CALIFORNIA AIR RESOURCES BOARD

LOW CARBON FUEL STANDARD
PROPOSED NEW TEMPORARY FUEL PATHWAY

Hydrogen from Biomethane Produced from Dairy and Swine Manure

November 6, 2020

Updated: 02/23/2021

Pursuant to section 95488.9(b)(4) of the Low Carbon Fuel Standard (LCFS) regulation,[1] the Executive Officer may approve a new Temporary pathway for a fuel or feedstock fuel combination not found in Table 8 of the LCFS regulation. Pursuant to this section, the proposed temporary pathway will be posted for 45 days for public comment prior to certification. If comments received require significant revisions of the originally published pathway, a revised pathway will be posted for public comment. Upon certification of a new Temporary pathway created by the Executive Officer, the pathway will be available for reporting for the quarter in which it is certified.

This document proposes a carbon intensity (CI) value for new Temporary pathway for hydrogen derived from biomethane produced through anaerobic digestion of dairy and swine manure. Public comments on the Temporary pathway for hydrogen derived from dairy and swine manure biomethane will be accepted for 45 days from November 6, 2020 through December 21, 2020.

Rationale

Table 8 (Temporary Pathways Table) of the Regulation contains one pathway for hydrogen produced from fossil liquefied natural gas (185 gCO_2e/MJ). Stakeholders are requesting the availability of a temporary pathway for hydrogen produced from dairy and swine manure-derived biomethane. This is to facilitate credit generation for hydrogen from biomethane derived from these feedstocks while pathway applications with operational data are under review.

The proposed temporary CI is applicable to hydrogen produced using steam methane reforming of biomethane derived from anaerobic digestion of dairy and swine manure. The biomethane used in hydrogen production should have a CI of ≤ -150 gCO_2e/MJ.

Proposed CI Calculation

Staff calculated the proposed CI value for hydrogen from biomethane produced from dairy and swine manure on the basis of the approved Temporary CI score of -150 gCO_2e/MJ in Table 8 for biomethane from dairy and swine manure used in natural gas vehicles. The proposed temporary carbon intensity pathway captures GHG emissions from manure handling, biogas production and upgrading, pipeline transportation of biomethane and its use in steam methane reforming, compression and liquefaction of H2, and final delivery to fueling stations in California. Consistent with the Lookup Table pathway for hydrogen produced from biomethane, it is assumed that 1 MMBtu of biomethane is used as feedstock to produce an equivalent quantity of hydrogen,[2] while fossil natural gas is used to generate the steam for the reformation

[1] All citations to the LCFS Regulation are found in Title 17, California Code of Regulations (CCR), sections 95480-95503.

[2] Applicants who use this pathway to report hydrogen dispensed for transportation use to generate credits in the LCFS program must provide evidence of equivalent quantities of biomethane for quantities of hydrogen reported: 1 MMBtu/MMBtu, or 0.126 MMBtu (HHV) of biomethane per kg of hydrogen.

process. Biomethane from dairy and swine manure is injected into the North American common carrier pipeline. U.S. average grid electricity is assumed for hydrogen liquefaction and compression operations.

The resulting CI was increased by an additional 5 percent and rounded to the nearest five CI points, consistent with the methodology used to determine existing Temporary CI values listed in the regulation.[3]

Table 1 lists the proposed Temporary CI for hydrogen from biomethane produced from dairy and swine manure.

Table 1. Proposed Temporary CI for hydrogen from biomethane produced from dairy and swine manure

Fuel	Feedstock	Process Energy	CI (gCO_2e/MJ)
Hydrogen (compressed or liquefied)	Dairy and Swine Manure	Grid electricity, natural gas, and/or renewables	-50

[3] LCFS ISOR Section 95488.9(b). Table 8: Revisions to the Temporary Pathways Table; page 23 of 50, or III-101