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Description:	Diesel Forum Comments encourage consideration of use of Renewable Diesel Fuel/ Hydrogenated Vegetable Oil (RD/99/ HVO) as a Clean Energy Resource
Filer:	Allen Schaeffer
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Before the California Energy Commission

Comments to

Docket 21-ESR-01

Energy System Reliability

Contact information:

Allen Schaeffer
Executive Director
Diesel Technology Forum
5300 Westview Drive # 308
Frederick, MD 21703

Tel: 301-668-7230
Email: aschaeffer@dieselforum.org

I. Introduction

The Diesel Technology Forum (Forum) is a not-for-profit educational association that represents manufacturers of diesel engines, vehicles, and equipment including mobile and stationary generators, along with component manufacturers and renewable and petroleum fuel producers. The Forum collects and commissions research that attests to the environmental and economic importance of diesel technology and serves to advocate these benefits broadly. More information including a list of members is available at www.dieselforum.org.

II. Background

In Docket **# 21-ESR-01** 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.

The following comments are in response to the Request for Information (RFI) on Clean Energy Resources for Reliability regarding the potential resources and attributes for consideration in these analyses.

III. General Comments on the Request for Information on the Clean Energy Reliability Investment Plan (CERIP)

As stated in the RFI, the CERIP is intended to be limited to clean energy resources so it would not consider any fossil solutions, but for comparison purposes it anticipates considering a wider variety of resources in the analysis.

We strongly encourage that the CEC in its evaluation include a fair and transparent evaluation of reciprocating engines using renewable fuels as discussed below as part of Distributed technologies along with others include in Table 3 of the RFI.

Moreover, we would encourage the CEC to develop a technology evaluation model that includes a comprehensive holistic analysis of competing technologies from a cradle to grave lifecycle perspective. Doing so would change the perception of a number of technologies that while perceived as “green” have deeply concerning environmental footprints.

The principal focus of the CEC efforts should always be energy system reliability; ensuring an adequacy of energy supplies and contingencies for addressing periods of high demands. This focus must also be viewed through the lens of affordability, especially when taking into account the challenges being faced by many disadvantaged communities in California. The performance of intermittent resources such as wind, solar and hydro will invariably present more base load management challenges for California during periods of peak electricity demand, as have been experienced over the last few years. Cost effectively balancing this intermittency with environmentally responsible solutions will remain a challenge. The growing popularity and deployment of Lithium-Ion battery systems should be re-evaluated as a result of a truly holistic

environmental assessment of lithium ion. From the scorched earth strip mining approach to obtain the materials, to the fact that only 5% is recyclable at end of life to the public health hazards that are at risk due to thermal runaway events, like the one experienced in September of this year at Moss Landing that resulted in shelter in place orders and a prolonged closure of Highway 1.[1]

Distributed systems -- specifically reciprocating engines using renewable fuels-- are already well-proven, safe assets that the state has utilized and will likely continue to rely on more in the future to ensure public health and safety and grid reliability during adverse weather events, and wildfire management strategies. These units are well equipped to help the state meet all of its goals of providing reliability, supporting the state's GHG reduction goals, being ready for deployment and ability to support equity communities.

A. Advanced renewable diesel fuel (RD) also known as hydrogenated vegetable oil (HVO) should be considered by the CEC in its evaluation of Clean Energy Resources for Reliability

As expected, the CEC's RFI focuses heavily on non-fossil-based resources such as fuel cells, solar, and wind. Advanced renewable diesel fuels (RD99/HVO) are proven to provide significant environmental benefits and diesel generators utilizing these low-carbon fuels are currently in service in California to support commercial customers, in microgrid applications and as part of the utility strategy for the planned safety power shutoffs (PSPS).

HVO is a premium quality diesel fuel made from renewable raw materials. The fuel has different properties compared to other biofuels, like biodiesel for example. HVO is sometimes confused with biodiesel or FAME (fatty acid methyl ester), they are in fact very different. Created using a hydrotreating process, HVO is a pure hydrocarbon diesel fuel with a similar chemical composition to fossil diesel, which is what allows the fuel to be used as a drop-in replacement.

