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Biodiesel and Renewable Diesel - Clean Energy Resources for Grid Reliability

Additional submitted attachment is included below.

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76 CR 410
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November 30, 2022

California Energy Commission
Docket Unit MS-4
Docket No. 21-ESR-01
715 P Street
Sacramento, CA 95814-5512

Re: Clean Energy Resources for Reliability

Summary Biography for Raymond J. Albrecht PE

Consulting environmental engineer with over 40 years of experience in the subject area of renewable heating and power generation technologies. Technical specialties have included electric and thermally-driven heat pumps, solid and liquid renewable fuels in thermal applications, and power generation. Have performed work for manufacturing companies, trade organizations and environmental agencies relating to equipment design, fuel utilization, regulatory permitting, emissions testing, and life-cycle analysis. Member of the ISO New England Planning Advisory Committee and active with the ISO New England Load Forecasting Committee.

Spent 30 years as lead technical staff person for fuels R&D at the New York State Energy Research and Development Authority (NYSERDA). Principal of Raymond J. Albrecht LLC for the past 14 years.

Graduate of Cornell University with a Bachelor of Science degree in engineering and a Master of Science degree in Theoretical and Applied Mechanics. Life Member of the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) and past chairman of ASHRAE Technical Committee 6.10 for Fuels and Combustion. Received the ASHRAE Distinguished Service Award in 2015. Licensed professional engineer (No. 056935) in New York. Served as a 1st Lt (Infantry) in the United States Army during 1970-80 (active plus reserve) and am a graduate of the US Army Infantry Officer School at Fort Benning, Georgia. Fulfilled my active reserve obligation in northeastern Kenya, near the Somali border.

Comments

I appreciate the opportunity to comment on Docket No. 21-ESR-01 Clean Energy Resources for Reliability. I recognize the importance of work undertaken by the California Energy Commission (CEC) and other key stakeholders in support of electric grid reliability. I support CEC efforts to identify and discuss clean energy resources to serve California's electric needs and transition the electric sector to a decarbonized grid. I believe that biodiesel and renewable diesel can help enable the California Energy Commission to achieve its policy goals in the power generation sector.

As a drop-in replacement for petroleum diesel, and as a technically feasible back-up or substitute for natural gas in many power generation applications, biodiesel and renewable diesel can help California achieve its carbon neutrality goals, while enhancing grid stability issues that are arising from the growing share of non-inertial, inverter-based solar PV and wind power generation systems. As demonstrated and CARB approved low-carbon fuels, biodiesel and renewable diesel are scheduled to grow substantially in the on-road and off-road diesel sectors in California. As these fuels become more widely available in California, they will also be available for use as a low-carbon fuels for power generation.

As part of the CECs efforts on Clean Energy Resources for Reliability, I recommend that CEC take the following steps:

- Include biodiesel and renewable diesel as renewable energy technologies in Table 1 (Supply Resources) of the RFI;
- Adopt a program to transition existing oil-fired power generation facilities, including engine-driven generation sets, combustion turbines and steam-cycle systems, to biodiesel and renewable diesel;
- Include biodiesel and renewable diesel as renewable distributed energy technologies in Table 3 (Supply/Demand Resources) of the RFI;
- Adopt a program to encourage biodiesel/renewable diesel-fired Combined Heat and Power Systems across the California grid for reducing carbon emissions, and importantly, for contributing to grid stability via service as inertial, synchronous condensers in voltage/frequency support of nearby solar PV and wind generation resources;
- Adopt a program to use biodiesel and renewable diesel for long-term storage in backup/emergency power generation systems;
- Classify biodiesel and renewable diesel as eligible forms of long duration storage.

Each of the above recommendations has been described further in this document.

I support the CEC's efforts to evaluate the cost effectiveness and feasibility of clean energy resources for power generation, and to establish a list of resources that could serve as the basis for replacing Diablo Canyon Power Plant for the longer term.

1. Include biodiesel and renewable diesel as renewable energy technologies in Table 1 (Supply Resources) of the RFI

CEC has included in the Request for Information a list of renewable supply resources (see Table 1: Supply Resources). I would suggest that biodiesel/renewable diesel-fired power generation be included in the *Renewables* section of the table. Biodiesel and renewable diesel achieve substantial carbon savings compared to both petroleum diesel and natural gas as evidenced under the California Low Carbon Fuel Standard. I would also suggest that the resource categories in Table 1 distinguish between firmly dispatchable and intermittent resources. Biodiesel and renewable diesel-fueled generation technologies are firmly dispatchable and thus have the capability to fill the gap when solar PV and wind

outputs are low. I would suggest further that regulatory policies and incentive programs offer enhanced support for the use of biodiesel/renewable diesel-fired power generation systems as long-duration (greater than 8 hours) storage technologies. Biodiesel and renewable diesel-fired generation technologies are especially valuable as low carbon options during prolonged, multi-day droughts of low solar PV and wind output.

