Comments of FuelCell Energy, Inc. on Volkswagen California ZEV Investment Plan Supplement

Introduction

FuelCell Energy, Inc. (FCE) appreciates the opportunity to comment on Electrify America's June 29, 2017, Supplement to the California Investment Plan. In general, we are very concerned about the lack of attention given in the plan to hydrogen infrastructure. Hydrogen infrastructure needs to be put in place in advance of vehicle deployment, and the we believe the comments in the plan supplement on the hydrogen supply overstate the adequacy of projected hydrogen supply.

ZEV infrastructure should support and advance the use of Fuel Cell Electric Vehicles (FCEVs). California and several other states are exhibiting leadership on FCEV deployment. The California Governor's office and legislature, California Energy Commission (CEC), and ARB all have made hydrogen infrastructure a key priority for meeting the state's zero emission vehicle goals. California Senate Bill 1505 (2006) requires that at least one third of all hydrogen for FCEVs come from eligible renewable resources.

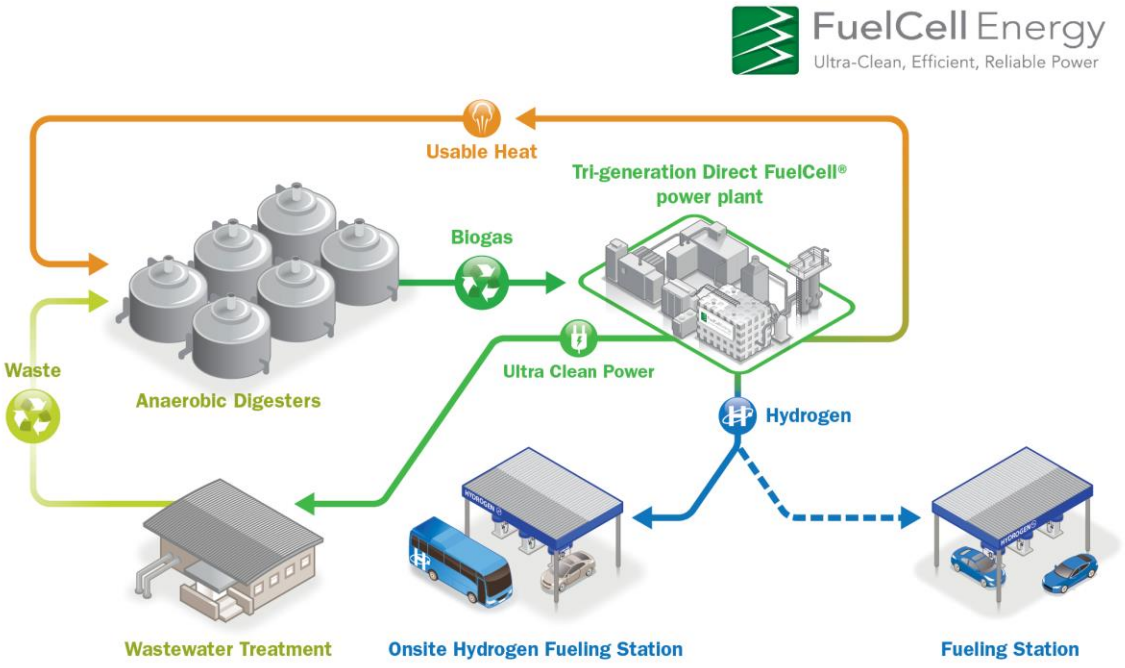
Early FCEV deployment presents a challenge to the industry. Renewable hydrogen production infrastructure often needs to come before sufficient hydrogen station investment, which in turn must come before broad vehicle demand. Inclusion in the ZEV Commitment would be a key catalyst to expanding the supply of renewable hydrogen and station infrastructure to support this growing market.

FCE has pioneered a number of emerging fuel cell applications, including hydrogen co-production fuel cells that produce distributed hydrogen for use in mobile applications. In 2016, FCE received contingent certification for a prospective pathway for its renewable hydrogen generation solution using fuel cells at wastewater treatment facilities under the Low Carbon Fuel Standard (LCFS), administered by the ARB.

