DASH Clean Energy

November 14th 2022

U.S. Department of Energy (DOE)
Cleanh2standard@ee.doe.gov
RE: Clean Hydrogen Production Standard (CHPS)

Dear DOE:

In response to the DOE request for stakeholder feedback on the DOE's proposed clean hydrogen production standard (CHPS), Dash Clean Energy (DCE) submits our response related to CHPS for ***low temperate Proton Exchange Membrane (PEM) and low temperature Alkaline electrolysis***.

About:

DCE is a leading developer of hardware, software and advisory services to the green hydrogen market, and we are pioneering the first hydrogen simulation modeling tool called HydroDATUM that can determine efficiency of electrolyzers in real time based on temperature, pressure, part load operations. Our software was designed from our experience in the wind and solar sector taking hourly simulations for renewable energy performance. In addition, HydroDATUM utilizes microgrid analysis to calculate the real time carbon intensity of hydrogen based on input source of electricity. Our work is currently funded by the California Energy Commission (CEC) and is co-authored by the National Fuel Cell Research Center at University of California, Irvine

<u>Data Values for Carbon Intensity</u>

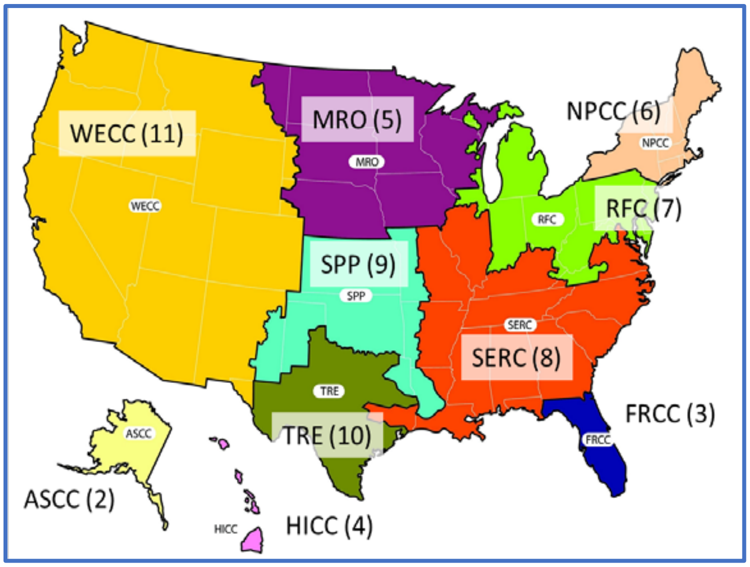
a. *Many parameters that can influence the lifecycle emissions of hydrogen production may vary in real-world deployments. Assumptions that were made regarding key parameters with high variability have been described in footnotes in this document and are also itemized in the attached spreadsheet "Hydrogen Production Pathway Assumptions." Given your experience, please use the attached spreadsheet to provide your estimates for values these parameters could achieve in the next 5-10 years, along with justification.*

<u>Response:</u>
See Attached Spreadsheet.

b. *Lifecycle analysis to develop the targets in this draft CHPS were developed using GREET. GREET contains default estimates of carbon intensity for parameters that are not likely to vary widely by deployments in the same region of the country* *(e.g., carbon intensity of regional grids, net emissions for biomass growth and production, avoided emissions from the use of waste-stream materials). In your experience, how accurate are these estimates, what are other reasonable values for these estimates and what is your justification, and/or what are the uncertainty ranges associated with these estimates?*

