DOCKETED

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Hydrogen Refueling Station GFO Recommendations

Additional submitted attachment is included below.

StratosFuel

December 31st, 2017

California Energy Commission
Docket Office, MS-4
1516 Ninth Street
Sacramento, CA 95814

Re: Docket No. 17-HYD-02, Hydrogen Refueling Station Workshop Comments

Dear CEC Administrator –

As a hydrogen industry stakeholder, StratosFuel appreciates this opportunity to provide a response in support of the next CEC Grant Funding Opportunity (GFO). The following is a list of recommendations in response to the Hydrogen Refueling Station Workshops held on November 30th, and December 4th, 2017:

1.0 Workshop on Hydrogen Refueling Infrastructure Alternative Funding Mechanisms

The purpose of this workshop was to introduce new funding mechanisms in order to increase station competition and maximize the development of hydrogen fueling stations while relying on both public, and private investments.

- **Recommendation 1: O&M**
  - O&M funding is a great incentive for developers, though the largest upfront cost of a station is equipment and installation. We recommend that O&M funding will still be provided, but not impact or reduce the amount of funding available for equipment. The choice between equipment and O&M funding (or a balance of both) is a great concept, but we think it will not be effective because of the high upfront equipment cost. Until we reach economies of scale and the cost of equipment is reduced the choice between O&M and equipment funding will be effective.

- **Recommendation 2: Regional Network Approach**
  - The regional network approach for funding is a great way to maximize hydrogen station expansion. This approach will enable developers to enter new underserved markets and create a more comprehensive network. Furthermore, having a regional approach will allow developers to capitalize on their supply chain needs, such as fuel, distribution, and maintenance. By having a regional network, developers will be able to centralize distribution of fuel and service technicians that will result in a reduction of operational costs.
  - Based on the regional model, more time will be needed to strategically plot a network. Given that time is of the essence, we recommend the Energy

Commission provide between 4-6 months of preparation to secure a regional network.

- Individual station size and volume should not be accounted for in the regional approach. This is because some areas of a region will have less throughput. Requiring a developer to install a larger station for an area with less throughput will reduce the amount of CapEx for other areas with greater demand. Therefore, the regional approach should be scored based on the number of stations that can be built, as well as the amount of throughput the region can achieve.
- We recommend that a region will be defined by a county or corridor. Similar approaches have been implemented with other Energy Commission grants, such as electric vehicle charging infrastructure, or car sharing programs. This will allow a developer to secure an area where they can cost-effectively impact and expand the network.
- It is recommended that funding be allocated for a region based on the number of stations and volume a developer can achieve. For example, there should be a minimum-funding amount for a set number of stations, and the funding should increased if more stations or volume is added. This will allow for a higher number of stations to be proposed and built under a single solicitation. This type of funding structure will also size stations based on location as opposed to having a one-sized fits all approach.

2.0 Workshop on Hydrogen Refueling Station Technical Requirements

The purpose this workshop was to discuss new ideas for "Minimum Technical Requirements" for future solicitations. StratosFuel was part of a larger discussion between hydrogen stakeholders that agreed to recommend a set of minimum technical requirements. We second the following recommendations brought forward by all stakeholders:

SUMMARY OF PROPOSED CHANGES

GFO-15-605 LDV HRS INFRASTRUCTURE APPLICATION MANUAL	2017 FUTURE GFO RECOMMENDATIONS
V. OVERALL ELIGIBILITY REQUIREMENTS	
B. PROJECT REQUIREMENTS	
2. Be for refueling stations for light duty vehicles.	2. Be for refueling stations for light duty vehicles. <u>Stations that plan to serve vehicles with larger tank systems should be designed commensurate to support the increased capacity requirements for both vehicles types, and is above and beyond the Minimum Technical Requirements described in this solicitation (Section VI).</u>

