Shell USA Inc.
P. O. Box 2463
Houston, TX 77252-2463
United States of America
Website: www.shell.com

Rachel Assink
Rulemaking Lead
rachel.assink@ecy.wa.gov
425-531-3444

Re: Comments on Chapter 173-424 WAC, Clean Fuels Program Rule

Dear Ms. Assink,

Shell USA, Inc. appreciates the opportunity to comment on Washington Department of Ecology's "Draft Rule Language" for the Clean Fuels Program ("CFP") rulemaking. Shell Hydrogen has been a leader in Hydrogen Fuel for over 20 years, and has been operating Hydrogen refueling stations in California for over 10 years. We have been actively engaged in the California LCFS market and rulemakings, including work with the California Air Resources Board (CARB) to design the Hydrogen Refueling Infrastructure (HRI) pathway.

It is against this background, and in an effort to ensure that Washington develops a workable clean fuels program, that we offer the below comments on the draft language as it pertains to Hydrogen.

WAC 173-424-560: We recommend adoption of an 800kg/day station capacity cap with full capacity eligibility for hydrogen refueling stations serving Light Duty (LD) vehicles; and a 6,000 kg/d station capacity cap with 3,000 kg/d crediting eligibility cap for hydrogen refueling stations serving Heavy/Medium Duty (HD/MD) vehicles; and an overall cap of 5 percent of prior quarter deficits.

> Stations serving LD with dispensing capacity less than 800 kg/day and serving HD/MD with dispensing capacity less than 6,000kg/day have proven to be insufficient in California to meet demand, resulting in poor customer experience, and hindering adoption of zero emission vehicles. We recommend station capacity caps of at least 800 kg/d for LD and 6,000 kg/d for HD/MD stations to ensure the hydrogen refueling stations supported by this program are successful.
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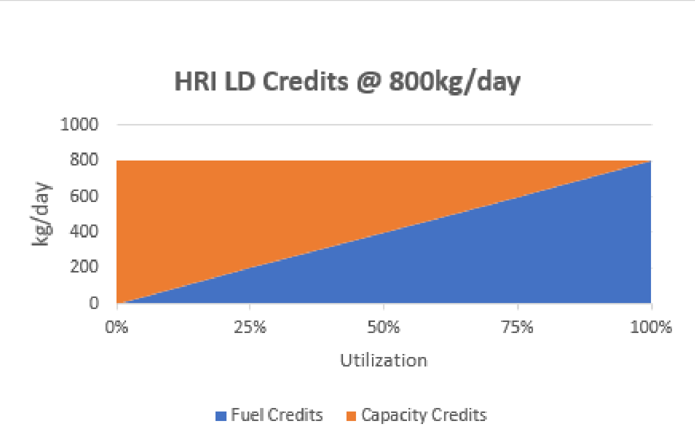
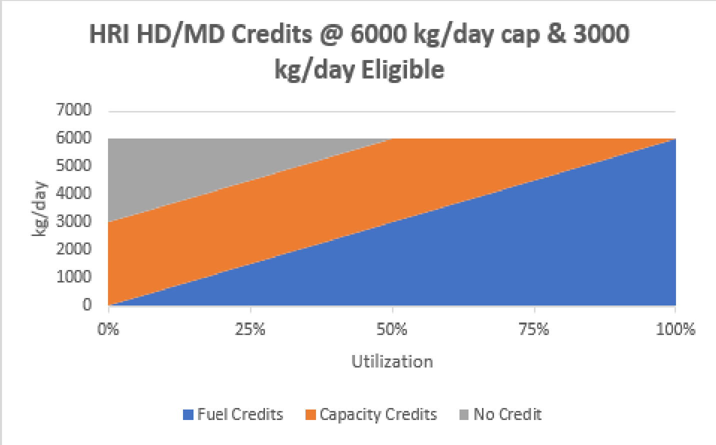
> Supporting stations of the right size by certifying a station serving MD/HD vehicles with up to 6,000 kg/d capacity, while avoiding potential excessive crediting or limitation in the number of stations that can be supported within an overall cap, can be accomplished with a limitation on the maximum crediting eligibility of 3,000 kg/d. This mechanism is illustrated in the figures below.





