



January 7, 2022

Dr. Cheryl Laskowski  
California Air Resources Board  
1001 I Street  
Sacramento, CA 95812

*Filed Online*

Re: Comments of Bloom Energy on December 7, 2021 LCFS Workshop

Dear Dr. Laskowski,

Bloom Energy Corporation (Bloom Energy) appreciates the opportunity to provide these comments on the staff concepts introduced at the December 7<sup>th</sup> workshop. Specifically, we offer the following responses to the proposed changes to the Low Carbon Fuel Standard (LCFS) <sup>1</sup>:

- **Strengthening interim pre-2030 Carbon Intensity (CI) compliance targets** would accelerate achievement towards California's climate and clean energy goals, providing the incentive market participants need to optimize existing projects, as well as incent near-term new capital investments into clean fuel projects deploying commercially available technologies;
- **Declining post-2030 CI compliance targets** would provide the market certainty that is necessary for investors to make the capital-intensive investments needed for clean fuel projects, and it would increase the benefits of strengthening pre-2030 CI targets.
- **Allowing for book-and-claim accounting** of new-or-expanded low-CI hydrogen injected into hydrogen pipelines would help advance green hydrogen development overall, and specifically for clean fuel applications;
- **A technology-agnostic approach to LCFS incentives will promote optimal environmental outcomes.** Promoting electricity storage might have limited benefits, but risks disjuncture with other clean energy, renewable energy and storage regulatory development that could create unhelpful distortions and regulatory uncertainty. Performance-based rules focused on optimizing LCFS outcomes would instead drive the market to create the best environmental outcomes.
- **Improvements to the CA-GREET model would produce enhanced environmental benefits.** Updating and better differentiating current

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<sup>1</sup> California Air Resources Board December 7<sup>th</sup>, 2021 Low Carbon Fuel Standard Workshop Presentation [https://ww2.arb.ca.gov/sites/default/files/2021-12/LCFS%2012\\_7%20Workshop%20Presentation.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-12/LCFS%2012_7%20Workshop%20Presentation.pdf)

assumptions would recognize choices that could significantly improve environmental impacts of clean fuel production.

- **Consider Further Developments of the Carbon Capture and Sequestration Protocol as part of the LCFS Amendment Process.**  
Leveraging the LCFS amendment process to further advance carbon capture sequestration and utilization protocols could simultaneously advance the state's climate strategy, while also accelerating development of technologies capable of CO<sub>2</sub> removal from the atmosphere.

Bloom Energy's mission is to make clean, reliable energy affordable for everyone in the world with a roadmap aligned with a zero-emission trajectory to reduce air pollution and carbon emissions, enhance resiliency, and chart a path toward a net-zero carbon future. As a leader in the energy industry, generating electricity from biogas with near-zero criteria pollutant emissions and significantly reduced carbon emissions, and as both the producer of extremely high efficiency and low cost hydrogen electrolyzers and of non-combustion hydrogen-powered fuel cells, we are pleased to provide our expertise and insights to benefit further LCFS development by the California Air Resource Board (CARB).

*Strengthening Interim Pre-2030- CI Targets and Declining Post-2030 CI Targets Will Advance California's Objectives & Attract Necessary Investment for Capital-Intensive, Long-Lasting Clean Fuel Projects,*

As noted in the workshop, the success of LCFS is based on CARB's clear market guidelines designed to spur innovation in technologies that can further drive down greenhouse gas emissions. Accelerated pre- 2030 CI targets would advance California's climate and clean energy goals, further incentivizes market participants to optimize existing projects through increased demand for credits, and provides new market entrants projects additional incentive to invest in clean fuel projects with technologies that are commercially available.

Many existing projects could reduce their environmental impacts by optimizing their own energy usage. Electricity consumed for process energy could be provided by currently available, efficient and reliable distributed energy technologies, such as fuel cells, resulting in fewer emissions, improved overall environmental impacts and increased credit availability. These same technologies can also create carbon-negative transportation fuel for electric vehicles, offering pathway optionality for biomethane projects. Pathway optionality enables projects to choose where they can deliver the greatest environmental impact and value.