HVO can be used in existing diesel engines without modification and is compatible with existing diesel infrastructure and stations. HVO meets California Air Resource Board (CARB) motor vehicle fuel specifications under Title 13, California Code of Regulations (CCR), section 2281 et seq., and meets the aromatic, sulfur, and lubricity standards, of ASTM specification D975-12a.1.HVO is widely available in California and is presently

A large port operating company in Long Beach, CA reported last week at the Catalyst H2 conference that through the use of renewable diesel, https://www.pressdemocrat.com/article/news/shelter-in-place-advisory-lifted-in-monterey-county-after-fire-at-tesla-bat/hey have seen a 79% reduction in GHG emissions and a stunning 70+% reduction in PM10 emissions.[2]

1 https://www.pressdemocrat.com/article/news/shelter-in-place-advisory-lifted-in-monterey-county-after-fire-at-tesla-bat/

2 11/15/22 Presentation of Matt Dickenson – Sustainability Director- Fenix Marine Services

B. Qualitative Attributes Evaluation of HVO/RD

In the CEC consideration of the qualitative attributes in Table 4 of the RFI, we offer the following with regard to HVO/RD.

Attribute	**Definition & Assessment of HVO/RD** *(Assessment of HVO/RD provided in italics)*
Readiness	Technological readiness and maturity: *HVO is in use today on a widespread basis and proven in all diesel engine applications both new and existing. The technology is 100% ready and mature. With high throughput of renewable diesel fuel, fuel quality is at a high level. The ability of both new and existing diesel generators to utilize this fuel is without question and has been officially endorsed by all major diesel generator engine manufacturers.*
Permitting	Ease of permitting processes (e.g., local, CEQA) required to implement the resource *There is an established permitting process for customers utilizing diesel generators in various settings. Conditions of permitting are based on type of units, intended applications, and include noise levels and emissions performance, fuel specification and quantity stored, testing and hours of operation.*
Interconnection	Ease of interconnection and availability of infrastructure (e.g., transmission line access) for successful implementation of the resource *Diesel generators utilizing HVO/RD utilize sophisticated switch gear and can easily interconnect.*
Supply Chain	*Efficiency and effectiveness of manufacturing and supply chains to support implementation of the resource.* *In 2021, U.S. renewable diesel production equaled about 815 million gallons (0.82 billion gallons) and consumption equaled about 1,163 million gallons (1.16 billion gallons), which included about 392 million gallons of imports. California uses most of U.S. renewable diesel fuel imports.* *https://www.eia.gov/energyexplained/biofuels/biodiesel-rd-other-use-supply.php#:~:text=In%202021%2C%20U.S.%20renewable%20diesel%20production%20equaled%20about,uses%20most%20of%20U.S.%20renewable%20diesel%20fuel%20imports.* On August 12, 2020, Reuters reported that U.S. refiner Phillips 66 plans to convert its Rodeo, California crude oil refinery into a renewable fuels plant using cooking oil and food

