Renewable Hydrogen Update to the Green-e® Renewable Fuels Standard – Draft for Second Stakeholder Comment Period

I. Eligible Sources and Pathways

Only the following renewable hydrogen production pathways may be used in Green-e® Renewable Fuels certified products in Canada and the United States. Other production pathways may be added in the future. Renewable hydrogen production pathways must meet all applicable rules in the Standard at the time of hydrogen production, unless the pathway has received an exemption by the Green-e® Governance Board.

Each pathway must be reviewed and approved by CRS before the resulting fuel can be used in a Green-e® Renewable Fuels certified product.

A. Fuel Types

This section applies only to renewable hydrogen.

B. Production Facility

Renewable hydrogen production facilities must use one of the following:

1. Electrolytic Processes

   The use of electricity to split water into hydrogen and oxygen in an electrolyzer is an electrolytic process.

   All electricity, except for electricity from collocated generation facilities[1], used in electrolysis must be Green-e® Energy certified; refer to the Green-e® Energy Documents page for program rules and eligibly criteria. This Green-e® Renewable Fuels Standard contains additional rules that electricity used in electrolyzers must meet.

2. Thermochemical Processes

[1] Collocated electricity generators used to power electrolyzers for renewable hydrogen production must still meet the generator requirements defined in the Green-e® Energy Standard

The use of energy from organic waste resources to produce biomethane that is then converted to hydrogen is a thermochemical process.

Steam methane reforming (SMR) is the only thermochemical process allowed under this Standard. High temperature steam is used to produce hydrogen from biomethane. Methane reacts with steam to produce hydrogen, carbon monoxide, and a small amount of carbon dioxide. Only biomethane that is Green-e® Renewable Fuels certified is acceptable to be used in SMR.

II. Location of Facilities

A. Geographic Location

1. Location of Renewable Hydrogen Production Facilities

Production facilities providing renewable hydrogen or Renewable Fuel Certificates (RFCs) for certified products must be located within Canada or the U.S.

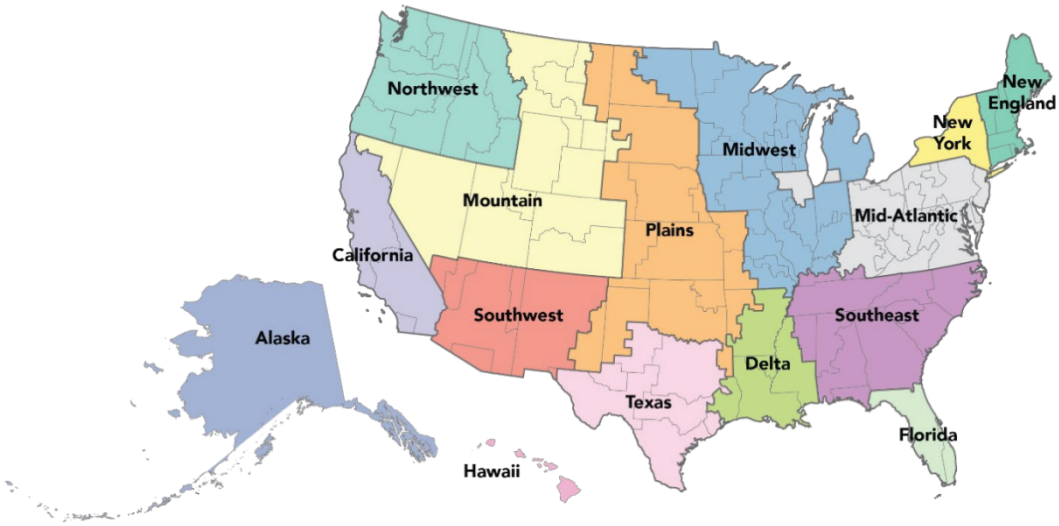
For hydrogen consumers in Hawaii, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, and the Northern Mariana Islands pursuing Green-e® Renewable Fuels certification as the end-user, renewable hydrogen must be produced and consumed in the same state/territory unless the following criteria are met:

a. It can be proven that the island imported renewable hydrogen from another area of the same country; and
b. Imports of renewable hydrogen used in the certified product must be accompanied by an RFC from the same distribution system as the imported gas

2. Location of Renewable Electricity Generator

Electricity generators providing renewable electricity or RECs to an electrolyzer must be located in the same region as the electrolyzer, based upon geographic regions used in the U.S. Department of Energy in its "Transmission Needs Study," dated October 30, 2023, and reproduced below.[2]

[2] U.S. Department of Energy, "Transmission Needs Study" (Oct. 30, 2023), at pg. 3 & Figure ES-1 (using geographic regions as designated by National Renewable Energy Laboratory), *available at https://www.energy.gov/sites/default/files/2023-12/National%20Transmission%20Needs%20Study%20-%20Final_2023.12.1.pdf*.



