California
FUEL CELL PARTNERSHIP
DRIVING FOR THE FUTURE

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California Energy Commission
Dockets Office, MS-4
Re: Docket No. 12-HYD-1 "Hydrogen and Transportation"
1516 Ninth Street
Sacramento, CA 95814-5512

Input for Developing a New Solicitation for a Hydrogen Infrastructure Network

Comments of the California Fuel Cell Partnership

August 10, 2012

Thank you for the opportunity to provide additional input to the CEC process to develop a new solicitation for a hydrogen infrastructure network in California. CaFCP appreciates and acknowledges CEC staff efforts to develop a transparent and balanced solicitation process. The funding in this solicitation is expected to bring the total number of fully funded public stations to 37, which will be the foundation for achieving the initial goal of a 68 station infrastructure by the end of 2015, as laid out in the previously submitted strategy document: *"A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles"*. These 68 stations will be located in clusters, destination and connector locations and expected to have the capacity to support the rollout and operation of up to 30,000 fuel cell vehicles[i].

In support of CEC staff efforts, CaFCP would like to provide the following comments that will help CEC staff to strengthen the solicitation, resulting in better stations and a more transparent solicitation process.

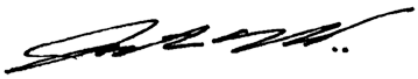
1. **Station performance**: CEC funded stations should be selected based on the following station performance criteria, meeting the detailed criteria requirements as stated in appendix A

Station Performance Criteria	
A	Fuel Protocol
B	Fill Performance
C	Station Capacity
D	Compliance Testing
E	Customer Experience
F	Communication Protocol
G	Hydrogen Quality
H	Nozzle
I	Station Reliability
J	Retail Sales
K	Other Requirements

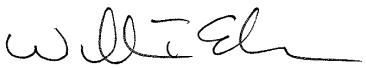
2. **Station locations**: CEC should focus on the station locations in the *Road Map*, which identifies where the initial network of 68 stations should be located. To prioritize which stations should be funded in this next solicitation, CEC should follow the input submitted by the CaFCP OEM workgroup, in collaboration with UCI. While all 68 stations are needed by the end of 2015, this prioritization will enable CEC to direct funding to those stations that OEMs, on behalf of customers, need first to successfully launch the commercial market.
3. **Solicitation transparency**: To make the solicitation process increasingly transparent, CEC should implement a NOPA reporting format that shows a summary of scores of submitted proposals based on the scoring of individual evaluators for each criterion in the solicitation (e.g. NOPAs for RFP 500-11-504, RFP 600-11-601, and RFP 600-10-612). This would increase transparency and likely improve future solicitation processes and results.
4. **SAE TIR J2601 reference**: The published edition of TIR SAE J2601 is currently being used by worldwide automakers as the guideline for hydrogen fueling for the demonstration phase of hydrogen fuel cell electric vehicles. TIR SAE J2601 is due to be replaced by a standard in 2013. The future standard, J2601, can be implemented with limited changes to stations designed to the TIR. Therefore, at this time, we expect station providers to reference TIR SAE J2601, since it is the current published document, per the letter submitted by SAE International and attached as appendix B. However we expect the stations, when built, to meet the finalized SAE J2601 performance criteria.

Thank you again for the opportunity to provide comments for the new hydrogen infrastructure network solicitation. Please, let us know if you have any questions or need clarification.

Sincerely,



Justin Ward
CaFCP Chair



Bill Elrick
Technical Program Director

[i] See Table 5 in *A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles. June 2012* <*http://cafcp.org/sites/files/A%20California%20Road%20Map%20June%202012%20%28CaFCP%20technical%20version%29_1.pdf*>

APPENDIX A

As highlighted in the CaFCP California Road Map[1], automakers (OEMs) anticipate vehicle sales to surpass 50,000 fuel cell electric vehicles (FCEVs) during the 2015-2017 timeframe. This includes approximately 5,000-15,000 through 2015 and 10,000-30,000 through 2016.[2] This will require 68, strategically-placed stations to be operational by the beginning of 2016. These stations will need to have the performance, capacity, and fueling protocol to match the demands and requirements of the FCEVs.