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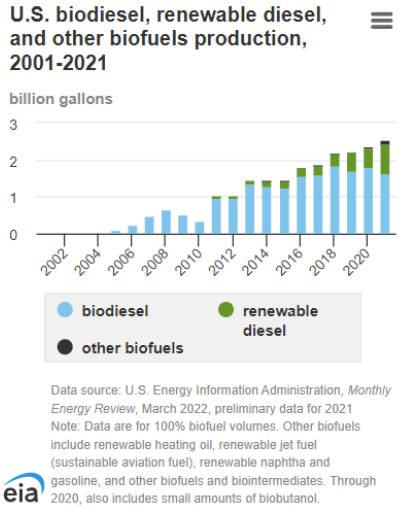
	wastes as feedstock. Phillips 66's proposal would cost up to $800 million to produce 680 million gallons a year of renewable diesel beginning in 2024. The US Energy Information Administration estimates that *U.S. Energy Information Administration - EIA - Independent Statistics and Analysis* On August 12, 2020, Reuters reported that U.S. refiner Phillips 66 plans to convert its Rodeo, California crude oil refinery into a renewable fuels plant using cooking oil and food wastes as feedstock. Phillips 66's proposal would cost up to $800 million to produce 680 million gallons a year of renewable diesel beginning in 2024.
Customer Acceptance	Operator and end-user acceptance of the technical aspects and value proposition of the resource *Diesel generator customers utilizing renewable diesel fuel appreciate the ability to leverage their installed asset (generator) by utilizing low carbon renewable biofuels to lessen impacts on the environment while providing seamless power generation as compared to conventional petroleum diesel. The price of renewable diesel fuel is market driven. Any price premium on the fuel as compared to conventional petroleum diesel is more than offset by the opportunity to utilize the installed asset (the generator) which is a significant capital investment.*
Cleanliness	Low GHG emissions and low criteria pollutant emissions *According to CARB, biofuels, such as ethanol, biodiesel, and renewable diesel displace fossil fuels and reduce the amount of fossil-based CO2 emissions released into the atmosphere. The percentages of biodiesel and renewable diesel in the total diesel blend have shown significant growth in recent years, growing from 0.4 percent in 2011 to 20.8 percent in 2020, due mostly to the implementation of the Low Carbon Fuel Standard. Without biofuels, California tailpipe fossil CO2 would be 15 MMT* *higher in 2020. California Greenhouse Gas Emissions for 2000 to 2020 Trends of Emissions and Other Indicators* *See additional information below table in the text.*
Dispatchability	Certainty and firmness of a resource, including ability to respond to different event frequencies, durations, and notification periods *Diesel-fueled backup generators utilizing HVO/RD are the gold standard for response time, load carrying capacity, and are in place at thousands of hospitals, critical communications, banking, and internet networks in California. With self-contained fuel supply, depending on load and size of units and other options, could operate continuously for several days*

	without need of fuel replenishment. Units can be monitored remotely and dispatched automatically with grid power outage. Cycling on and off of units to meet variable power demands is carefully managed with switchgear and transfer systems. Additionally, the ability to handle cold load pick-up and block loads is paramount to certain use cases with most other technologies (including natural gas engines) not being capable to address these critical safety use cases.
Policy Alignment	Ability to support policies and availability incentives, current and expected *The use of HVO in California in a variety of settings and sectors is well established. This HVO/RD fuel currently supports California's low carbon fuel standard requirement for the transportation sector. Also CARB recently adopted new rules that require harbor craft to use renewable diesel, as noted here: [CARB passes amendments to commercial harbor craft regulation | California Air Resources Board]*
Equity	Equity considerations such as impacts on low income and disadvantaged communities, and tribes *Providing access to reliable electrical power during times of grid outages has been a hallmark of the use of diesel generators in a variety of settings, including tribal and remote locations. Use of HVO/RD in these units provides reliability of electric power while minimizing environmental and community impacts through reduced emissions and use of waste feedstocks converted into valuable renewable energy. Additionally, the small footprint/high power density and safe operations of diesel gensets should be noted when compared to the real estate requirements and significant risks of thermal runaway and the resulting dispersion or air borne toxins from Lithium-Ion storage.*

Additional Qualitative Attribute Information



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https://www.eia.gov/energyexplained/biofuels/biodiesel-rd-other-use-supply.php#:~:text=In%202021%2C%20U.S.%20renewable%20diesel%20production%20equaled%20about,uses%20most%20of%20U.S.%20renewable%20diesel%20fuel%20imports.

C. Additional Background information on Diesel Generators

1. Diesel Generators Underpin Public Health and Safety and Grid Reliability

Diesel backup generators have played a principal role in supporting public health and safety for decades across California. While alternatives to diesel units exist and zero-emissions solutions for select, short duration use cases are becoming more viable, diesel technology remains as an important solution to provide mission critical power during power outages of any duration. Diesel generators may be sized to meet any demand while diesel fuel and diesel units are mobile and may be delivered to almost any location including remote communities. These units can provide long duration, highly reliable, and safe uninterrupted power. In addition to being safe, diesel generators are durable and maintain an impressive record for providing reliable service when most needed. Moreover, they are almost 100% recyclable at the end of their decades long life.

