

August 27, 2024

Ms. Liane Randolph, Chair  
**California Air Resources Board**  
1001 I Street  
Sacramento, CA 95814

Re: Comments to Proposed Low Carbon Fuel Standard Amendments (Amendments)

Dear Ms. Randolph:

Proteum Energy® (“Proteum”) thanks you for the opportunity to provide comments on the proposed modifications to the text of the Low Carbon Fuel Standard (LCFS) amendment issued August 12, 2024 (the “15-day Changes”). We commend the board and CARB staff (Staff) on their efforts to update the LCFS to support California’s greenhouse gas (GHG) emission reduction goals toward achieving carbon neutrality.

CARB’s 2022 Scoping Plan emphasizes the necessity of increasing the production of low carbon intensity (CI) hydrogen so that California can hit its decarbonization targets leading to carbon neutrality by 2045. To do so, it expressly “calls for accelerating the transition from combustion of fossil fuels to hydrogen.”

But the Scoping Plan also acknowledges the challenge of producing green hydrogen when it talks about the uncertainty surrounding “the availability of solar to support both electrification of existing sectors and the production of hydrogen through electrolysis” and the vast amount of additional solar capacity that electrolysis would require. As described below, Proteum’s technology can help California surmount this challenge by producing renewable low-CI hydrogen without reliance on electrolysis and the additional solar capacity required for such green hydrogen.

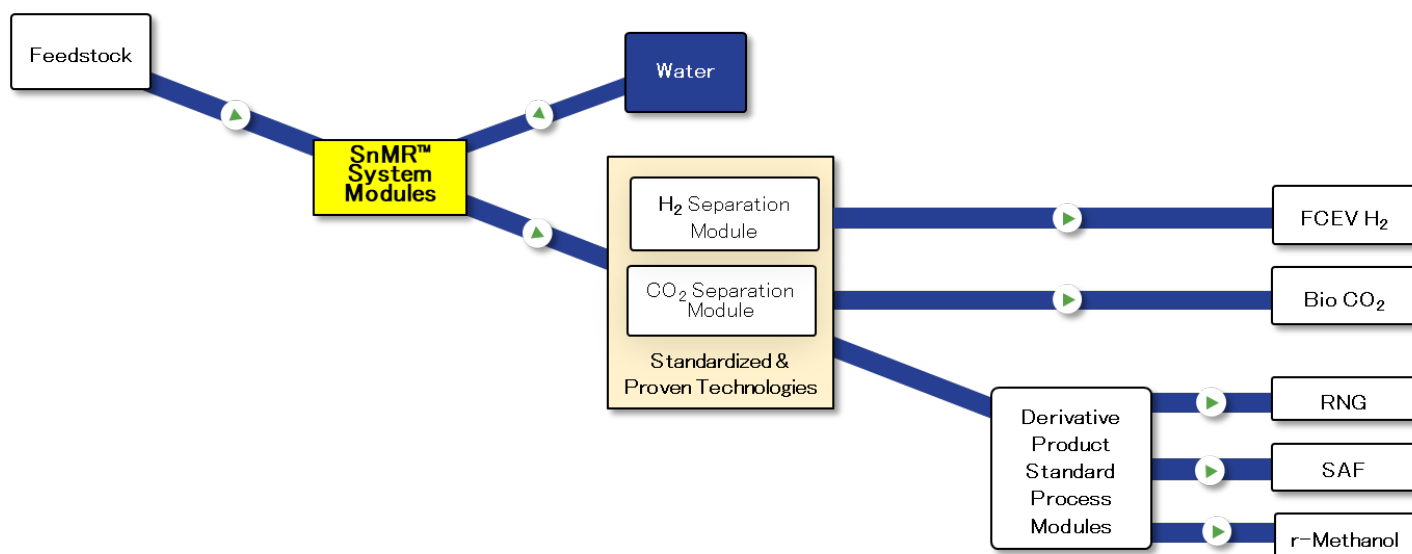
Indeed Proteum is a company that can help California accelerate GHG reductions by producing CI-negative transportation fuels. It is the producer of clean hydrogen and other ultralow-CI fuels for sale into the California transportation market using highly innovative proprietary technology, as described more fully below. As CARB has often made clear the transition to the electrification of heavy-duty trucking will be difficult and take many years due to the weight and range of batteries, as well as the long charging times. Hydrogen solves both of those problems, and we encourage the Amendments to do even more to encourage its production and use.

**Proteum plans to produce low/negative carbon intensity fuels from renewable ethanol feedstock in California.** Our technology, called Steam Non-Methane Reforming (SnMR™), reforms ethanol feedstock into clean hydrogen, renewable natural gas (RNG) and biogenic CO<sub>2</sub> for use to produce bio-methanol and sustainable aviation fuel (SAF). Our first two California projects will use California corn ethanol as their feedstocks, and both will employ CCS with CO<sub>2</sub> sequestered in California.

We have been developing our technology since 2014 and have been awarded 11 patents in the US and internationally, with an additional 21 patents pending. Proteum has successfully deployed our technology with Diamondback Energy and has a demonstration facility in Bryan Texas. Our production process does not require methane feedstock unlike steam methane reforming (SMR), nor does it utilize electrolysis. Our process uses less water and power than competing technologies, providing an ideal production process for California markets where water and power are constrained.

Utilizing available CCS, our SnMR™ technology platform can produce fuel cell grade hydrogen and bio-methanol with a negative carbon intensity (CI). Our Northern California project will be designed to produce 34 MT/day of carbon-negative fuel cell grade hydrogen, which will be liquified and delivered to FCEV refueling facilities in California, 450 MT/day of carbon-negative renewable methanol for marine bunkering fuel, and 3,100 MMBtu/day of renewable natural gas.

