

November 14, 2022

U.S. Department of Energy
Hydrogen and Fuel Cell Technologies Office
Cleanh2standard@ee.doe.gov
Reference: Clean Hydrogen Production Standard

Dear DOE Implementers of the CHPS,

Thank you for providing the Draft Clean Hydrogen Production Standard. In addition to other comments that I have submitted the following clarifications should be helpful.

Use of GREET

While the GREET model is complex, it provides a recognized framework for life cycle analysis that is included in the Inflation Reduction Act (IRA) statute. The following considerations regarding the use of GREET are worthy of your consideration.

- DOE (or the IRS) could publish standard values for defined fuel pathways to make compliance with the IRA statute more straightforward. For example, water electrolysis with 100% renewable power or biomass gasification with a threshold for fossil energy inputs could receive a standard value for GHG intensity.
- GREET provides a recognized basis for the upstream life cycle factors of many fuels and energy carriers. The following are well understood and could be taken from GREET at face value:
 - Well to gate for natural gas and other process fuels. Improving up the CI for pipeline natural gas or diesel used in transport would be very challenging.
 - Statewide GHG intensity for electric power (notwithstanding the use of RECs). The values are available in GREET. LCA practitioners should avoid using eGRID power values that do not include upstream emissions.
 - Carbon intensity of corn ethanol used to produce hydrogen is readily adjusted to reflect process energy inputs, CO₂ capture, and other factors in the fuel cycle.
 - The indirect land use emissions from the CCLUB model are in GREET by reference.
 - Regenerative agriculture practices in the Feedstock CI Calculator (FD-CIC) are in GREET by reference.
 - The balance of nitrogen fertilizer shares and fertilizer shares requires further evaluation to assure that nitrogen and phosphate represented as the corn farming input aligns with the fertilizer shares
 - Fugitive emissions from ethanol T&D should be treated on a carbon neutral basis.
 - The GREET carbon balance for organic waste to RNG requires further evaluation. A totality of emissions approach would account for CO₂ emissions from landfills as well as biofuel production.
 - Fugitive emissions from vegetable oils and ethanol should result in zero non-biogenic CO₂ emissions.

ISO Standards

The CHPS references the use of ISO standards, which is appealing due to the extensive stakeholder input on these standards. However, the value of the standards should be identified in the CHPS. Several key elements are of interest:

- Explanation of terms such as co-products, displacement (substitution) method, and preference for avoiding allocation
- Requirements for stakeholder input in ISO 14040 seem out of place for individual hydrogen producers. DOE's request for public input on the CHPS is consistent with the requirement to solicit stakeholder input.
- Requirements for third-party verification in ISO 14067 provides a framework for reviewing the GHG intensity of hydrogen. The ISO requirements include documentation of uncertainty and data quality, which appear reasonable. DOE could provide further guidance for third party reviews.
- The documentation of biogenic carbon in ISO 14067 is helpful. DOE could provide further guidance.

Life Cycle Associates Qualifications

Life Cycle Associates Life Cycle Associates, LLC, is a California-based limited liability company formed in 2007 that analyzes the energy and environmental impacts of fuels and energy systems. Our work furthers the reduction of harmful emissions and negative impacts on the environment and climate. Life Cycle Associates provides services to a diverse client base, including fuel providers, technology developers, government agencies, investors, and environmental groups. The Company's primary place of business is Portola Valley, California, 94028.

Our qualifications are based on over 60 years cumulative experience in alternative fuels, fuel production processes, delivery logistics, and environmental impacts. A significant portion of our work in alternative fuels concerns the evaluation of new fuel production technologies, their energy balance, and economics. LCA has expertise in sustainability issues and metrics and we have developed modeling tools to calculate sustainability results for a wide array of fuel pathways and sustainability criteria, including water use and discharge, biodiversity, land use change, criteria pollutants, and air toxics.

If you have any questions or comments, please let me know.

Best Regards,



Stefan Unnasch
Managing Director
Life Cycle Associates, LLC