Low carbon fuel projects often involve significant capital investment, long development timelines, and long-lasting equipment that must demonstrate economic usefulness across their anticipated useful time in service. Uncertainty over program compliance targets, especially with respect to the program's own useful and dependable lifespan, introduces significant investment risk when considering expending funds on capital-intensive projects expected to last 10 to 20 years. Adaptations to the LCFS program to extend the program's

usefulness in the near and long term would be extremely beneficial to the investment climate for clean fuel projects.

The proposed adoption of pre-2030 CI targets and post-2030 declining targets would remove a current source of investment friction, clearly communicate regulatory certainty to market participants, and accelerate development and deployment of low carbon fuels. Bloom Energy supports CARB's proposals to accelerate pre-2030 targets and introduce declining post-2030 targets, and commends staff for developing these very beneficial, mutually reinforcing proposals.

*Allow for Book and Claim of New or Expanded Low CI Hydrogen Injected Into Hydrogen Pipelines*

A Book and Claim accounting process specific to new or expanded low CI hydrogen into pipelines would advance low-CI hydrogen development and production and enable increased availability of decreasing CI fuels. The Book and Claim accounting process for Renewable Natural Gas (RNG) provides a framework that could be modeled to support further development of low CI hydrogen. While expansion of this concept to injection of low CI hydrogen into natural gas pipelines awaits the California Public Utilities Commission adopting appropriate hydrogen injection provisions for the gas system, we encourage CARB to consider this opportunity to support low CI hydrogen development through the LCFS, as well. CARB's adoption of a Book and Claim regime like that available for RNG would provide the right signal to advance low CI hydrogen production.

*Promoting Electricity Storage in the LCFS Would Have Limited Benefits, & Could Cloud Market Certainty as Storage Regulatory Development Continues Elsewhere*

Bloom fully supports measures to expand the adoption of clean electricity in all appropriate venues. CARB has appropriately focused the LCFS on elements that clearly advance the availability of declining CI fuels. While electrical energy storage has a role to play in making clean energy available when it is most needed, the LCFS program should focus on eliminating unnecessary barriers to the use of storage to generate LCFS credits, rather than considering incentives that could conflict with ongoing electricity regulatory development under the energy storage, resource adequacy, Renewables Portfolio Standard, SB 100/Clean Energy Standard, and Integrated Resource Plan proceedings before other agencies.

Bloom Energy encourages CARB to follow a technology agnostic approach. This could be accomplished by identifying a key performance objective such as incenting technologies that avoid emissions during net peak demand periods. Doing so would ensure that the most environmentally beneficial technologies can make the best use of excess renewable production to provide for clean, firm power during net peak demand periods, whether that is electricity storage, green hydrogen, or other means.

A pathway-wide and technology agnostic-approach to clean electricity would incent additional clean electricity projects for clean fuel production to a much greater extent

than a targeted technology approach. Targeted technology approaches run the risk of distorting the market and advancing less-beneficial outcomes than performance-based approaches. For example, with an EER of 3.4 for an EV vehicle (vs an EER of 1 for a CNG vehicle) and an electrical efficiency of 50%, an EV vehicle would displace around 70% more fossil fuel than CNG produced from the same source. Unfortunately, LCFS credit generation rules do not presently reflect this environmental impact, and thus disadvantage the more environmentally beneficial outcome. Equivalent EV and CNG projects, with respective scores, produce ~10%-14% more total credits for the electricity pathway before allocation of base credits.

#### *Updating CA-GREET Assumptions Would Drive Improved Environmental Outcomes*

As we have worked with the CA-GREET model, we have identified several ways in which it misses opportunities to better align CI scoring with the environmental impacts of clean fuel production. Bloom Energy recommends that CARB consider the items detailed below as it contemplates future iterations of the model. Bloom Energy proposes these additional air quality and environmental benefits are captured in any subsequent iteration of the CA-GREET model, due not only to their environmental and health benefits, but also their beneficial economic impacts.

