



October 6, 2025

California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on Solicitation to Inform Implementation of Carbon Capture, Removal, Utilization, and Storage Program: Senate Bill 905

Dear Air Resources Board:

Yosemite Clean Energy (YCE) appreciates the opportunity to comment on the implementation of SB 905. YCE is a bioenergy development company that specializes in transforming farm and forest wood waste into carbon-negative hydrogen, renewable natural gas, SAF and other e-fuels. Our process removes carbon from the natural carbon lifecycle by separating the hydrogen and carbon molecules present in wood waste, with the latter being sequestered. This prevents carbon and other dangerous short-lived climate pollutants from being released into the atmosphere when this waste otherwise inevitably decomposes or burns. **As such, we submit the below recommendations:**

- Include definitions of BECCS and BiCRS and adopt policies to advance these important CCSU pathways, ensuring modelling methodologies acknowledge forest and agricultural biomass pathways (CA-GREET vs H2-GREET)
- Include CCSU in the power sector as well as for other industrial sectors
- Avoid adopting environmental protections that duplicate or exceed existing protections for air or water quality – CCSU should not be held to higher standards than other types of projects
- Adopt permit consolidation requirements that require concurrent rather than consecutive permitting and include specific timelines

1. The Over-Archiving Goal of SB 905 Regulations Should be to Accelerate, Not Constrain, CCSU.

Every recent report on how to achieve carbon neutrality has emphasized the need for CCSU to offset emissions that cannot be avoided. As Princeton University's Net-Zero America report stated, "All pathways rely on large-scale CO₂ capture and utilization or storage."¹ Stanford University, Lawrence Livermore National Lab and others agree with this assessment.²

These studies also emphasize the need to ramp up CCSU and other climate solutions quickly. As The Net-Zero America report explains:

"Building a net-zero America will require immediate, large-scale mobilization of capital, policy and societal commitment, including at least \$2.5 trillion in additional capital

¹ Princeton University, *Net-Zero America: Potential Pathways, Infrastructure, and Impacts*, Final Report Summary, October 29, 2021, at slide 10.

² Stanford Center for Carbon Storage Carbon Removal Initiative, *Pathways to Carbon Neutrality in California*, September 2021, at page 15; Lawrence Livermore National Laboratory, *Getting to Neutral – Options for Negative Carbon Emissions in California*, January 2020, at pages 1-2.



investment (relative to business as usual) into energy supply, industry, buildings, and vehicles over the next decade . . . major investment decisions must start now, with levels of investment ramping up as the transition proceeds . . . Each transition pathway features historically unprecedented rates of deployment of multiple technologies.”³

Deploying this scale of capital and this fast a build rate will require regulatory certainty and much faster timelines at every stage of the process, including the permitting phase. As Stanford said in its report on getting to carbon neutrality, “Time is of the essence . . . 2045 is closer than you think.”⁴ It is critical, therefore, that regulatory agencies do not unnecessarily constrain the development of CCSU by imposing stricter environmental standards than are applied to other sectors or frequently moving the goal posts.

YCE urges the Air Board to keep the focus of a CCSU program on policies and incentives to accelerate its deployment, which was the goal of SB 905.

2. A CCSU Program Should Prioritize BECCS and BiCRS.

Bioenergy or biomass with CCSU should be a central focus and priority of the SB 905 program for several reasons:

- BECCS or BiCRS can reduce Short-Lived Climate Pollutants, the most urgent climate solution, in addition to providing CCSU.
- BECCS offers the largest opportunity for carbon negative emissions in California.
- Increasing BECCS can also help to decarbonize the electricity, fuels, and hard to electrify sectors.
- BECCS and BiCRS provide numerous co-benefits, including wildfire mitigation, protection of air and water quality, reduction in landfill waste, and creating good, permanent jobs in a circular economy.

