BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes.	Rulemaking 20-05-003 (Filed May 7, 2020)

OPENING COMMENTS OF ELECTROCHAEA CORPORATION ON THE ADMINISTRATIVE LAW JUDGE'S RULING SEEKING FEEDBACK ON MID-TERM RELIABILITY ANALYSIS AND PROPOSED PROCUREMENT REQUIREMENTS

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Pursuant to the *Administrative Law Judge's Ruling Seeking Feedback on Mid-Term Reliability Analysis and Proposed Procurement Requirements*, (ALJ's Ruling, or Ruling) issued February 22, 2021, and ALJ Julie Fitch's March 12, 2021 email ruling granting a request to extend the comment deadline**,** Electrochaea Corporation (Electrochaea) submits these opening comments.

I. INTRODUCTION

Electrochaea appreciates the opportunity to provide these limited responses to certain questions posed in the ALJ's Ruling. Electrochaea's interest in this proceeding and related proposed near-term procurement requirements is to highlight for the Commission the longer-term potential of renewable natural gas (RNG). To realize this potential, the Commission should provide market signals that encourage investments in RNG and the development of additional policies supporting similarly situated zero-carbon fuels.

RNG functions as a drop-in replacement for fossil gas. As such, it leverages existing infrastructure, from gas storage and distribution to residential appliances and industrial

equipment. Realization of this potential will require regulatory support to ensure that RNG projects, including from biomethanation, are online when needed. Such support will enable the required advanced planning for financing, permitting, site preparation, and related work associated with such investments. The interrelatedness of gas and electrical grids has become increasingly apparent through growing reliability concerns and the Commission should work to ensure regulatory frameworks are in place to allow for cross-benefits to be realized through new technologies. The idea of "cost" must be looked at more holistically to recognize opportunities for savings through policies that incentivize new resources that can aid in achieving climate goals. In the context of this interrelatedness and long-range planning, the concept of "storage" should be considered more broadly to include RNG and related types of technologies, which can provide storage-like features to the grid.

II. BACKGROUND ON ELECTROCHAEA'S TECHNOLOGY

Electrochaea has developed an industrial-scale solution for the production of grid-quality renewable natural gas that can replace any use of fossil natural gas. The proprietary power-to-gas process converts renewable energy and carbon dioxide (CO2) into grid-quality methane. This technology, called biomethanation, takes hydrogen produced using renewable power and combines it with CO2 to produce methane, effectively storing the renewable electrical energy in the chemical bonds of the methane.

The core of Electrochaea's power-to-gas system is a selectively evolved microorganism – a methanogenic archaea – that excels through unprecedented catalytic ability and industrial robustness. The technical advantages of this biocatalyst enable our biomethanation technology to operate at lower capital and operating costs and with greater flexibility than conventional thermochemical methanation processes. Our biomethanation plants have demonstrated flexible

operation with immediate recovery after different periods of shutdown. This flexibility is important to accept intermittent renewable power when it is available.

De-risking of the process for commercialization began in 2011, using raw biogas to produce methane at a brewery digester in St. Louis, Missouri, and continued with field trials in Foulum, Denmark. In 2016, an industrial-scale plant was commissioned near Copenhagen, Denmark at a wastewater treatment plant. The biomethanation plant has been in intermittent operation for 3.5 years, with 4,500 total operating hours. Grid quality methane (>97% methane) is produced by the self-sustaining biocatalyst and has been injected onto the Danish gas grid. A second-generation plant, with automated remote operation, was commissioned in 2019 in Switzerland, and was injecting high quality methane onto the gas grid within 96 hours of startup. The plant has produced methane for more than 1,300 hours. In the United States at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, a biomethanation facility, partially supported by Southern California Gas Company, has continued the demonstration of the feasibility of commercialization of the power-to-gas technology using a biocatalyst.

III. COMMENTS

Electrochaea offers the following discrete comments on the ALJ's questions concerning resource eligibility under Section 5.1 of the Ruling.

A. *"10.The process of identifying resource types and amounts that are cost-effective, and can potentially fulfill a procurement need, but have market or other barriers to procurement, is explored in Section 6.5.4 of the Procurement Framework Staff Proposal. Comment on the approach described in this ruling, with reference to the Staff Proposal and/or other approaches you recommend."*

Electrochaea strongly supports the development of a decision-making process open to technologies and energy sources that should be included in modeling and future procurement. A

tailored analysis is required for larger, more complex resources that touch multiple systems. Setting strategic goals, while not being overly prescriptive of how to achieve them, allows for emerging technologies to develop under a flexible framework. For example, recognition of hydrogen's potential towards climate goals should not stop with using hydrogen as an end product. Hydrogen can also be used as an input for the production of other low carbon intensity fuels, such as RNG synthesized using power-to-gas technologies. Interrelated resources and systems do not always fit neatly into existing modeling and regulatory frameworks, and the Commission should conduct tailored analysis of unintended barriers to ensure the best-fit resources are not unnecessarily excluded from modeling.

