

California Energy Commission

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Draft Solicitation Concepts for Hydrogen Refueling Infrastructure

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California Energy Commission

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**Re: Air Liquide Advanced Technologies U.S. written comments to
CEC's Draft Solicitation Concepts for Hydrogen Refueling Infrastructure 15-HYD-01**

Air Liquide Advanced Technologies U.S. ("ALATUS") appreciates the opportunity to comment on the draft concept for Hydrogen Refueling Infrastructure referenced above (15-HYD-01). We commend the CEC for continuing to engage with industry on this topic as an open dialogue is core to the success and building of momentum in this arena. Moreover, we appreciate the CEC's extension of the original response period for this critical phase of stakeholder solicitation. We believe these efforts will lead to the most comprehensive and promising Solicitation to date and should provide positive results that will further advance California's globally-recognized leadership on environmental and energy independence objectives.

In addition to the comments contained herein, Air Liquide also fully supports the hydrogen fueling industry's prior response that was submitted through the California Fuel Cell Partnership on September 14th. We believe that document highlights many of the key items our industry is focused on as we seek to deliver a revolutionary new infrastructure base to the state. In addition to the Fuel Cell Partnership comments, we offer below a few additional and complimentary points for your consideration.

Again, thank you for the opportunity to comment and we look forward to Air Liquide's continued presence and expansion within the growing California Hydrogen Fueling Infrastructure market.

With Regards,



Bob Oesterreich

Director of Hydrogen Energy

Air Liquide Advanced Technologies U.S.

**Written Comments to the document,
“HYDROGEN DRAFT SOLICITATION CONCEPTS Alternative and Renewable Fuel and
Vehicle Technology Program
Subject Area – Hydrogen Refueling Infrastructure”**

Submitted 10/20/15 with Extension Permission by the C.E.C.

Air Liquide Advanced Technologies U.S.

GENERAL COMMENTS:

1) Lack of Incentive for Hydrogen Supply Chain (purification/fill & distribution) Improvements:

Previous solicitations have included an incentive for supply chain development. We feel the omission of such an incentive in the current Draft, however, runs counter to the CEC's objective of advancing the program's goals. "Hydrogen Energy" applications -- specifically, those for fueling -- are inherently different than traditional "industrial" bulk hydrogen applications. Hydrogen Energy applications can benefit from specialized delivery equipment, transportable systems, and the compression, purification and analytical systems used to supply them. This specialized equipment is required to service multiple hydrogen refueling stations (HRSs) and provides a base of support which in turn allows for a more efficient utilization of the limited capacity from existing central production facilities. This infrastructure requires notable planning and financial resources to implement and operate -- beyond the numerous, strategically located HRSs.

For instance Section III. C. of PON-13-607 stated, *"The Energy Commission will provide funding for ancillary equipment needed to supply hydrogen fuel to funded fueling stations, including fill equipment and transport trailers, provided that all such costs are incorporated into the budget for each proposed station. Ancillary equipment costs must be included in the total proposed station cost."* Air Liquide believes this support for ancillary equipment is critical to the success of these stations long-term and should be included in future PONs as well. The inability to recover capital costs of ancillary equipment fundamentally alters the financial calculus for these projects and takes away an important incentive to continued investment in California by our industry.

2) Evaluation of Regionally Delivered H2 Sources by State, Type & Pressure:

To promote and further ensure the near and mid-term viability and success of its expanding HRS network, the CEC should further evaluate existing plans in how hydrogen is to be delivered to each of the stations (ie: gas vs. liquid delivery) by the various station developers. Studying these plans against existing regional hydrogen sources is a key determinant to understanding the short and mid-term viability of the stations themselves. Since long-distance distribution (ie; >200 miles one-way) of liquid and gaseous hydrogen is oftentimes prohibitively expensive, with the latter being far less efficient as well, it is essential to separate and assess the SoCal and NorCal regions individually. To elaborate, it would be difficult to expect that SoCal H2 sources, be they gaseous or liquid, could competitively and reliably support the planned NorCal H2 station requirements. When looking at available resources to provide gaseous hydrogen already on the ground in NorCal, there are far fewer sites capable of generating the higher pressures needed (450 Barr) for vehicles in comparison to the standard industrial pressures (180-250 Barr). Absent a more in-depth evaluation of this issue and a mitigation strategy, we fear many stations may be unsupportable if existing resources are not enhanced near the stations.