FCE's Tri-Generation Direct FuelCell® (Tri-Gen) generates approximately 1,200 kilograms per day of hydrogen. Simultaneous with hydrogen production is the generation of approximately 2 megawatts of electric power and 0.7 million Btu/hour of

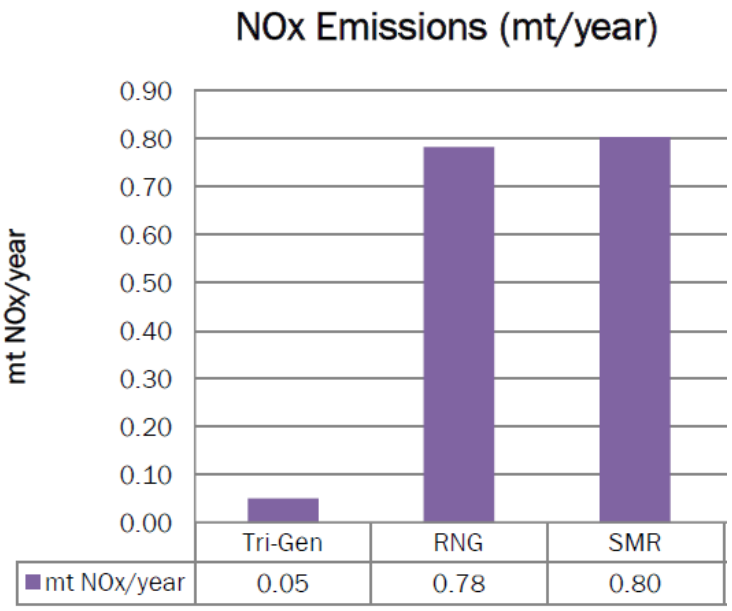
thermal energy. Tri-Gen fuel cells can provide a local, renewable, cost-effective, and efficient infrastructure bridge for distributed hydrogen production for FCEVs.

In January 2016, ARB's Low Carbon Fuel Standard (LCFS) team completed a life cycle analysis on the Tri-Gen fuel cell system and determined that it has a negative carbon footprint when using biomethane from a water resource recovery facility. According to ARB, using dairy-derived biomethane has the potential for superior environmental benefits.



In addition to negative carbon emissions, Tri-Gen has some unique environmental advantages among hydrogen generation sources. While the source of the hydrogen is biomethane reforming within the fuel cell stack, unlike conventional reforming (which requires consumption of water and burning of fuel to produce heat) the water and heat needed by the reforming process are byproducts of the fuel cell operation. Avoiding fuel combustion to support reforming avoids significant NO_X emissions that are produced when hydrogen is manufactured in conventional steam reformers.

This figure compares NO_X emissions from a trigeneration unit producing hydrogen to a comparably sized steam methane reformer (SMR) and an equivalent vehicle application using renewable natural gas (RNG, natural gas produced by upgrading biogas).



Avoiding water consumption is an obvious benefit to sustainability. In fact, Tri-Gen is a *net producer* of water. During the process of hydrogen recovery, water created by the Tri-Gen fuel cell system's reactions is condensed and separated for other purposes. This leads to net water production of 0.6 million gallons per year for each Tri-Gen system.

Growth of FCEV Market and Need for Renewable Hydrogen Infrastructure

California's FCEV market is expected to grow rapidly. Hyundai, Toyota, and Honda have FCEV's commercially available today. Many other automobile manufacturers have announced plans for commercially launching FCEV's including General Motors, BMW, Audi, and Mercedes. Providing renewable hydrogen for fuel cell buses and material handling are also emerging markets. According to ARB:

- Auto manufacturer projections indicate that California's FCEV fleet will grow to 10,500 by the end of 2018 and 34,300 by the end of 2021, representing a near doubling from the previously reported projections of 18,465 FCEVs in 2020.
- A total of 51 currently funded and operational FCEV stations will be available by the end of 2016. These 51 stations will have a fueling capacity of 9,400 kilograms per day, equivalent to an expected demand of approximately 13,500 FCEVs.
- The 2015 auto manufacturer survey results suggest the FCEV market may grow faster than previously projected based on the 2014 survey. As a result, currently funded stations will support hydrogen demand of California's FCEV fleet out to 2018. After 2018, the number of vehicles expected to be on the road may need more fuel than can be provided by the number of hydrogen stations that can be built with currently available public funding, assuming funding levels and station capacity remain unchanged.

FCE believes that in addition to potential supplemental funding for hydrogen stations, the VW Commitment should prioritize renewable hydrogen production as required by SB 1505.

Sincerely,

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