In the near-term, BECCS offers the single biggest opportunity for carbon negative emissions.⁵ All major reports that have considered how to achieve carbon neutrality assign a central role to BECCS, both to sequester carbon and to generate carbon negative emissions.⁶ As the Net-Zero America study concludes:

“Biomass plays an especially important role because *i*) it removes CO₂ from the atmosphere as it grows and so combustion of hydrocarbon fuels made with sustainable-biomass carbon results in no net CO₂ emissions to the atmosphere, *ii*) it can be converted into H₂ while capturing and permanently sequestering its carbon, resulting in a net negative-emissions fuel, and *iii*) it can similarly be used to make negative emissions electricity and replacements for petrochemical feedstocks (via pyrolysis).”⁷

It is hard to overestimate the significance of BECCS for addressing climate change. According to Lawrence Livermore National Lab, BECCS could generate two-thirds of all the carbon negative emissions needed for California to reach carbon neutrality.⁸ Stanford University also estimates

³ *Net-Zero America*, footnote 1 above, at slide 6.

⁴ *Pathways to Carbon Neutrality in California*, footnote 2 above, at page 21.

⁵ LLNL, *Getting to Neutral*, footnote 2 above, at page 2.

⁶ See, eg, LLNL, Stanford, Princeton studies cited above.

⁷ *Net-Zero America*, footnote 1 above, at page 33.

⁸ LLNL, *Getting to Neutral*, footnote 2 above, at page 2.



that using California's biogas potential for energy could cut the state's total carbon emissions by eight percent and recommends coupling bioenergy with CCSU to maximize emissions reductions.⁹

To achieve this, any regulations implemented must enable the use of all eligible waste, with an added emphasis and urgency regarding the highest emitting sectors. As such, **we ask CARB to prioritize and expedite CCS pathways that utilize biomass from the highest polluting sectors, such as the forestry and agriculture industries.** Multiple studies emphasize the urgent need to curb emissions from these sectors in particular, as major polluting events in these industries – like catastrophic wildfires and pile burning – often undo all other emission-reduction efforts¹⁰.

YCE targets these waste streams in particular, but new regulatory hurdles at the federal level have slowed plant development. The Department of Energy's (DOE) Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model – 45VH2-GREET– established for the Section 45V tax credit, excluded all biomass waste streams apart from corn stover, meaning any bioenergy projects using other forms of biomass have to go through a lengthy administrative process to receive a provisional emissions rate (PER). To prevent worsening the extreme slowdown this arbitrary decision has caused, **we urge CARB to use models and methodologies that have both forest and agricultural waste biomass built in.**

Given the enormous and unique climate benefits of BECCS and BiCRS, YCE urges the Air Board to include specific CCSU pathways and incentives for bioenergy with CCSU.

3. A CCSU Program Should Include Its Use in the Power Sector.

A CCSU program should include its use in the electricity sector. Given the need for firm power and the many legacy power plants that rely on combustion, including CCSU in the power sector should be a priority of the SB 905 program.

Numerous studies have concluded that achieving 100 percent carbon free and reliable power will require enormous amounts of clean, firm power that is available whenever needed for as long as needed to fill in around solar and wind power. The California Energy Commission has estimated the California will need up to 15,000 megawatts of new, firm power to ensure reliability as the grid deploys more and more intermittent resources such as solar and wind.¹¹ Other studies estimate that California will need closer to 30,000 megawatts of firm power for reliability and cost-containment.¹² Nationwide, Princeton estimates that the United States will need almost 600 gigawatts of new, firm power to achieve carbon neutrality.¹³ Princeton also determined that bioenergy and decarbonized hydrogen could provide 100 percent of that clean firm power.¹⁴

⁹ Stanford Center for Carbon Storage / Carbon Removal Initiative, *Pathways to Carbon Neutrality in California – The Bioenergy Opportunity*, April 2022.

¹⁰ Michael Jerrett, Amir S. Jina, Miriam E. Marlier, *Up in smoke: California's greenhouse gas reductions could be wiped out by 2020 wildfires*, Environmental Pollution, Volume 310, 2022, 119888, ISSN 0269-7491, <https://doi.org/10.1016/j.envpol.2022.119888>; Butte County Local Hazard Mitigation Plan, Annex H, 2024; LLNL, *Getting to Neutral*.

¹¹ California Energy Commission, *2021 Integrated Energy Policy Report*, Volume III, at page 72.

¹² E. Baik, et al, "What is different about different net-zero carbon electricity systems?" published in *Energy and Climate Change* 2 (2021) 100046, July 2021.