Source: National Renewable Energy Laboratory.

Figure ES-1. Geographic regions used in the Needs Study.

B. Fuel Transport

For purposes of Green-e® certification, participants are responsible for using the book-and-claim accounting system to substantiate ownership and transfer of renewable hydrogen and/or RFCs, including in transactions involving physical or contractual flows of hydrogen through a pipeline. CRS requires participants to disclose the region of production and the method of fuel transport, as described in the Green-e® Renewable Fuels Code of Conduct. The following fuel transportation methods (or combinations thereof) are allowable under this Standard. In all cases, CRS reserves the right to require additional documentation for verification purposes.

1. Renewable Hydrogen Transportation Through Common Carrier Pipeline

    a. Pipeline-Connected Hydrogen Production Facilities

    The hydrogen production facility where hydrogen is connected to a common carrier pipeline and blended or connected to a dedicated hydrogen pipeline where the hydrogen can be injected and transported along the pipeline system

b. Standalone Hydrogen Production Facilities

For standalone hydrogen production facilities not directly connected to a pipeline, the fuel may be transported by truck or other means to a common carrier pipeline or dedicated hydrogen pipeline injection site if:

i. The overall carbon intensity calculation accounts for the entire transportation of the fuel (vehicle type, fuel type, distance traveled), and

ii. The total carbon intensity remains under that of the established carbon intensity threshold

2. Renewable Hydrogen Onsite Use or Conversion

a. Renewable Hydrogen Consumed On-site

Renewable Hydrogen may be consumed on-site by the producer or delivered directly to another consumer via a private pipeline and the use or sale may be Green-e® certified, if:

i. Attributes / RFCs are not sold separately; they must be retained and claimed by the consumer, and

ii. The overall carbon intensity calculation includes the entire transportation of the fuel (vehicle type, fuel type, distance traveled), and the total carbon intensity remains under that of the established carbon intensity threshold in Section V

b. Chemical Transportation

For conversion of renewable hydrogen to other chemicals for transportation, the renewable hydrogen attributes must be retired upon chemical conversion.

c. Other Means of Transportation to the Consumer

For hydrogen facilities transporting renewable hydrogen via truck and other means directly to the consumer/marketer/retailer or to any other third party. Attributes / RFCs can be sold separately from the fuel. From 2029 onwards a geographical market boundary will be introduced based upon geographic regions used in the U.S. Department of Energy in its "Transmission Needs Study," dated October 30, 2023, depicted in Figure 1. From 2032 onwards attributes/RFCs cannot be sold separately; they must be retained and claimed by the consumer of the fuel.

III. Renewable Electricity Generation Facility Age for Electrolytic Hydrogen Production (Incrementality)

All renewable electricity generation facilities must have a Commercial Operation Date (COD) no more than 36 months before the date that the hydrogen production facility was placed in service. This time limit for an eligible electricity generation facility is referred to as the "Energy Online Date".

A. Facility "Energy Online Date" Requirements

A renewable electricity generation facility must meet at least one of the following conditions in relation to the Energy Online Date that applies to the reporting year:

1. The electricity generation facility was placed in operation (producing renewable electricity) on or after the applicable Energy Online Date

2. The renewable electricity generation capacity is a separable improvement to or enhancement of an existing generation facility that was first placed in operation before the applicable Energy Online Date, such that the proposed incremental production is contractually available for sale and measured separately from the pre-existing generation capacity at the facility

3. The generator performed a 100% switch from non-renewable electricity production to eligible renewable electricity production on or after the applicable Energy Online Date

4. The generation facility began producing eligible electricity in a co-production process with non-eligible electricity on or after the applicable Energy Online Date. In this case, only the electricity output attributable to the eligible inputs is eligible for renewable hydrogen production. Calculation and verification methodologies must be approved by the Green-e® Governance Board

B. Renewable Portfolio Standards (RPS) and Clean Energy Standards (CES)

1. In states with qualifying electricity decarbonization standards and qualifying GHG cap programs, currently California and Washington, the RECs produced from renewable energy facilities that are sold to hydrogen production facilities in those states are not required to comply with incrementality requirements listed in section III.A.