The Procurement Framework Staff Proposal notes that "[r]esource types currently not considered in the IRP planning track may become cost-effective under the GHG reductions required to meet the state's 2045 objectives – includes carbon-free dispatchable power to replace existing plants that burn natural gas, such as small modular nuclear reactors, gas with carbon capture, utilization and storage, biogas, hydrogen, or other power-to-gas storage applications."[1] This is a critical observation and one that is clearly supported by the recent 2021 SB 100 Joint Agency Report (SB 100 Report, or Report).[2] The Report notes that while its analysis did not specifically model RNG, it did utilize "generic zero-carbon resources" in sensitivity study modeling to simulate RNG and other similar resources. The outcome shows a significant reduction in cost when these resources are included in a zero-carbon future.[3] Other studies have also modeled that using low-carbon power, such as RNG, for firm electrical generation can

[1] Staff Proposal for Resource Procurement Framework in Integrated Resource Planning (Nov 2020), included as Attachment A to *Administrative Law Judge's Ruling Providing and Incorporating into Record Staff Paper on Resource Procurement Framework* (Nov. 18, 2020), at pg. A-47. (Procurement Framework Staff Proposal).
[2] 2021 SB 100 Joint Agency Report (March 15, 2021) California Energy Commission Docket No. 19-SB-100. (SB 100 Report).
[3] SB 100 Report, at pg. 92.

reduce the cost of electricity on the path to zero-carbon electricity.[4] While the SB 100 Report decided that "due to high uncertainty in the available cost and performance data of pre-commercialized technologies, some technologies were not included in the core scenarios."[5] Electrochaea urges the Commission to identify and explicitly evaluate barriers to these crucial but emerging technologies.[6] Cross-benefits, such as that of balancing the electric grid during times of over-generation while simultaneously greening the gas grid, are not easily quantified through existing analysis that may lack full recognition of the increasingly interrelated gas and electric grids.

Incentivizing interrelated processes, however, may require additional regulatory framework changes to ensure the appropriate pay-off for the power grid in terms of both reliability and GHG reduction. It is important to note that many of these new technologies seek to utilize the grid in ways not formerly anticipated. For example, utilizing otherwise curtailed energy during times of overproduction requires a tracking mechanism or contractual arrangement to ensure the energy supporting the biomethanation facility is renewable. While we already recognize the inherent value of storing energy for later use or in a different location, there is no effective market or other meaningful value system in place to appropriately incentivize development of such emerging storage resources. With an eye on system-wide reliability, the creation of another mechanism of seasonal storage can and should be encouraged. Further, Renewable Portfolio Standards and other state-level climate goals can serve, appropriately, to

[4] NA Sepulveda, JD Jenkins, FJ de Sisternes, RK Lester (2018) "The Role of Firm Low-Carbon Electricity resources in Deep Decarbonization of Power Generation", Joule 2:2403-2420.
[5] SB 100 Report, at pg. 12.
[6] Electrochaea urges the Commission to look beyond California's borders for examples, such as Electrochaea biomethanation plants that are injecting renewable natural gas into commercial gas grids in Switzerland and Denmark.

induce a more holistic valuation approach to the overall burdens of the State's long-term energy plan rather than limited to current cash-only costs of low-cost, legacy energy sources.

Finally, in developing such a decision-making process, it is important also to balance the administrative burden of individual resource analysis with the need for early and pointed market signals. We therefore recommend the Commission staff quickly develop a decision-making approach that avoids regulatory delays. Relatedly, Electrochaea also suggests that such a process utilize commercial data provided by industry, rather than relying on what might be no-longer-applicable legacy data.

B. *"11.Comment on whether the suggested amount of geothermal and/or long-duration storage resources should be required to be procured as part of the mid-term procurement requirements."*

Electrochaea agrees that the declining ELCC values of certain resources calls for increased resource diversity in future procurement for reliability needs.[7] The retirement of Diablo Canyon and OTC plants, both of which represent a significant loss in firm capacity, necessitates procurement of resources that can provide these same attributes. Future increased levels of solar and other intermittent resource penetration (and their resulting curtailment), however, can be better utilized in the development of long-term storage to meet the required reliability needs.

It is important that long-term storage solutions be viewed broadly as a tool for time-shifting, not necessarily exclusive to non-generator resources that charge, discharge, and then cycle. There are multiple solutions that can provide the same benefits to the grid. Renewable power-to-gas is a reliable and cost-effective means of time-shifting, though not the only one.

[7] Administrative Law Judge's Ruling Seeking Feedback on Mid-Term Reliability Analysis and Proposed Procurement Requirements (February 22, 2021) at pg. 17. (Ruling).

Pumped hydro, for example, offers seasonal storage, though with its own set of geographic and circumstantial limitations. In its procurement directive, the Commission should recognize multiple types of resources when considering what might be considered "storage," and, in the context of our above comments, acknowledge that there may be barriers worth overcoming to realize cross-benefits. Such barriers can take the form of overly-limited regulatory definitions that unnecessarily define resources by specific capabilities or technologies (e.g., "storage" = "battery").