Below is a simple process flow diagram that illustrates the steps in Proteum's production process.



However, the viability of our California projects depends on the availability of LCFS credits.

Proteum believes that the spirit of the proposed Amendments furthers the State's GHG objectives, while certain terms could be enhanced to better support carbon abatement technologies to accelerate GHG reduction. We offer the following comments, which we believe will materially enhance the effectiveness of the Amendments.

#### **Proteum supports many of the modifications proposed in the 15-Day Changes.**

We support the 9% step-down in 2025 and the inclusion of AAM. However, we are disappointed that the first potential triggering of the AAM remains as in the 45-day package so that 2028 remains the first year for which the AAM can amend CI reduction targets. Instead we recommend that 2025's performance should be able to trigger the AAM. A 2025 data-year triggering would be able to impact CI targets in 2027. In short, the AAM should be allowed to trigger as early as needed to guard against the case where the step down is not sufficient to address the current oversupply,

particularly since CARB did not include a more aggressive step-down in 2025, as recommended by ICF and advocated for by many stakeholders in comments on the 45-day package.

We also applaud the adding of the term “captured CO<sub>2</sub>” to the type of feedstocks that can be used to produce Alternative Jet Fuel. Proteum’s captured CO<sub>2</sub> can be used to produce AJF as well as negative-CI methanol marine fuel.

**In addition to the foregoing, we request the following modifications to the 15-day Changes.**

**The Amendments should encourage ethanol as a renewable feedstock to produce ultralow-CI transportation fuels.** An important benefit of using ethanol as a feedstock is that atmospheric CO<sub>2</sub> can be captured and permanently removed through Proteum’s SnMR™ process combined with CCS. Crops and the cellulosic resources used to produce ethanol capture CO<sub>2</sub> directly from the air which is liberated in Proteum’s SnMR™ process with production of renewable transportation fuels; when sequestered, this CO<sub>2</sub> is permanently removed from the atmosphere. This process is not only renewable but exceeds the carbon abatement benefits of other production processes like electrolytic hydrogen using renewable power. With the support of LCFS credits, it does so in a more economically feasible way than other abatement methods like direct air capture. Accordingly, the use of sustainable ethanol as a feedstock for hydrogen production for transportation fuels should be encouraged. In particular: (i) The definition of “Renewable Hydrogen” should *include hydrogen produced from ethanol feedstock*; (ii) The definition of “Biomethane” should *provide for biomethane produced from reformation of ethanol feedstock*; (iii) The definition of “Biomass” should *include all plant-based materials, including ethanol* to encourage Biomass reformation innovation; and (iv) *Reforming of ethanol* should be added to the list of suggested hydrogen production methods for drop-in fuels at § 95488.1(d)(4) and innovative production techniques at § 95488.1(d)(6).

To support innovation in the production of low-CI transportation fuel production, the term “renewable hydrocarbon” should be defined and *include renewable oxygenated hydrocarbons, including ethanol and other biomass sources, that meet the requirements of § 95488.9(g).*

**Sustainable farming practices should be acknowledged and encouraged.** Proteum endorses Staff’s proposal to assure that Biomass used to produce transportation fuels be sustainable. This concept can be developed further—and to a greater benefit—by allowing Biomass producers to *demonstrate and certify their sustainable farming practices* utilized to materially reduce CI using the Tier 2 fuel pathway certification process. Lumping leading edge sustainable Biomass producers into a pre-set CI disincentivizes them from making further investment and innovation to reduce GHG.

**Support for CCS.** Proteum encourages Staff to provide clear support for CCS in the production of renewable transportation fuels. The process of reforming ethanol and other Biomass feedstocks benefit greatly from the use of CCS, which enables Proteum to produce carbon-negative transportation fuels. Due to the expense and required economies of scale, the Amendments should not restrict CCS to facilities co-located with fuel production. The Amendments can incentivize CCS in renewable transportation fuel production separate and apart from questions about utilizing CCS solely when producing fossil-based fuels.

**Addition to the definition of Alternative Jet Fuel.**

Please add clarifying words to the definition of Alternative Jet Fuel as follows:

“Alternative Jet Fuel” means a drop-in fuel, made from non-petroleum sources, **including without limitation ethanol**, or captured CO<sub>2</sub>, which can be blended into conventional jet fuel without the need to modify aircraft engines and existing fuel distribution infrastructure.

**Additions to the Tier 1 Hydrogen Calculator and Instruction Manual.**

In Section 2.1, Pathway Type, in Section 2, Pathway Inputs, on the Site-Specific Inputs tab of the proposed CA-GREET 4.0 Tier 1 Hydrogen Calculator, please add Steam Non-Methane Reforming as described above as a Pathway Input. In Section 2.3 of the same tab, please change the title to “SMR and Steam Non-Methane Reforming Feedstock” and add ethanol to the list of feedstocks.

Please make the corresponding changes in the accompanying Instruction Manual.

Despite CARB's diligent efforts, we fear that the Amendments, as proposed, will stifle the renewable and clean transportation industry in California. We urge CARB to revise and issue an additional 15-day proposal that will more fully encourage investments in clean hydrogen and other ultralow-CI renewable fuels to support its zero-emissions end use goals. We appreciate Staff's work to develop the proposed rule and their commitment to improving the LCFS. We thank you for considering Proteum's comments which we believe will advance the State's GHG reduction goals.

Very truly yours,

PROTEUM ENERGY, LLC



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