

Packaged CHP Accelerator

January 26, 2023

Agenda

- Welcome and DOE Perspective –
Anne Hampson, Program Manager, U.S. DOE Industrial Efficiency and Decarbonization Office
- Packaged CHP Accelerator Overview -
Bruce Hedman, Coordinator, Packaged CHP Accelerator
- Packaged CHP eCatalog Update –
Richard Sweetser, Coordinator, Packaged CHP eCatalog
- Packaged CHP Market Profile –
David Jones, Manager-Energy Markets, ICF
- DOE Onsite Energy Program –
Meegan Kelly, Technology Manager, U.S. DOE Industrial Efficiency and Decarbonization Office

This webinar is being recorded

U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Welcome and DOE Perspective

Anne Hampson, Program Manager

Industrial Efficiency and Decarbonization Office

Office of Energy Efficiency and Renewable Energy

January 26, 2023 | Packaged CHP Accelerator



Industrial Efficiency and Decarbonization Office

VISION FOR THE FUTURE

An efficient and competitive industrial sector with net-zero greenhouse gas emissions by 2050.

MISSION

IEDO accelerates the innovation and adoption of cost-effective technologies that eliminate industrial GHG emissions.

MAJOR PROGRAM PILLARS



ENERGY- AND EMISSIONS-
INTENSIVE INDUSTRIES



CROSS-SECTOR TECHNOLOGIES



TECHNICAL ASSISTANCE AND
WORKFORCE DEVELOPMENT

Two Offices as of October 9, 2022

Industrial Efficiency & Decarbonization Office (IEDO)

Director

Deputy Director

Chief Engineer

Operations

Energy Intensive Industries

Cross-Sector Technologies

Technical Assistance & Workforce

Technical Project Officers

Advanced Materials & Manufacturing Technologies Office (AMMTO)

Director

Deputy Director

Senior Advisor

Operations

Energy Technology Manufacturing & Workforce Development

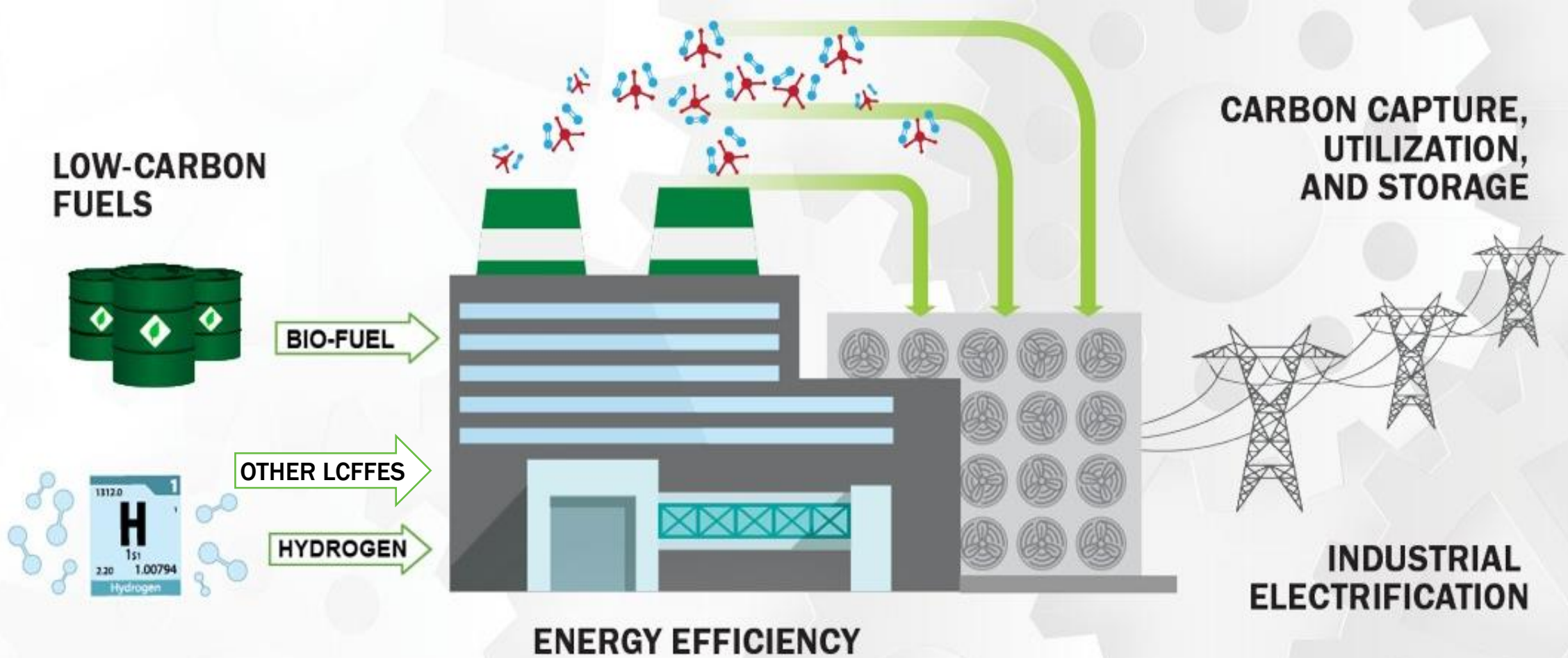
Next Generation Materials & Processes

Secure & Sustainable Materials

Technical Project Officers

Recent Release: Industrial Decarbonization Roadmap

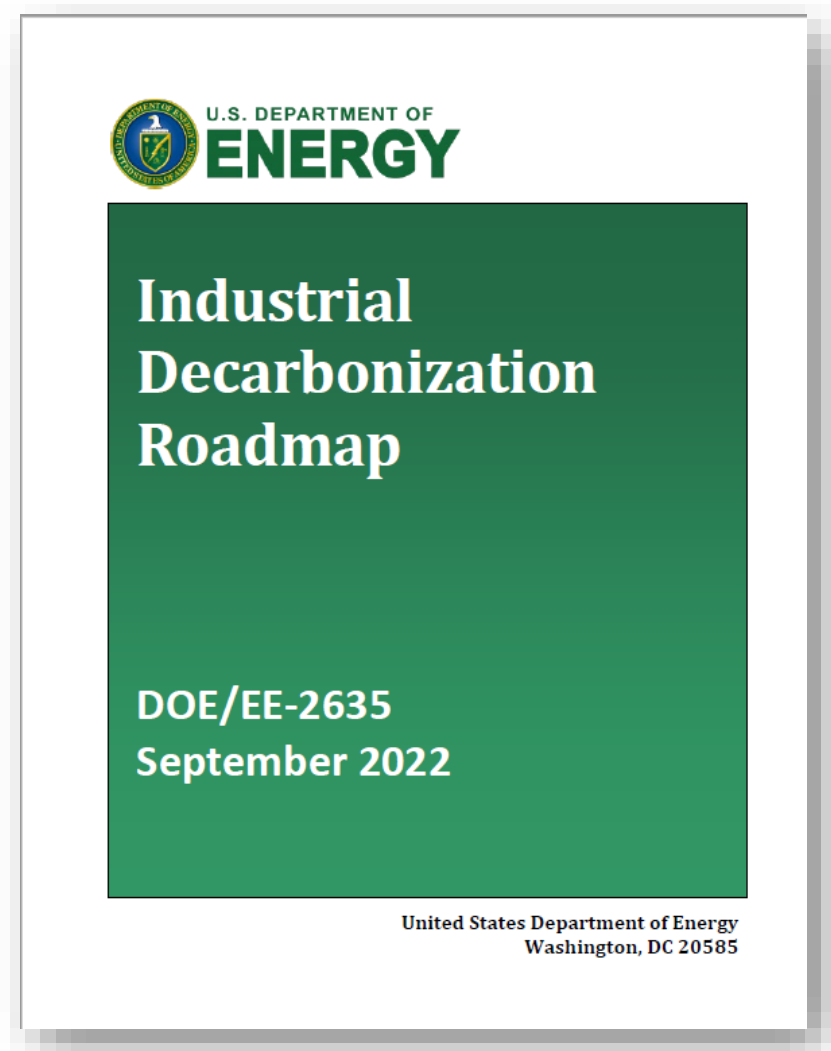
Four Main Strategies to Decarbonize the Manufacturing Sector



<https://www.energy.gov/eere/doe-industrial-decarbonization-roadmap>

CHP in Industrial Decarbonization Roadmap

- **Industrial CHP can provide significant GHG emissions 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.
- In order to prevent lock-in, **CHP units installed today must have emissions below marginal grid emissions** for the duration of their useful lifetime, including through retrofits to use clean sources of energy where possible.
- **RNG and hydrogen fueled CHP systems can be a long-term path** to decarbonizing industrial thermal processes resistant to electrification because of technology or cost barriers, and for critical operations where dispatchable onsite power is needed for resilience and reliability.



[https://www.energy.gov/sites/default/files/2022-09/Industrial Decarbonization Roadmap.pdf](https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf)



Industrial Heat™

Goal: The Industrial Heat Shot™ is a Department-wide initiative to develop cost-competitive industrial heat decarbonization technologies with at least 85% lower greenhouse gas emissions by 2035.




85% Reduction



2035



U.S. DEPARTMENT OF
ENERGY

The background is a light blue surface decorated with various festive items. There are numerous small, flat, circular confetti pieces in a wide array of colors including red, blue, yellow, green, pink, and orange. Interspersed among the confetti are several large, three-dimensional paper pom-poms in bright colors like yellow, pink, blue, and green. These pom-poms have a distinct hexagonal or honeycomb-like texture. Additionally, the corners of the image feature the tips of colorful party hats in shades of green, blue, pink, and yellow. The overall composition is vibrant and celebratory.

**Thank You
Packaged CHP
Accelerator
Partners**



Thank you

Email: Anne.Hampson@ee.doe.gov

For additional information and to subscribe for updates:

manufacturing.energy.gov

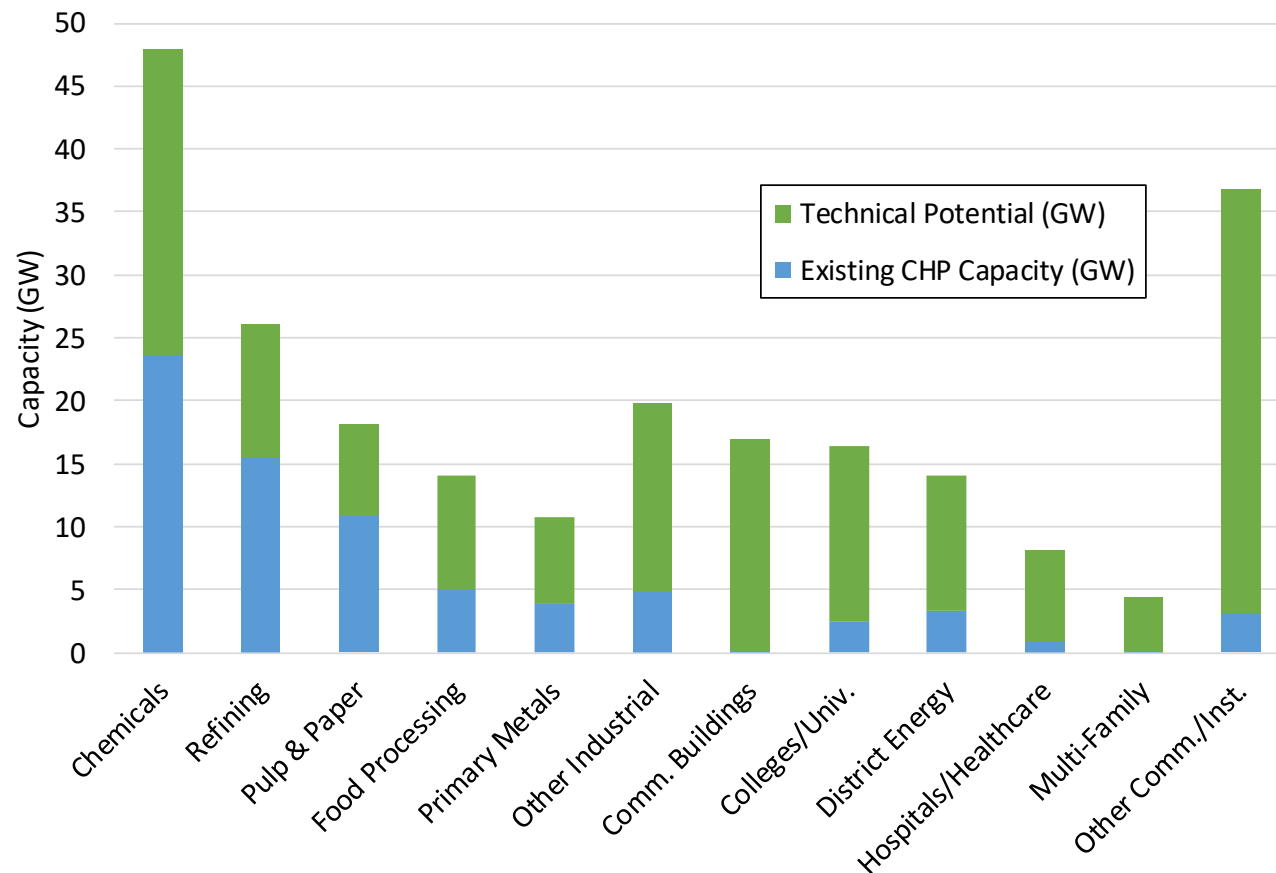


Packaged CHP Accelerator

Bruce Hedman

Large Potential in Non-Traditional CHP Markets

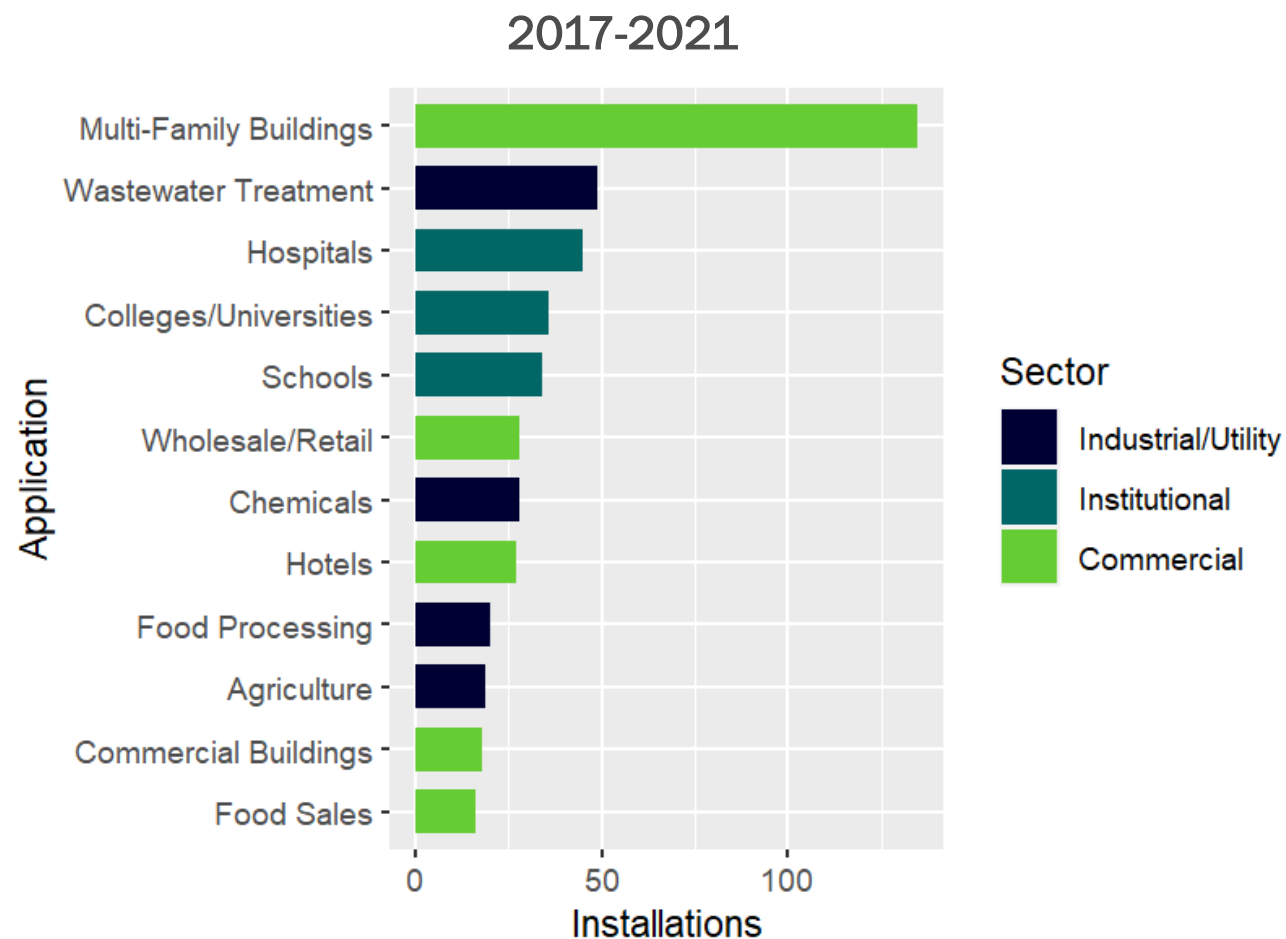
- Small/midsized industrials, commercial, institutional, multi-family and government applications
- Resilience and carbon reduction are key drivers
- Markets utilize smaller CHP systems (< 10 MW)
- Markets have limited CHP experience
- Users have limited technical resources
- History of issues with system performance and with CHP sales and service support
- Many perceived risks by both users and suppliers



Source: "Combined Heat and Power (CHP) Technical Potential in the United States", ICF, March 2016

Packaged CHP Systems Address Key Market Needs

- Packaged systems reduce on-site man-hours and in-field design changes
- Controlled factory assembly promotes consistency and reduces delays
- Factor acceptance testing ensures package meets specification before deployment
- Packaged/modular systems speed up project timelines – arrives on site tested and ready to install
- Packaged/modular systems come complete and ready to install – eliminates dealing with multiple vendors and project teams at the site
- Packaged systems reduces risk for both user and supplier



DOE Packaged CHP eCatalog

- A national web-based searchable catalog of DOE-recognized packaged CHP systems and suppliers with the goal to reduce risks for end-users and vendors through partnerships with:
 - CHP Packagers that assemble and support recognized Packaged CHP Systems
 - Solution Providers that install, commission and service packaged CHP systems
 - CHP Engagement partners that provide CHP market deployment programs at the state, local and utility level
- Pre-engineered and tested packaged CHP systems that meet DOE performance requirements
- eCatalog audience: end-users with engineering staff, consulting engineers, utilities, state energy offices, regulators, federal agencies, and project developers.
- Users search for applicable CHP system characteristics, and get connected to packagers, installers and CHP engagement programs
- Allows users to compare technology options on a common basis

U.S. DEPARTMENT OF ENERGY | COMBINED HEAT & POWER eCATALOG
RECOGNIZED PACKAGED CHP SYSTEMS

SEARCH eCATALOG | SITE GUIDE | BENEFITS | FINANCING | RESOURCES | PACKAGERS | SOLUTION PROVIDERS | CUSTOMER ENGAGEMENT NETWORK | CHP TAPS | NEWS & EVENTS | Contact Us | Sign In

COMBINED HEAT & POWER FOCUSED NEWS & EVENTS
VIEW ALL NEWS & EVENTS

Upcoming Event

WHAT'S NEXT SUMMIT
Axios April 5, 2022, 9:30 am to 5:00 pm ET
Join Axios virtually for the inaugural What's Next Summit - an event spotlighting the innovators making their mark on the future of work, life and getting around.
Axios journalists will lead newsmaking interviews and deep-dive discussions - asking the questions that you want to know about what's coming across 5 key themes: Next Cities, Work Shifts, Electric Everything, Financial Flux and Trending Tech. ... more
[READ MORE](#)

Upcoming Event

WORLD HYDROGEN NORTH AMERICA
Energy Central Apr 6 & 7, 2022
Join us to discover and debate how/if the world's simplest, and most abundant, molecule has the potential to curb greenhouse gas emissions for good... more
[READ MORE](#)

News

ONTARIO'S MINISTER STANDS UP FOR COMBINED HEAT POWER
Canadian Biomass Apr 4, 2022
Efficiency is important. We talk about it a lot. When it comes to the principles of governing a province, it's good to be efficient. When it comes to matters of protecting the environment, efficiency is an important tool in our box. Being efficient comes with a host of benefits, like smaller price tags, better reliability, and better access to the things we all need, like sources of heat and energy. Combined heat and power technologies are energy-efficient systems that generate both,
[READ MORE](#)

COMBINED HEAT & POWER eCATALOG OF RECOGNIZED PACKAGE CHP SYSTEMS
**PACKAGED CHP SYSTEMS:
RIGOROUS RECOGNITION PROCESS**

[SEARCH THE eCATALOG](#)
308 CHP Packages Available

Getting Started: [REGISTER](#) [SITE GUIDE](#)

The Packaged Combined Heat and Power Catalog (eCatalog) is a voluntary public/private partnership designed to increase deployment of CHP in commercial, institutional and multi-family buildings and manufacturing plants. The core of the eCatalog are CHP Packagers who commit to provide pre-engineered and tested Packaged CHP systems that meet or exceed DOE performance requirements and CHP Solution Providers who commit to provide responsible installation, commissioning, maintenance and service of recognized Packaged CHP systems and also provide a single point of project responsibility.

CUSTOMER ENGAGEMENT PARTNERS: INCENTIVIZING CHP IN YOUR AREA
MAXIMIZE YOUR CHP INVESTMENT WHEN YOU INSTALL RECOGNIZED SYSTEMS
An essential element in market success of energy efficient technologies, such as CHP is a robust customer engagement partner to educate end-users and provide assistance through the project development process. States, localities and utilities that are implementing programs and policies to increase the use of CHP in support of key economic, security, efficiency and environmental goals can integrate the eCatalog into their efforts by linking recognized CHP packages offered by Solution Providers or Packagers in their region to their programs. The eCatalog provides a unique platform for convening recognized CHP equipment and suppliers with state, local and utility market outreach, customer acquisition and incentive programs.

eCATALOG PACKAGED CHP SYSTEM PERFORMANCE
Packaged CHP System standardized¹ electrical and thermal performance data presented for comparison in the eCatalog have been reviewed and recognized as accurate based on engineering data and available performance test data submitted by the Packagers. Emissions data presented in the eCatalog are based on either third-party emissions test results when available, or prime mover manufacturer's emissions certification data, both using standard EPA test methodologies or equivalent. When evaluating CHP performance for a particular project, it is important to use final performance data from the Packager or Solution Provider that reflects specific site conditions such as actual fuel characteristics, ambient temperatures and altitude, and thermal load temperatures or pressures. As an example, hot water thermal capacity ratings in the eCatalog are based on a standard hot water supply temperature of 180 F, with packager specified return temperatures for each system. Actual hot water available from a packaged CHP system for a project will depend on the specific temperature requirements of the hot water supply and return at the site, and may vary from data presented in the eCatalog.