Diesel is one of only a few solutions that can provide full electrical load within seconds of an outage – a necessary attribute for critical facilities like health centers that rely on uninterrupted sources of power. Diesel generators are often the preferred technology to provide black start capabilities at conventional sources of prime power generation. The latest generation near-zero emissions solutions are available in diesel generators to provide backup power. While a wide variety of technologies and fuel types are on the drawing boards today, diesel technology remains as the most flexible, reliable, and cost-effective solution to deliver mission critical power during outages and emergencies.

Cost-effective diesel generators continue to be integrated into sustainable microgrids to couple the benefits of zero-emissions renewable power with the proven and durational reliability of diesel. While last in a microgrid's loading order, diesel gensets provide the backbone of the microgrid with their ability to reliably provide long duration capacity in the absence of renewable generation and after the microgrid's energy storage capacity (typically 4 hrs. or less) has been depleted.

2. Emissions Performance of Diesel Generators: Tier 4 Technology Units achieve near-zero emissions

There are different emissions standards required of diesel generators that operate either exclusively as sources of emergency backup power or non-emergency units that provide temporary backup power.

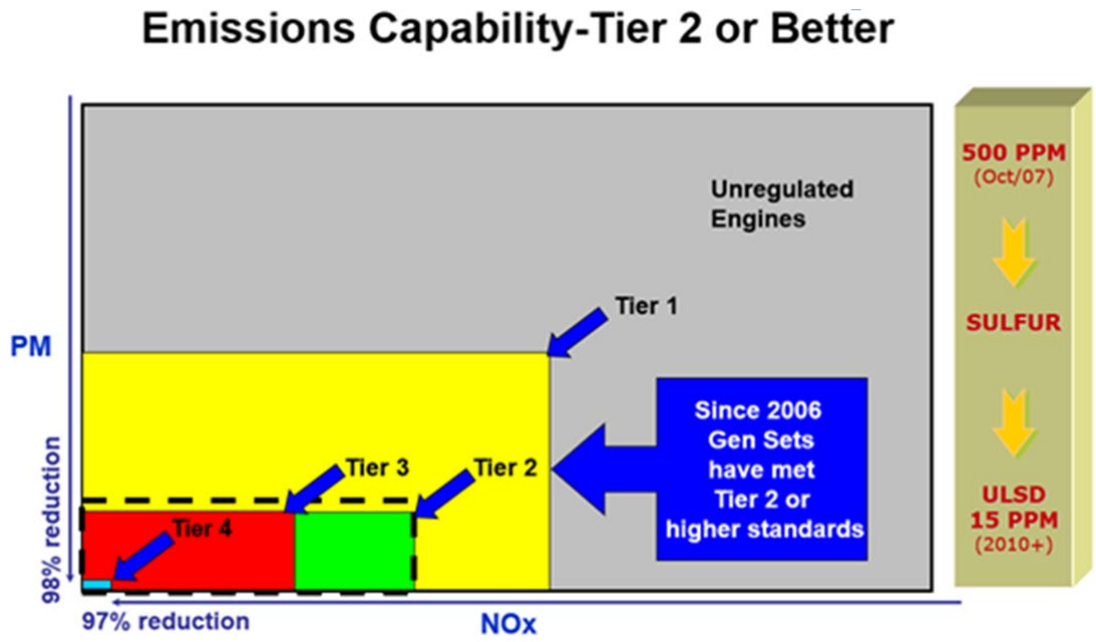
Diesel Emergency Generators

Generators manufactured and installed on or after 2011 that are designed to operate exclusively as

[1]

emergency units are required to meet stringent minimum emission standards. Generators that provide up to 560 kW of mechanical power must meet, at a minimum, the Tier 3 emissions standard established jointly by U.S. Environmental Protection Agency and the California Air Resources Board. Emergency units that provide in excess of 560 kW of mechanical power must meet the Tier 2 emissions standards. The chart below demonstrates the emission reduction requirements for both emissions of oxides of nitrogen (NOx) and particulate matter greater than 2.5 microns (PM 2.5).