2. Adopt a program to transition existing oil-fired power generation facilities, including combustion turbines and steam-cycle systems, to biodiesel and renewable diesel

I would suggest that CEC model the benefits of increased, firmly dispatchable, renewable generation technologies on the grid, and how best to encourage their deployment. CEC should seek to establish a balanced portfolio of dispatchable and intermittent generation resources that maximizes the diverse and complementing benefits of solar PV, wind and renewable fuels. CEC should evaluate closely the comparative performance and economics of renewable fuels vs. battery storage. While battery storage can be favorable for short-duration periods (e.g., afternoon to evening supply shifting), the associated high capital costs can be a barrier to widespread implementation. It is my sense that battery storage can be practical for short-duration storage but that renewable fuels would be advantageous, especially when repowering existing generation facilities, for filling the grid supply gap during long-duration conditions of low solar PV and wind output. I would suggest that CEC establish a master plan for firmly dispatchable, renewable power generation with specific near-term and long-term targets.

3. Include biodiesel and renewable diesel fuels as renewable, distributed energy technologies in Table 3 (Supply/Demand Resources) of the RFI

I would suggest that biodiesel/renewable diesel-fired power generation, in the form of Combined Heat and Power (CHP) and other microgrid design concepts, be included as a designated *Resource Type* under the category of *Distributed Technologies* in Table 3: Supply/Demand Resources. I would also offer that the technologies listed in Table 3 be separated into two categories, those that use renewable fuel (biodiesel, renewable diesel, renewable natural gas, and green hydrogen), and those that use fossil fuel or non-green hydrogen.

4. Adopt a program to encourage biodiesel/renewable diesel-fired Combined Heat and Power Systems, especially where petroleum diesel fuel is currently used.

CHP is an effective technology for improving efficiency, reducing emissions and lowering operating costs in commercial and industrial facilities, including food processing plants, colleges and universities, sewage treatment plants, and other applications with heavy thermal loads. CHP systems are often the most valuable energy option in producing high-value electricity and thermal outputs.

I would suggest the CEC adopt a program to encourage biodiesel/renewable diesel-fired Combined Heat and Power (CHP) systems across the California grid for reducing carbon emissions, reducing the net cost of renewable fuel utilization, and importantly, for contributing to grid stability via service as inertial, synchronous condensers in voltage/frequency support of the grid when there is nearby solar PV and wind generation.

California is to be commended for its achievements under the Public Utility Commission (CPUC) Rule 21 in the standardization of CHP/DER interconnection requirements which enhance grid stability and reliability. CPUC has been a leader in the adoption of IEEE Standard 1547-2018 *IEEE Standard for*

Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces.

The newly revised IEEE 1547-2018 standard requires distributed energy resources to provide specific grid supportive functionalities including active frequency support of the grid, lengthier and wider voltage and frequency ride-through capability, as well as generator-utility communications and control functionality, including the ability to receive signals from the grid. But the standard only allows, and does not require, active voltage regulation, and thus there is room for further improvement in control function, and the job has not been entirely completed. The IEEE 1547-2018 standard is formatted more as a performance standard, rather than a prescriptive design standard, and can be highly complex in its application. Also, the follow-up IEEE 1547.1-2021 standard, which includes product testing and conformity procedures, is new to the inverter/control manufacturing industry and thus poses challenges in interpretation and application of requirements.

I would therefore suggest that both existing and newly installed, inertial-type CHP systems could be employed across the California grid, thus using the more traditional method of spinning generation to provide active regulation and ride-through capabilities, to help supplement grid reliability.

5. Adopt a program to use biodiesel and renewable diesel for long-term storage in backup/emergency power generation systems

California has a program to incentivize the replacement of high emissions vehicles, biomass combustion systems, agricultural equipment and other categories to reduce air emissions and to transition away from traditional petroleum diesel. I would recommend that the CEC adopt a program to support the transition to cleaner fuels in existing backup/emergency power generation systems. The transition to cleaner fuels could be accomplished as a drop-in technique without major capital cost investment and would serve to substantially improve air quality and lower carbon emissions, especially during periods of stagnant atmospheric conditions.

6. Classify biodiesel and renewable diesel as eligible forms of long duration storage

The California Long-Duration Energy Storage Program, authorized by AB 205 (Budget, 2022) includes storage systems that can provide at least eight hours of continuous power discharge. Eligible technologies under the program currently include, though are not limited to, thermal storage and hydrogen. Biodiesel and renewable diesel produced from low-carbon feedstocks should be included in the Long-duration Energy Storage Program. Both fuels can be used to produce firmly dispatchable power, which is the most valuable form of renewable power, thus filling the gap when low output conditions occur for solar PV and wind. Biodiesel and renewable diesel can thereby serve the dual functions of supporting grid reliability while contributing to further decarbonization by reducing the need for fossil-fired backup generation.

CONCLUSIONS

CEC policy analysis and recommendations will be of critical importance in meeting the combined goals of grid reliability, climate protection and air quality. CEC could enable the accomplishment of these goals by giving greater recognition to clean, renewable fuels.

There is no single solution to help California achieve its ambitious goals. Allowing biodiesel and renewable diesel to be part of the solution for grid reliability in California will help achieve emissions benefits immediately, enhance local air quality in disadvantaged and EJ communities, and ease any potential cost and supply concerns. I ask that biodiesel and renewable diesel be recognized as full partners with other renewable energy resources in your policy planning.

I thank CEC staff for their work on the importance of grid reliability and look forward to collaborating with you. Please feel free to contact me if any questions should arise.

Sincerely,

Raymond J. Albrecht PE
Consulting Environmental Engineer