2022
Docket Number: 21-ESR-01

Mainspring Energy Comments on the October 28th Lead Commissioner Workshop on Clean Energy Alternatives for Reliability

Additional submitted attachment is included below.

Mainspring Energy
3601 Haven Avenue
Menlo Park, CA 94025
mainspringenergy.com

November 10, 2022

California Energy Commission
Docket Number 21-ESR-01
Docket Unit, MS-4
715 P Street Sacramento, California 95814

Re: October 28th Lead Commissioner Workshop on Clean Energy Alternatives for Reliability

To Whom It May Concern:

Mainspring Energy, Inc., ("Mainspring") applauds the California Energy Commission ("Commission") for examining clean energy alternatives for reliability in the October 28, 2022 Lead Commissioner Workshop ("workshop"), and we appreciate the opportunity to provide comments.

The workshop explored a multitude of challenges and opportunities associated with developing and deploying clean energy alternatives for reliability, including a framework for identifying technologies and approaches for meeting key reliability goals. Mainspring offers the following comments and recommendations.

About Mainspring

Driven by its vision of the affordable, reliable, net-zero carbon grid of the future, Mainspring has developed and commercialized a new power generation technology —the linear generator— delivering local power that is dispatchable (i.e., flexible power output) and can be powered using a range of fuels (i.e., flexible fuel input). Mainspring's linear generator uses a low-temperature, uniform reaction that maintains peak temperatures below the levels in which NOx forms (1500°C), resulting in near-zero NOx emissions. This is in contrast to the burning of a fuel with a flame, which creates high temperatures and high NOx emissions. Mainspring's linear generator offers a unique and highly flexible capacity and energy solution that simultaneously addresses the critical need of reducing greenhouse gas and criteria pollutant emissions, while also enhancing grid reliability and resilience.

Modular and scalable, Mainspring's linear generators can be deployed near load, either customer- or grid-sited. Full dispatchability and virtually no limits on daily starts/stops also allows linear generators to consistently follow load while also firming renewables, thereby facilitating the continued rapid adoption of

renewable energy. Linear generators add resilience and real capacity to the grid while also providing enhanced flexibility to help avoid renewable curtailment.[1]

I. Executive Summary

Mainspring thanks the Commission for the opportunity to provide comments on the workshop. Through these comments we recommend:

- Linear generators should be added to the Preliminary List of Resource Options;
- Fuel and operational flexibility, especially in the form of resources able to generate electricity from hydrogen, should be a key attribute that should be recognized both in qualitative resource attributes and across the supply and demand resource option categories;
- The Distributed Electricity Backup Assets Program ("DEBA") should include linear generators.

II. Linear generators should be added to the Preliminary List of Resource Options

Linear generators provide a range of benefits, as previously recognized by the Commission.[2] As a modular and scalable technology, Mainspring's linear generators can be deployed in load pockets as a flexible capacity expansion solution with the ability to immediately generate electricity from a range of renewable fuels – including both 100% hydrogen and ammonia. Linear generators are capable of operating with the same operational efficiency as the cleanest fuel cells, while offering unparalleled fuel flexibility. Linear generators are fully dispatchable with fast start/stop and full load tracking capabilities from zero to full power output. 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.

Linear generators are a clean firm resource that can increase reliability in grid-constrained locations by providing primary power, backup power, and complementing existing and forthcoming deployment of renewable energy through firming variable generation. Linear generators also provide demand response and peak load reduction, to rapidly provide locational and temporal value without significant transmission line additions (the demand side value of linear generators is described in greater detail in Section III of these comments). Mainspring's products are UL listed and have been operating at numerous sites throughout California, including at grocery stores, cold storage facilities, landfills, and food distribution centers, as well as part of multi-resource microgrids. The Commission should consider these and other technical attributes in building a cleaner grid by recognizing linear generators as a distinct technology under the distributed energy resources ("DERs") category of the preliminary list of supply side resource options as presented in the workshop.

Table 1 below provides an overview of how linear generators match each of the preliminary qualitative attribute definitions shown in the workshop presentation.

[1] For additional information on technical specifications and performance benefits, visit https://www.mainspringenergy.com/technology/.

[2] Energize Innovation Powered by California Energy Commission, "High-Efficiency and Ultra-Low Emissions Linear Generator Demonstration Project in Southern California". Available at: https://www.energizeinnovation.fund/projects/high-efficiency-and-ultra-low-emissions-linear-generator-demonstration-project-southern

Table 1: Linear Generator Applicability to Commission Preliminary Qualitative Attribute Definitions