5. Be open to the public, meaning that no physical obstructions or physical obstacles exist to preclude an individual from entering the station premises and walking on or driving on the station premises.	5. Be open to the public, meaning that ~~no physical obstructions or physical obstacles exist to preclude an individual from entering the station premises and walking on or driving on the station premises~~ the station is: (a) open for business 24 hours/day, 7 days/week, unless restricted by local ordinance or conditional use restriction by the Authority Having Jurisdiction (AHJ), (b) setup where customers or OEMs are not restricted or required to execute agreements, or be subject to training requirements, as a permissive for use of the dispenser, and not be required to enter a PIN code for operation of the dispenser.
VI. MINIMUM TECHNICAL REQUIREMENTS	
A. HYDROGEN QUALITY	
A.1.a. Hydrogen quality readings shall be taken at the hydrogen refueling station, at a minimum, every 3 months. The date the hydrogen quality reading(s) is taken and any special condition(s) used while the reading(s) were taken shall be reported to the Energy Commission Agreement Manager in Monthly Progress Reports. The hydrogen quality shall also be tested every time the hydrogen lines are potentially exposed to contamination due to maintenance or other activities.	A.1.a. Hydrogen quality readings shall be taken at the hydrogen refueling station, at a minimum, ~~every 3 months~~ every 6 months. The date the hydrogen quality reading(s) is taken and any special condition(s) used while the reading(s) were taken shall be reported to the Energy Commission Agreement Manager in Monthly Progress Reports. The hydrogen quality shall also be tested prior to initial station opening, and every time the hydrogen lines are potentially exposed to contamination due to maintenance or other activities.
A.1.b. The hydrogen refueling station design and operation shall include best practices, equipment, and software to ensure the most safe and reliable operations of dispensers possible. The hydrogen refueling station design shall also allow for future equipment retrofits that improve and/or automate the monitoring of common contaminants of the hydrogen gas stream.	A.1.b. The hydrogen refueling station design and operation shall include best practices, equipment, and software to ensure the most safe and reliable operations of dispensers possible. ~~The hydrogen refueling station design shall also allow for future equipment retrofits that improve and/or automate the monitoring of common contaminants of the hydrogen gas stream~~.

A.1.c. The station design and operation shall include best practices, equipment, and software that monitor the gas stream humidity for stations that use on-site or off-site electrolyzers to produce hydrogen.	[delete and combine with a revised A.1.d, below]
A.1.d. The station design and operation shall include best practices, equipment, and software that monitor carbon monoxide and carbon dioxide for stations that produce hydrogen on-site using steam methane reformation (SMR).	[combined and revised A.1.c and A.1.d] A.1.d. <u>On-Site Hydrogen - For station designs that include on-site production and/or purification, the system shall include a continuous monitor of key contaminants (i.e.; canary species) per the specific technology configuration, and control, as described by CSA HGV 4.9.</u>
	[new section] <u>Delivered Hydrogen - The delivery of hydrogen shall meet, as minimum criteria, the requirements of CSA HGV 4.9.</u>
	[new section] <u>Each fueling position shall include a "Dispenser Fueling Filter" as defined by CSA HGV 4.9.</u>
C. FUELING PROTOCOLS	
3. 350 Bar Fueling: Dispensing H35-T20 is optional under this solicitation. If the hydrogen refueling station will dispense H35-T20, the application shall describe how the station developer will self-declare compliance with H35-T20 in SAE J2601. If the station will fuel vehicles other than light duty (i.e., medium duty, delivery vehicles, and/or buses), the station throughput, circulation, and hydrogen dispensing shall prioritize the light duty vehicles' need for hydrogen storage, dispensing, point of sale, and other aspects.	**3. 350 Bar Fueling:** Dispensing ~~H35-T20~~ <u>H35</u> is optional under this solicitation. If the hydrogen refueling station will dispense <u>H35</u> ~~H35-T20~~, the application shall describe how the station developer will self-declare compliance with <u>H35</u> ~~H35-T20~~ in SAE J2601. ~~If the station will fuel vehicles other than light duty (i.e., medium duty, delivery vehicles, and/or buses), the station throughput, circulation, and hydrogen dispensing shall prioritize the light duty vehicles' need for hydrogen storage, dispensing, point of sale, and other aspects.~~ ~~For example, if the H35 fill is used in a custom set up for a delivery truck with a 20 kg tank capacity, a special fueling protocol to allow this shall be described.~~ The application shall describe how the station's design will accommodate custom H35 fills ~~requiring a special fueling protocol~~ without impacting light duty vehicles. If the fill is for other than a light duty vehicle, ~~the fill must be attended by a technician and~~ the application shall describe the

