C C D C

CALIFORNIA CLEAN DG COALITION

June 24, 2022

California Air Resources Board
1001 I Street
Sacramento, CA 95814

Electronically submitted to: http://www.arb.ca.gov/lispub/comm/bclist.php

Subject: The Draft 2022 Scoping Plan Update

The California Clean DG Coalition (CCDC) appreciates the opportunity to provide these comments regarding the Draft 2022 Scoping Plan Update. CCDC is an ad hoc group interested in promoting the deployment of distributed generation. Its members represent a variety of technologies, including combined heat and power (CHP), renewables, gas turbines, microturbines, reciprocating engines and storage.[1]

Introduction and Summary of Position

The Draft 2022 Scoping Plan update provides the framework for an "ambitious and aggressive approach to squeezing the carbon out of every sector of the economy," with the goal of setting California on a path to achieve carbon neutrality by 2045 or earlier.[2] CCDC generally supports the staff-proposed scenario that forms the basis of the Draft 2022 Scoping Plan (the Proposed Scenario). Importantly, it attempts to best balance cost-effectiveness, health benefits, and technological feasibility.[3]

Technology and fuel advancements are being made today and must continue to occur to meet the state's clean energy and climate change goals. The Draft 2022 Scoping Plan Update gets it right

[1] CCDC is presently comprised of AB Energy USA LLC; Cal Microturbine; Capstone Green Energy Corporation; DE Solutions, Inc.; Holt of California; MMR Power; and Northeastern-Western Power Systems.
[2] Draft 2022 Scoping Plan Update, Executive Summary (first page, unnumbered).
[3] *Id*. at p. iv.

when it finds "…***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."[4] The Proposed Scenario appropriately recognizes that cost-effective solutions "to slash GHG emissions" are available, such that the Proposed Scenario is able to rely on existing technologies.[5]

With respect to CHP, the Proposed Scenario would adopt the approach in Alternatives 2, 3, and 4 to CHP at industrial facilities, which allows for legacy technologies to reach a natural end of life with retirement by 2040.[6] The Proposed Scenario appears to also contemplate an approach to electric generation that includes sources, including non-legacy CHP, that meet the sector GHG target of 38 $MMTCO_2$ in 2030 and 30 $MMTCO_2$ in 2045, as well as increased use of Renewable Portfolio Standard and SB 100 Zero Carbon Resources by commercial and industrial facilities over the same period.[7] This approach would facilitate deployment of clean, on-site CHP as one of many options the state will need to look to as it transitions to a decarbonized grid. CCDC supports this approach for the reasons set forth below.

CHP has the Attributes Necessary to Facilitate the State's Transition to a Carbon-Free Grid

CARB is correct that an "all of the above" approach is necessary if the ambitious and aggressive Proposed Scenario is adopted. It is also appropriate to use a progressive transition from fossil fuels, given that renewable or renewable paired with storage resources are not available today to meet all of California's electric demand, or to provide a resilient supply of power in the face of multi-day Public Safety Power Shutoff (PSPS) events and outages.

CHP is an existing, evolving technology that is highly efficient and able to provide substantial resiliency benefits, while reducing emissions. Properly designed systems generally operate with an overall efficiency of 65% to 85%; some systems are close to 90%.[8] This is a substantial improvement compared to importing electricity from remote fossil-fueled power plants in the United States, which have an average efficiency of 39%.[9] Use of on-site boilers or hot water heaters for thermal energy needs increases this traditional overall system efficiency to 50%.[10] CHP is able to achieve such high efficiency because it uses less fuel to produce both electricity and thermal energy.

---

[4] Draft 2022 Scoping Plan Update, p. vii (emphasis added).
[5] *Id*.
[6] Draft 2022 Scoping Plan Update, pp. 45 and 46 and Table 2.2.
[7] Draft 2022 Scoping Plan Update, Table 2.2 and Appendix C, Table C-1.
[8] 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, https://www.epa.gov/chp/chpbenefits.
[9] 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/.
[10] *Id*.