IV. Vintage and Time Matching

A. Hydrogen Production Vintage Requirements

For Green-e® certified transactions made during a given calendar year, the renewable hydrogen used in that transaction must have been produced within the date range shown in Table 1. Proper claims and ownership of attributes / RFCs must be proven regardless of the date of fuel injection or shipping, in accordance with Sections IX.

Table 1: Eligible Renewable Hydrogen Production Dates by Year of Certified Transaction

Year of Certified Transaction	Maximum Years before Transaction that Fuel was Produced	Earliest Eligible Fuel Production Date	Latest Eligible Fuel Production Date
2026	5	1/1/2022	12/31/2026
2027	5	1/1/2023	12/31/2027
2028	3	1/1/2026	12/31/2028
2029	3	1/1/2027	12/31/2029
2030	2	1/1/2029	12/31/2030
2031 and beyond	2	Increases 1 year per year	Increases 1 year per year

B. Time Matching of Renewable Electricity for Electrolysis

For Green-e® certified sales made through December 31, 2029, renewable electricity or RECs used toward electrolytic hydrogen production must be retired from the same reporting year that the renewable hydrogen is produced and meet the electricity vintage rules as defined in section III.B of the Green-e® Renewable Energy Standard for Canada and the United States. For Green-e® certified sales made on or after January 1, 2030, such renewable electricity or RECs must be generated in the same hour that the hydrogen is produced.[3]

V. Green House Gas Emissions

A. Upstream Carbon Emissions

[3] Once the hourly matching requirement comes into effect CRS may consider allowing for incrementality exceptions for a limited percentage of the renewable energy procured for hydrogen production

Each hydrogen production pathway is required to undergo a third-party life-cycle analysis performed by a CRS-approved verifier, to account for the well-to-gate greenhouse gas emissions.[4] Accepted methodologies for calculating a CI value can be found on Green-e® Renewable Fuel Standard page. The CI of renewable hydrogen must be equal to or lower than 4 kg of CO_2e per kg of hydrogen up to the point of injection or shipping. All upstream fugitive emissions associated with hydrogen distribution such as hydrogen leakage from trucking or discharge of hydrogen vapors from pressure-containing equipment or facilities and components inside plants such as valves, piping flanges, pumps, storage tanks, compressors, etc. must be disclosed to CRS. CRS reserves the right to require additional accounting of fugitive emissions in the CI score of renewable hydrogen in the future based on advancements in technologies to measure these fugitive emissions. SMR facilities utilizing carbon capture and storage (CCS) technologies to reduce their CI score must have onsite functional CCS technologies. Facilities cannot lower their CI score by purchasing CCS credits from other facilities.

B. Midstream and Downstream Carbon Emissions

The midstream CI of renewable hydrogen, including pipeline leakage, must be disclosed to the customer at the point of customer receipt in accordance with the Green-e® Renewable Fuels Code of Conduct. Downstream CI reporting is optional.

VI. NOx Emissions

All NOx emissions from SMR facilities, including NOx emissions from CCS, must be reported to CRS as part of the hydrogen production facility review process. All hydrogen production facilities must be in compliance with all state and/or federal laws/rules regarding NOx emissions.

VII. Water Use in Hydrogen Production Facilities

Hydrogen facilities using electrolysis or SMR that are sourcing water from the D1, D2, D3, and D4 drought areas of the USA and Canada (as defined by the U.S. Department of Agriculture's United States Drought Monitor Map (USDM) and Agriculture and Agri Food Canada's Canadian drought monitor map (CDM) by, respectively), must use recycled or repurposed water to produce renewable hydrogen, if available.

If recycled or repurposed water is not available for electrolysis, the electrolyzer must be equipped with a dry cooling system in order to reduce water consumption. Before

[4] Upstream emissions from leakage, extraction, production, and processing operations

approval of a renewable hydrogen production facility, and every five years after approval, the preceding five years will be reviewed to determine whether the facility was located in a drought area at any time.

If recycled or repurposed water is not available for use in SMR, we allow the use of other technologies, which can substantially reduce the water consumption in hydrogen production via SMR.

IX. Pipeline Blending

Hydrogen blended into gas pipelines is eligible under this standard. This Standard does not impose limits on blend levels; however, gas distribution companies and regulators may apply their own limits, which must be followed.