The CaFCP has identified both minimum requirements and performance targets for the high priority stations identified by the CaFCP OEM Workgroup and UC Irvine (given in alphabetical order in Table 1, from the automotive group and UC Irvine).[3]

Table 1. Station Location Priority List

Phase 1–Highest Priority
Anaheim
Beverly Hills/Westwood
Cupertino
Hollywood/West Hollywood/Melrose
Mission Viejo/Laguna Hills
Mountain View
Pasadena
San Diego
San Francisco
Torrance/Redondo Beach
Westminster/Huntington Beach
Woodland Hills/Calabasas/Agoura Hills

The following criteria, summarized in Table 2, have been defined to ensure FCEV customers can fuel their vehicles quickly and reliably without interoperability and compatibility issues.

Table 2. Station Performance Criteria

A	Fuel Protocol
B	Fill Performance
C	Station Capacity
D	Compliance Testing
E	Customer Experience
F	Communication Protocol
G	Hydrogen Quality
H	Nozzle
I	Station Reliability
J	Retail Sales
K	Other Requirements

[1] *A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles. June 2012* <http://cafcp.org/sites/files/A%20California%20Road%20Map%20June%202012%20%28CaFCP%20technical%20version%29_1.pdf>

[2] See Table 5 in *A California Road Map: The Commercialization of Hydrogen Fuel Cell Vehicles. June 2012* <http://cafcp.org/sites/files/A%20California%20Road%20Map%20June%202012%20%28CaFCP%20technical%20version%29_1.pdf>

[3] UC Irvine. *Hydrogen Station Prioritization*. August 2, 2012. Submittal to California Energy Commission.

The CaFCP requests CEC incorporate the following requirements into the upcoming Program Opportunity Notice (PON) where "Minimum Requirements" should be considered screening criteria for each station/proposal and "Performance Targets" identify capabilities which should be utilized to provide a further means of comparing competing projects in a priority location, providing additional points for those that achieve these performance targets.[4]

A. Fueling Protocol

Minimum Requirements (Screening Criteria)

- *Stations must meet the limits, tolerances, and operating conditions of the vehicle fuel systems listed in SAE J2601 Technical Information Report (TIR).*

Performance Targets (for additional scoring points during PON review)

- Stations capable of meeting the upcoming SAE J2601 standard (as characterized by the SAE letter dated August, 09 2012 to the CEC and attached as Appendix B)
- Stations capable of optionally performing alternative fill protocols, either as necessary and/or requested by an OEM for a specific vehicle, or for testing of future advanced protocols to further standards protocol development.

Discussion – Fuel Protocol

One of the key station performance requirements is that stations meet the SAE International (SAE) J2601 fueling protocol. This document is presently a technical information report (TIR), but will become a standard in early 2013. The J2601 fueling protocol is the globally accepted fueling protocol, which ensures that a given FCEV will receive the same quality of fill at every hydrogen station. FCEVs should not be expected to use stations that do not use the SAE J2601 TIR protocol. Therefore, the OEMs strongly believe that all stations funded by the CEC must meet the current SAE J2601 TIR.

The CaFCP expects the J2601 standard (i.e. beyond the current TIR) will incorporate real-world learning during testing and analysis of hydrogen stations using the current J2601 TIR completed by both station providers and OEMs. While the CaFCP appreciates the updated version is not yet published, we believe the CEC should identify a manner to include additional consideration for proposals which have the capability to incorporate the future J2601 standard.

B. Fill Performance

Minimum Requirements (Screening Criteria)

- *All stations must dispense hydrogen at 70 MPa and 35 MPa and must be designed to provide the appropriate SAE TIR J2601fill protocols (Type A for 70 MPa and Type B for 35 MPa fills).*

[4] As noted above, UC Irvine and OEM analysis and recommendations regarding specific station locations have been provided in a separate submittal

Performance Targets (for additional scoring points during PON review)
- In real-world conditions, stations may not always be able to perform as designed. In these cases, stations must be able to fill a vehicle to >90% SOC in under five minutes at 25°C ambient temperature (with and without IRDA communication) while maintaining the tolerance listed in SAE J2601 TIR.

Discussion – Fill Performance

The Fill Performance requirements listed above ensure that a customer can fuel a FCEV in a time comparable to a conventional gasoline vehicle. As the future J2601 standard is expected to adjust some of the existing tolerances to match real world conditions, the OEMs believe all stations must be able to accurately fill a FCEV in real-world setting in less than five minutes.