Because CHP uses less fuel to generate usable energy, CHP that runs on natural gas today reduces CO_2 emissions compared to the grid. However, CHP is not solely a fossil technology. Current CHP technology can use biogas and biofuels, depending on availability of such fuels, which further reduces emissions. Developers of CHP projects understand the importance of additional efforts to achieve GHG emissions reductions. Most existing turbines can run on hydrogen mixtures up to 20-40% and, going forward all major engine and turbine manufacturers are targeting 2030 for 100% hydrogen for prime movers.[11] Research and development investments, including by the U.S. Department of Energy, are being made to address challenges associated with using 100% hydrogen to fuel a generating facility.[12]

CHP is a proven resilient baseload anchor for microgrids, a critically important attribute as multi-day PSPS events and other extended outages occur more frequently. When CHP is paired with renewables, like solar or wind generation, overall emissions reductions are optimized, while long-duration, dispatchable on-site power assures reliability. Further, the reliability and resiliency benefits of CHP may help reduce the use of backup generators purchased by individual customers, over which regulatory authorities have little authority or oversight.

With the right market signals, most CHP can be operated flexibly, enabling GHG reductions 24/7. By shutting the CHP system off or considerably reducing output when renewables are at the margin, the need for battery storage is reduced and costs significantly reduced.

CHP systems can be changed out or modified in the field as necessary to accommodate fuel-switching opportunities in support of decarbonization. The typical payback period for CHP projects is approximately six to eight years, or less.[13] This means that once the initial capital and installation costs are recovered, decarbonization decisions can be made based on operating costs only. Fuel switching opportunities arise several times during the life of a project.[14] For example, industrial CHP prime movers are usually overhauled every eight to 10 years, which provides at least three opportunities to switch fuels or develop and alternate decarbonization strategy,[15] consistent with the state's timeframe for decarbonizing the California grid.

Conclusion

Clean on-site CHP is a highly efficient energy generation solution that reduces emissions today, and will continue to do so in increasing amounts, through use of clean fuels as they become available, and when paired with renewable resources. CHP provides customers with reliability and resiliency, the need for which has become more urgent in recent years. While CCDC is always concerned with proposals to phase out any category of CHP, such as the proposal in the

[11] Attachment, CHP Program Transition; Onsite Generation Program (EERE Advanced Manufacturing Office), U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, p. 8.
[12] *Id*. at p. 4.
[13] Attachment, CHP Program Transition; Onsite Generation Program (EERE Advanced Manufacturing Office), U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, p. 9.
[14] *Id*.
[15] *Id*.

Staff Proposal for legacy CHP facilities at industrial facilities to retire at the end of their natural lives, CCDC recommends and strongly supports allowing other clean on-site CHP to be deployed in light of its potential to reduce GHG emissions, on a trajectory that matches the 2045 or earlier timeframe for achieving carbon neutrality set forth in the Draft 2022 Scoping Plan Update.

CCDC appreciates CARB's consideration of these comments, and respectfully requests that the Draft 2022 Scoping Plan appropriately recognize the benefits of clean, on-site non-legacy CHP and its potential as an option to meet the goals of the Proposed Scenario.

Sincerely,

Jen Derstine
VP, Marketing and Distribution
Capstone Green Energy Corporation
Chair, California Clean DG Coalition

