



June 24, 2022

Clerk's Office, California Air Resources Board
1001 I Street
Sacramento, CA 95814

Electronically submitted to: <https://ww2.arb.ca.gov/applications/public-comments>

RE: Comments on the Draft 2022 Climate Change Scoping Plan

This information is provided in response to the California Air Resources Board (CARB) Notice of Public Meeting to consider the Draft 2022 Climate Change Scoping Plan.

The Combined Heat and Power Alliance (CHP Alliance) appreciates the opportunity to submit feedback on the Draft 2022 Scoping Plan Update and commends CARB for identifying a technologically feasible, cost-effective, and equity-focused path to achieve carbon neutrality by 2045, or earlier, while also assessing the progress the state is making towards reducing its greenhouse gas emissions by at least 40 percent by 2030 from 1990 levels. The CHP Alliance generally supports the staff-proposed scenario that forms the basis of the Draft 2022 Scoping Plan (the Proposed Scenario). Specifically, we support the scaling up new options such as green hydrogen for hard to electrify end uses and renewable gas where needed,¹ and agree that we need to keep all options on the table, as it will take time to fully grow the electricity grid to be the backbone for a decarbonized economy. We know that electrification is not possible in all situations.² However, with respects to the Proposed Scenario plan to retire CHP facilities by 2040,³ we strongly urge CARB to consider the environmental and resilience benefits of CHP and its role in achieving deep decarbonization, particularly in energy intensive sectors. CHP utilizing renewable and lower-carbon fuels such as clean hydrogen can enable significant emissions reductions across the industrial and buildings sectors that will be critical to achieving California's goal of statewide carbon neutrality by 2045. To ensure that hydrogen used in California achieves the maximum greenhouse gas reductions at the lowest possible cost, we urge California to make CHP central to its hydrogen strategy and to incorporate CHP with hydrogen at every possible location.

¹ Draft 2022 Scoping Plan Update, Executive Summary, p. i (second page)

² Draft 2022 Scoping Plan Update, Executive Summary: Energy and Technology Transitions, p. vii.

³ Draft 2022 Scoping Plan Update, Table 2.2: Actions for the Proposed Scenario: AB 32 GHG Inventory sectors, p. 62.



About the CHP Alliance

The CHP Alliance is a diverse coalition with more than 70 members including equipment manufacturers and distributors, engineers, utilities, labor, contractors, non-profit organizations, and educational institutions, many with operations and interests in California.⁴ Our members come together with the common purpose to educate all Americans about CHP and waste heat to power (WHP), and how CHP and WHP can make America's manufacturers and other businesses more competitive, reduce energy costs, enhance grid reliability, and reduce emissions.

About CHP

CHP is a proven and highly efficient technology that can reduce emissions using traditional fuels and can reduce emissions even further using clean hydrogen fuel. Properly designed systems typically operate with an overall efficiency of 65 to 85 percent, with some systems approaching 90 percent.⁵ No other technologies using traditional fuels can reach these levels of efficiency. This is compared to an average efficiency of 39 percent for fossil-fueled power plants in the U.S., and an efficiency of 50 percent when electricity generation is combined with an on-site boiler for thermal energy needs.⁶ CHP systems achieve these high efficiencies by recovering the waste heat by-product of electricity generation as useful thermal energy for heating and cooling.⁷ Because they operate efficiently, CHP systems combust less fuel to provide the same energy services. This efficient generation of energy reduces all types of emissions, including greenhouse gases such as carbon, criteria pollutants, and hazardous air pollutants.

⁴ "Who We Are," Combined Heat and Power Alliance, accessed March 2022, <https://chpalliance.org/about/>.

⁵ "Combined Heat and Power (CHP) Technical Potential in the United States," U.S. Department of Energy, March 2016, p. 3, www.energy.gov/sites/prod/files/2016/04/f30/CHP%20Technical%20Potential%20Study%203-31-2016%20Final.pdf; "CHP Benefits," U.S. Environmental Protection Agency Combined Heat and Power Partnership, last accessed March 2022, <https://www.epa.gov/chp/chpbenefits>.

⁶ "Combined Heat and Power and a Changing Climate: Reducing Emissions and Improving Resilience," Combined Heat and Power Alliance, January 2021, p. 10. <https://chpalliance.org/resources/chp-and-a-changing-climate-reducing-emissions-and-improving-resilience/>.