C. Station Capacity

Minimum Requirements (Screening Criteria)
- *Per the CaFCP Road Map document, all of the stations combined, funded by CEC through the 2012 PON should average a daily capacity of 210 kg per day*
- *Each individual station must have a minimum daily throughput capacity of 140 kg per day.*
- *Stations must be capable of delivering five H70 fills per peak hour, at the SAE-defined 7 kilograms (kg) of hydrogen per fill.*
- *Station proposals should outline a clear pathway to manage a potential peak load of 10 fills per hour (H70) at the SAE-defined 7 kilograms (kg) of hydrogen per fill.*
- *Stations must be able to manage two periods of peak demand during each 24-hour period (rush hour).*

Performance Targets (for additional scoring points during PON review)
- Stations immediately capable (without upgrades) of delivering hydrogen at two potential peak loads of 10 fills per hour (H70) at the SAE J2601 defined 7 kg of hydrogen per fill.
- Stations capable of delivering 250 kg per day, or more.
- Stations capable of demonstrating easy, cost-effective capacity upgrades (including upgrades to 250 kg per day or more).

Discussion – Station Capacity

As described in the CaFCP Road Map, all of the stations funded under the forthcoming 2012 PON should have an average daily capacity of 210 kg over a 12 hour period, among all of the awarded stations. However, an individual station may not be able to meet this daily average due to considerations such as location, footprint, etc. In such situations the individual station must have a minimum daily throughput of 140 kg per day capacity. This will require other stations to provide a higher than average throughput to compensate for the overall network deficiency. In addition, stations must be capable of delivering at least five H70 fills per peak hour, at the SAE-defined 7 kilograms of hydrogen per fill.

As identified in the Performance Targets above, stations with higher peak capacity and daily throughput should be rewarded. Advancements in station performance are needed to prepare the network for the commercialization of FCEVs. Preference for proposals should be given to those with higher daily capacity (250 kg/day or larger) or a clear, discernible path for capacity upgrades. The installation of larger stations, such as increasing towards 250 kg/day and 500 kg/day in the 2015-2017 timeframe, will be necessary to ensure sufficient hydrogen capacity for an increasing population of FCEVs, as identified in the Road Map. This will allow the initial network of 68 stations to develop to the point where market forces (or the CFO) can take over. Table 5 below illustrates one possible scenario if proposals only offered two station sizes - 140 kg (*minimum requirement*) and 250 kg (*target*) per day.

Table 3. Example: Station Size Scenario

	Number of Stations	Size (kg/d)
Target Capacity	8	250
Minimum Capacity	5	140

Total Stations	13
Average (kg/d)	207.7

Further, preference should be given to stations that are immediately able to meet the target capability of two potential peak loads of 10 fills per peak hour at 7 kg per fill, H70 without any upgrades. This load is based upon SAE TIR J2601, which specifies fill rates based upon ambient temperature, pre-cooling temperature, and initial tank pressure.[5] The minimum daily capacity (at 140 kg per day) assumes a station is likely to encounter high demands for fueling twice per day[6], and lends to the overall average station capacity as described previously in Table 3. Stations which are unable to meet this peak demand may still be considered, as long as the proposal provides detailed information on how the station can be upgraded to handle this demand.

D. Compliance Testing

Minimum Requirements (Screening Criteria)

- *Stations shall show compliance with SAE TIR J2601by testing the station to CSA HGV 4.3 or equivalent prior to opening.*

Discussion – Compliance Testing

OEMs (and their customers) require assurance that the proper testing, verification, and compatibility procedures have been completed on the station prior to its retail use. The State of California (Division of Measurement Standards) and station providers should work together to ensure the testing is completed and the outcome is shared with OEMs.

[5] Based upon maximum fill time of 6.3 minutes listed in Table G-1 of SAE J2601 TIR. Stations may not always fill under worse case conditions, and may not always fill 7 kg, but the conservative assumptions assure customers will receive a total fueling time close to 3 minutes.

