



California Air Resources Board (CARB)
101 I Street
Sacramento, CA 95814
(delivered via attachment to webform)

Re: Comment to the Preliminary Draft of Regulatory Amendments and Amendment Concepts.

The recent webinar on the 22nd of February discussed a number of potential changes to the Low Carbon Fuel Standard program. Specifically, § 95488.8 (A) discusses the use of RNG as an input to hydrogen production, which demonstrates a willingness on CARB's part to enable different production models for hydrogen.

Like many, our team sees hydrogen as a fuel-of-the-future due to its zero-carbon content, but the practical reality is that hydrogen remains difficult to transport and store. Indeed, cost-efficient storage and transportation to dispensing stations remain key bottlenecks for expanded hydrogen-use in vehicles. We recommend that CARB expand § 95488.8 (A) to allow not only pure hydrogen, but also hydrogen-derived fuels to qualify for book and claim credits.

Catalytic methanation of hydrogen is an established way to improve hydrogen delivery to the customer. In this process, hydrogen and carbon dioxide are combined over a catalyst to produce methane (or RNG). If this gas is injected into existing natural gas pipelines, RNG by methanation can act as a carrier to deliver green hydrogen (albeit as a different gas species) to customers with much lower losses. Many more vehicles will be able to use this hydrogen-derived fuel since the number of RNG-dispensing stations exceeds the number of hydrogen stations substantially.¹ More stations means more vehicles will use low-CI fuels, thereby helping the LCFS program achieve its goal to reduce the overall carbon intensity (CI) score for the transportation fuel pool.

To allow the delivery of hydrogen-derived RNG, our team recommends the following:

Regulatory Text

1. The book and claim system as described in § 95488.8 (A) can be expanded from:

“... RNG... as an input to hydrogen production” to

“..RNG ... as an input to hydrogen production OR renewable hydrogen as an input to RNG production.”

¹ There are 63 light duty hydrogen stations in California, with 41 additional stations planned. (Data from Energy.ca.gov.) In comparison, Clean Energy's website indicates the company has over 550 RNG stations across the US. SoCalGas alone has over 65 CNG/RNG stations in the Los Angeles area, with roughly 19 in the San Francisco Bay area.

2. The last sentence in the Additional Regulatory Text Concept for Section 95488(i) p.28, can be changed to include "...biomethane produced via methanation using renewable hydrogen".

Modification of Tier 1 Calculator for Hydrogen

The Quantalux team also reviewed the Tier 1 Simplified CI-calculator for Hydrogen and found that this calculator can be readily expanded to include methanation and pipeline transport to a dispensing station. Initial modifications can include:

a. Site Specific Inputs tab:

- i) In Section 2.5 "Fuel Type Produced", add "RNG via Methanation." Gaseous H2 and Liquified H2 become inactive.
- ii) If "RNG via Methanation" is selected, Columns 4.5 and 4.6 (Section 4) should become inactive.
- iii) Add Section 4, Column 4.11 "RNG Injected"

b. Pathway Summary tab:

- i) Total RNG via Methanation would be added under Finished Fuel Quantities (with appropriate units)
- ii) Natural gas (C15 & C16) would become inactive for RNG via Methanation
- iii) Grid electricity (C17) would use the eGrid regions to identify regional emission factors (similar to the DSM Tier 1 Calculator).
- iv) RNG becomes inactive under B&C accounting (C19)
- v) Gaseous H2, Liquid Tanker Truck and Compression and Precooling become inactive.
- vi) Add new cells for "Transportation by Pipeline". The CI for pipeline transportation of RNG can be taken from the DSM Tier 1 model for Biomethane transport to CNG station (2.27, Biogas-to-RNG tab), namely:
 - Transport: 4.08 gCO₂e/MMBtu-mile and
 - Leakage: 1.72 gCO₂e/MMBtu-mile.

These values show that the CI for transporting RNG via pipeline is far less than H2 as compressed gas in a tanker truck.

Summary

The recommended changes to the regulatory language and the H2 Tier 1 Calculator are a starting point only. CARB staff will doubtless apply their expertise to hone the model in order to be fully in sync with the GREET models. Our team welcomes continued discussions with CARB on our recommendations.

Thank you for the opportunity to comment on proposed changes to the LCFS program.

joe