COMBINED
HEAT AND POWER
ALLIANCE

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Combined Heat and Power Alliance
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RE: Department of Energy's (DOE) Request for Information (RFI) on Barriers and Pathways to Integrating Onsite Clean Energy Technologies in the Industrial Sector (DE-FOA-0002830)

The Combined Heat and Power Alliance (CHP Alliance) commends the DOE Advanced Manufacturing Office (AMO) for providing the opportunity to submit comments on RFI regarding barriers and pathways to integrating onsite clean energy technologies in the industrial sector.

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.[1] 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 renewable and low-carbon fuels, such as renewable natural gas (RNG) and clean hydrogen. Properly designed systems typically operate with an overall efficiency of 65 to 85 percent, with some systems approaching 90 percent.[2] 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

[1] "Who We Are," Combined Heat and Power Alliance, accessed September 2022, https://chpalliance.org/about/.
[2] "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.

energy needs.[3] CHP systems achieve these high efficiencies by recovering the waste heat by-product of electricity generation as useful thermal energy for heating and cooling.[4] Because they operate so efficiently, CHP systems combust less fuel to provide the same energy services. This efficient generation of energy reduces all types of emissions across industrial sectors, including greenhouse gases such as carbon, criteria pollutants, and hazardous air pollutants.

As outlined in DOE's September 2022 Industrial Decarbonization Roadmap,[5] CHP technology is prevalent in many industrial applications including chemicals, pulp and paper, refining, primary metals, and food industries, but can also be found in crop production, nonmetallic minerals, and other industrial uses.[6] Industrial CHP can provide significant greenhouse gas emission reductions in the near- to mid-term as marginal grid emissions continue to be based on a mix of fossil fuels in most areas of the country, and CHP systems utilizing clean fuel sources can be a long-term path to decarbonizing thermal processes resistant to electrification and for critical operations where dispatchable onsite power is needed for both resilience and reliability. CHP has long used digester and biogas as clean fuel sources,[7] and systems deployed today can operate on increasing percentages of RNG as availability increases. Additionally, CHP manufacturers are testing and operating CHP systems on high percentage hydrogen fuels, up to 100% clean hydrogen. The CHP Alliance published a roadmap to convert all existing and new CHP systems to 100% clean hydrogen by 2030 or sooner, highlighting that existing systems can convert to 100% clean hydrogen at reasonable cost and with minimal downtime because these conversions can occur during scheduled overhauls.[8]

To ensure CHP is used effectively and efficiently in the strategies for widespread industrial decarbonization, there are several research, development, and demonstration needs for future CHP applications that DOE will have to address:[9]

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[3] "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/.
[4] "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/201507/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_syste ms.pdf.
[5] "Industrial Decarbonization Roadmap," U.S. Department of Energy, September 2022, p. 14, https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf.
[6] "Many Industries use Combined Heat and Power to Improve Energy Efficiency," U.S. Energy Information Administration, July 27, 2016, https://www.eia.gov/todayinenergy/detail.php?id=27252.
[7] DOE's CHP Installation Database lists 608 CHP systems with a total of 538 megawatt operating on digester gas and landfill gas utilizing reciprocating engines, gas turbines, microturbines and fuels cells. "CHP Installations," U.S. Department of Energy, last modified October 31, 2021, https://doe.icfwebservices.com/chpdb/.
[8] "Clean Hydrogen and Combined Heat and Power: A Roadmap for Industrial and Commercial Decarbonization," CHP Alliance, March 2022. https://chpalliance.org/wp-content/uploads/2019/08/CHP-Hydrogen-Roadmap-2.pdf.
[9] "Industrial Decarbonization Roadmap," U.S. Department of Energy, September 2022, p. 15, https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf.

- Prime mover development (e.g., reciprocating engines, gas turbines, and microturbines) to maintain high efficiency.
- High reliability and low criteria air pollutant emissions on biofuels and high levels of hydrogen.
- Options for new cycles/working fluids.
- Controls and control schemes for integrating with a dynamic smart grid and distributed microgrids.
- Conversion of natural gas infrastructure to operate on high levels of RNG and hydrogen.
- Heat exchangers to deal with "dirty" but hot streams.
- Considering solar/thermal integration for lower-grade heat.

There are additional financial, regulatory, and informational barriers to consider when integrating CHP into industrial applications, which are explained in detail in the section below.