"Even a small blip on the power grid can disrupt our production equipment and cause six to eight hours of lost production time. With the CHP systems, if there is a power blip we go into island mode and don't experience any disruption."

— John Eustis, Toray Plastics America
Senior Director, Engineering, Procurement & Logistics for 7.5 MW and 12.5 MW CHP Systems

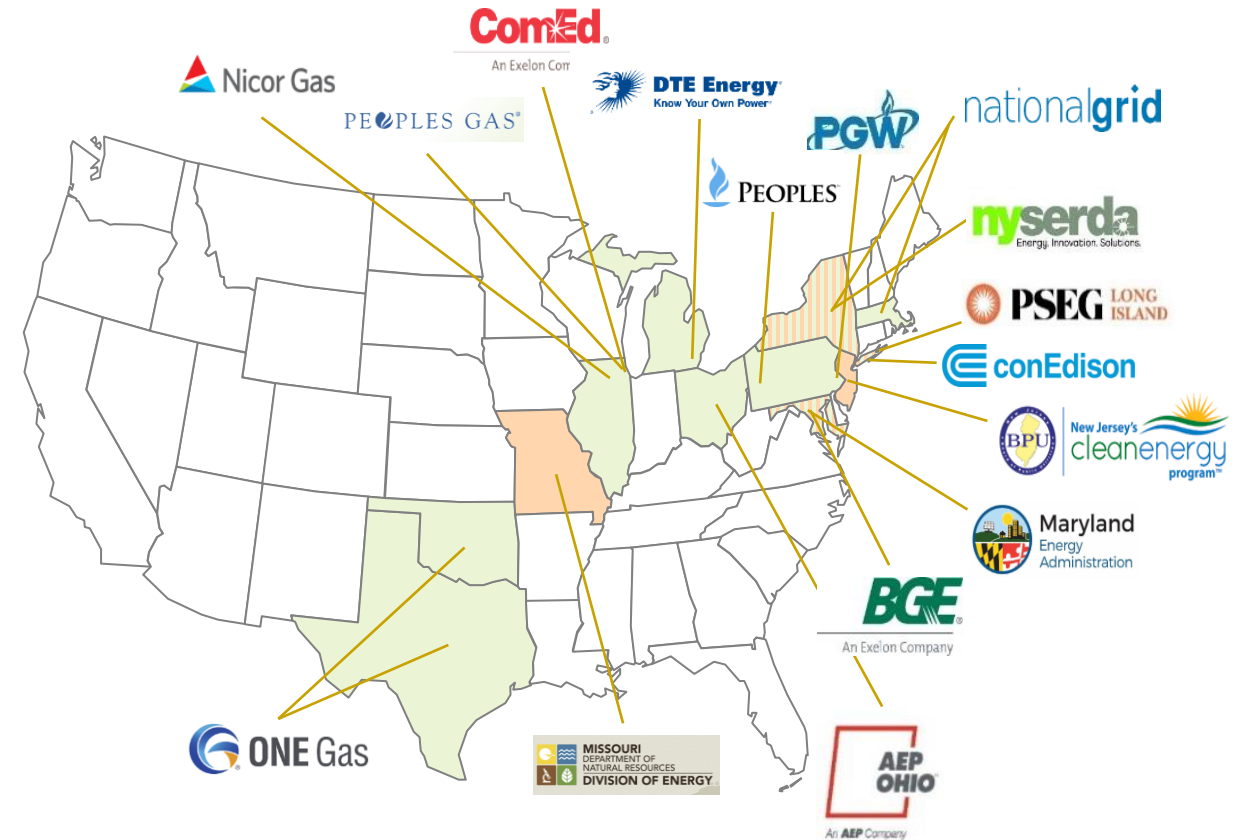
LEARNING | APPLYING | CASE STUDY

<https://chp.ecatalog.ornl.gov/>

DOE Packaged CHP Accelerator

- **Better Buildings Accelerators** demonstrate innovative policies and approaches designed to accelerate investment in energy efficiency
- **Objective:** Help launch, publicize and populate the DOE eCatalog, and promote efficient packaged CHP solutions to end users and design community
- **Goals:** Verify packaged CHP system performance in industrial, commercial, institutional and government markets
- **CHP Engagement Partners:** Utilities, states and federal agencies committed to promoting packaged CHP via CHP deployment and/or incentive programs
- **CHP Supplier Partners:** CHP packagers and solution providers participating in the national eCatalog

CHP Engagement Partners



<https://betterbuildingssolutioncenter.energy.gov/accelerators/packaged-chp>

DOE Role in Packaged CHP Accelerator

- Develop and maintain a national, web-based CHP *eCatalog* of DOE-recognized CHP packaged systems offered by pre-qualified CHP suppliers
- Review and validation of the packaged CHP systems in the *eCatalog*
- Provide technical assistance to partners through the CHP Technical Assistance Partnerships (CHP TAPs) and access to DOE tools and resources
- Aggregate and analyze installation, cost, and performance data to validate the benefits provided by packaged CHP systems
- Collect and share best practices and lessons learned
- Facilitate peer-to-peer information exchange

PACKAGED COMBINED HEAT & POWER ACCELERATOR



Standardized, packaged CHP systems can overcome numerous barriers to CHP installations in commercial, institutional, multifamily, light industrial, and Federal applications by reducing design errors, limiting uncertainty about projected performance, shortening project install time, streamlining permitting, and reducing the overall cost. Partners will validate that installation times and total project costs for pre-engineered, technically-validated packaged CHP systems can be reduced by 20% or more. Partners will also evaluate the integration of new technologies with packaged CHP systems and identify R&D challenges and opportunities around packaged CHP and related technologies.



[Packaged Combined Heat and Power eCatalog](#) Solutions at a Glance

To increase deployment of combined heat and power (CHP) in commercial, institutional, and multifamily buildings and manufacturing plants, DOE created this catalog of CHP packages and providers. Access the catalog to maximize your CHP investment and get high-performing solutions from responsible providers.



[Learn How to Use eCatalog for CHP Projects](#) Fact Sheet

This fact sheet introduces the open-source, Packaged Combined Heat and Power Catalog (eCatalog), which allows users and consulting engineers to view DOE-recognized Packaged CHP systems based on their needs.



[Better Buildings Packaged CHP Accelerator Fact Sheet](#) Fact Sheet

This Fact Sheet introduces the Packaged CHP Accelerator, which is designed to verify project performance, cost, and installation practices of packaged CHP systems appropriate for industrial, commercial, institutional, multifamily, and government facilities.



[CHP Webinar Series](#) Webinar

The webinar series includes presentations related to packaged CHP technologies, markets, and policies, and topical information about the Packaged CHP Accelerator and eCatalog developments.



[Market Sector Fact Sheets](#) Fact Sheet

Coming Soon: Market sector fact sheets provide an overview of individual market sectors conducive to packaged combined heat and power (CHP) deployment, including information on current and potential installations, CHP-related site requirements, and individual CHP case studies.



[CHP Technical Assistance Partnerships \(TAPs\)](#) Technical Assistance

DOE's CHP Technical Assistance Partnerships (CHP TAPs) promote and assist in transforming the market for CHP, waste heat to power, and district energy technologies/concepts throughout the United States.

CHP Engagement Partner Role

- Help launch, publicize and populate the eCatalog, and promote efficient packaged CHP solutions to end users and design community
- Enroll in the eCatalog as a Customer Engagement Partner
- Engage end users and the design community on applications of packaged CHP systems and use of the *eCatalog*
- Provide input on the needs of Engagement Partners in terms of interface with and information in the *eCatalog*
- Document and share lessons learned and best practices – *Partner Profiles*

PACKAGED COMBINED HEAT & POWER ACCELERATOR



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CHP Supplier Partner Role

- Become a qualified *eCatalog* CHP Packager or CHP Solution Provider
- Submit packaged CHP systems for inclusion in the *eCatalog*
- Provide feedback to DOE on the technical elements of the *eCatalog* development
- Provide packaged CHP installation data
- Identify potential technology gaps and R&D opportunities

PACKAGED COMBINED HEAT & POWER ACCELERATOR



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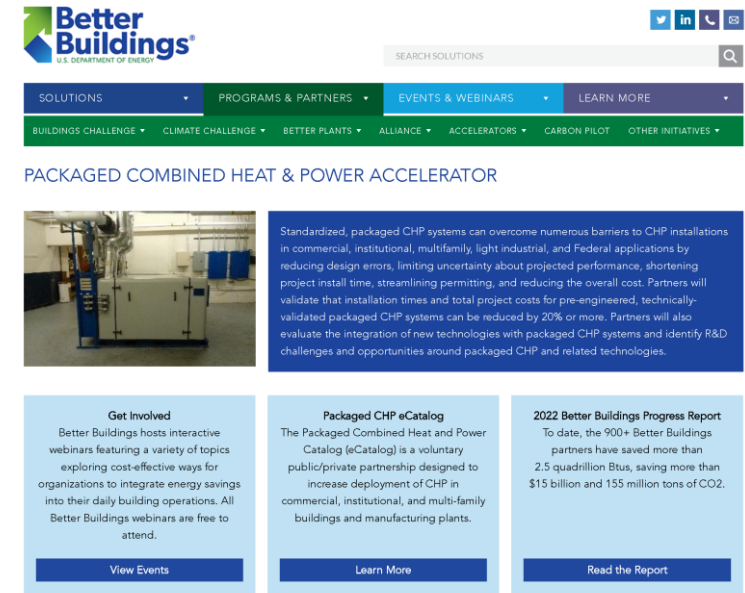


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DOE Packaged CHP Accelerator – Key Deliverables

- Topical Webinar Series on Market/Technology Issues
 - CHP market engagement programs
 - CHP incentive program design and EM&V
 - CHP and Microgrids
 - CHP and Resilience
 - DOE tools and resources
 - CHP financing strategies
 - Renewable Natural Gas
 - CHP and hydrogen
 - CHP markets (Hospitals, Controlled Environmental Agriculture)
 - Development of a hydrogen infrastructure
- Two Packaged CHP panels at DOE's Better Buildings Summit (2020 and 2022)
- Packaged CHP Market Profile Report
- CHP Market Fact Sheet Series on key target markets
- Packaged CHP eCatalog enhancements
- CHP Engagement Partner Profiles that document best practices and lessons learned



<https://betterbuildingsolutioncenter.energy.gov/accelerators/packaged-chp>

Market Sector Fact Sheets

- Brief summaries of key CHP market sectors
- Actionable information on CHP benefits, addressable loads, site requirements, typical systems and brief project profiles
- Account reps, end users, and design community
- Current Fact Sheets:
 - Colleges and Universities
 - Commercial Office Buildings
 - Correctional Facilities
 - Greenhouses
 - Hospitals
 - Hotels
 - Nursing Homes
 - Wastewater Treatment Plants



<https://betterbuildingssolutioncenter.energy.gov/accelerators/packaged-chp/market-sector-fact-sheets>

Next Steps – CHP Engagement Partners

- Complete Enrollment in the eCatalog
 - Including recognizing packages and packagers in your region
- Complete Partner Profiles
 - Brief description of goals, objectives and elements of CHP deployment programs and use of the eCatalog
- eCatalog Customer Engagement Network
 - Vehicle for DOE to maintain a relationship with CHP Engagement Partners on CHP and onsite energy markets
 - Venue for occasional topical webinars, outlet for DOE tools and resources, continuing dialogue with key stakeholder group

Customer Engagement Network

CHP Engagement Network members (utilities, federal agencies, states, and municipalities) commit to promote Packaged CHP Systems (via the eCatalog) to their customers, constituents, or members and to validate the performance and the benefits of packaged CHP. Customer Engagement Programs can range from education and outreach on the benefits and applicability of CHP, to technical assistance in evaluating and implementing CHP, to incentives or other financial support depending on the objectives and resources of individual Customer Engagement Network members.