SECTION SPECIFIC COMMENTS:

Section 3: Lack of Support for Land/Site Owners:

One of the most challenging aspects of site acquisition thus far in the program has been the property owners and other tenants. While it may be the responsibility of the proponent "Station Provider" to lead the project effort, oftentimes the site owner, acting as a landlord, holds significant leverage during the lease negotiations. In our experience, this has occasionally lead to lengthy negotiations and unreasonable expectations on the part of site owners. These issues must all be addressed prior to moving forward with permitting submission as the site owner's signature is required on almost all permit applications. A financial incentive, specifically for the site owners (i.e. a portion of the total funding, made contingent upon expedient signature of permit submission documents) could potentially decrease site acquisition duration, prevent many last minute location changes and ensure site owner's full commitment to the development of hydrogen infrastructure. Funding amounts might be based on local indexed land value and proportional to the requested funding.

A second benefit, beyond site owner incentives, would be the encouragement of larger station operators to become involved – with a site owner potentially working with multiple station providers at multiple locations. So far, many companies which own and operate multiple locations have been hesitant to participate in hydrogen fueling infrastructure due to the relatively small program size and disparate opportunities for funding. For these larger companies, there is very little benefit to early entry into this market. Such a proposed incentive for multi-site station operators could provide sufficient cause to consider participation.

Section 10. A. Paragraph 1:

It is not clear what is meant by this statement: *"The delivery vehicle/vessel shall include a "sticker" or chart on the outside of the vehicle/vessel that communicates the hydrogen purity readings for the hydrogen contained in the vehicle/vessel, i.e., the date the reading(s) is taken, the reading(s), and any special condition(s) that were used while the reading(s) were taken. Additionally, the name of the company and / or organization that took the reading(s) shall also be included."* As a longstanding, global gas supplier Air Liquide strongly discourages the requirement to display a sticker of the most recent delivery, but rather (like the DMS) utilize a static sticker that the delivered H₂ is in conformance with minimum purity requirements. The rationale for this approach is as follows:

When considering purity confirmation of delivered fluid products, consideration must be given to the delivered "state" (i.e.: liquid or gaseous), as well as the delivery "transfer mode". For instance, with cryogenic H₂ delivery the liquid H₂ is transferred from road transport into the stationary bulk LH₂ vessel to increase its contents (typical to a "full" level. Same is the case for *some* gaseous GH₂ deliveries where the contents of higher pressure delivery vessels are "cascaded" or pressure-transferred into stationary vessels located at the site to increase ("bump") the latter's pressure (contents). The stationary vessel could be trailer-mounted or more permanently secured on the ground. Other routine high pressure GH₂ deliveries are "swaps" where the entire pressurized gaseous hydrogen container is replaced at the time of

each delivery, typically on mounted trailers. It is our assumption that the CEC is looking to have this sticker or chart placed "*on the outside of the vehicle/vessel*" that remains at the site.

The industrial gases industry currently offers various grades of hydrogen purity as well as various means of determining compliance. For instance: batch "Certificates of Conformance" [COC] paperwork which declares that the gas produced and batched "conforms" to the specifications contracted. COCs are sometimes made on batched product prior to its transfer into delivery transport. The more detailed compliance assurance is the per-delivery "Certificates of Analysis" [COA] where the contents of each filled transport are analyzed prior to delivery.

With already established and globalized quality, methodology and record retention procedures within our industry, we recommend against the CEC's "'sticker' or chart" suggestion on the vessel for the following reasons:

1. The liquid and gas "bumps" involving the filling of stationary vessels will always be a "blend" of the latest delivery added to the residuals of all prior deliveries; so if the purity varies between deliveries, the data of the latest sticker or chart can never be fully accurate. This effectively moots the original intent; again, for H2 delivered to stationary vessels (be it gas or liquid).
2. As a result, the compliance costs associated with ensuring sticker accuracy for every load will likely add additional compensatory charges for end-users.

Section 10.I:

We suggest this sentence state that current minimum Renewable Hydrogen Requirement is "33%"

Section 10.K:

There is a potential conflict between the Draft Concepts and the NFPA.