¹³ *Net-Zero America*, footnote 1 above, at slide 30.

¹⁴ *Id.*



Environmental Defense Fund has explained why increasing clean, firm power is needed not just for reliability, but to keep electricity rates affordable:

“California needs a significant amount of clean firm power to meet its decarbonization targets while keeping rates affordable. Failing to procure clean firm power will require a massive overbuild of solar and wind that will increase rates by about 65 percent in 2045; by contrast, using clean firm power California could keep rates similar to those found today.”¹⁵

The Net-Zero America study also found that BECCS was important to maintain electricity reliability while reducing emissions from the electricity sector. The study assumes a significant amount of power in 2050 will be generated from BECCS.¹⁶ And Lawrence Livermore National Lab, in *Getting to Neutral*, also found that BECCS to hydrogen and electricity are the most cost-effective and beneficial uses of BECCS.¹⁷

Deploying CCSU in the electricity sector will be critical to maintain reliability, decarbonize firm power sources, and maintain costs while California electrifies more and more end uses.

4. Strategies to Protect Air and Water Quality Should Not Impose Higher Standards than Required for Other Sectors.

YCE supports regulations to protect air and water quality, but urges the Air Board not to impose stricter standards on CCSU than are required for other sectors and not to duplicate federal requirements. California already has the strictest air quality standards in the country and those should apply to CCSU as they do to other sectors. There is no reason to impose CCSU specific standards for criteria pollutants or toxic air contaminants that are already regulated under state and federal law.

On carbon dioxide emissions, YCE urges the Air Board to use the standards adopted by US EPA for Class VI injection wells. Class VI permits require:

- analysis of the CO₂ stream;
- continuous monitoring of injection pressure/rate/volume and annulus pressure/volume;
- quarterly corrosion monitoring;
- groundwater quality/geochemical monitoring above the confining zone;
- well testing; tracking of the CO₂ plume and pressure front;
- surface air and/or soil-gas monitoring;
- adoption of strategies to detect and quantify any surface leakage, and
- reporting of CO₂ received, injected, produced, and emissions from equipment leaks and/or venting between the flow meter and wellhead.¹⁸

YCE appreciates the need to protect public health and safety, but requiring CCSU to meet higher standards than other types of projects would only slow or stop its deployment in California, leading to the far worse outcome of failing to meet the state's climate goals. Relying on existing state and

¹⁵ Comments of Environmental Defense Fund on the 2021 Preferred System Plan Ruling, filed in R.20-05-003 on September 27, 2021, at page 2.

¹⁶ *Net-Zero America*, footnote 1 above, at slide 39.

¹⁷ LLNL, *Getting to Neutral*, footnote 2 above, Figure ES-5 at page 8.

¹⁸ 40 CFR 98.440.



federal standards strikes the right balance between the need to accelerate CCSU deployment and protecting public health and safety.

5. A Consolidated Permitting Process Should Also Require Concurrent Permitting to Reduce Delays and Conflicts.

YCE strongly supports the use of consolidated permitting, but the consolidated permit process should also require that permit review and development occur simultaneously rather than consecutively. In one recent waste to hydrogen project, the regional air district would not begin its permitting process until both the local Health Risk Assessment (HRA) and the CEQA permit were issued. The HRA and CEQA permits took about 1.5 years, after which the air permit took another 3.5 years, for a combined permitting process of more than 5 years. Had all three permits been reviewed concurrently – rather than consecutively – the project would have saved 1.5 years and millions of dollars in delays. Although this was not a CCSU project, it illustrates the need for concurrent, as well as consolidated, permitting.

As noted above and as every climate study underscores, the need for speed is paramount. Steps to consolidate permitting need to be coupled with steps to accelerate permitting, including concurrent permit review.

Thank you for your consideration of these comments. We look forward to the development of the SB 905 program and to rapid deployment of CCSU in California.

Sincerely,

A handwritten signature in dark ink that reads "Thomas Hobby". The signature is fluid and cursive, with the first name "Thomas" and last name "Hobby" clearly legible.

Thomas Hobby - MBA, MA, MSc. P. Ag

Chief Executive Officer