Packaged CHP eCatalog

Richard Sweetser

CHP eCatalog Summary

The screenshot shows the homepage of the U.S. Department of Energy's Combined Heat & Power eCatalog. The header includes the DOE logo, the site title 'COMBINED HEAT & POWER eCATALOG', and navigation links for 'Contact Us' and 'Sign In'. A secondary navigation bar lists various categories: SEARCH eCATALOG, SITE GUIDE, BENEFITS, FINANCING, RESOURCES, PACKAGERS, SOLUTION PROVIDERS, TRADE ALLY NETWORK, CUSTOMER ENGAGEMENT NETWORK, CHP TAPS, and NEWS & EVENTS. The main content area features a large banner for 'PACKAGED CHP SYSTEMS: RIGOROUS RECOGNITION PROCESS' with a 'SEARCH THE eCATALOG' button indicating '340 CHP Packages Available'. To the left, there is a sidebar with 'COMBINED HEAT & POWER FOCUSED NEWS & EVENTS' and an 'Upcoming Event' section for the '2023 ASHRAE WINTER CONFERENCE' (February 4-8, 2023, Atlanta, Georgia). The event description mentions two seminar panels about CHP and a 'READ MORE' link. Below the banner, there are buttons for 'REGISTER' and 'SITE GUIDE', and a section titled 'CUSTOMER ENGAGEMENT NETWORKS: INCENTIVIZING CHP IN YOUR AREA' with a 'MAXIMIZE YOUR CHP INVESTMENT' sub-header. A paragraph at the bottom explains the network's role in educating end-users and providing assistance.

CHP eCatalog is: a national searchable web-based catalog that provides engineers with DOE recognized CHP suppliers and technical data for application of CHP systems to their projects.

CHP eCatalog audience: end-users with engineering staff, consulting engineers, utilities, state energy offices, regulators, federal agencies, and project developers.

Users search for: applicable CHP system characteristics, and get connected to packagers, installers, utilities and state energy programs.

CHP eCatalog allows users: to compare CHP technology options on a common basis.

CHP eCatalog reach: equipment ranging from 24 kW to 16.7 MW and package solutions in every Zip Code.

New to the CHP eCatalog: Zero Carbon Systems

- 100% Hydrogen CHP Packages
 - 2G and Jenbacher
 - 108 kW – 1 MW
- Back Pressure Steam Turbines (NLine Energy: 272 kW)
- Organic Rankine Cycle Systems (CETY : 140 kW)

eCatalog by the Numbers (January 2023)



Almost 500 new users per month

DOE Packaged CHP eCatalog Packagers

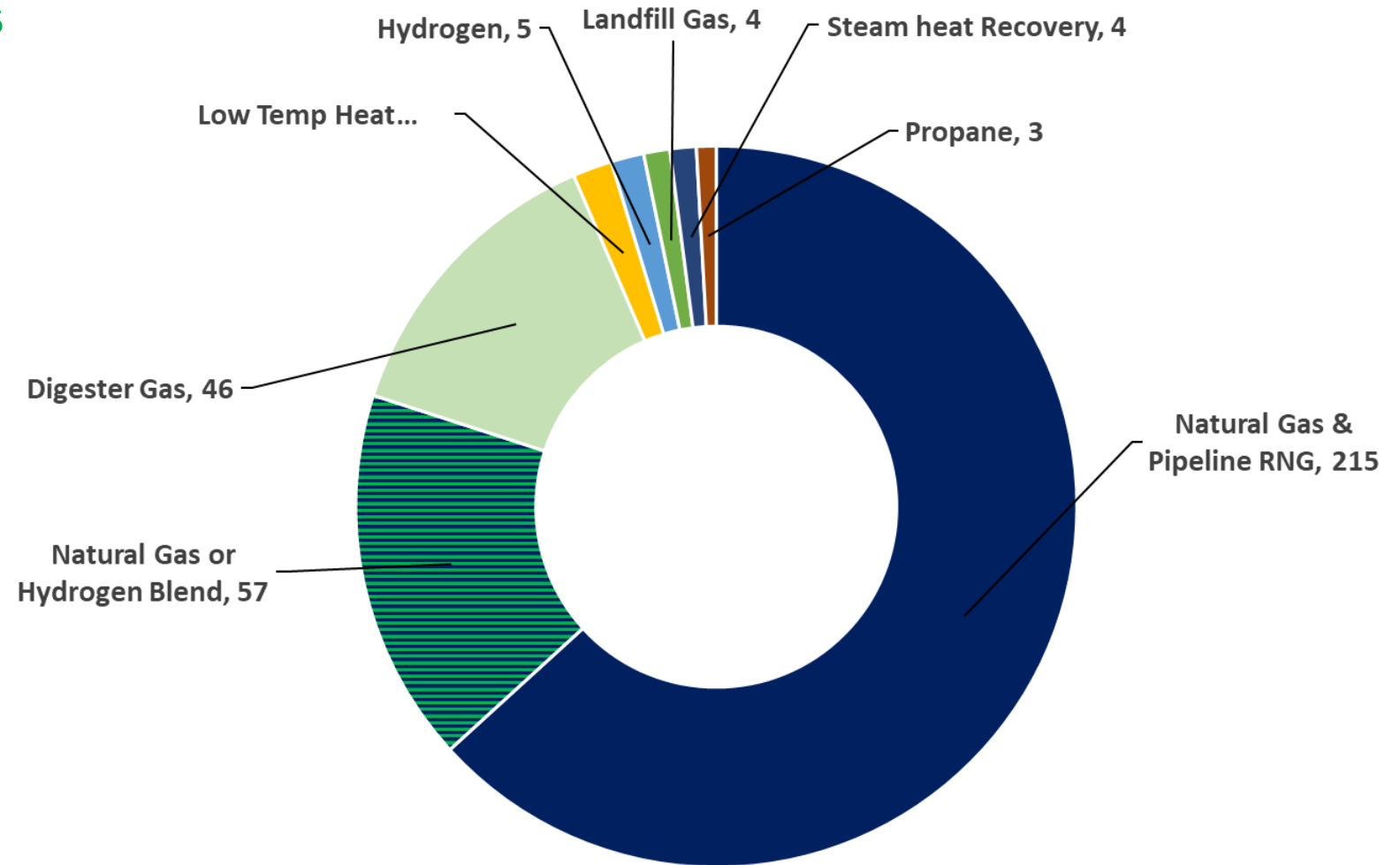


Packaged CHP eCatalog Product Offerings by Fuel Type

340 CHP Product Offerings

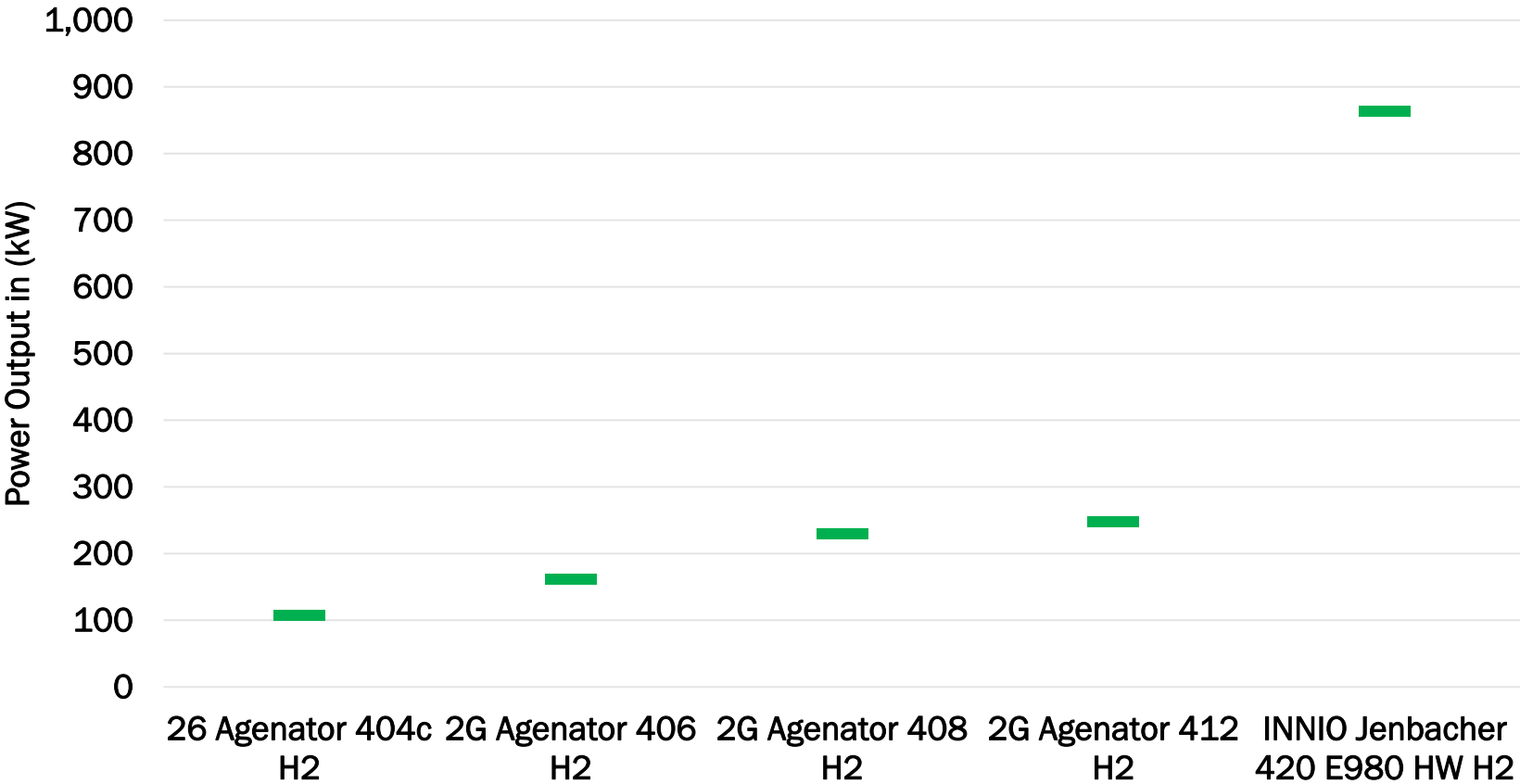
57 of the 272 natural gas CHP systems have posted Hydrogen Blend Capability – with no change to the package.

Note may change performance.