NFPA 2 states, "*10.3.2.1.2 Qualified Operator. Dispensing operations shall be performed by an operator who has been qualified by training to perform the functions necessary in the filling operation as described by the manufacturer's operating instructions*".

The Draft Concepts state in Section 10.K that "The station shall be open to the public (unrestricted access)

without a requirement of ... formal/registered station training of each individual consumer." How does the state anticipate awardees will comply with the conflict between the requirements of section 10.K that no consumer training will be required and the above requirement of NFPA 2, adopted as the CA Fire Code? Will the state accept the dispenser's built-in video show as a "qualification" per the "manufacturer's operating instructions?"

During the Draft Workshop, one of the fuel providers in the room also stated that adding a station operator will add \$80K-\$100K annually to the cost of each station. Will the CEC cover such costs via additional O&M funding?

Market Viability:

[4th bullet-point]: *"The station will contract with local fleets to assure high, constant hydrogen utilization throughout the station's lifetime."*

Does this refer to "local" fleets in the immediate area such as taxis or commercial fleets or does this refer to local fleets in the state, e.g. the OEMs involved in providing vehicles into the market? Or to something else? Does the CEC expect Station Developers to secure purchases in advance?

[5th bullet-point]: Can the CEC provide an example of the last criteria for Market Viability: *"demand for refueling station is reasonable, realistic and documented?"*

Project Readiness:

[9th bullet-point]: What is a *"Regional Readiness Plan"* and how does a proponent coordinate this? This has not been a criteria in previous solicitations.

[10th bullet-point]: Please further clarify the requirement that the *"[c]orrespondence demonstrates that the site's representative is committed to operating the hydrogen fueling station."* Does this mean that the station operator intends to operate the site as a hydrogen-fueling station? Or that the site owner has consented to operation of the station on its premises?

Sustainability:

GHG appears in both the project budget and in sustainability - are these requirements consistent?

GHG W2W v. H2O W2W Detail: During the workshop Air Liquide commented on the very thorough GHG (namely CO2 and methane) Well-to-Wheel "W2W" analysis that compare H2 fueling against existing alternative fuels and BEVs. These GHG comparisons are exhaustive, and shed favorable light on FCEVs and BEVs, hence one of the major driving forces of the CEC's H2/FCEV infrastructure pursuit. With the severe sustained drought and existing water conservation efforts that the Governor's office is seeking, is it prudent to continue to ignore the "H2O W2W" comparative analysis for the different H2 generation methods? Despite a perceived benefit, it appears that the H2O W2W comparison data is less thorough and less referenced by the state, with less comparison between the H2 generation technologies.

A high level lead-in is provided here that might be considered by state agencies to ensure that the resulting H2 generation technology can be thoroughly defended and properly credited in award calculations. In many hydrogen generation methods (including electrolyser and reformation), not all water supplied to the system is acceptably utilized or suitably converted to H2. To avoid process fouling in the hydrogen generator, the incoming supply water is initially subjected to a reverse osmosis ("RO") process where ions, salts and particulates are concentrated and rejected via a separate stream. This stream is diverted prior to the molecular

“cracking”, or reformation water shift steps. The rejected water stream is often termed “grey water” and is not considered suitable for human consumption. The quality of the source water supply will impact RO efficiency. Similarly, the parameters of different H2 OEMs equipment variations will also impact the grey water generation. As much as 30% (or more) might be rejected as grey water ... this should be appropriately accounted for in a complete W2W analysis.

In summary, it would appear that some H2 sources may pose greater threats to the state's drought than others. Moreover, when factoring in H2O consumption, it is unclear what effect this variable may have on the current “renewable equation.”

Miscellaneous comments/inputs:

1. As there are and will continue to be significant manpower, resource and administrative/task requirements to establish, support and grow a station infrastructure, we recommend the CEC consider further increasing and extending O&M incentives to last longer than 3 years...perhaps out to 10 years to ensure the long-term viability of the station network.
2. HySTEP: Prior to embedding this as a validating requirement, the CEC/CARB should further validate the ability of the device to confirm conformance in the same manner as SAE J2601.
3. We recommend the CEC include additional details on the “absolute minimum required safety features” for a station design to be considered as an acceptable GFO bid contender.