ATTACHMENT

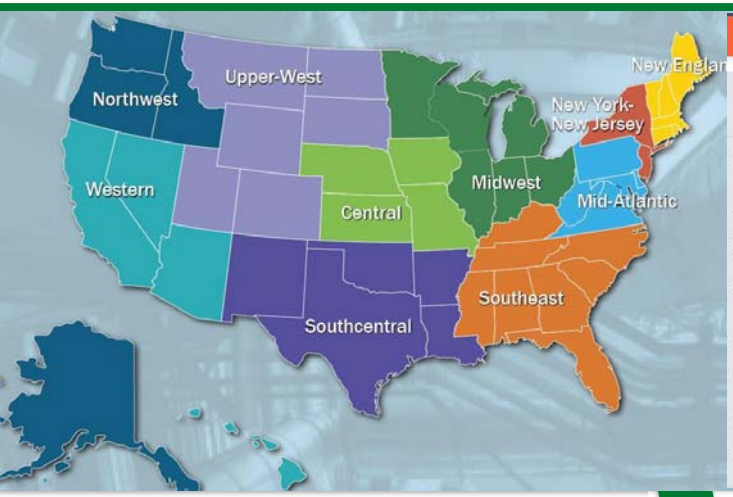
U.S. DEPARTMENT OF ENERGY

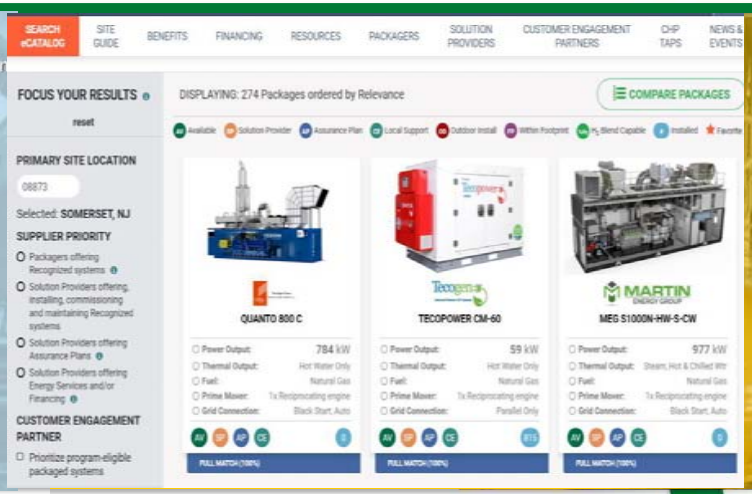
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

CHP Program Transition; Onsite Generation Program

EERE Advanced Manufacturing Office

DOE Combined Heat and Power Deployment Program





10 regional CHP
TECHNICAL ASSISTANCE PARTNERSHIPS
provide fact-based technical support

- vendor, fuel, & technology neutral
- assistance covers site screening through procurement, operations, maintenance, & commissioning
- education & workforce development opportunities

Evaluating & deploying
PACKAGED SYSTEMS

reduce | risk to end-user and supplier project cost & installation time

PACKAGED CHP ACCELERATOR
verify improved project performance, cost, & installation practices

CHP eCATALOG
web-based, searchable catalog of recognized packaged CHP systems & suppliers

Developing
MARKET RESOURCES & TOOLS

- CHP Installation Database
- Microgrid Installation Database
- CHP functionality – REopt Lite tool
- CHP Resilience Site Screening Tool
- Resilience Risk Evaluation Tool
- Case Studies and Best Practices

Programmatic Approach to CHP

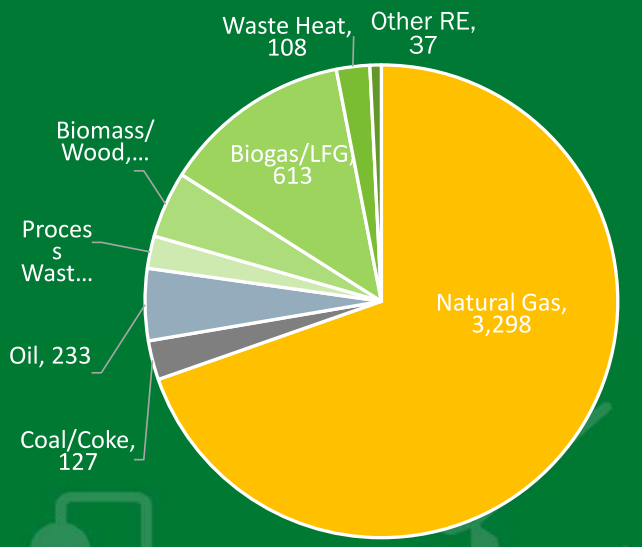
AMO's approach to CHP-related R&D and deployment activities have evolved over time.