For example, if the H35 fill is used in a custom set up for a delivery truck with a 20 kg tank capacity, a special fueling protocol to allow this shall be described. The application shall describe how the station's design will accommodate custom H35 fills requiring a special fueling protocol without impacting light duty vehicles. If the fill is for other than a light duty vehicle, the fill must be attended by a technician and the application shall describe the procedures for the fill, perhaps after the normal hours of operation without interfering with fueling light duty vehicles (i.e., the fueling of light duty vehicles will not be affected).	procedures for the fill, perhaps after the normal hours of operation without interfering with fueling light duty vehicles (i.e., the fueling of light duty vehicles will not be affected).
4. HyStEP: The application shall state that the station/fuel dispenser shall be evaluated using the U.S. Department of Energy Hydrogen Station Equipment Performance (HyStEP) device, as practicable, for station commissioning. The evaluation shall occur after the station becomes operational. Should the HyStEP device be unavailable, the station/fuel dispenser fueling protocol shall be evaluated using best practices with automobile Original Equipment Manufacturers (OEMs). The application shall include milestones and due dates for the possibility of using HyStEP and automaker best practices.	**4. ~~HyStEP~~ Fueling Protocol Confirmation:** The application shall state that the station/fuel dispenser shall be evaluated using ~~the~~ a 3rd Party National Recognized Test Laboratory (NRTL) as the target process to confirm the fueling interface in accordance with CSA HGV 4.3 (as referenced above). Should the 3rd Party NRTL be unavailable, the station/fuel dispenser shall be evaluated using the U.S. Department of Energy Hydrogen Station Equipment Performance (HyStEP) device, as practicable, ~~for station commissioning~~ to confirm the fueling interface. Should the 3rd Party NRTL, or HyStEP device, be unavailable, the station/fuel dispenser shall be evaluated using best practices with automobile Original Equipment Manufacturers (OEMs), to confirm the fueling interface. The evaluation may ~~shall~~ occur after the station becomes operational. The application shall include milestones and due dates ~~for the possibility of using HyStEP and automaker best practices~~ to implement the confirmation process. Note: A list of NRTLs may be referenced at

	https://www.osha.gov/dts/otpca/nrtl/nrtllist.html

D. MINIMUM DAILY FUELING CAPACITY

Each station shall have the capability to dispense a minimum average daily capacity of no less than 180 kg. Applicants will be required to adhere to the minimum daily fueling capacity proposed in their application. Minimum daily fueling capacity refers to the station's capacity to fuel light duty vehicles over a 12 hour period, between 6 a.m. and 6 p.m. on a daily basis.

A station in a "cluster" area shall have a minimum of 2 fueling positions. A "connector" or "destination" station may install only 1 fueling position, but the site layout shall not preclude the future addition of a second fueling position.

A single fueling position is defined as an H70 fueling interface with a dedicated customer vehicle access, user control, and point of sale interface. The fueling position may also include an H35 nozzle, in addition to, the H70 nozzle. For a station with multiple fueling positions, each fueling position shall be capable to operate independently and in-parallel (simultaneously).
[see enclosed diagram below]

Each fueling position ~~station~~ shall have the capability to dispense a minimum average daily capacity of no less than 160 ~~180~~ kg. Applicants will be required to adhere to the minimum daily fueling capacity proposed in their application. Minimum daily fueling capacity refers to the station's capacity to fuel light duty vehicles over a 12-hour period, between 6 a.m. and 6 p.m. on a daily basis.