⁷ "Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems," U.S. Environmental Protection Agency, Combined Heat and Power Partnership, February 2015, p. 3. https://www.epa.gov/sites/production/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf.



CHP in California

Today, there is nearly 8,400 megawatts (MW) of CHP capacity installed across over 1,200 sites in California.⁸ Looking to the future, the Department of Energy has identified 11,772 MW of remaining CHP (including WHP) total technical potential capacity at nearly 29,000 sites in California, as described in the table below.

CHP Technical Potential in California (including WHP)⁹

Top Industrial Sectors		Top Commercial Sectors	
Petroleum Refining	1,427 MW	Commercial Office Buildings	1,410 MW
Chemicals	1,111 MW	Colleges and Universities	1,273 MW
Food	776 MW	Multifamily Buildings	757 MW
Stone/Glass/Clay	204 MW	Govt. Buildings	571 MW
Transportation Equipment	147 MW	Hospitals	555 MW
Paper	134 MW	Military	445 MW

CHP and Clean Hydrogen

Historically, CHP units have run on traditional fuels, and many today use natural gas. This use of CHP can be thought of as “CHP 1.0,” the first wave of CHP technologies that relied on fossil fuels. However, CHP units can be fueled by renewable and lower-carbon fuels, including hydrogen, known as “CHP 2.0.” Use of hydrogen fuel can allow CHP systems to reduce emissions even further than they do under CHP 1.0. Hydrogen fuel can serve as the primary fuel source for CHP systems and further reduce emissions across the industrial, commercial, and municipal sectors. Moreover, CHP systems use hydrogen fuel efficiently, requiring less fuel inputs for the same energy outputs compared to other generation units. Given the high cost of hydrogen, using hydrogen fuel efficiently in CHP systems will help to keep costs low and enable significant

⁸ “Combined Heat and Power Installation Database,” U.S. Department of Energy, data current as of October 31, 2021, <https://doe.icfwebservices.com/state/chp/CA>

⁹ “Combined Heat and Power (CHP) Technical Potential in the United States,” U.S. Department of Energy, March 2016, p. D-9, www.energy.gov/sites/prod/files/2016/04/f30/CHP%20Technical%20Potential%20Study%203-31-2016%20Final.pdf



greenhouse gas reductions. Efficient use of hydrogen fuel should be central to any hydrogen and climate strategy, and CHP helps to meet this goal.

Today's existing and newly installed CHP systems can use a substantial blend of clean hydrogen – ranging from 20-100%, according to equipment manufacturers.¹⁰ Work is being done to increase the volume of hydrogen fuel that can be used in CHP systems industry-wide, and some CHP systems are already capable of running entirely on clean hydrogen.¹¹ Gas turbine manufacturers are looking to provide equipment that can accommodate higher percentages of hydrogen fuel: various companies in the U.S. and abroad are deploying or working on hydrogen-ready technology. In 2019, a number of European companies committed to provide gas turbines that can handle 20% hydrogen content in fuel by 2020, and 100% by 2030.¹² Earlier this year, the CHP Alliance put out a roadmap to convert all existing and new CHP systems to 100% clean hydrogen by 2030 or sooner, highlighting that existing systems, including ones installed today, can convert to 100% hydrogen at reasonable cost and with minimal downtime because these conversions can occur during scheduled overhauls.¹³

However, a critical barrier to clean hydrogen is its price and the need to scale up production to ensure adequate supply to meet demand. In the past several decades, America has succeeded in driving down the cost of wind and solar energy using a variety of policy tools to scale up these technologies. State governments should use the same approaches to scale up production and supply of clean hydrogen, which will help drive down the costs and should ensure this fuel is used as efficiently as possible by pairing it with CHP. We urge California to bring together hydrogen suppliers, CHP developers, end-users, industry experts, and other stakeholders to understand, analyze, educate, and address the key issues for the deployment of clean hydrogen, such as modernizing gas pipeline infrastructure. We also urge California to adopt policies to incentivize gas utilities to scale up the use of clean hydrogen, and to ensure that any tax