DEPLOYMENT

- Covered industrial, commercial, and institutional end-users across the U.S.
- Fuel-agnostic
- Focused on packaged systems to reduce risk
- CHP for critical infrastructure resilience

R&D

- Flexible CHP technologies
- Net-zero fueled CHP (biomass, biogas, RNG, hydrogen)
- High-efficiency engines/turbines
- Performance modeling in microgrids and district energy systems



Number of CHP installations by fuel type

CHALLENGES

- *Questions about CHP's suitability in a decarbonizing economy*
- *Perception of CHP as a fossil technology*
- *State regulations / approaches to natural gas*

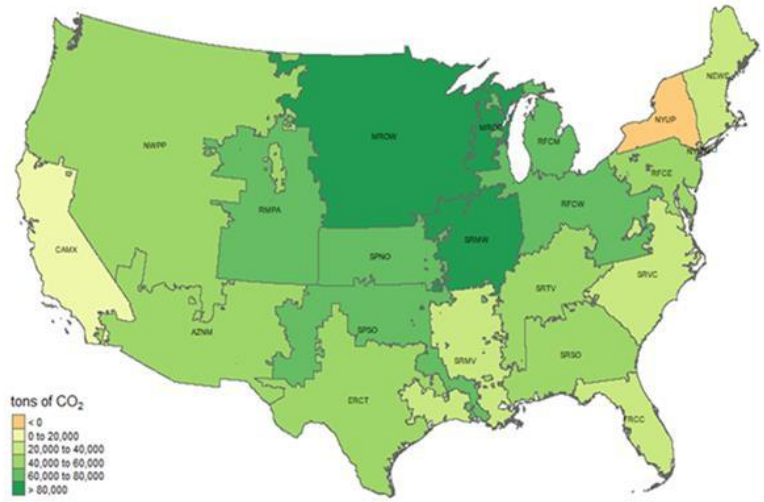
23% of existing CHP systems use renewable fuels

Transitional CHP Program

- **Focus program activities mostly on renewably fueled CHP**

  biofuels | waste heat | green hydrogen

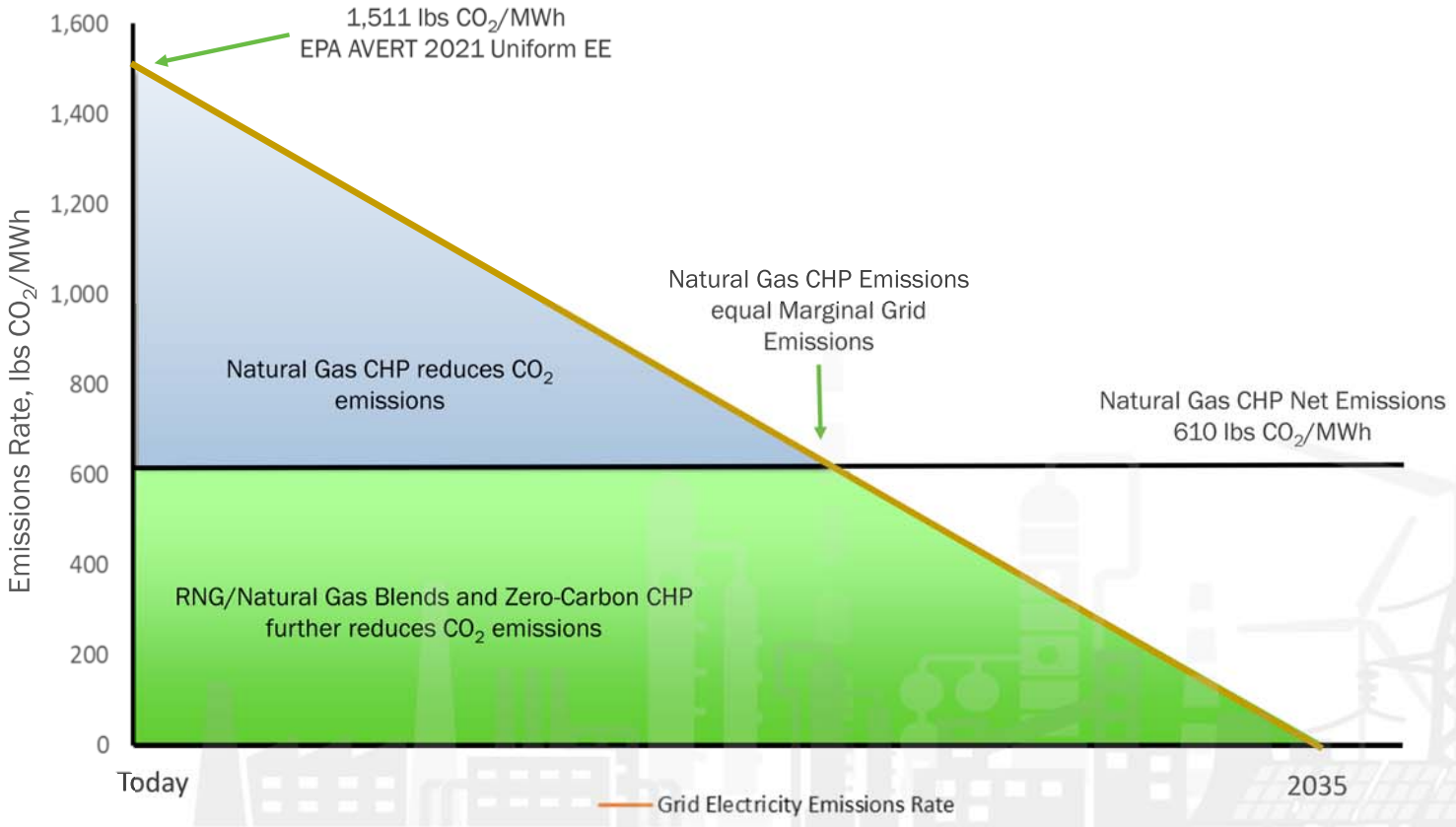
- **Natural gas-fired CHP for:**
  - Heavily fossil geographies
  - Hard-to-decarbonize industries
  - Long-term resilience
  - Sites with fuel flexible outlooks