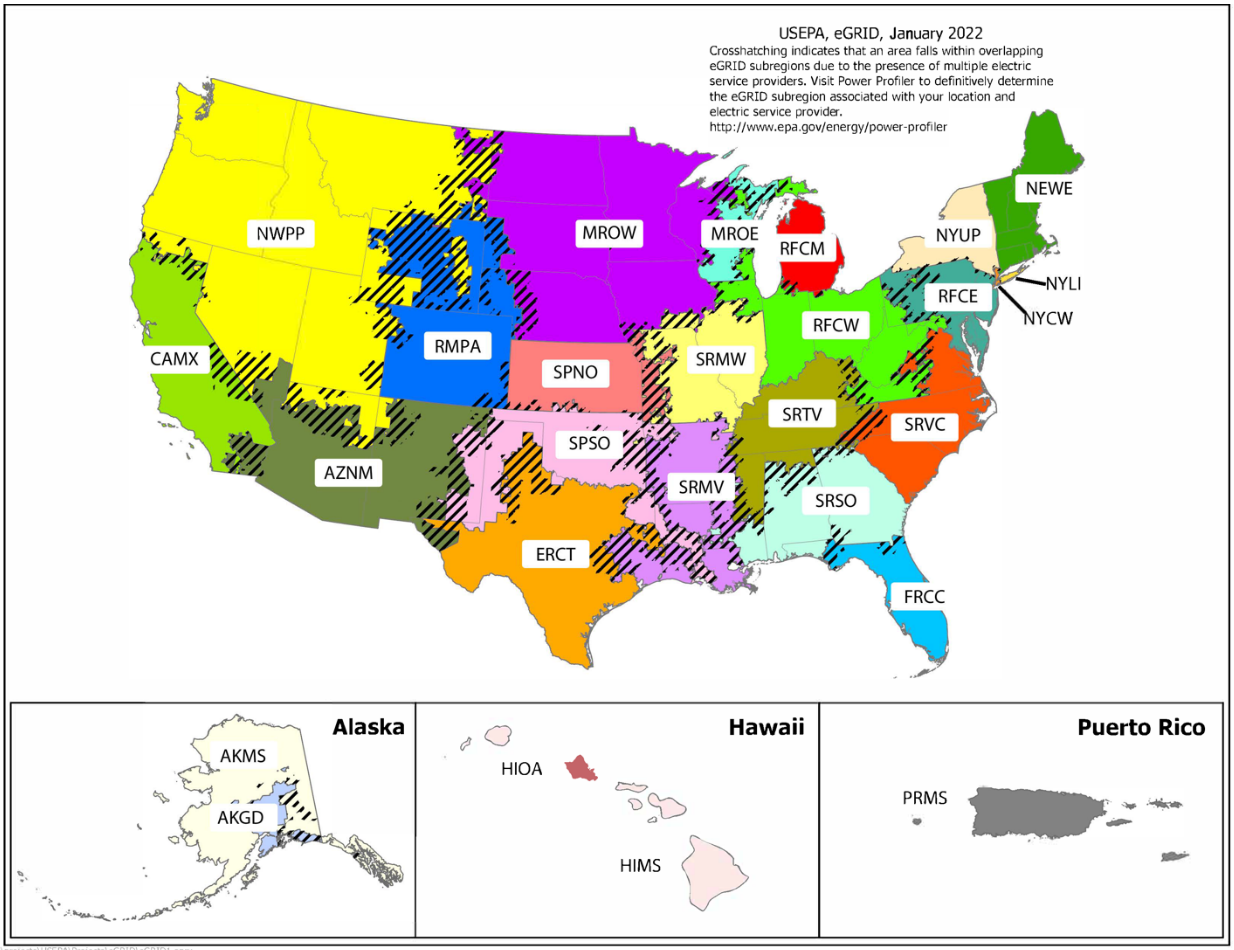
Response:

The 2021 release of the Argonne GREET model version of the model uses EIA's Annual Energy 10-region North American Electric Reliability Corporation (NERC) to develop region-specific GHG emissions for electricity generation. Figure 1:



The State of California revised the GREET model to utilize the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID) to determine the impact of stationary electricity use in fuel and feedstock production. The environmental characteristics in eGRID include emissions rates, net generation, resource mix, air emissions for nitrogen oxides, sulfur dioxide, carbon dioxide, methane, nitrous gas, and many more properties. They take generation data from the Energy Information Administration (EIA) and integrate it with the Environmental Protection Agency (EPA)'s emission data, producing valuable variables such as emissions per megawatt-hour of electricity generation (lb/MWh), which is able to directly portray the environmental impact of electricity generation.

eGRID contains 26 subregions to capture subregional variabilities in GHG emissions for electricity generation. The subregion emission rates most accurately represent the actual electricity used by consumers by limiting the import and export of electricity within an aggregated area. The subregions were defined by EPA as a compromise between NERC regions and balancing authorities. Figure 2:



DCE highly recomends that the CHPS is based off of eGRID data as this data was developed by the Federal Government to more accurately determine emission profiles from electricity generation in sub-regions and more actually reflects the electricity profile for projects using low temperature electrolysis.

Implementation:

How should the GHG emissions of hydrogen commercial-scale deployments be verified in practice? What data and/or analysis tools should be used to assess whether a deployment demonstrably aids achievement of the CHPS?

Should renewable energy credits, power purchase agreements, or other market structures be allowable in characterizing the intensity of electricity emissions for *hydrogen production? Should any requirements be placed on these instruments if they are allowed to be accounted for as a source of clean electricity (e.g. restrictions on time of generation, time of use, or regional considerations)? What are the pros and cons of allowing different schemes? How should these instruments be structured (e.g. time of generation, time of use, or regional considerations) if they are allowed for use?*

Response:

Renewable Energy Credits (RECS) represent the energy generated by renewable energy sources, such as solar or wind power facilities. Buying RECs is *not* equivalent to buying electricity. Instead, RECs represent the clean energy attributes of renewable electricity. Simply put a wind or solar farm that generates 1 megawatt of renewable energy also generated 1 REC.

Originally, RECs were a mechanism that utilities used to comply with Renewable Portfolio Standards (RPS) statutory requirements for deploying renewable energy, and REC's where a way to provide proof of regulatory compliance. Eventually commercial and Industrial (C&I) customers wanted to voluntary decarbonize and the voluntary REC market was developed for C&I to claim the renewable attributes and this would allow them to proclaim they are "100 percent powered by clean energy". Also called unbundled RECS.