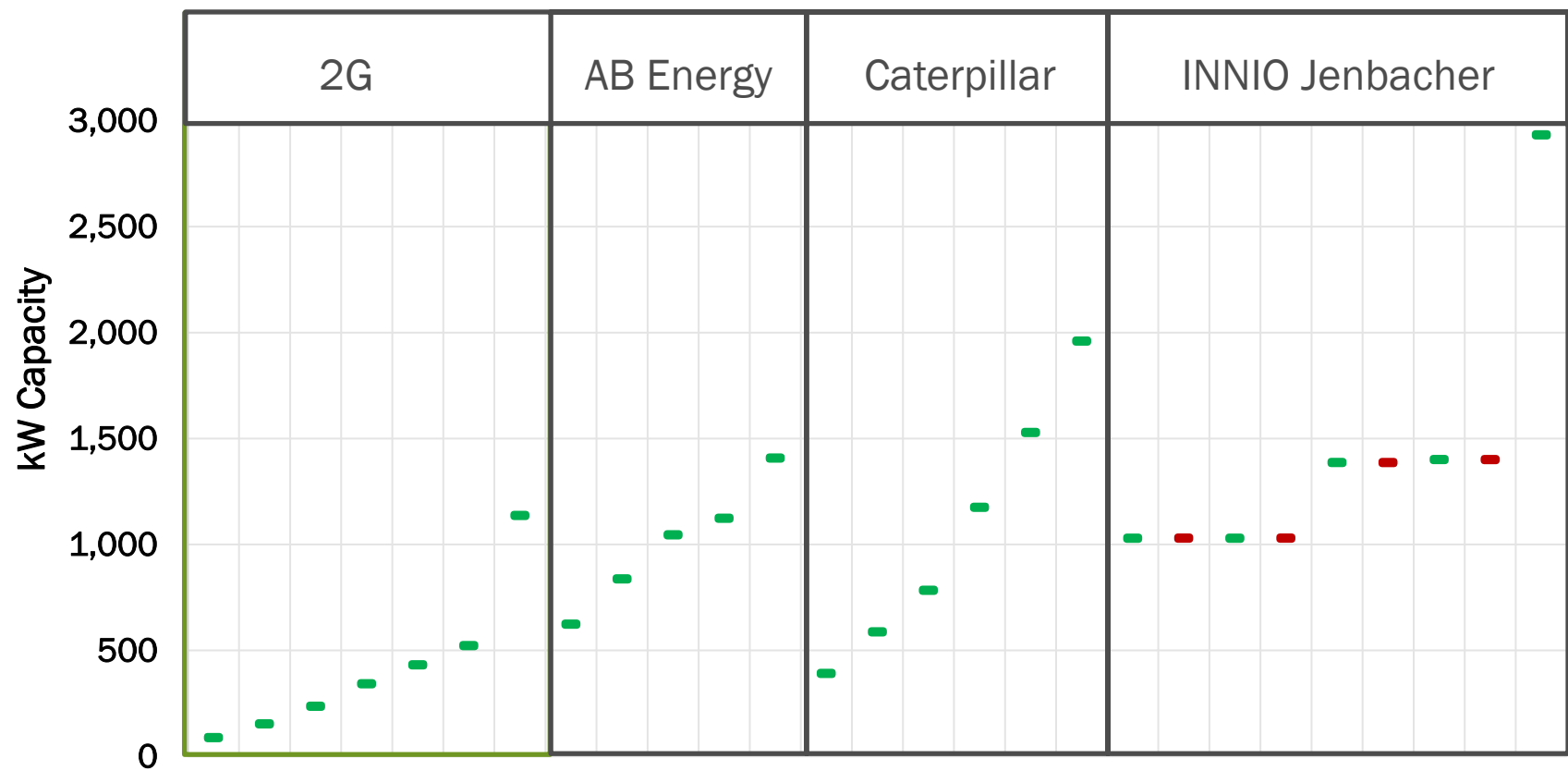
Hydrogen and Renewable Fuels in DOE CHP eCatalog

Currently Five 100% Hydrogen Packages Are Recognized



BIO Gas fueled CHP Systems in the eCatalog

Currently 21 Digester Gas and 4 Landfill Gas Packages are Recognized



2022 CHP eCatalog Growth

2022 Additions









- 4 - Packagers
- 2 - Solution Providers
- 4 - Customer Engagement Partners
- 13 - Trade Allies Joining
- 40 - New CHP Packages
 - 15 - Natural Gas Engine Systems
 - 4 - Digester Gas Engine Systems
 - 4 - Landfill Gas Systems
 - 2 - Propane Systems
 - 5 - Hydrogen Systems
 - 4 - Steam Heat Recovery
 - 6 - Low Temperature Heat Recovery (ORC)

Current eCatalog

- 42 - Packagers
- 26 - Solution Providers
- 18 - Customer Engagement Partners
- 13 - Trade Allies
- 340 - Package Offerings
 - 272 - Natural Gas Engine Systems
 - 46 - Digester Gas Engine Systems
 - 4 - Landfill Gas Systems
 - 3 - Propane Systems
 - 5 - Hydrogen Systems
 - 4 - Steam Heat Recovery
 - 6 - Low Temperature Heat Recovery (ORC)

2022 New Feature – Comparison Capability

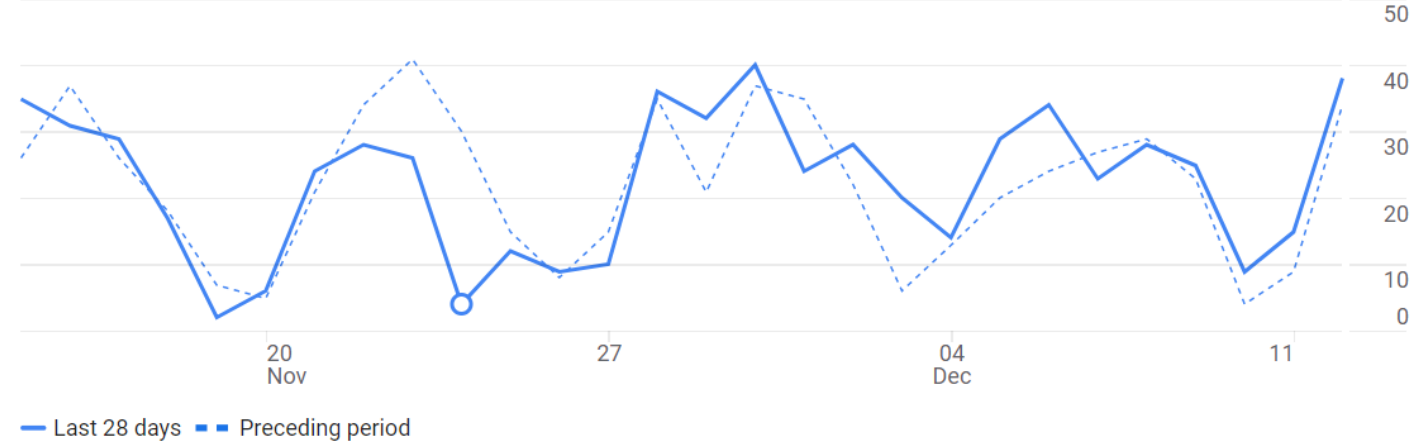
[DOWNLOAD AS PDF](#)
[DOWNLOAD AS EXCEL](#)

Model Number	ECOMAX 20 NGS 1.1 HW	C2000N6CD-NG-HW	avus 2000c NG	MEG S2000N-HW
				
	VIEW PACKAGE DETAILS	VIEW PACKAGE DETAILS	VIEW PACKAGE DETAILS	VIEW PACKAGE DETAILS
Seller	Solution Provider  AB Energy	CHP Packager  Cummins	Solution Provider  2G Energy Inc.	Solution Provider  Martin Energy Group
Prime Mover	Reciprocating engines x1 JENBACHER JGS 612 J01	Reciprocating engines x1 Cummins HSK78G	Reciprocating engines x1 MWM TCG2020v20	Reciprocating engines x1 Siemens 100EM
Net Power Output	1,970 kW	1,956 kW	1,928 kW	1,947 kW
Thermal Outputs	Hot Water	Hot Water	Hot Water	Hot Water
Fuel	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG
Grid Connection Type	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic
Outdoor Placement	Standard Option	Standard Option	Standard Option	Standard Option

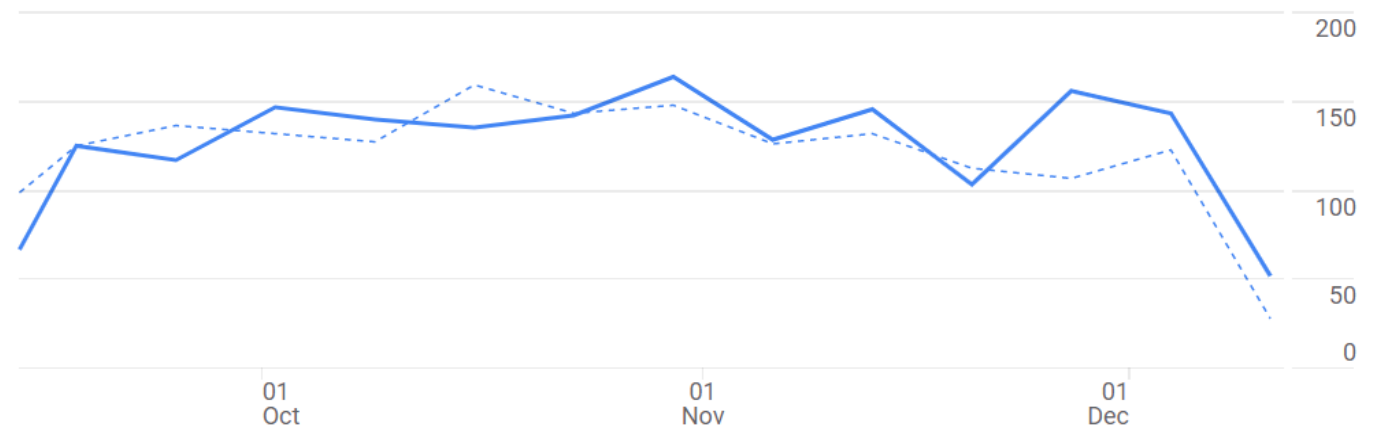
eCatalog High-level Usage

- 508 users in 28 days
- 90% of new users find the eCatalog through a search engine or have a direct link - indicating promoting the site through referrals will have impact
- 1,600 users in 90 days
- Takeaways:
 - the eCatalog is being used
 - promotion and outreach will increase use
 - feedback from you will improve functionality and operability

508 Users 28 Days (Nov 15 - Dec 12)



1,600 Users: 90 Days (Sep 12 - Dec 12)



In the Near-term

- Already added registered user company name and position for better data analytics.
- Will be adding user feedback mechanisms to the eCatalog, for example:
 - After certain searches, have a simple popup and ask the question “was this information helpful?”
 - When someone uses the compare function have a popup that asks “did you find this comparison helpful?”

CREATE AN ACCOUNT

NOTE: A username and password are required to create a basic account. Any additional information you provide will be pre-populated should you choose to enroll as a CHP Packager, Solution Provider, or Customer Engagement Network.