Each fueling position shall have the capability to dispense a minimum of 200 kg over a period of 24-hours (6 a.m. to 6 a.m.) on a daily basis. Stations which require a batch process such as resupply from delivered gas, or recovery period for production or compression processes, must include the delay caused by this process step over the 24-hour period. The 24-hour fueling capacity shall also represent a repeatable value such that fueling could occur on consecutive days between periods of planned maintenance.

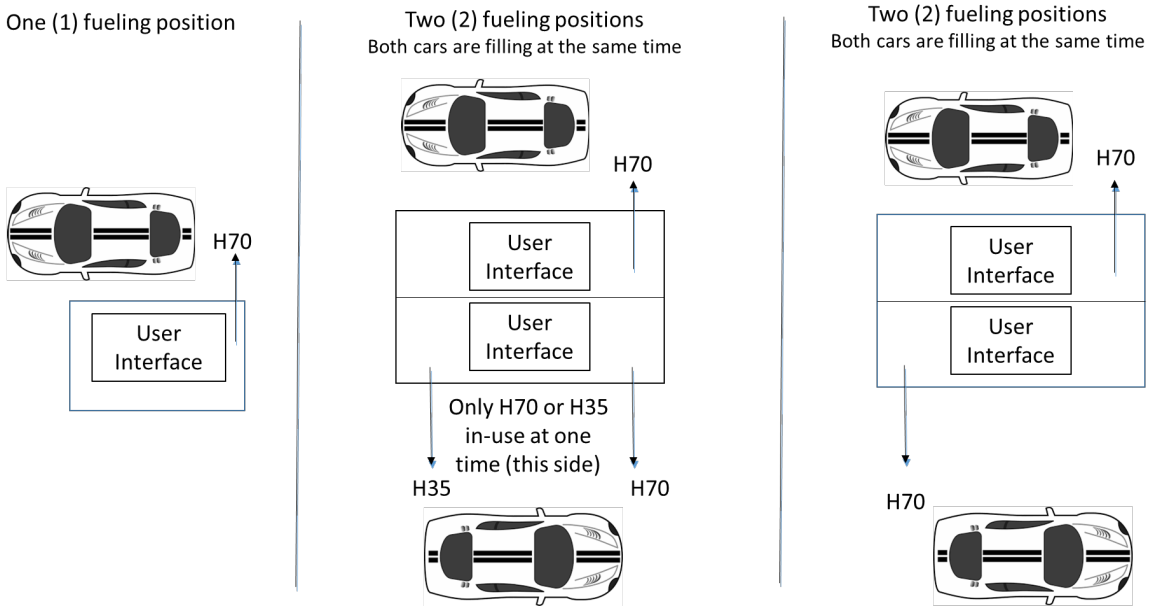
A single "fill" is described in the following table, per CSA HGV 4.9, as a reference to evaluate station performance and equipment capability.

Metrics:	Minimum Criteria:
SAE J2601 Protocol Class	H70-T40
CHSS Size	125 L
Dispensed Mass	4 kg
State of Charge (SOC),	98% +2/-1%