The Ruling suggests that long development lead times for long-duration storage indicate we should be procuring these resources soon to ensure they come online in time.[8] Electrochaea agrees that it is essential to provide the right procurement signals now. Aligning the regulatory framework and directing this type of procurement early is essential to driving early development and investment. Further, a power-to-gas facility can provide significant flexibility to accurately meet future needs because it has a relatively short lead time,[9] while mitigating replacement of existing infrastructure and corresponding higher costs to customers.

C. *"13.Comment on the proposal for all LSEs to engage in joint procurement of geothermal and/or long-duration storage, with the potential for IOUs to be required to backstop such procurement. This suggestion corresponds to Section 7.2.2 of the Procurement Framework Staff Proposal. If you have an alternative proposal, describe it in detail and/or identify whether it is one of the other options included in the Procurement Framework Staff Proposal. In addition, comment on whether identifying need for backstop procurement in 2023 would allow sufficient time to contract for and build these resources by 2025, and, if not, how you would propose to address this timing issue."*

While Electrochaea takes no specific position on a central procurement entity or joint procurement framework,[10] Electrochaea cautions against any resolution of this issue that might

[8] Ruling, at pg. 17.
[9] Electrochaea anticipates a timeframe of approximately 3-5 years from conception to a facility being online. From start of construction through commissioning is closer to two years.
[10] Procurement Framework Staff Proposal at pg. A-61.

result in a single solution with a single technology. Any scenario must leave room for innovation and flexibility as may be appropriate for the varying geographies and systems of the various load serving entities. Generally, we understand the need to ensure large resources with capacities exceeding any individual LSE's needs are picked up, but still caution against a one-size fits all approach.

D. *"14.Comment on how fossil-fueled resources should be treated for purposes of compliance with the procurement requirements proposed in this ruling. Include responses to the potential limitations suggested above and/or propose additional restrictions, if you feel that fossil generation should count but be subject to limits."*

Electrochaea supports allowing gas-fueled resources to qualify as eligible for compliance, including redevelopment or repowering at existing electric generation sites, recognizing the need for additional restrictions. The fossil nature of the currently-used fuel for such *fossil-fueled resources,* not the inherent nature of the generating asset (e.g. gas turbine), causes the net GHG emission from generation. Therefore, limitations or restrictions on the GHG impact of the *fuel*, as established by recognized life cycle analysis methodologies and as recognized by the Commission, could enable the use of existing generation assets for compliance with procurement requirements when using appropriate low carbon or 'non-fossil' fuels. In particular, Electrochaea supports the Commission's suggestion of imposing restrictions that "[require] fossil-fueled capacity used to count toward the procurement recommended in this ruling to burn a percentage of green hydrogen (hydrogen produced with zero GHG-emitting resources) or biomethane."[11] Such a restriction would both ensure a continued commitment to California's climate goals and send the correct market signals to such fuel supplies that will be needed in the longer term.

[11] Ruling, at pg. 10.

Restriction of the fuel options for this purpose to current definitions of "green hydrogen or biomethane," which currently have technology-limited definitions, may discourage development or deployment of technologies with equal or greater capacity to reduce GHG-emissions. Providing a technology-neutral definition for "renewable gas or renewable gases" as part of the Commission's recommendations would provide the State with additional options to encourage the use of existing generation resources to simultaneously meet procurement requirements and GHG emission targets. Renewable natural gas is essentially a drop-in replacement for fossil natural gas and requires no additional infrastructure, nor any investment in reconfiguration. There are no technical limitations on how much can be burned in an existing plant, nor any storage issues associated with the fuel. But, arbitrarily imposed regulatory limitations on what RNG production methods are eligible may limit the amount of such fuel available in the market. It is essential to regulate the end product, so that all potential production processes are enabled and can maximize the GHG reductions and amount of RNG available.

Adding carbon capture to a plant, another suggested limitation, makes existing fossil gas plants greener, and near-zero emission if the carbon capture process can be run on renewable power itself. Though we note this adds an additional complication of how to ensure the renewable power is there when it is needed, rather than creating an additional load on the system during times of peak demand when the gas generator is most likely to be running.

There is an abundance of potential CO2 waste sources to be utilized as feedstock for biomethanation facilities in California – from dairy digesters, to landfills, to wastewater treatment plants, to carbon captured from flue gases. Utilizing RNG allows renewable energy to be stored and later utilized in existing plants that are already often located in transmission-constrained areas where reliability is the biggest issue.

As demonstrated in the SB 100 Joint Agency Report and discussed above, in order to cost-effectively reach California's ambitious and achievable climate goals, we will need zero-carbon energy to be online and supporting reliability needs. It is thus important to send the right policy and market signals now.

IV. CONCLUSION

Electrochaea appreciates the opportunity to submit these comments and looks forward to working with the Commission and other parties in this proceeding.

Dated: March 26, 2021

Respectfully submitted,

/s/ Sarah Kozal

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