Federal rules regarding the operation of these emergency units allow for the operation as needed during an emergency. Federal rules limit the operation of these generators to under 100 hours per year for testing and maintenance including 50 hours of "other" limited non-emergency situations. These rules are in place to ensure that units designated as an emergency backup generator do not provide prime power.



In addition to federal standards, local standards pertaining to emission performance and use of emergency backup units may apply that are more stringent than the federal requirements.

Non-Emergency Mobile Diesel Generators Depoyed in Emergency Response

Mobile diesel generators not designed to provide emergency backup power may be deployed as an emergency generator when called on during a state of emergency. These units meet a specific emissions standard pertaining to the year of manufacture. Non-emergency mobile diesel generators manufactured beginning in 2012 must meet the Tier 4 emissions standard.

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While Tier 4 is the current standard,, there remains a significant fleet of units manufactured to meet previous standards that is available for use today. This pre-Tier 4 fleet remains in high demand for disaster response and to address select widespread emergencies. These units may be called on to provide emergency power as was done in August in response to Gov. Newsome's emergency proclamation stemming from the unusually high heat weather event that strained the ability of California's grid to meet demand. Through the Portable Equipment Registration Program (PERP) managed by the California Air Resources Board, non-emergency mobile diesel generators may be procured from in and out-of-state suppliers to provide an extra source of emergency backup power. These untis, of varying emission standards, may operate as emergency backup power without restrictions that apply to the operators of this equipment by individual air districts.

3. Benefits of Advanced Biofuels to Deliver Greenhouse Gas and Criteria Pollutant Emission Reductions

One of the fastest growing solutions to reduce greenhouse gas emissions in California is the use of renewable diesel fuel in heavy duty vehicles. More greenhouse gas emissions have been eliminated by the use of renewable diesel fuel, sometimes refered to as hydrotreated vegetable oil (HVO) and technically categorized as 100 percent renewable diesel fuel (ASTM, D 975 spec, CARB Diesel), through the Low Carbon Fuels Standard (LCFS). Renewable diesel can reduce greenhouse gas emiisions by over 80% when compared to diesel #2. Since the LCFS program was implemented in 2011, renewable diesel fuel is the second leading fuel reducing greenhouse gas emissions behind ethanol and exceeding the benefits of electrified cars, buses and trucks by more than 2:1.