- **R&D investments pair with deployment priorities to prepare for the future by:**
  - Addressing challenges with renewable fuels, such as hydrogen
  - Developing technologies for flexible grid connections

CHP's Evolving Role as the Grid Approaches Net-zero

Avoided Emissions with CHP – Now and Into The Future



INDUSTRY: Addressing Difficult-to-decarbonize Industries

CHP is well suited to address steam and process heat, 95% of which is currently fossil fueled.

More than two-thirds of CHP capacity is currently found in industrial facilities. These installations provide 68 GW of electric capacity for the industrial sector, many of which are from large CHP installations in energy-intensive industries:

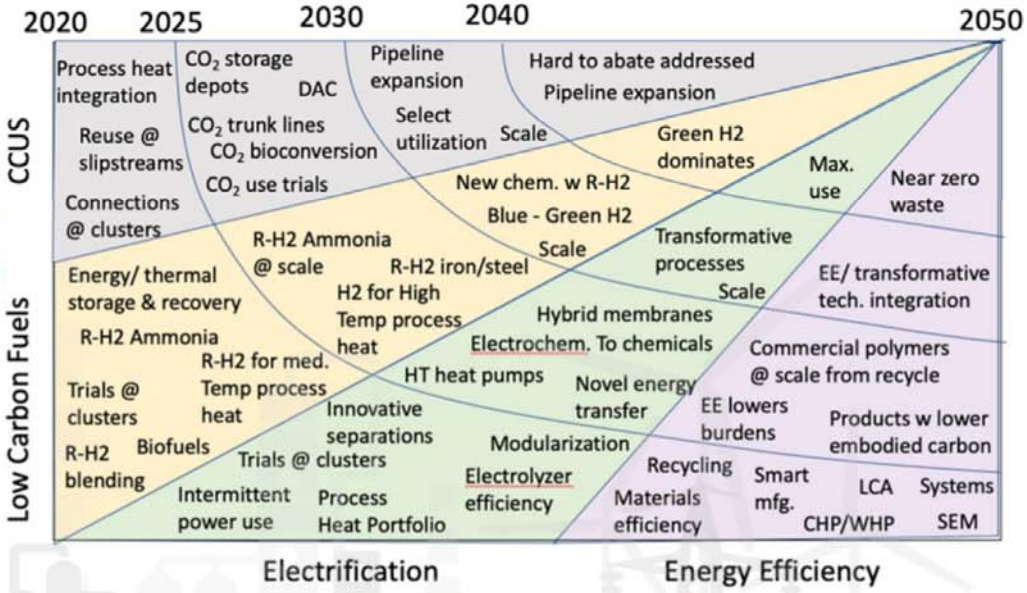
chemical plants | pulp and paper mills | other large industrial sites

KEY TARGETS

Industrial facilities across the U.S., with a focus on those with process heat and challenging decarbonization pathways

CHP supports decarbonization of the industrial sector while additional technologies reach maturity.