California's implementation of 1,200 kg/day capacity limit for stations serving Light Duty vehicles has effectively ensured that stations are now built to deliver a user experience that encourages adoption of zero emission vehicles, with at least two dispensers and higher reliability. The success of California's LD HRI Pathway can be seen in the average hydrogen station capacity increasing 2.5 times since the policy was adopted and station development programs now underway that are 5 times larger than all prior developments, with hydrogen supply that is over 90% renewable and fully decarbonized.

To further improve upon the HRI pathway in California, the California Air Resources Board has introduced expansion of the HRI program to stations serving HD vehicles, with an additional 2.5% of prior quarter deficits, and 6,000 kg/d station cap with 3,000 kg/d crediting eligibility. In seeking similar outcomes, we encourage Washington to adopt these same parameters.

Why is at least 800 kg/d capacity a good idea for stations serving LD vehicles? A few items to consider in evaluating the recommendation based on data from California:

- Fill Quantity: Average Light Duty fill is 3.2 kg/fill.
- Duration to Build: Stations take time to build, with many stations taking greater than two years.
- Redundancy: 500kg/day station typically has one dispenser and 800kg/day requires two dispensers

If stations were built with a 500kg/day cap vs 800kg/day cap, that would mean ~93 fewer cars would be serviced per station, and up to 60% more stations would be required to service the same population. The impact of 60% more stations with limited redundancy could negatively impact the success of customer adoption of zero emission vehicles and end-to-end resources as outlined below:

- Washington State agency resources could see up to 60% more applications for the clean fuels program and construction permitting. This increase in applications without sufficient resourcing could increase station development timelines. For example, Hydrogen Station construction permits can take up to a year in California, a state that is familiar with Hydrogen and has had Hydrogen Refueling Stations for 10+ years. Delays could limit station developers' ability to catch up in the event vehicle demand surpasses station capacity. The impact of station development getting behind was observed in California, and customers reacted by stopping/slowing adoption.
- A typical deployment of a 500kg/day station has 1 dispenser. If the dispenser is not operational the full station will not be operational. 800 kg/day stations require 2 dispensers, enabling redundancy in the event one dispenser fails.

Why is at least 6,000 kg/d capacity a good idea for stations serving HD vehicles? The observations above are relevant for MD/HD, and would be observed at a larger scale. Heavy Duty trucks currently average 50kg/fill and require daily fills. A 1300kg/day cap station will only fill ~26 Trucks vs a 6000kg/day cap station that will be capable of filling ~120 Trucks. Without right sized stations, commercial trucking will struggle to adopt fuel cell vehicles.

Why is at least 5 percent of prior quarter deficits a good idea for capacity crediting for hydrogen refueling stations? To ensure there is effective network coverage of both LD and MD/HD stations we recommend eligibility to certify new stations into the HRI program should be based on the estimated potential HRI credits from all approved stations not exceeding 5 percent of deficits in the prior quarter, and there should be equal allocation of 2.5% for HD/MD and 2.5% for LD. California is currently in the process of proposing the same allocation.

Experience in California has shown hydrogen refueling station coverage and capacity are essential *precursors* to introduction and adoption of hydrogen fuel cell electric vehicles, and to the good experience amongst early adopters that will support growth into the early majority customers. Furthermore, the development process for hydrogen refueling stations should not and often cannot be accelerated to catch up to demand, as local planning and permitting processes serve important functions for establishing this new infrastructure in and around communities. Even as the capacity crediting to individual stations naturally declines as utilization and hydrogen fuel sales increase, it is imperative to provide sufficient room in the HRI support to "seed" the initial market launch and maintain the pace of station capacity buildout somewhat ahead of demand.

Although the total quantity of HRI crediting could be seen as "diluting" the CFS policy targets with the additional crediting, the CARB in 2019 famously made the decision that such dilution would be an essential sign of establishing viable low-carbon and zero-emission fuel substitution through the availability of fueling infrastructure, which would then allow the acceleration of the LCFS policy. Now in the 2022 rulemaking the CARB has in fact proposed to accelerate the LCFS policy due to increasing availability of low-carbon fuels in California.