[6] Two potential (non-sequential) peaks per day x 7 kg x 10 fills per day

E. Customer Experience

Minimum Requirements (Screening Criteria)
- *Customers must experience fueling as they would at an existing fueling station in the region.*

Discussion – Customer Experience

The CaFCP believes customers must have access to a comparable setting (e.g. well-lit, easy entry/exit, safe environment) to existing retail fueling stations (e.g. gasoline or natural-gas) with regional or local differences being taken into account.

F. Communication Protocol

Minimum Requirements (Screening Criteria)
- *70-MPa stations must fill vehicles using IRDA communication which meets SAE TIR 2799*
- *All stations must safely fill using non-communication protocols.*

Discussion – Communication Protocol

All stations must have IRDA capability and follow the SAE TIR J2799 communication protocol. In addition, each station must have the capability to fuel using non-communication protocols (according to SAE). Station providers should establish processes and procedures to avoid undesired interaction between communication and non-communication protocols.

G. Hydrogen Quality

Minimum Requirements (Screening Criteria)
- *Station providers shall ensure compliance with SAE J2719:*
  1. *Prior to the first fueling at the station (e.g. retail or OEM testing).*
  2. *Verified annually (or as required by California Division of Measurement Standards)*
  3. *After major maintenance (e.g., compressor, electrolyzer, reformer maintenance)*
- *Stations that produce hydrogen on-site should have the capability to real-time monitor key constituents that are likely to contaminate the hydrogen stream.*

Discussion – Hydrogen Quality

Ensuring compliance with hydrogen quality standards is a key consideration for OEMs and their customers. Not meeting SAE J2719, infrequent testing or improper maintenance procedures could significantly impact the performance and durability of a FCEV. Station providers shall define their hydrogen quality testing and analysis procedures to ensure proper compliance with SAE J2719. Further quality assurance protocols are recommended for stations generating hydrogen on-site (e.g. through electrolysis or reformation) to ensure real-time hydrogen quality is meeting standards.

H. Nozzle

Minimum Requirements (Screening Criteria)
- *Station must use nozzles which meet SAE J2600*

Discussion – Nozzle

The CAFCP expects station providers to utilize nozzles which meet SAE J2600 in order to match the receptacles on FCEVs.

I. Station Reliability

Minimum Requirements (Screening Criteria)
- *Station providers must agree to maintenance agreements for at least 3 years.*
- *Station providers must respond to maintenance issues within 12 hours*
- *Station providers must provide a 24-hour, toll free service number*
- *Stations must have the capability to immediately report the operational status of the station, including low capacity, to the CaFCP Station Status program or equivalent*

Performance Targets (for additional scoring points during PON review)
- Stations which provide a comprehensive maintenance plan and execute a higher uptime (i.e. percent accessible and available for customer fills).

Discussion – Station Reliability

In this nascent industry and limited number of hydrogen stations, customers will depend on only a few stations for their routine fuel needs. Dependable access to these locations will become an important market enabler. In contrast, the market for FCEVs may stall if stations are routinely unavailable or unavailable for extended periods of time. Therefore, the CaFCP believes it is not only critical to fulfill the network of 68 stations, but each station within the network must remain sufficiently available when customers require it.

The CaFCP recommends the CEC require station providers to develop operation and maintenance (O&M) plans to ensure a positive customer experience. The CaFCP believes that maintenance agreements should be in place for the duration of the CEC funding (anticipated to be 3 years), that maintenance issues are fully addressed within 12 hours, and that customers have access to customer service numbers and station status updates. The CaFCP believes the CEC should provide stronger consideration for stations that demonstrate higher availability and/or potentially develop contracts terms which reward or withdraw O&M funding based on actual station availability.

J. Retail Sales

Minimum Requirements (Screening Criteria)
- *All stations must sell fuel without the use of access and/or liability agreements or user contracts—for either corporate customers/partners or individual customer access.*

- *All stations must be publicly accessible and have accessibility for at least 18 hours a day, 7 days a week.*
- *Stations must have the ability to accept credit cards and have a user interface (HMI) similar to gasoline dispensers*

Performance Targets (for additional scoring points during PON review)

- Stations that can immediately perform retail sales based upon the requirements by California Division of Measurement Standards.
- Stations which are publically accessible and can provide hydrogen 24 hours a day, 7 days a week.