	Comm. Fill | Note: The terms "cluster", "connector", and "destination" are referenced in the publication "A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles, California Fuel Cell Partnership (2012).
E. MINIMUM PEAK FUELING CAPACITY	
1. Minimum Peak Fueling Capacity for 700 Bar Refueling: Each station shall have the capability to provide a minimum of five 4kg H70-T40 fills per hour, back-to-back, without vehicle users having to wait for the station to recharge. Minimum peak fueling capacity refers to the station's ability to serve peak fueling demand between 6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.	**1. Minimum Peak Fueling Capacity for 700 Bar Refueling:** Each fueling position ~~station~~ shall have the capability to provide a minimum of five (5) ~~4kg~~ H70-T40 fills (20 kg), where "fills" are described above, per 1-hour, back-to-back, without vehicle users having to wait for the station to recharge. The back-to-back (consecutive) fill sequence is defined per CSA HGV 4.9. Each fueling position shall have the capability to repeat this 1-hour capacity performance across 3 consecutive hours within the 12-hour term. This is defined as the 3-hour capacity. ~~Minimum peak fueling capacity refers to the station's ability to serve peak fueling demand between 6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.~~
2. Minimum Peak Fueling Capacity for 350 Bar Refueling: Stations that opt to provide H35-T20 shall provide a minimum of four 4kg H35-T20 fills per hour, back-to-back, without vehicle users having to wait for the station to recharge. The peak fueling capacity for H35-T20 does not need to be demonstrated in the same hour as the H70-T40.	**2. Minimum Peak Fueling Capacity for 350 Bar Refueling:** Stations that opt to provide H35 ~~H35-T20~~ shall provide a minimum of four (4) 2kg ~~4kg~~ H35 ~~H35-T20~~ fills per hour, back-to-back, without vehicle users having to wait for the station to recharge. The peak fueling capacity for H35 ~~H35-T20~~ does not need to be demonstrated in the same hour as the H70-T40.
G. POINT OF SALE (POS) TERMINAL	
The hydrogen refueling station shall include a POS terminal that accepts major credit cards, debit cards, and fleet card payment systems like those commonly used at gas stations. 1. The POS terminal shall be	The hydrogen refueling station shall include a POS terminal that accepts ~~major credit cards, debit cards, and fleet card payment systems like those commonly used at gas stations~~, the major retail and commercial card rail systems, including MasterCard, Visa, Wex, and Voyager, as minimum criteria.

compatible with card payment systems that use embedded microprocessor chip technology, i.e., Europay, MasterCard, and Visa (EMV) now managed by EMVCo for automated fuel dispensers. 2. The POS terminal shall use standard, public product codes to specify hydrogen fuel sale type in the transaction record.	1. The POS terminal shall be compatible with card payment systems that use embedded microprocessor chip technology, i.e., Europay, MasterCard, and Visa (EMV) now managed by EMVCo for automated fuel dispensers. ~~2. The POS terminal shall use standard, public product codes to specify hydrogen fuel sale type in the transaction record.~~
J. STATION DESIGN REQUIREMENTS	
Hydrogen refueling stations funded under this solicitation must be designed to allow for and be permitted for the hydrogen refueling station to accept delivery of hydrogen fuel from a mobile hydrogen refueler or hydrogen tube trailer.	Hydrogen refueling stations funded under this solicitation must be designed to allow for and be permitted for the hydrogen refueling station to accept delivery of hydrogen fuel ~~from a mobile hydrogen refueler or hydrogen tube trailer~~.
	[new section] **Operations** - The station provider shall include a response and maintenance plan consistent with the following: (1) An immediate response to any safety alarm, including fire or hydrogen detection. (2) The station provider shall demonstrate the ability to respond with service technicians to the site in less than 4 hours. (3) Upon system failure, commercially reasonable efforts should be employed to ensure the fueling equipment is operational within a 24-hour period. (4) Notification should be provided to OEMs, and listed on CaFCP SOSS, no less than 48-hours ahead of any planned shutdown.

Fueling Position Example Diagram



All of our recommendations align with California's hydrogen initiatives as well as others global hydrogen efforts. Given the importance to facilitate an expedited pathway to complete the 100 stations, and the impact on business planning, equipment design, and supply chain development, we respectfully request the CEC take the following steps to reach a firm consensus amongst industry stakeholders:

1) Develop a draft GFO document reflecting the attached recommendations for review
2) Convene a workshop(s) for industry members to provide comment and clarification of the draft GFO

Thank you for your consideration. For further information please contact Jonathan Palacios-Avila.

Sincerely,

Jonathan Palacios-Avila
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