

**Application No. B0032****Staff Summary****Air Liquide Hydrogen Energy  
LAX Station SMR  
Landfill Gas to Gaseous Hydrogen  
North American Fossil-based Natural Gas to Gaseous Hydrogen****Intermediate Facility: Northeast Mississippi Landfill Gas Recovery Project**

Deemed Complete: 12/12/2019  
Posted for Comment: 12/24/2019  
Certified and Posted: 1/13/2020  
CI Effective: 10/1/2019  
Fuel Pathway Code(s): See below

**Pathway Summary**

Air Liquide Hydrogen Energy seeks certification of two pathways for gaseous hydrogen produced by steam methane reformation (SMR) produced onsite of the LAX hydrogen station, using average North American landfill gas and fossil natural gas (NA NG), respectively. The renewable hydrogen pathway uses book-and-claim accounting for biomethane (RNG).<sup>1</sup>

The pathway is consistent with the Lookup Table pathways, Compressed H<sub>2</sub> produced in California from central SMR of biomethane from North American landfills (HYB) and the Compressed H<sub>2</sub> produced in California from central SMR of North American fossil-based NG (HYF),<sup>2</sup> with the following exceptions: the hydrogen production stage and hydrogen transport stage. Therefore, this pathway requires a Tier 2 application (95488.5(a)).

The applicant has provided three months of invoices for the amounts of natural gas and electricity consumed, and the metered quantity of hydrogen produced by the onsite SMR unit. Using this data, the applicant determined the CI using the CA-GREET3.0 model. The key parameters in CA-GREET3.0 include:

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<sup>1</sup> All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), section 95480-95503. Book-and-claim accounting is primarily addressed in 95488.8(i) of the LCFS regulation.

<sup>2</sup> [CA-GREET3.0 Lookup Table Pathways Technical Support Documentation](https://ww3.arb.ca.gov/fuels/lcfs/ca-greet/lut-doc.pdf). Available at: <https://ww3.arb.ca.gov/fuels/lcfs/ca-greet/lut-doc.pdf>

Conversion efficiency (Hydrogen Tab, cell B100):

$$\eta_{\text{conversion}} = \frac{\text{MMBtu H}_2 \text{ (Produced)}}{\text{MMBtu N} + \text{MMBtu Electricity (Consumed)}}$$

Natural Gas share (Hydrogen Tab, cell B109):

$$\text{Share}_{\text{ng}} = \frac{\text{MMBtu N}}{\text{MMBtu N} + \text{MMBtu Electricity}}$$

Electricity share (Hydrogen Tab, cell B113):

$$\text{Share}_{\text{electricity}} = \frac{\text{MMBtu Electricity}}{\text{MMBtu N} + \text{MMBtu Electricity}}$$

Share of Natural Gas input as Feedstock (remainder input as process fuel) (Hydrogen tab, cell B103):

$$R_{\text{feed}} = \frac{\text{Btu H}_2 \text{ (Produced)}}{\text{Btu CH}_4 \text{ (Consumed)}} \times \psi$$

Where  $\psi$  is the stoichiometric energy ratio, a static factor of 0.8334 Btu CH<sub>4</sub> / Btu H<sub>2</sub>.

Since the Hydrogen is produced onsite at the dispensing location, no transportation emissions are included in the pathway CI.

### Carbon Intensity of Hydrogen Pathway

The CI is determined from life cycle analysis conducted using the Board-approved CA-GREET3.0 model. Model inputs are identical to those documented in the Lookup Table Technical Support Documentation, including the emissions associated with pipeline-injected RNG produced from average North American landfill gas, with the exception of hydrogen production and transport. The following table lists the proposed CI for this pathway.

#### Proposed Pathway CI

Fuel & Feedstock	Pathway FPC	Pathway Description	Carbon Intensity (gCO <sub>2e</sub> /MJ)
Gaseous Hydrogen from Landfill gas	HYG025B0032 0100	Gaseous Hydrogen from landfill gas from onsite SMR at the LAX station and dispensed in vehicles	158.25
Gaseous Hydrogen from NA Fossil Natural gas	HYG031B0032 0200	Gaseous Hydrogen from NA fossil natural gas from onsite SMR at the LAX station and dispensed in vehicles	176.43

## **Operating Conditions**

The certified CI value in the above table may be used to report and generate credits for fuel quantities that are produced at the facility in the manner described in the applicant's LCA report, and dispensed for transportation use in California, subject to the following requirements and conditions:

1. Fuel pathway holders are subject to the requirements of the California Air Resources Board's (CARB) Low Carbon Fuel Standard (LCFS) regulation, which appears at sections 95480 to 95503 of title 17, California Code of Regulations. Requirements include ongoing monitoring, reporting, recordkeeping, and third-party verification of operational CI and a controlled process for providing product transfer documents or other similar records to counterparties or CARB.
2. The fuel pathway holder must include monthly records of all energy used and hydrogen produced in its Annual Fuel Pathway Report submitted to CARB for third-party verification of the operational CI.

## **Staff Analysis and Recommendation**

Staff has reviewed the Air Liquide Hydrogen Energy application for hydrogen, and has replicated, using the GREET3.0 model the carbon intensity calculations provided by the applicant. On the basis of this finding, the Air Liquide Hydrogen Energy application for LCFS Tier 2 pathways stated in above table will be certified after all the comments received during the 10-day comment period are addressed satisfactorily by the applicant. The certification is subject to the operating conditions set forth in this document.