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June 16, 2016

Air Resources Board
1001 I Street
Sacramento, CA 95814
(Comment submitted electronically via ARB website)

RE: Proposed LCFS Amendment to begin implementing SB 1505

Dear Air Resources Board:

Sierra Energy appreciates the opportunity to provide comments regarding the draft regulations developed by the Air Resources Board ("ARB"), pertaining to SB 1505 and renewable hydrogen ("Draft SB 1505 Regulation"). Sierra Energy is developing a commercial facility in California that will be capable of producing hydrogen from separated municipal solid waste ("MSW") and other renewable feedstocks. Sierra Energy is supportive of the Draft SB 1505 Regulation that has been proposed. In addition we are providing two complementary recommendations relating to SB 1505 implementation for your consideration:

- Consistent with the requirements of SB 1505, ARB should evaluate the current state of hydrogen production and confer with the Secretary of CalEPA to enable the Secretary to provide strategic recommendations to the Legislature and Governor that will spur development of clean sources of hydrogen fuel; and,

- During the course of this evaluation, ARB should consider and evaluate renewable natural gas as a unique hydrogen source that enables SB 1505 compliance and provides co-benefits including substantial reductions in emissions of the short-lived climate pollutant methane.

Sierra Energy's Expertise

Sierra Energy and Sierra Northern Railway are both companies within the Sierra Industrial Group. Sierra Energy is a waste gasification and renewable energy company founded in Davis, California in 2004. Sierra Northern Railway was formed in August 2003 through the merger of two Northern California shortline railroads: the Sierra Railroad Company and the Yolo Shortline Railroad. As a result, Sierra Energy has relevant experience and capabilities that range from the conversion of methane-emitting MSW, to the reduction of black carbon from locomotives.

Sierra Energy's FastOx Gasifier is a robust and flexible technology, capable of processing post-recycled MSW, hazardous waste, medical waste, construction and demolition waste, and other waste streams. The application of Sierra Energy's waste gasification technology reduces the air, soil and water pollution created by landfills; and produces clean, low carbon energy for transportation and power.

Sierra Energy is currently installing a modular, community-scale waste gasification system at U.S. Army Garrison Fort Hunter Liggett in Monterey County. Sierra Energy's technology was selected by the US Department of Defense's ("DoD") Environmental Security Technology Certification Program to help increase DoD energy security, reduce waste and energy costs, drastically reduce greenhouse gas emissions, and help meet the U.S. Army's net-zero initiatives. The project has also received grant support from the California Energy Commission to convert the resulting syngas into Fischer-Tropsch diesel fuel for transportation applications. Regarding hydrogen, the Defense Logistics Agency awarded Sierra Energy a Small Business Innovation Research grant to further explore the production of hydrogen fuel from waste.

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Recommendations

ARB should evaluate the current state of hydrogen production and confer with the Secretary of CalEPA to enable the Secretary to provide strategic recommendations to the Legislature and Governor that will spur development of clean sources of hydrogen fuel.

Passed in 2006 as a cornerstone of California's planned hydrogen economy, SB 1505 provides that ARB shall:

> *"(A)dopt regulations that will ensure that state funding for the production and use of hydrogen fuel, as described in the California Hydrogen Highway Blueprint Plan, contributes to the reduction of greenhouse gas, criteria air pollutant, and toxic air contaminant emissions, and would require these regulations to meet minimum requirements, as specified."*

As stated in the SB 1505 at Section 1(l):

> *"According to the California Hydrogen Highway Blueprint Plan, the absence of specific goals for reducing emissions and using renewable resources to produce hydrogen fuel might actually increase greenhouse gas and particulate matter emissions relative to petroleum fueled vehicles."*

We support ARB's decision to integrate the Draft SB 1505 Regulation to implement one aspect of SB 1505, the requirement that hydrogen be produced from renewable energy resources.

In addition, we would recommend that ARB take this opportunity to implement a crucial aspect of SB 1505 that has thus far been neglected. This provision (the "Incentive Provision") is now codified at California Health and Safety Code §43869(g):

> *"(g) The Secretary for Environmental Protection, in consultation with the state board, shall recommend to the Legislature and the Governor, on or before January 1, 2010, incentives that could be offered to businesses within the hydrogen fuel industry and consumers to spur the development of clean sources of hydrogen fuel."*

There has been substantial progress made in California regarding the establishment of a network of hydrogen fueling stations that form the beginnings of the hydrogen highway. In addition, great strides have been made by automakers in developing

advanced hydrogen fuel cell electric vehicles ("FCEVs"). However, the one piece that remains lagging from California's hydrogen vision is the development of a new generation of hydrogen production technologies that provide additional GHG and criteria pollutant reductions as compared to conventionally produced hydrogen.

The Incentive Provision of SB 1505 was intended to address this crucial component and should be set in motion immediately by ARB. This action would support a January 1, 2017 strategic hydrogen production recommendation to the Legislature and Governor by the Secretary of CalEPA.