WAC 173-424-560: *Recommendation – "NEW" Multi-Modal HRI* additive capacity cap

We recommend the creation of a Multi-Modal calculation, that accounts for stations that have shared Fueling Supply Equipment components and are able to fuel a combination of weight classes or vehicle types (i.e. HD + LD, Cars + Buses) at different dispenser locations simultaneously. This station archetype will be crucial for freeway destinations that fill cars and class 8 trucks. We recommend an allocation approach for multi-modal stations that is additive for the capacity cap (i.e., up to 800 kg/day for the dispensers serving LD + up to 6,000 kg/day with 3,000 kg/d crediting eligibility for dispensers serving HD).

WAC 173-455-150: *Recommendation - Fee Allocation by program participation levels*

We recommend that the fee allocation should be based on program participation levels, and not spread evenly across all participants. Usage allocation will ensure that there is proper participation by small players, who might otherwise see a high fee as a barrier to entry.

WAC 173-424-420: *Recommendation – Simple reporting of total kg dispensed, by station classification.*

We encourage adopting simplified reporting of fuel dispensed that accounts for 1) vehicle class the stations was certified for and 2) quantity dispensed. Current "station to vehicle" interfaces do not record vehicle weight class, and thereby reporting would require significant technology development and/or implementation of inaccurate manual tracking.

The hydrogen industry standard fueling protocol SAE J2601 requires the "Station – Vehicle interface" to record the size and type of tank, as that dictates the fueling protocol. Vehicle weight class (i.e. HD/MD/LD) type does not impact the fueling protocol.

WAC 173-424-560: *Recommendation – adoption of an update to HySCapE 1.0 in a version 2.0 of this tool.*

We encourage the adoption of an update to HySCapE 1.0 in a version 2.0 of this tool, as HySCapE 1.0 is limited to 700 bar pressure stations serving LD vehicles, and does not account for recent technology developments. An update to the model may include improving accuracy and accommodating a wider range of station designs, including consideration of: (a) fueling at 350 bar or 500 bar pressure; (b) fueling for light-duty, medium-duty, and heavy-duty vehicles including an approach to allocating station capacity for "multi-modal" stations that provide fuel to several vehicle classes; (c) liquid hydrogen stations that do not maintain constant head pressure; (d) gaseous hydrogen stations that do maintain constant compressor inlet pressure; and (e) modes of supply including pipeline and trailer-swap. These updates would be easy to implement within the mass-flow modeling framework, serving to keep the model current to advances in technology and the potential range of hydrogen refueling station designs likely to be proposed for capacity certification.

We understand the CARB may be engaging with the National Renewable Energy Laboratory (NREL) for the purpose of updating the HySCapE model as part of the current LCFS rulemaking in California, and encourage the Department of Ecology to contact CARB on this topic.

WAC 173-424-560: *Recommendation – Not limiting HRI credits generated for the FSE in the prior quarter must be less than the difference between the total capital expenditure reported pursuant to (f)(iii)(A) of this subsection and the total grant revenue or other funding reported pursuant to (f)(iii)(E) of this subsection in the prior quarter.*

We encourage not limiting the developing of hydrogen fueling infrastructure with this provision, as the CARB in California decided, because it is unnecessary and could have unintended consequences.

Unlike charging infrastructure for which a similar provision does exist in the California LCFS pathway for Fast Charging Infrastructure (FCI), hydrogen refueling stations are (a) decreasing rapidly in capital cost, (b) require new infrastructure capacity for introduction of the first fuel cell electric vehicles, and may therefore experience (c) increasing utilization and decreasing retail pricing over time. In this context, a provision limiting the cumulative HRI credit revenue to be less than the total capital expenditure net of grant funds is:

1.) Unnecessary: the HRI pathway in California has proven effective in motivating hydrogen station development by de-risking the station utilization from the rate of fuel cell electric vehicle introduction. The natural balance and off-ramp of the pathway – via decreasing HRI crediting as utilization increases – along with the station capacity caps ensure business models remain focused on selling hydrogen fuel through serving customers with competitive pricing and services rather than maximizing HRI crediting.