Discussion – Retail Sales

Fueling at a hydrogen station should be no different than filling at a comparable gasoline or natural gas station. Onerous accessibility requirements by any of the project participants, such as access agreements, liability agreements, or user contracts, will reduce the use of the station and should not be allowed. As in the retail gasoline model, stations that have a simple, easy-to-use credit card interface shall be the model for early commercialization. Furthermore, given a limited network of stations, hydrogen fueling should be publically accessible for at least 18 hours a day, 7 days a week to ensure customers have access to hydrogen fuel when they require it.

In the 2014-15 timeframe, the CaFCP anticipates all station providers will have equipment, processes, and procedures in place to support retail sales of hydrogen. We understand the California Division of Measurement Standards plays a critical role in this effort and believe the CEC should provide strong consideration for those proposals that can immediately begin retail hydrogen sales. Additionally, consideration should also be for those stations with hydrogen fueling availability 24 hours / 7 days per week.

K. Other Requirements

Minimum Requirements (Screening Criteria)

- *Station shall meet all applicable codes and standards, including, but not limited to SAE, NFPA, CSA HGV, UL, and CGA.*

Discussion – Other Requirements

The CaFCP expects equipment providers, engineering design firms, construction companies, station operators, including all contractors and sub-contractors, to meet the full extent of applicable codes and standards for a hydrogen station. The CaFCP is fully committed to a safe, reliable fueling experience for all FCEV users and customers.

SAE International

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August 9, 2012

Commissioner Peterman and CEC Staff
California Energy Commission
Dockets Office, MS-4
Re: Docket No. 12-HYD-1 Hydrogen and Transportation
1516 Ninth Street
Sacramento, CA 95814-5512

To whom it may concern:

This is an informative letter regarding the published SAE Technical Information Report, J2601, "Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles" and the upcoming standard, J2601 by the SAE Fuel Cell Interface Working Group. The goal is to provide clarity on the intended usage of the TIR version and some insight into what is coming in the standard. In addition, SAE would like to provide a recommendation on how to best provide the referencing of these documents in the upcoming solicitations for stations.

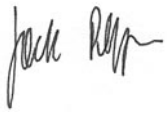
The published edition of TIR SAE J2601 describes goals and performance targets for hydrogen fueling of light duty, Fuel Cell Electric Vehicles. It is a table-based approach which specifies a fueling rate and a pressure target where the fueling should stop. SAE J2601 was created by worldwide automakers, hydrogen suppliers, industry experts, and government representatives. This TIR is currently being used worldwide as the only guideline for hydrogen vehicle fueling for these vehicles.

The TIR J2601 is to be replaced by a standard with the same title in 2013. The scope is to also include the infra-red data communications (from SAE J2799) and the lessons learned in the field to enable the first "commercial infrastructure" of hydrogen fueling. The standard is to enable commercial fueling of hydrogen with customer satisfaction and fueling performance as the main focus. To this goal, station operators around the world have given real world fueling data to the SAE Fuel Cell Interface Working Group for the purpose of furthering the document. These have already been incorporated into the draft standard, such as the tolerances to better match real world conditions and updating the fueling tables to reflect representative fueling hardware. The new standard J2601 can be implemented with limited changes, for stations designed with fueling hardware to TIR J2601 with the recommendation below.

The timeline for the Standard SAE J2601 is to be published in early 2013. For reasons of station capability and timeline, it is recommended that you use language as *"SAE J2601"* as a reference for a minimum performance criteria. This would allow the station providers to quote using the published 2010 TIR edition of J2601 document, but commission stations using the updated edition of the standard when it is released.

The Interface team also recommends that the stations in California at a minimum be designed to provide fueling which match the SAE J2601 H70 Type A fueling protocol (T40)-nomenclature used in future standard) and H35 Type B (T20) using both non-communication and communication Protocols. This would be available to reference in both the TIR & Standard versions.

Thank you for your consideration.
Sincerely,



On behalf of SAE Fuel Cell Interface Working Group

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Mr. Bill Elrick, California Fuel Cell Partnership
Mr. Pat Perez, California Energy Commission
Mr. Jesse Schneider, Chairperson, SAE J2601 SAE Fuel Cell Interface Working Group
Mr. Eugene Steele, Chairperson, SAE Fuel Cell Committee