- **During the course of this evaluation, ARB should consider and evaluate renewable natural gas as a unique hydrogen source that enables SB 1505 compliance and provides co-benefits including substantial reductions in emissions of the short-lived climate pollutant methane.**

Renewable natural gas is an optimal source of renewable hydrogen and should receive special attention during ARB's evaluation of incentives that could be offered to businesses within the hydorgen fuel industry and consumers to spur the development of clean sources of hydrogen fuel. Renewable natural gas ("RNG") is a broad term that refers to gaseous fuel, primarily methane that is produced by the fermentation of organic matter. RNG includes biogas and synthetic natural gas that is generated from organic waste or other renewable sources.

For fuel cell applications, RNG can be upgraded to methane that meets pipeline or other applicable natural gas specifications. The use of RNG fulfills multiple California policy goals by 1) capturing and destroying methane, a highly potent short-lived climate pollutant from landfills; 2) displacing petroleum and natural gas; 3) converting waste streams such as separated MSW into fuel thereby reducing soil and water impacts; and 4) stimulating California's clean energy economy.

Fuel cells are already utilizing hydrogen-rich RNG at multiple facilities with substantial potential for expansion. The U.S. Department of Energy (DOE) estimates that U.S. RNG resources have the capacity to produce about 5 GW of power at 50 percent electrical efficiency.[1] DOE has determined that most of RNG resources are located near the major demand centers for hydrogen generation for FCEVs and power generation from stationary fuel cells.[2]

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[1] Power Point Presentation of Sunita Satyapal, National Renewable Energy Laboratory, Expanding the Use of Biogas with Fuel Cell Technologies, Biogas with Fuels Cells Workshop, June 11, 2012, *http://energy.gov/sites/prod/files/2014/03/f11/june2012_biogas_workshop_satyapal.pdf* (last viewed July 9, 2015).

[2] Ibid.

Already, nearly a dozen municipal wastewater treatment plants in California and New York use anaerobic digestion and fuel cells to generate power. Microsoft has developed an off-the-grid data center in Cheyenne, Wyoming, powered by a 300-kW fuel cell that utilizes RNG from wastewater. Microsoft has announced plans to locate smaller data facilities and fuel cells near stranded RNG rather than investing in the electrical infrastructure required by larger data centers.[3]

Sierra Energy's FastOx Gasifier utilizes separated MSW as its feedstock to generate RNG. DOE estimates the potential of U.S. landfills to produce methane at 12.4 million metric tons of methane annually, enough hydrogen to refuel 13 million FCEVs a day.[4] Once ARB completes its rulemaking under SB 1505, RNG from MSW could fulfill the mandate that 33 percent of hydrogen gas sold at fueling stations be derived from renewable sources.

Morry Markowitz, the President of the Fuel Cell and Hydrogen Energy Association recently developed the following summary of other projects utilizing renewable hydrogen:

1. *Orange County, California's wastewater treatment plant successfully demonstrated a fuel cell tri-generation system using a biogas-powered fuel cell to generate not only power and heat, but also a stream of hydrogen gas in a two-year pilot project, producing power and heat, and routing renewably-generated gas at a publicly-accessible hydrogen fueling station located at the facility.*

2. *Vancouver, Canada, using landfill gas (LFG). In addition to producing power, a nearby hydroponic greenhouse uses the fuel cell's waste heat, while renewable hydrogen is exported for vehicle fueling or industrial applications. Facilities with biomass waste can also benefit from fuel cell power generation.*

3. *Gills Onions (California), America's largest onion processor, converts 75 percent of its onion processing waste into low-emission, carbon-neutral power via a 600-kilowatt (kW) fuel cell. The biogas-powered system provides baseload power to the facility and uses byproduct heat to support the processing of onion waste in the anaerobic digester. The company says it saves about $700,000 annually in electricity costs and eliminates*

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[3] Jason Verge, Microsoft Opens Zero-Carbon Methane-Powered Data Center In Wyoming, Data Center Knowledge, November 7, 2014, **http://www.datacenterknowledge.com/archives/2014/11/07/microsoft-opens-zero-carbon-methane-powered-data-center-wyoming/** **(last viewed July 9, 2015).**

[4] Satyapal Power Point.

$400,000 in annual costs associated with hauling onion waste to farm fields.

4. *The Blue Lake Rancheria Tribe (California) also takes advantage of local biomass, converting sawdust from a timber operation into hydrogen-rich synthesis gas in an integrated biomass-to-fuel cell power system.*[5]

Conclusion

Thank you for your consideration of our input. Please contact our attorney, Graham Noyes of Keyes, Fox & Wiedman, if any further input would be helpful. We look forward to continuing to participate in this proceeding.

Sincerely,

Michael Hart

[5] Morry Markowitz, "Fuel Cells: Opening New Markets for Today's Energy Resources," Blog posted on the Energy Collective, June 8, 2015, http://www.theenergycollective.com/mmarkowitz/2236691/fuel-cells-opening-new-markets-today-s-energy-resources (last viewed June 14, 2016).