Attribute	Commission Definition	Linear Generator Applicability
Readiness	Technological readiness and maturity	Operating at numerous sites throughout California, including at grocery stores, cold storage facilities, landfills, and food distribution centers, as well as as part of multi-resource microgrids
Permitting	Ease of permitting processes (e.g., local, CEQA) required to implement the option	UL listed, and meets all local Air Quality Management District (including numerous permits in the South Coast AQMD) and California Environmental Quality Act requirements
Interconnection	Ease of interconnection and availability of infrastructure (e.g., transmission line access) for successful implementation of the option	UL listed grid-tie inverters with numerous permissions to operate in California Investor-owned and municipal utilities
Supply Chain	Efficiency and effectiveness of manufacturing and supply chains to support implementation of the option	Ability to scale manufacturing with 9-12 months notice to meet any reasonable demand including significant manufacturing and assembly at our Menlo Park, CA headquarters; fuel flexibility significantly reduces supply chain risk
Customer Acceptance	Operator and end-user acceptance of the technical aspects and value proposition of the Option	Reference customers include Kroger, Lineage Logistics, Florida Power & Light, and PG&E (Others available under NDA)
Cleanliness	Low GHG emissions and low criteria pollutant emissions	Demonstrated ability to generate electricity with ultra-low emissions using a low-temperature reaction from zero- and low-carbon fuels including clean hydrogen, ammonia, and nearly all biogas options, along with natural gas
Dispatchability	Certainty and firmness of an option, including number of events, frequency of events, and event duration	Fully dispatchable with fast start/stop and full load tracking capabilities from zero to full power output; availability that beats NERC averages ensures that power is available when needed
Policy Alignment	Availability of supportive policies and incentives, current and expected	Fully aligned with California's climate and resilience goals, able to provide zero- and low-carbon power wherever and whenever needed, and to run on clean fuels like hydrogen which will be a critical means to accelerate deployment of and store renewable energy
Equity	Equity considerations such as impacts on Low Income and Disadvantaged Communities	Significantly improve air quality and provide resilient localized power to increase reliability where generators are located, with nearly one third of deployed units already serving disadvantaged communities

Beyond qualitative attributes, Mainspring will provide material quantitative benefits to California's grid and environment as we continue to scale linear generator deployment in the coming years. Mainspring is happy to discuss sharing projections of capacity, energy, and levelized cost metrics directly with Commission staff.

III. Fuel and operational flexibility are key attributes that should be recognized both in qualitative resource attributes and *across* the supply and demand resource option categories

Mainspring applauds the Commission for taking an outcome-based approach to appraising the values different technologies and resources can provide, as this is an essential step towards increasing the reliability of California's energy grid. Flexibility, in terms of both fuel flexibility and operational flexibility, should be explicitly recognized, especially as hydrogen becomes more plentiful as a byproduct of renewable energy.

A. Fuel flexibility

The ability to use multiple fuel sources in the same technology without the need for hardware changes (i.e. fuel flexibility) should be explicitly delineated in the qualitative resource attributes (as applicable to fuel-based technologies). Particularly in light of the recent proliferation of diesel and gasoline-powered backup generators, it is essential that the Commission appropriately value fuel-flexible technologies to prevent energy users from purchasing single-fuel resources that become stranded assets as technology, as well as energy, environmental, and air quality regulations advance.[3] Fuel-flexible technologies –particularly those that are operationally flexible as well (i.e., dispatchable)– represent the most prudent investment of taxpayer and ratepayer dollars, enabling operators to continue utilizing resources as cleaner fuels become available and as resiliency issues require. This is especially true as production of clean hydrogen ramps up as a means to increase and store renewable energy production. It is critical that the Commission appropriately value technologies able to use these fuels to enable California's evolution toward a cleaner grid.

B. Operational flexibility

The Commission should value the ability of generation resources to start and stop quickly, and vary power output (load follow) to meet demand and firm renewables (i.e., operational flexibility). As presented, the resource options are bifurcated into supply and demand categories. Mainspring urges the Commission to incorporate operationally flexible technologies that are capable of producing value on *both* the supply and demand sides (e.g. a single resource that can provide both primary power and demand response). A critical barrier to the effective deployment of operationally flexible resources is the narrow (and potentially anachronistic) use cases under which these resources are studied and evaluated. Appraising generation resources on multidimensional value (i.e. value stacking), rather than solely on a single dimension (e.g. backup power, black start, etc.), enables and incentivizes new and innovative sources of clean firm power to provide as much value as possible, while also representing the most prudent use of taxpayer and ratepayer funds to drive improvements in both emissions and grid solvency.

[3] Steven Moss and Andy Bilich, M.Cubed, "Diesel Back-Up Generator Population Grows Rapidly in the Bay Area and Southern California" (2020). https://bit.ly/34qOr0b. Backup generators have reached 7,360 MW of capacity in the South Coast AQMD and 4,840 MW of capacity in the Bay Area AQMD based on information for BAAQMD and SCAQMD. The report estimates an average capacity of 0.543 MW for units in SCAQMD and 0.628-0.642 MW for units in BAAQMD.

Linear generators present one of the best options for customers and utilities to complement their variable renewables with an option that can be available at any time to meet the needs of the customer, without a significant land use requirement. This is especially notable as linear generators drive value for the demand categories described in the workshop presentation, including demand flexibility and permanent load shifting, alongside the supply categories. Mainspring strongly recommends the Commission consider value stacking on both the supply and demand side when evaluating incentive mechanisms by incenting technologies that simultaneously provide multiple use cases on both sides of the utility meter. Resilient behind-the-meter applications include primary power, onsite solar firming, peak load reduction, and demand response; and resilient front-of-the-meter applications include local microgrids, peaker plant and diesel displacement, and T&D resilience and non-wires alternatives. California has established aggressive targets to combat the climate crisis and clean firm power resources are essential to ensuring that greenhouse gas emissions reductions can be achieved without sacrificing affordability, year-round reliability, and multi-day resilience.

IV. The Distributed Electricity Backup Assets program should include linear generators

Consistent with Section I above, Mainspring recommends the DEBA program include linear generators. As described in detail previously in these comments, linear generators provide a unique suite of benefits to operators, the grid, and the environment, enabling greater flexibility while lowering emissions. In addition to the potential technology types outlined in the workshop presentation, Mainspring urges the Commission to include linear generators as an eligible technology.

Conclusion

Mainspring appreciates the opportunity to comment on the workshop and looks forward to collaborating in the future.

Sincerely,

/s/ Serj Berelson

Serj Berelson,
Senior Policy Manager, West
Mainspring Energy