Name, Email, And Password (Required)

First Name

Last Name

Email / User Name

Password

Confirm Password

Zip

Company Name

Company Position/Title





Additional Information (Optional)

Contact Title

Phone Number

Street Address

City

Model Number	JMC 320 D805 HW	ECOMAX 10 NGS 1.1 HW	Quanto 1200 C	C1000S-ICHP HPNG DM Max Efficiency
				
	<div><div>VIEW PAGE</div><div>CHP JENB</div><div>INNIO</div></div>			<div><div>VIEW PAGE</div><div>CHP JENB</div><div>INNIO</div></div>
Seller				
Prime Mover	Reciprocating Engine JGS20 D805	JGS 320 D805	TCG 2020 V12	Corporation C200
Net Power Output	1,030 kw	1,046 kw	1,176 kw	1,000 kw
Thermal Outputs	Hot Water	Hot Water	Hot Water	Hot Water
Fuel	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG	Natural Gas or Pipeline RNG
% Hydrogen that can be accepted as currently configured*	20%	n/a	n/a	n/a
*FOR NON-100% HYDROGEN FUEL: ALL PROVIDED PERFORMANCE FIGURES BASED ON NO HYDROGEN ADDED				
Grid Connection Type	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic	Grid Parallel and Stand-alone Transition: Automatic
Outdoor Placement	Indoor Only	Standard Option	Standard Option	Standard Option
Performance				
Model Number	JMC 320 D805 HW	ECOMAX 10 NGS 1.1 HW	Quanto 1200 C	C1000S-ICHP HPNG DM Max Efficiency
Gross Electricity Output	1,062 kw	1,062 kw	1,200 kw	1,000 kw
Net Electricity Output	1,030 kw	1,046 kw	1,176 kw	1,000 kw
CHP Fuel Input (MMBtu per hour HHV)	10.25 MMBtu/hr	10.11 MMBtu/hr	10.40 MMBtu/hr	11.40 MMBtu/hr
Net Electric Efficiency % (HHV)	34.3%	35.3%	38.6%	29.9%
Hot Water				
Model Number	JMC 320 D805 HW	ECOMAX 10 NGS 1.1 HW	Quanto 1200 C	C1000S-ICHP HPNG DM Max Efficiency
Hot Water Flow	250 gpm	247 gpm	371 gpm	500 gpm
Supply Temp to Site	180 °F	180 °F	180 °F	180 °F
Return Temp from Site	140 °F	140 °F	158 °F	163 °F
Hot Water Capacity	4.60 MMBtu/hr	4.56 MMBtu/hr	4.08 MMBtu/hr	4.30 MMBtu/hr
Thermal Efficiency %	44.9%	45.1%	39.2%	37.7%
Emissions				

U.S. DEPARTMENT OF ENERGY

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In the Near-term

- Support Recognized Packagers in completing their offerings
- Continue partnership through Customer Engagement Partner Network
- Increase market outreach of the eCatalog to key target audiences
 - Conferences
 - IDEA CampusEnergy2023
 - Energy Solutions Center
 - DOE CHP TAPs
 - All use and promote the eCatalog
 - Can support local eCatalog events
 - Increase trade articles about the eCatalog

WANTED: YOUR IDEAS

We welcome your ideas about target audiences, conferences, key meetings, and other ways to spread the word and increase visibility of the eCatalog.

Packaged CHP Market Profile

David Jones

Highlights from Packaged CHP Technology Overview and Market Report

- Packaged CHP Technology Overview and Market Profile Report
- Sent to Packaged CHP Accelerator partners along with “save the date” email for this meeting
- We would appreciate any high-level comments or suggestions that we should incorporate into the final version



Packaged Combined Heat and Power (CHP) Technology Overview and Market Profile

JANUARY 2023

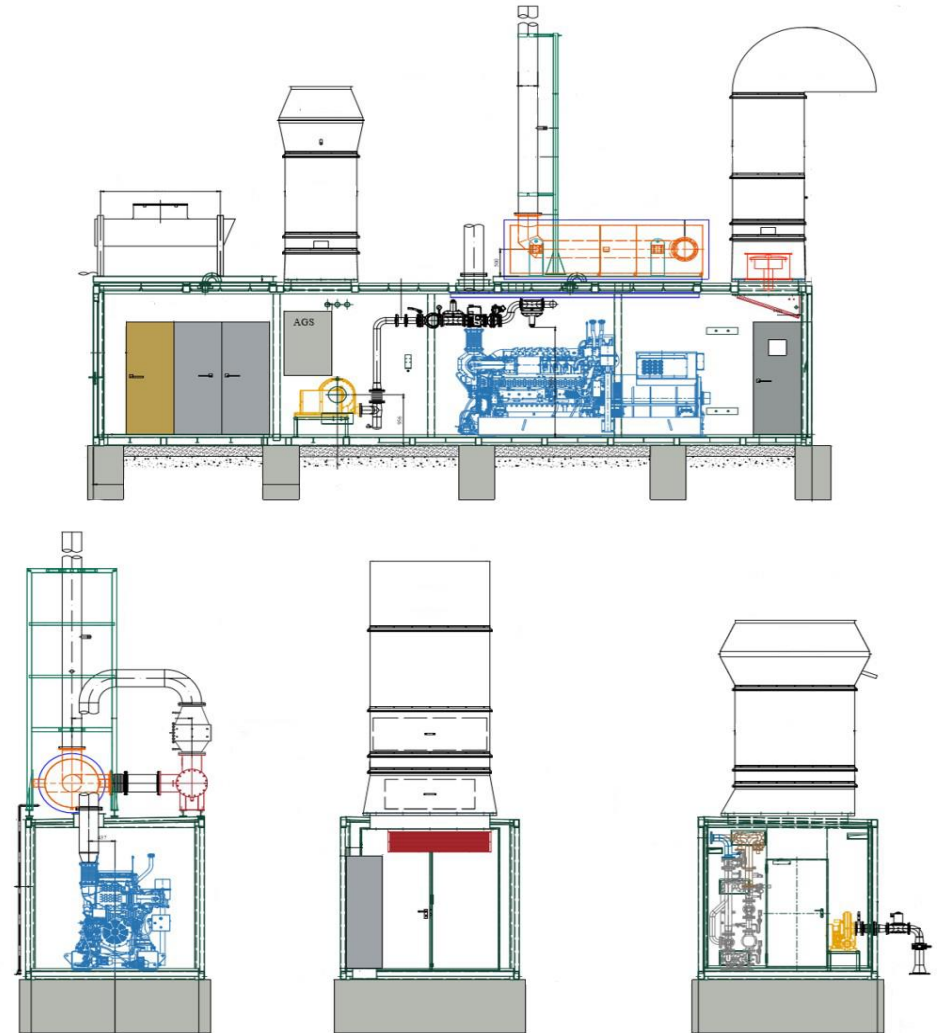
U.S. DEPARTMENT OF
ENERGY

Agenda

- *Packaged CHP Benefits*
- *Packaged CHP in Non-Traditional Markets*
- *Cost and Time Reductions from Packaged CHP*
- *Packaged CHP Offerings and Suppliers*
- *Packaged CHP Market Profile*

Packaged CHP System Are Standard Repeatable Designs

- Standardized, pre-engineered CHP system
- Includes all equipment, piping, wiring and ancillary components
- Minimal onsite engineering and design requirements
- Can be shipped as single or multiple modules with standard interconnections
- Standard maintenance contracts and third party own/operate options

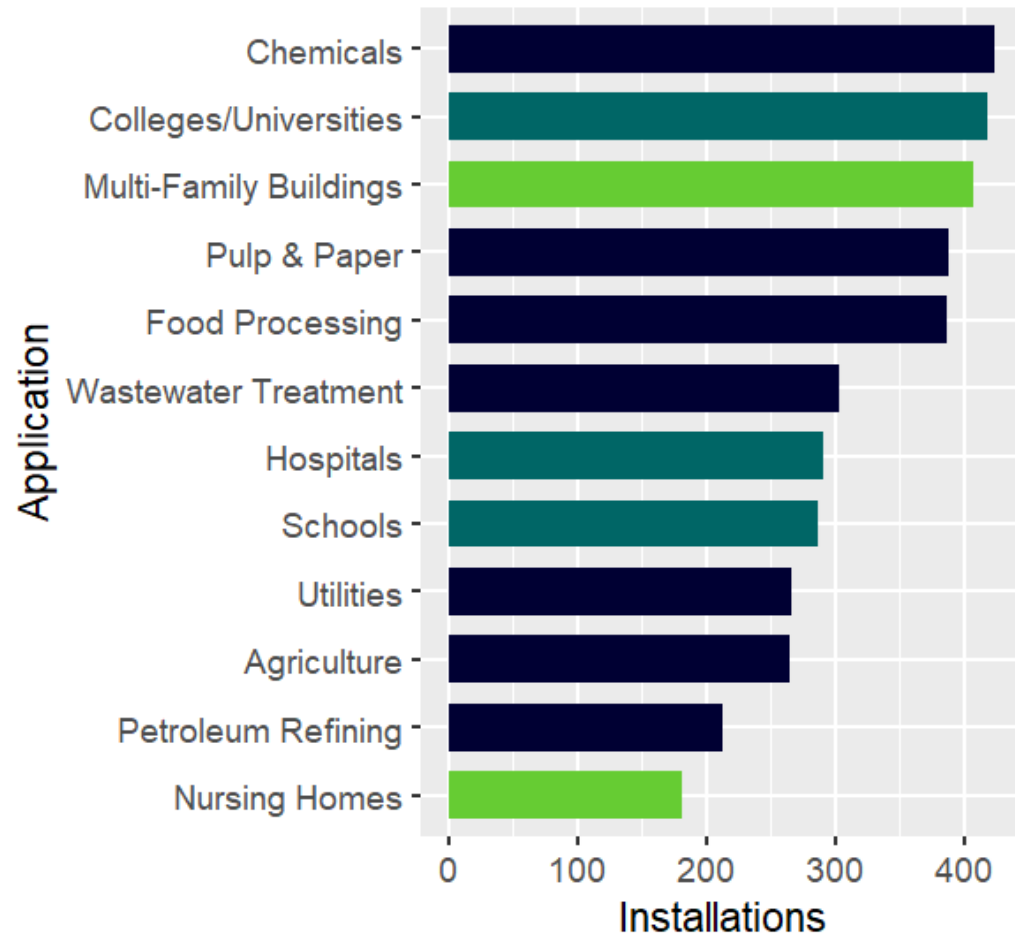


Packaged CHP Systems Enable CHP Benefits for Non-Traditional Sectors

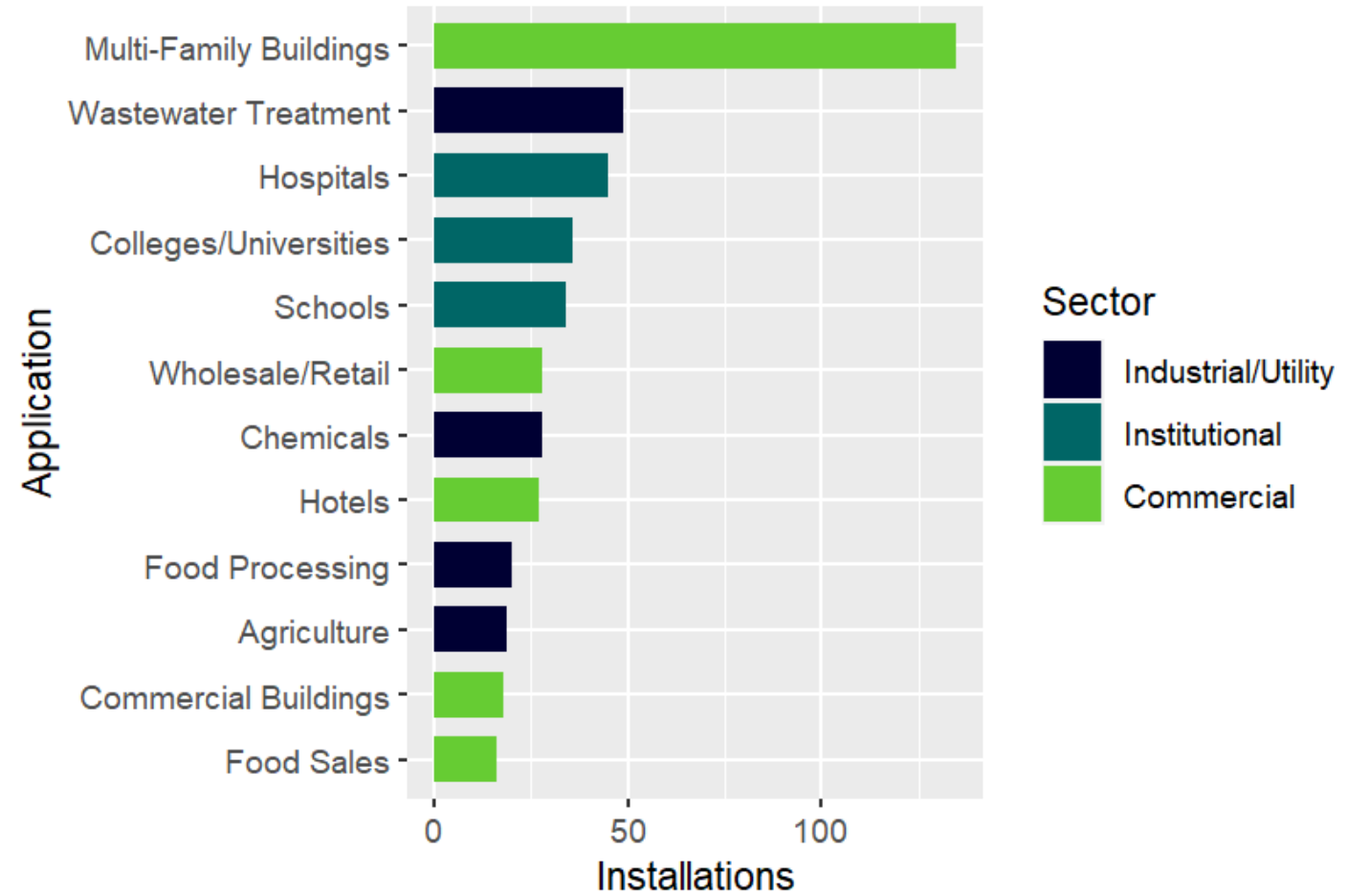
- The features outlined in previous slide – *standard, repeatable designs with minimal engineering requirements* – make CHP more accessible to **non-traditional** CHP sectors
- Traditionally, most CHP systems were custom-engineered at large industrial or institutional facilities
- Packaged CHP systems open up the market to **smaller residential, commercial, and institutional applications**
- NYSERDA CHP Catalog Program: **over 90%** of packaged CHP systems were installed in residential/commercial/institutional sectors, <1 MW in size
 - Over 50% installed at multifamily buildings
- As packaged CHP systems have become more predominant, a trend towards non-traditional CHP sectors can be seen in the DOE CHP Installation Database