Technology Pathways: Industrial Decarbonization



CHP enables three of the four pathways for industrial decarbonization (energy efficiency; low-carbon fuels; electrification) while mitigating the need for CCUS.

DERs: Pairing CHP with Wind, Solar, Storage for Resilience

CHP is a resilient base load anchor for multi-technology microgrids, particularly those incorporating renewable generation sources like solar PV or wind.

CHP paired with renewables optimizes overall emissions reductions while providing long-duration, dispatchable onsite power from a fuel-based technology.

KEY TARGETS

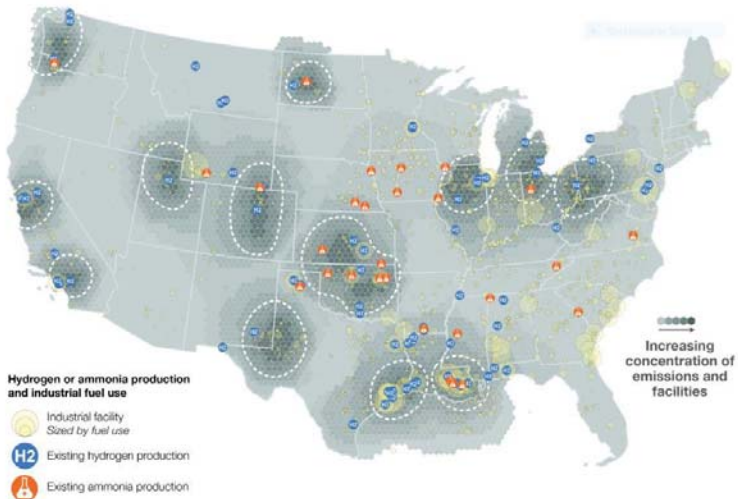
critical infrastructure, cities, and communities

United States Marine Corps Recruit Depot (MCRD) Parris Island, SC, installed a hybrid microgrid including a 3.5MW natural gas-fired CHP system plus 5.5 MW solar photovoltaic arrays to provide secure and resilient energy. The site also incorporated a 4 MW battery-based energy storage system, all of which are controlled by a microgrid control system capable of fast load shedding.

FUEL: Increasing Net-zero CHP Installations

- Existing CHP systems can utilize **biogas and biofuels**.
  - *Opportunity exists to increase installation at sites like wastewater treatment plants.*
- All natural gas-fueled CHP is compatible with **renewable gas,** pending availability.
- Most existing turbines and engines can operate on **hydrogen mixtures up to 20-40%.**
- All major engine and gas turbine manufacturers are working on the capability to operate at **high levels of hydrogen,** targeting 2030 for 100% hydrogen prime movers.
- CHP systems can be **changed out or modified in the field** to 100% hydrogen-fuel blends

The ultimate scale of hydrogen-fueled CHP deployment will depend on resource availability.



Source: "An Atlas of Carbon and Hydrogen Hubs for United States Decarbonization". Great Plains Institute, January 2022

Near-term demonstration projects can identify challenges and opportunities in real-world environments.

CHP Flexibility Offers Multiple Opportunities for Reoptimization

- **Short payback periods and regular maintenance schedules offer multiple decision points for reoptimization of emissions reduction measures as the grid evolves and other decarbonization options mature:**
  - **Payback:** Typical payback for CHP installations is between 6–8-years. After the initial equipment and installation costs are recovered, future decarbonization decisions can be based on operating costs only.
  - **Fuel-switching opportunity:** Industrial CHP prime movers require periodic overhauls on an 8 to 10-year cycle (at ~10 to 15% of the original installation cost), **which offer at least three opportunities** to switch fuel or select an alternate decarbonizing path. CHP installations typically have between 25 to 30-year equipment lifetimes.