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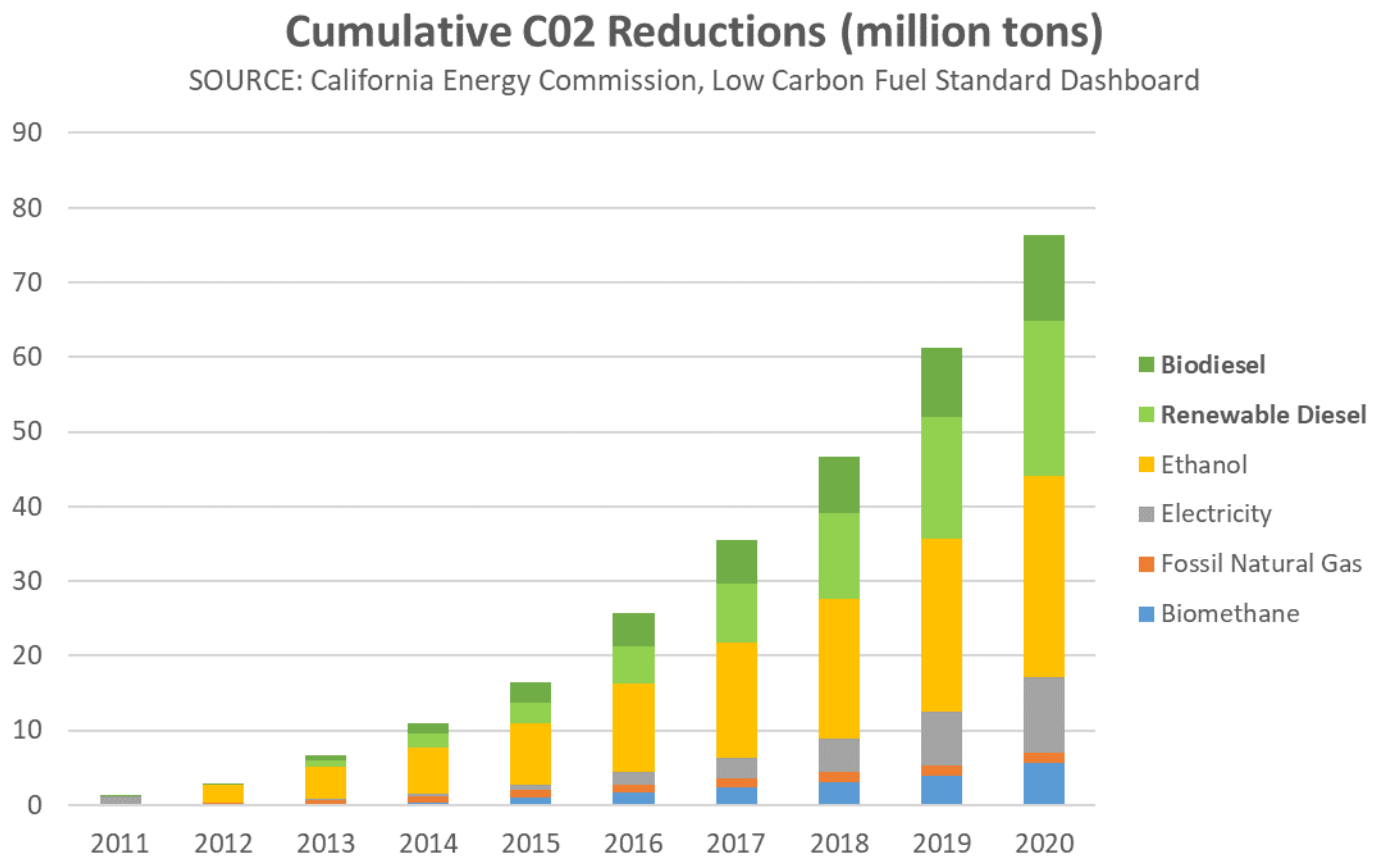

Chart Source: https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm

Both stationary and mobile diesel generators are capable of operating on this fuel, which is a drop in alternative to Diesel #2 (petroleum diesel) and again, is CARB certified.

One hundred percent renewable diesel fuel is derived from waste agricultural products, predominantly waste soy, and animal fats, to yield a fuel that meets the same chemical and engineering specifications as petroleum diesel fuel (ASTM D 975). As such, renewable diesel fuel may be used as a 100 percent replacement fuel to petroleum fuel and may use the existing fuel delivery infrastructure (pipelines, storage and fueling tanks) as petroleum diesel fuel.

We would like to specifically highlight the fact that renewable diesel fuel is distinct from biodiesel fuel. Both fuels are derived from the same feedstock (waste vegetable residues and animal fats), but a different chemical process is used to derive biodiesel that meets its own engineering specification (ASTM D 6751). Diesel engine manufacturers approve engines, old and new, to operate on blends of biodiesel up to 20 percent biodiesel and 80 percent petroleum diesel fuel (B20). Some new diesel engines are approved to operate on blends of biodiesel up to B30.

Renewable diesel fuel(RD99/HVO) may be used as 100 percent replacement to petroleum diesel fuel

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and may reduce greenhouse gas emissions by upwards of 80 percent. Research indicates that the use of renewable diesel fuel also contributes to the reduction of criteria pollutants. The benefits of fuel switching may be more pronounced when used in engines that do not operate with any emission control technologies or meet a lower emissions standard. NOx may be reduced by 13 percent and PM may be reduced by 29 percent when switching from petroleum-based diesel fuel to renewable diesel fuel when used in engines that do not come with diesel particulate filters or SCR catalysts, according to research commissioned jointly by the Bay Area Air Quality Management District and the South Coast Air Quality Management District.

4. Diesel as a Cost-Effective Emergency Backup Power Solution

We understand and appreciate that there are many fuel and technology types available in the marketplace today with the potential to provide emergency backup power. Fuel cells, natural gas gensets, wind, solar and battery backup solutions are capable to provide mission critical power along with diesel solutions. By and large, these alternatives have higher acquisition costs, much larger space requirements that may exclude them from many applications and frequently higher total cost of ownership. Additionally, the intermittent nature of some of these resources combined with durational limitations dictate that many of these resources in mission critical applications be paired with diesel gensets.