CHP Installations have Shifted from Industrial to Commercial/Institutional

Pre-2017



2017-2021

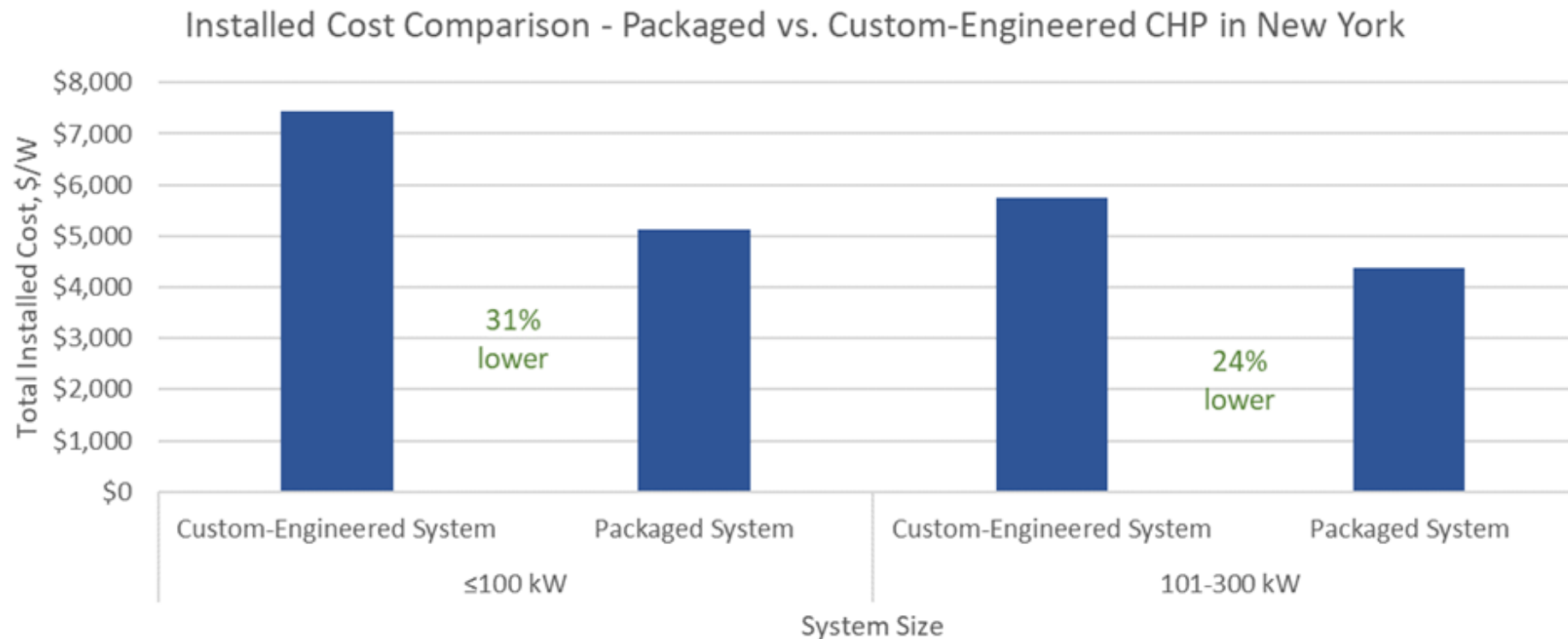


Source: ICF analysis of CHP Installation Database data, September 2022

Analysis of Cost and Time Reductions from Packaged CHP

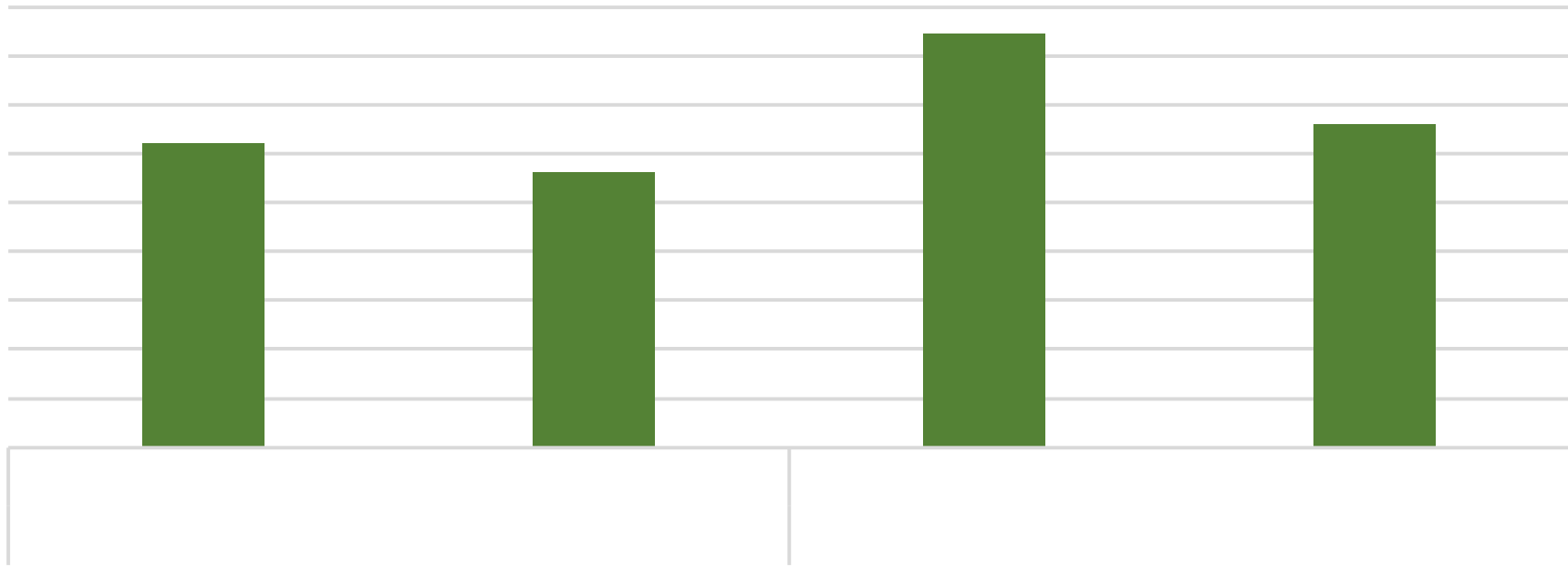
- DOE CHP Deployment program collected data on CHP installation costs and timelines for packaged systems and custom-engineered systems
- Data can be difficult to collect, and regional differences can lead to mismatched comparisons
- The NYSERDA CHP Program collected cost and installation time data on custom-engineered and packaged CHP systems, offering directly comparable data with regional similarities
- NYSERDA data was assembled, outliers and exceptional projects were removed, and average cost and time differences were compared for custom-engineered and packaged CHP systems

Project Cost Reductions from Packaged CHP



Packaged CHP systems offered significantly lower costs than custom-engineered systems installed through the NYSERDA CHP Program

Project Time Reductions from Packaged CHP



Packaged CHP installations had reduced timelines between the start of the project and final commissioning in New York compared to custom-engineered systems.

DOE Packaged CHP eCatalog Growth in Offerings

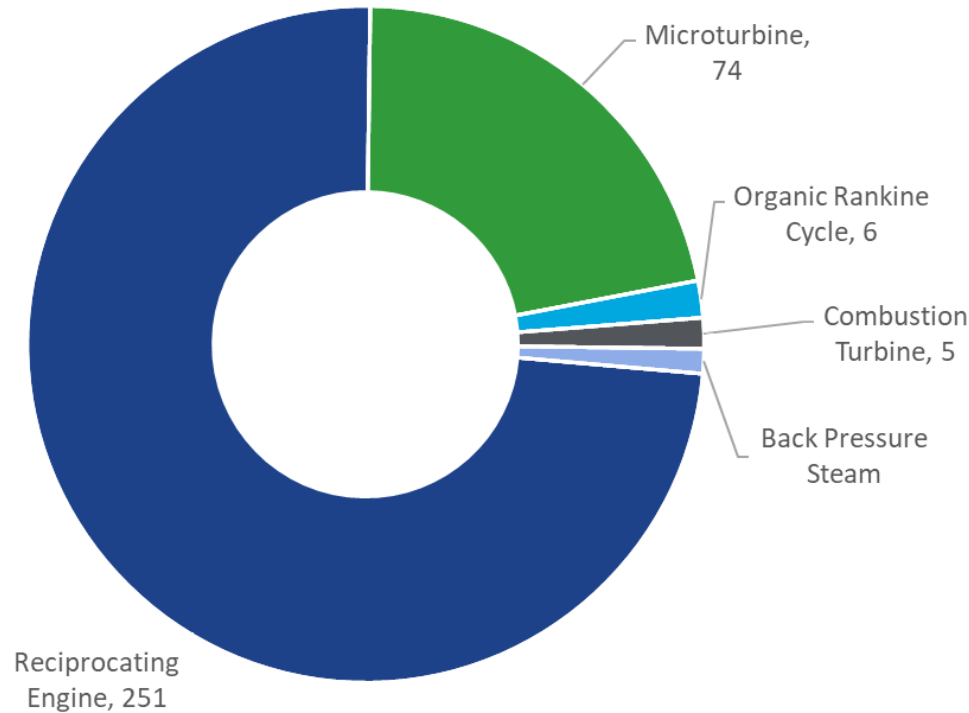
As of 2022, the Packaged CHP eCatalog includes:

- 340 packaged CHP system offerings
- 42 recognized CHP packagers
- 26 solution providers
- Reciprocating engines, microturbines, gas turbines, steam turbines, and ORCs
- Systems using natural gas, propane, biogas, hydrogen, and waste heat for fuel