Barriers and Pathways to Integrating CHP in the Industrial Sector

DOE published a report to Congress in 2015 highlighting barriers to improving energy efficiency in industry.[10] The report examines several economic, financial, regulatory, and informational barriers limiting the deployment of onsite CHP and WHP systems at industrial facilities, the majority of which remain barriers today, and provides opportunities to overcome these barriers. Key barriers that still need to be addressed include:[11]

Economic and Financial Barriers

- *Internal competition for capital.* Payback expectations and capital budget constraints influence CHP investment decisions.
- *Natural gas outlook.* The availability and long-term price forecast for natural gas impacts investments in CHP.
- *Accounting practices.* Emphasis on minimizing upfront capital costs, and the "split incentive" between capital improvement and operation and maintenance (O&M) budgets.
- *Financial risk.* Industrial facilities may have a hard time finding low-cost financing due to financial risks.
- *Access to favorable tax structures.* Lack of financing instruments such as Master Limited Partnerships or Real Estate Investment Trusts.
- *Sales of excess power.* The inability to sell excess power or access to reasonable sales agreements for excess power.

[10] "Barriers to Industrial Energy Efficiency," U.S. Department of Energy, June 2015, https://www.energy.gov/sites/default/files/2015/06/f23/EXEC-2014-005846_6%20Report_signed_v2.pdf
[11] Ibid., p. 9

Regulatory Barriers

- *Utility business model.* The structure of utility cost recovery and lost revenue mechanisms can reduce a utility's interest in promoting industrial CHP projects.
- *Environmental permitting and regulatory issues.* Output-based regulations (lb/MWh versus lb/MMBTu) and New Source Review permitting requirements.
- *Inconsistent interconnection requirements*. Lack of standardized interconnection requirements can impede CHP.
- *Lack of recognition of environmental benefits.* Lack of financial value for the potential emissions benefits of CHP.
- *Failure to recognize the full value of CHP in regulatory evaluations.* Utility procurement and resource plans may omit some value streams provided by CHP.
- *Standby rates.* Structure of standby rates that are not designed to closely preserve the nexus between charges and cost of service.
- *Exclusion from clean energy standards.* CHP's eligibility under CEPS programs.
- *Capacity and ancillary services markets.* Electricity markets and programs may limit CHP's ability to participate.

Informational Barriers

- *Awareness of available incentives*. Insufficient knowledge of federal, state and utility incentives and eligibility requirements for CHP projects.
- *Technical knowledge and resource availability.* Lack of in-house technical expertise or the resources to hire outside staff for the design, development, and operation of a CHP system.

There are several pathways to consider when addressing the barriers hindering the deployment of CHP and WHP in the industrial sector, including:[12]

Economic and Financial Pathways

- Consider incentivizing CHP and WHP utilizing clean fuels in future federal technology-neutral investment and production tax credit structures.
- Consider criteria identified by FERC in determining the Public Utility Regulatory Policies Act avoided cost rate.

[12] Ibid., p. 18

- Consider expanding the ability of industrial customers to sell excess power to third parties in retail markets.

Regulatory Pathways

- Consider, where appropriate, various methods that may align customer and utility incentives to achieve greater savings from CHP.
- Consider output-based regulations that recognize thermal energy in federal regulations.
- State air agencies can consider output-based regulations that recognize thermal energy.
- Consider offering streamlined air permitting for small scale CHP systems.
- Consider best practice interconnection standards as a basis for state rulemaking where appropriate.
- Evaluate standby charges to ensure they are fair, just, and reasonable, and accurately reflect the costs and benefits of distributed generation and that they are designed to closely maintain the balance between charges and the cost of service.
- Consider including CHP in energy efficiency resources standards, if consistent with state policy goals.

Informational Pathways

- Consider increasing outreach to industrial end-users on the benefits of CHP, highlight success stories on a sectoral basis.
- Consider expansion and awareness of CHP resources through AMO R&D projects,[13] the CHP Deployment Program,[14] and the CHP Technical Assistance Partnerships (CHP TAPs) program.[15]

Conclusion

The CHP Alliance appreciates the opportunity to submit recommendations to DOE regarding barriers and pathways to integrating onsite clean energy technologies in the industrial sector

[13] "Combined Heat and Power (CHP) and District Energy," U.S. Department of Energy Advanced Manufacturing Office, accessed September 2022, https://www.energy.gov/eere/amo/combined-heat-and-power-chp-and-district-energy.
[14] "Combined Heat and Power Deployment," U.S. Department of Energy Better Buildings, accessed September 2022, https://betterbuildingssolutioncenter.energy.gov/chp.
[15] Better Buildings Program CHP technical assistance partnerships are regional partnerships that promote CHP, waste heat to power, and district energy technologies. The CHP technical assistance partnerships have completed more than 500 technical assistance activities with an estimated capacity of 800 megawatts. "CHP Technical Assistance Partnerships (CHP TAPs)," U.S. Department of Energy Better Buildings, accessed September 2022, https://betterbuildingssolutioncenter.energy.gov/chp/chp-taps.

and looks forward to working closely with DOE staff and other affiliated agencies as this process unfolds.

Respectfully,

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