   Furthermore, in a competitive market, the HRI credit revenue helps hydrogen station operators reduce hydrogen fuel pricing, which can accelerate adoption of fuel cell electric vehicles, thereby increasing station utilization and decreasing HRI crediting. This is a virtuous cycle now occurring in California. The HRI credit revenue is, in fact, part of the feedback loop that makes this pathway naturally balancing.

2.) Unintended Consequences: a cap on HRI credit revenue could inhibit the natural balance between station development and fuel cell electric vehicle demand that the HRI pathway is intended to de-risk and enable. Specific unintended consequences could include: (a) diminished motivation to reduce capital costs if this reduces the HRI crediting potential, resulting in structurally higher hydrogen fuel prices in Washington; and (b) the premature closure of hydrogen stations that reach a cap on HRI credit revenue, for example through good success in low capital costs and/or low carbon intensity supply and/or high grant funding, with the combined effects of discouraging these good outcomes and diminishing rather than growing the nascent hydrogen fueling network supporting fuel cell electric vehicle owners.

In conclusion, a similar provision does <u>not</u> apply to hydrogen refueling infrastructure in the HRI pathway of the California LCFS for good reasons that are proving out in practice; we encourage Washington to follow suit in <u>not</u> adopting this provision as it could be detrimental to the intended outcomes of the HRI pathway.

WAC 173-424-560: *<u>Recommendation: Adopt California's reapplication HRI pathway requirement, which allows for 10 years of crediting in the event an applicant reapplies for the same station in the event</u> the station is not operational within 24 months of application approval.*

We encourage the Department of Ecology to adopt California's HRI pathway requirement, which allows for only 10 years of crediting in the event an applicant reapplies for the same station if the station is not online within 24 months of the application. In California, this has proven to be a good balance between encouraging early announcement of station development to bring market confidence for the introduction and adoption of hydrogen fuel cell electric vehicles, while effectively discouraging speculative applications to the HRI pathway if they are unlikely to be completed in a timely manner.

WAC 173-424-900: *<u>Recommendation: Incorporation of complete details associated with the hydrogen production, distribution and dispensing pathways (i.e. compression, pre-cooling, transportation)</u>*

We encourage the following clarifications in regards to Hydrogen Pathway in Table 6.0.

a. Hydrogen pathway details and clarity, similar to California's Greet 3.0 Table F.3.(*Appendix A Below*):
    i. Details to include distribution and dispensing (compression and pre-cooling).

    ii. Eligibility criteria for each pathway (e.g. transportation distance within [100 miles] of the production facility.)

b. Encourage the inclusion of liquid hydrogen pathway in the look up tables, similar to California LCFS.
c. WAHYER to include pathways for electrolysis generated using geothermal, hydropower, and ocean power renewable electricity.

Please feel free to contact Neil Bhagia at neil.bhagia@shell.com or 608-213-6056 for any additional information or questions regarding our submission.

We appreciate your time and consideration of our comments.

Sincerely,

Wayne Leighty

Commercial Head, North America
Shell Hydrogen Mobility

Appendix A.: Example CA-GREET3.0 Lookup Table Pathways

Table F.3. Summary of CI Results by Life Cycle Stage for Hydrogen Pathways

Fuel Pathway Code:	HYF	HYFL	HYB	HYBL	HYEG	HYER
Process Description:	NG to Gaseous H_2 from SMR	NG to Liquid H_2 from SMR	Biomethane to Gaseous H_2 from SMR	Biomethane to Liquid H_2 from SMR	Gaseous H_2 from electrolysis (grid electricity)	Gaseous H_2 from electrolysis (wind/solar electricity)
NG Recovery	6.07	6.07				
NG Processing	3.31	3.31				
NG or RNG Transport	5.50	5.50	9.47	9.47		
LFG Recovery			0.79	0.79		
LFG Processing			42.74	42.74		
H_2 Production	20.46	21.79	20.46	21.79	153.95	0
H_2 Production Non-Combustion	64.09	68.26	7.78	8.29		
Liquefaction		45.28		45.28		
H_2 Transport	7.21	0.74	7.21	0.74		
Gaseous H_2 Compression and Precooling	11.04		11.04		10.51	10.51[27]
Total CI	**117.67**	**150.94**	**99.48**	**129.09**	**164.46**	**10.51**