¹⁰ “Clean Hydrogen and CHP: A Roadmap for Industrial and Commercial Decarbonization,” Combined Heat and Power Alliance, March 2022, <https://chpalliance.org/resources/publications/clean-hydrogen-and-combined-heat-and-power-a-roadmap-for-industrial-and-commercial-decarbonization/>

¹¹ “The UKs First 100% Hydrogen CHP,” 2EA, February 19, 2021, <https://www.2ea.co.uk/The-UKs-first-100Percent-hydrogen-CHP.html>

¹² Sonal Patel, “High-Volume Hydrogen Gas Turbines Take Share,” *POWER*, May 1, 2019, <https://www.powermag.com/high-volume-hydrogen-gas-turbines-take-shape/>.

¹³ A CHP system overhaul typically occur every 8-10 years for a unit that runs continuously. “Clean Hydrogen and CHP: A Roadmap for Industrial and Commercial Decarbonization.” Combined Heat and Power Alliance, March 2022, <https://chpalliance.org/resources/publications/clean-hydrogen-and-combined-heat-and-power-a-roadmap-for-industrial-and-commercial-decarbonization/>



credit or incentive must be made available to all technologies capable of utilizing clean hydrogen for electric power.

While hydrogen fuel has the potential to see more extensive use in CHP systems in the future and achieve deeper emissions reductions, it is critical that CARB keep in mind the following considerations when developing hydrogen policies to ensure that this potential becomes a reality:

- **Transportation:** The existing gas pipeline system may provide a cost-effective way to transport clean hydrogen, but additional research is required to determine what quantities of hydrogen can safely be transported or what retrofits may be required.
- **Distributed Generation:** Distributed generation technologies such as CHP can be deployed at the point of clean hydrogen production, allowing the use of hydrogen fuel in CHP systems and the realization of corresponding emissions benefits while the development of hydrogen-ready pipelines is still underway.
- **Use:** While research and development of 100% hydrogen-ready CHP technologies is ongoing, technology manufacturers and end users will need support as they continue to evaluate what amount of hydrogen current equipment can use, identifying the retrofits and upgrades needed to ensure the adjustment of existing equipment for hydrogen use is easy and affordable, and the development and deployment of new equipment as required.

CHP in the Industrial Sector

There are limited commercially available and economically viable electrification options to replace industrial processes that require higher-temperature heat, such as steel forging, glass manufacturing, chemicals, and cement production. For these processes, onsite combustion may continue to be needed, and decarbonization will require fuel substitution to hydrogen, renewable natural gas (RNG), or other low-carbon fuels.¹⁴ It is important to restate that CHP systems use RNG, hydrogen, and other low-carbon fuels as efficiently as possible, requiring less fuel inputs for the same energy outputs compared to other generation units. This efficient generation of energy reduces all types of emissions, including greenhouse gases such as carbon, criteria pollutants, and hazardous air pollutants. In fact, an Energy Futures Initiative report on pathways for deep decarbonization in California highlighted CHP as a solution for greenhouse gas

¹⁴ Draft 2022 Scoping Plan Update. Sector Transformation: Industry, p. 166.



emission reductions in the industrial sector.¹⁵ Additionally, microgrids are emerging as a key enabler of electrification and decarbonization at industrial facilities,¹⁶ and in the U.S. over 200 microgrids used CHP, equivalent to 35 percent of all the nation's microgrids. Moreover, CHP serves as a critical backbone to over 67 percent of those microgrids that operate continuously.¹⁷

Conclusion

The CHP Alliance appreciates CARB's consideration of these comments, and respectfully requests that the Draft 2022 Scoping Plan appropriately recognize the numerous benefits of CHP systems utilizing clean fuels and its potential as an option to meet the carbon-neutrality goals of the Proposed Scenario.

Sincerely,

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¹⁵ "Optionality, Flexibility, & Innovation: Pathways for Deep Decarbonization in California." Energy Futures Initiative, May 2019. <https://energyfuturesinitiative.org/reports/optionality-flexibility-innovation/>

¹⁶ Draft 2022 Scoping Plan Update. Sector Transformation: Industry, p. 166.

¹⁷ "Microgrid Installations," U.S. Department of Energy, data current as of July 31, 2021. <https://doe.icfwebservices.com/microgrid>