- CI scoring for the EV pathway and CNG pathways are inconsistent in assumed tail gas flaring treatment. For example, the CA-GREET model assumes the same amount of flaring in both cases, but results in awarding CNG a 100% allocation factor for avoided methane while awarding EV only 97%. Bloom proposes both pathways be treated equally under the model, awarding each a 100% allocation factor.
- In the Tier 1 DSM Calculator, any on-site electricity from biogas (upgrading and compression) is assumed to have the qualities of a reciprocating engine, with the same emissions profile (642 gCO<sub>2</sub>e/MJ) and efficiency (37%). The significantly lower emissions and a higher efficiency of advanced technology is not rewarded/reflected in the current model. Bloom proposes advanced technology emission and efficiency profiles are added to the model to recognize and reward their enhanced environmental performance.
- In the Tier 1 LFG and Tier 1 WWS calculator there is no field that contemplates the carbon emissions profile of on-site electricity generation (for process energy) from biogas as opposed to flaring. The carbon emissions profiles vary significantly, and it is important to advancing LCFS program objectives to both recognize the differences and to reward the technologies that provide better outcomes. For example, combustion engines would perform approximately 10 CI points worse and using fuel cell technology would perform approximately 2 points better than flaring, using CA-GREET model assumptions. Bloom Energy proposes that the calculator be updated to recognize and reward technologies that provide better alternatives to flaring, which drastically increases localized air pollution and is particularly harmful to neighboring communities.
- Advanced technologies, such as fuel cells, have superior air, water and other environmental benefits that are not captured in the CO<sub>2</sub>e emissions calculations.

- The CA-GREET model should recognize and reward opportunities to substantially reduce NO<sub>x</sub>, SO<sub>x</sub>, particulates and VOC emissions, and result in significant environmental and health benefits<sup>2</sup>.
- With California's continued water resource concerns, the significant variation in clean fuel production technologies' capabilities to reduce water consumption should also be recognized. For example, fuel cells use 99% less water than comparable electric generation technologies.
- Other environmental impacts, including land use, resilience, reliability and waste factors, can also be reduced if the CA-GREET model recognizes them and provides an appropriate economic signal for clean fuels producers to choose the least-impactful options. In the absence of recognition of these factors, avoidable environmental impacts may instead go unmitigated.

*Consider Further Developments of the Carbon Capture and Sequestration Protocol as part of the LCFS Amendment Process*

As part of the LCFS amendment process, Bloom Energy would also encourage CARB to consider developing new carbon capture and sequestration protocols, potentially including carbon utilization, and incorporating them into the LCFS. Bloom Energy fuel cells produce relatively pure streams of CO<sub>2</sub>, which can be easily captured and utilized or permanently sequestered. However, without widespread infrastructure for moving CO<sub>2</sub> to geologic sequestration sites, ongoing challenges facing geological sequestration, and the distributed scale at which we operate - there is little opportunity for us to do so.

At the same time, several companies and technologies are emerging to permanently store CO<sub>2</sub> in concrete, plastics, other materials, or through other means. CARB should provide the greatest opportunity possible to sequester CO<sub>2</sub> through its protocol and CCS program, which will allow the greatest opportunity to deploy this necessary climate strategy at locations throughout the state, including those that may not be proximate to geological sequestration sites or connected to potential future CO<sub>2</sub> transportation networks.

Bloom Energy is encouraged to see CARB advance clean fuels, including biogas, electric vehicles and hydrogen. As a leader in the clean hydrogen production and utilization technologies, the signal that CARB is sending by identifying hydrogen as a key fuel in the transition to a clean energy future could hardly be of greater importance. Bloom Energy is committed to the development of the hydrogen market through its Solid Oxide Electrolyzers and hydrogen-fueled Bloom Energy Servers, as well as its continued development of the bioenergy market through its biogas- and RNG-fueled Bloom Energy

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<sup>2</sup>*Air Quality and GHG Emission Impacts of Stationary Fuel Cell Systems*, An Assessment Produced by the Advanced Power and Energy Program at the University of California, Irvine, March 2018, available at: [http://www.apecp.uci.edu/PDF\\_White\\_Papers/AQ\\_Benefits\\_Of\\_Stationary\\_Fuel\\_Cells\\_BenMAP\\_Final\\_041718.pdf](http://www.apecp.uci.edu/PDF_White_Papers/AQ_Benefits_Of_Stationary_Fuel_Cells_BenMAP_Final_041718.pdf)

Servers. We look forward to working with stakeholders throughout this process to improve the LCFS and create a cleaner and more resilient future.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brady Van Engelen', with a stylized, cursive script.

Brady Van Engelen  
Policy Manager, Bloom Energy