The chart below provides a rubric by which to compare diesel, along with Tier 4 diesel units, against other alternatives. Across many important attributes of emergency backup power solutions, diesel is often the preferred solution necessary to provide mission critical power. The chart below was confirmed by several diesel generator manufacturers, including renewable backup up technology providers, concerning the ability of existing solutions to provide 1,500 kW of mechanical energy through backup power to a health center in Los Angeles, CA. While certain zero-emissions and renewable power solutions may have lower fuel costs or lower storage needs, diesel generators come with lower acquisition costs, minimal space requirements and often lower total cost of operations paired with the tried-and-true responsiveness and reliability that has made them the standard for mission critical back-up applications.

	Energy Resources	Capital Expense	Annual O&M	Annual Fuel Cost	TCO	Storage	Life Safety Dispatchable	Space Requirement
Utility + Diesel T2 [Baseline]	1500 kW Diesel T2 Generator Set	$ XX	$ YY	$ ZZ	$ XYZ	24	Yes	XY
Utility + Diesel T4	1500 kW Diesel T4 Generator Set	X 2	X 1.5	X 1	X 3	24	Yes	X 1.25
Utility + NG	1540 kW NG Generator Set	X 2.3	X 1	X 0.25	X 4	∞	No	X 1.25
Utility + Solar + Storage	1500 kW Solar + 1500 kW/3000 kWh ESS	X 13	X 0.9	N/A	X 13	12	Yes	X 200
Utility + Storage (8 hr.)	1500 kW/12MWh ESS	X 12.5	X 1.2	N/A	X 14	8	Yes	X 8

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5. Diesel Provides Cost Effective Solutions to Backstop Sustainable Microgrids

Diesel backup units are also integrated into sustainable microgrid or hybrid microgrid solutions. The integration of these units is a cost-effective strategy to provide critical power when renewables, including wind and solar, are off-line and when the duration of the outage exceeds battery storage capacity. Recently, the City of Camarillo, CA determined that the integration of diesel backup generators into five municipal owned sustainable microgrids were a cost-effective approach to provide needed power while also reducing emissions. Specifically, the City determined that combining solar, battery storage and diesel generation into a microgrid will provide a resilient system that can handle the more frequent shorter-term outages lasting 1-2 hours in duration than on solar and battery alone with a diesel generator to be used only when needed for longer term emergency outages. This hybrid system nearly eliminates carbon emissions, only generating emissions when the diesel unit is called on to provide power when batteries are depleted. This solution is also generating cost savings for the city as well.[1]

6. **Consideration of Diesel Technology as a Clean Source of Temporary Power When Integrated into Microgrid Solutions**

As the proposed decision would allow a utility to continue to deploy diesel backup units as temporary sources of generation at safe-to-energize substations provided the utility agrees to transition to clean sources of temporary power, we request that the definition of clean sources of temporary power allow for the integration diesel generators to provide mission critical power when renewable sources of power are off-line, or sources of backup storage are depleted. As the analysis and case study referenced above indicate, the integration of existing diesel units into clean microgrid applications in the City of Camarillo, CA deliver cost effective clean sources of power.

D. Summary

We thank the CEC for consideration of these comments.

The use of HVO/renewable diesel fuel in diesel generators is currently a key and proven asset in ensuring reliability of electrical power for public and private customers and California's electric grid during periods of peak demand or adverse conditions. As the CEC evaluates means to ensure energy system reliability, we strongly urge that HVO/RD be considered as a Clean Energy Resource; one that is ready today, easily deployable and one that can help the state ensure reliability.

Respectfully submitted,

[1] https://www.cityofcamarillo.org/Feasibility_Study.pdf

Allen Schaeffer

Allen Schaeffer
Executive Director
Diesel Technology Forum
5300 Westview Drive # 308

Frederick, MD 21703
Tel: 301-668-7230
Email: aschaeffer@dieselforum.org

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