S&P Global said in a report that this type of purchase of RECs can be problematic as they make it appear that credit purchaser has invested in the physical buildout of renewables, when in reality they have not. Many corporations flaunt that they are switching to renewable energy and reduced emissions, but physically they have not made any changes.

The purchase of unbundled credits "can make it look as if a company's electricity emissions have become zero, when they haven't," says Matthew Brander, senior lecturer of carbon accounting at the University of Edinburgh.

Some of the largest buyers are corporations, many of which celebrate their progress towards "net-zero" goals, but which may not be contributing as much to the energy transition as it appears.

Using RECs also allows a company to say it has reduced its scope 2 emissions simply by writing a check, while it can continue to put out greenhouse gases as before, said S&P.

"The reaction when you tell companies about this is mixed," said Brander," Some corporates are horrified when they find out about non-additionality. Others ignore it, saying they'll keep buying unbundled RECs as long as existing standards allow them to do it, and as long as their peers do it."

Many C&I customers have abandoned the unbundled REC market in favor of signing long term PPA's and the according to the Clean Energy Buyers Association 11.07 GW of renewable energy was procured in 2021 by C&I.

The problem with REC's and CHPS is the hydrogen produced from electrolysis is only as clean as the source of the electricity. The hydrogen electricity buyer knows how much renewable energy was generated but not ***when*** it was generated. Allowing developers to claim RECs for electrolysis goes against the sole purpose of the CHPS. In fact, using the average grid emissions factor the actually emissions for electric hydrogen will "increase" emission by a factor of 2 compared to baseline SMR production. In addition, to increasing emissions electrolyzer projects located in industrial areas, are most likely to be located in disadvantaged communities, increasing the peak demand in the region and increasing the local emissions profile of the region.

Allowing electrolyzers to pull grid electricity can greatly increase the demand on the grid and create spikes in energy and the need for Peaker Plants are used to compensate for the imbalance in the market.

According the Clean Energy Group: *Even though these Peaker plants do not run much, their limited operation contributes significantly to local air pollution in the city's communities of color. Combustion of fossil fuels at Peaker plants emits localized pollutants such as nitrogen oxides (NOx) and sulfur dioxide (SO2), which are both directly harmful and can contribute to the secondary formation of ozone and fine particulate matter (PM2.5). Peakers, particularly older ones, emit a higher level of pollutants relative to the electricity they generate. When New York's gas-fired peaker plants are operating, "they can account for over one-third of New York's daily power plant NOx emissions."*

In 2022 Dash Clean Energy issued a whitepaper on this topic with associated Carbon Intensity (CI) and every region of the country will have higher CI with grid tied electrolyzers, and compared the associated CI scores for virtually connected wind and solar plants supplemented with the grid.

Dash Clean Energy is making the following recommendations for the clean hydrogen standard for low temperature electrolysis projects:

1. **Direct Connection**: Hydrogen production facilities and renewable generation must be either be connected via a direct line or take place within the same installation. These projects will automatically qualify and have a carbon intensity of zero.

2. **Time-matched procurement:** For hydrogen produced from a facility relying on renewable or virtual PPAs, the PPAs must generate an amount of electricity that is at least equivalent to the amount of electricity relied on to produce hydrogen on an hour-for-hour basis. The renewable generating facility associated with the PPA must have come online no earlier than 36 months prior to the time the hydrogen production facility achieves commercial operation. Hourly matching helps connect clean energy purchasing to underlying electricity consumption

   Hydrogen electrolyzer developers should be allowed to provide verification of their Carbon Intensity based upon modeling tools available to them such as HydroDATUM, or other carbon-based accounting software tools, and the developers should not be restricted to the GREET model. Developers should be allowed to submit production pathways based on their intended operations of their electrolyzer, and the DOE should allow for third party accounting to confirm they are meeting their time matching requirements.

3. **Local Procurement:** Electrolyzer projects procuring clean energy on the local/regional electricity grid where the electricity consumption occurs. Virtually connected zero carbon resources should be located within the same sub-region as defined by eGRID. The electrolyzer should be time matched to production of the zero carbon resources. Transmission losses for the point of production to the point of consumption shall be defined by each region as determined by eGRID.

   Utilize EPA's eGrid local grid analysis as this is the only way to drive the electricity related emissions that a electrolyzer is directly responsible for down to zero.

4. **Enabling new generation**: Electrolyzer projects must contract with new low carbon energy projects.

5. **Renewable Resource Curtailment/Grid Support**. Electricity taken from the grid and used to produce hydrogen at times of imbalance when renewable resources would otherwise have to be curtailed qualifies as clean hydrogen. The amount of electricity that would have otherwise been curtailed by a transmission system operator must be equal to or greater than the amount of electricity consumed during that time period by the hydrogen producer.