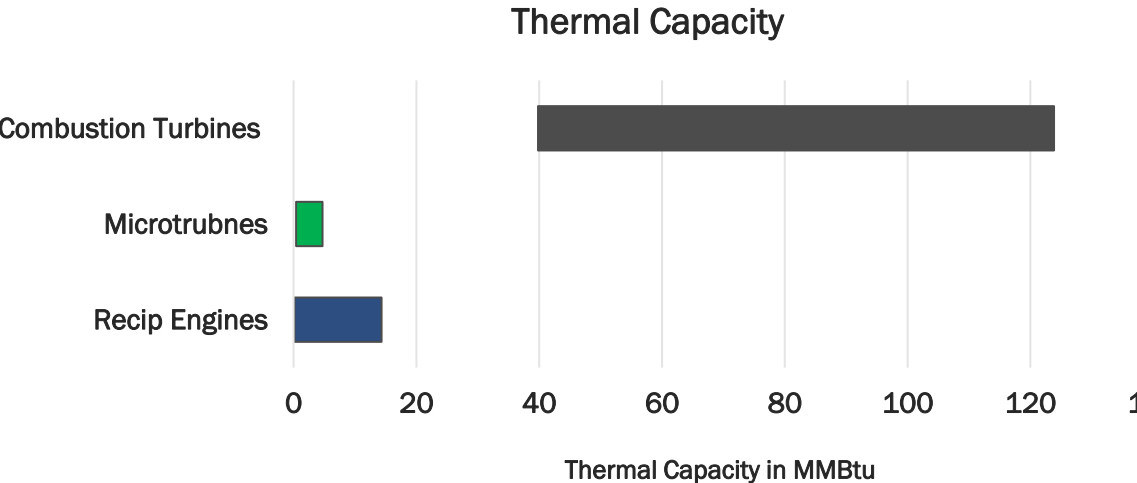
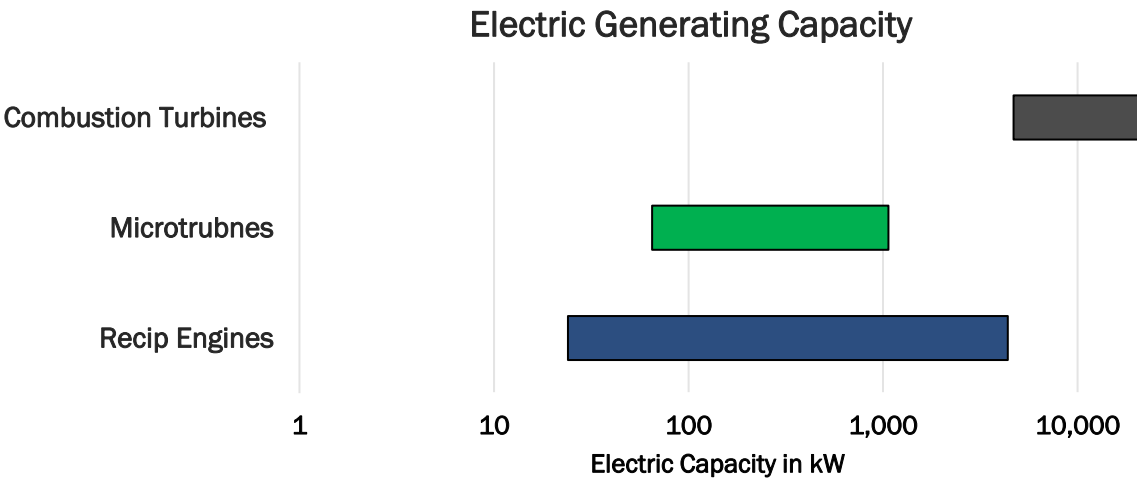


CHP eCatalog Offerings Cover all Technologies, Sizes, and Thermal Offtakes

340 CHP Package Offerings in eCatalog



Thermal offtakes: hot water, steam, chilled water (all combinations); direct process drying

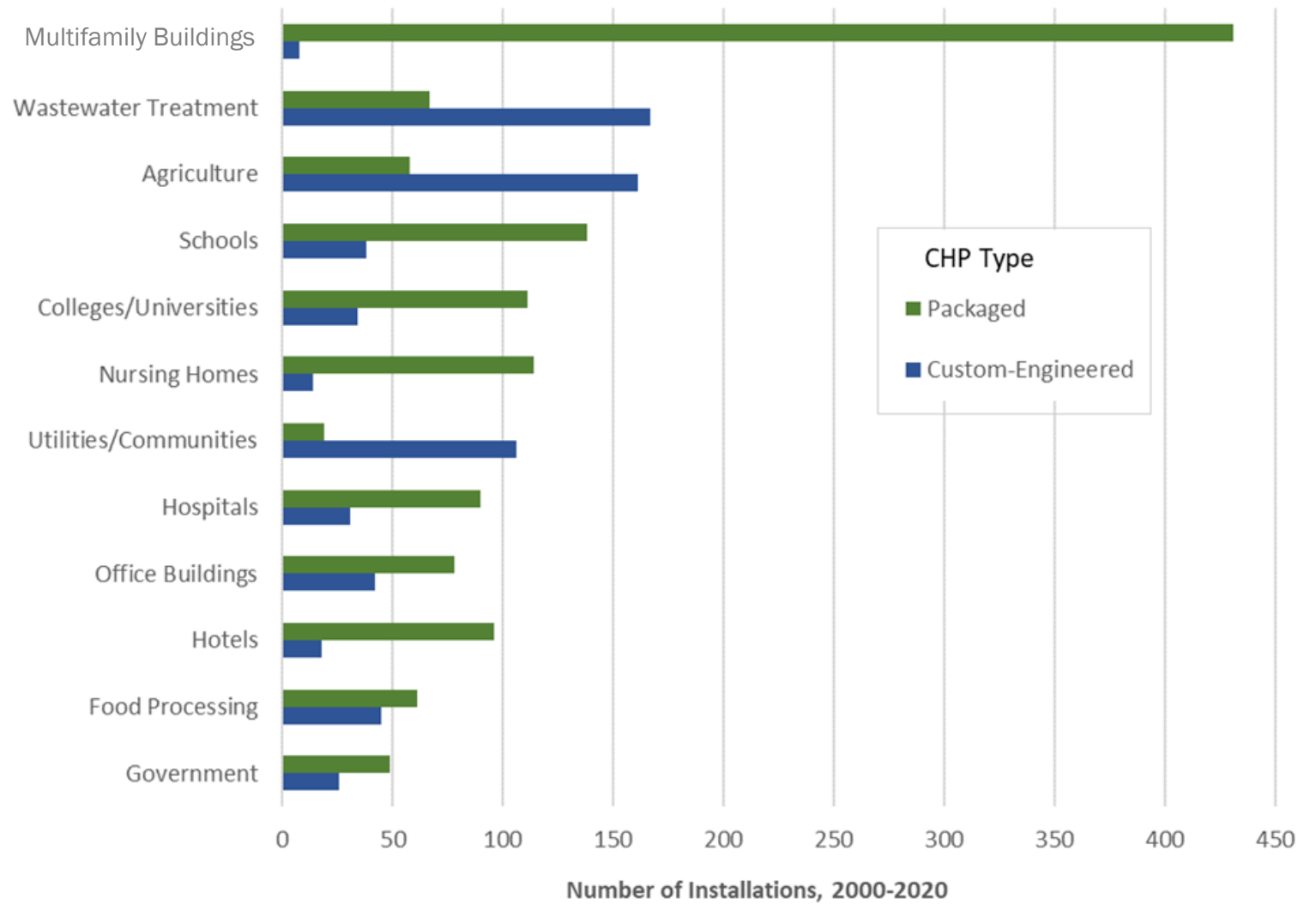


Key Markets for Packaged CHP

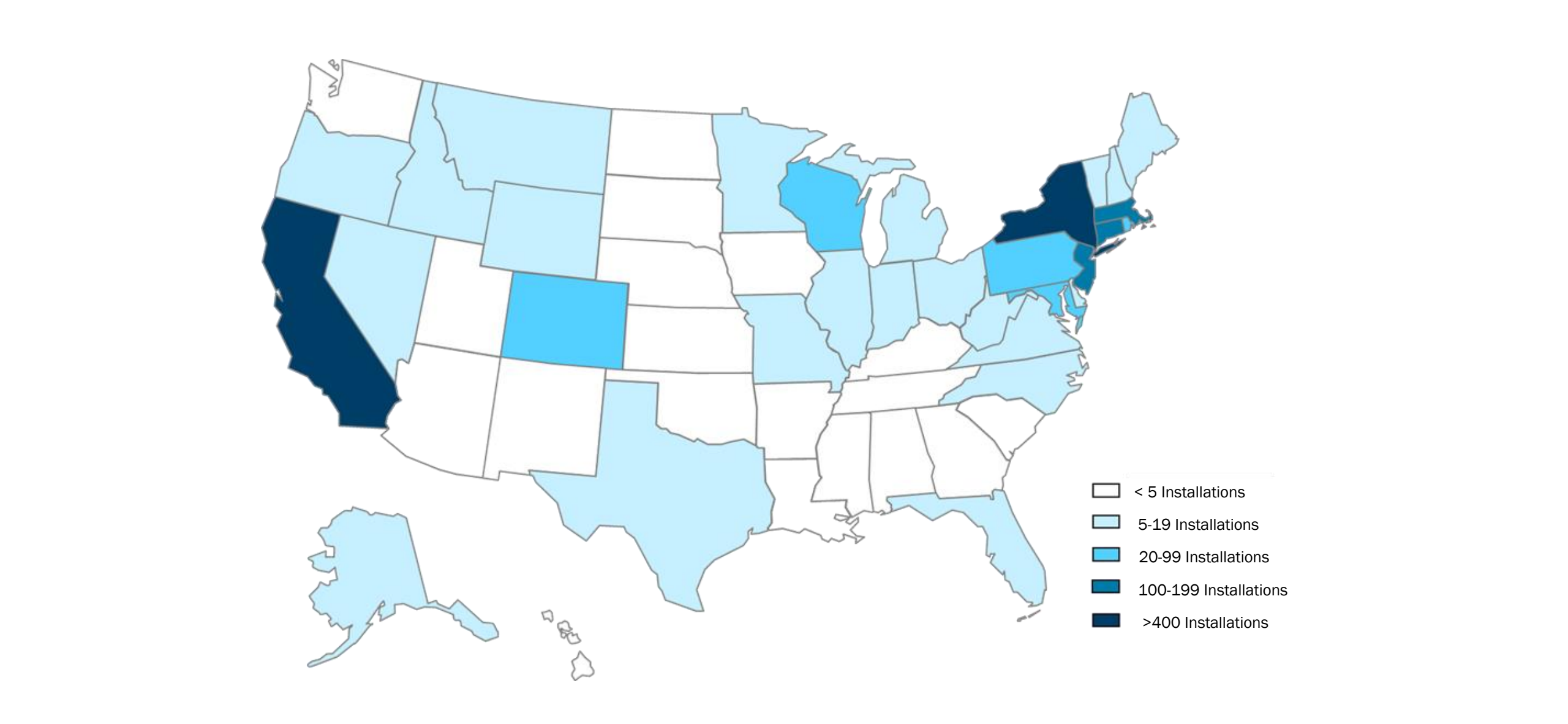
DOE CHP Deployment Program evaluated CHP installations from 2000-2020 to determine if they were packaged or custom-engineered.

Packaged systems have expanded the CHP market to include a variety of market sectors, including small commercial, institutional, and multifamily facilities that can realize the benefits of CHP.

Industrial facilities (i.e. food processing) can also benefit.



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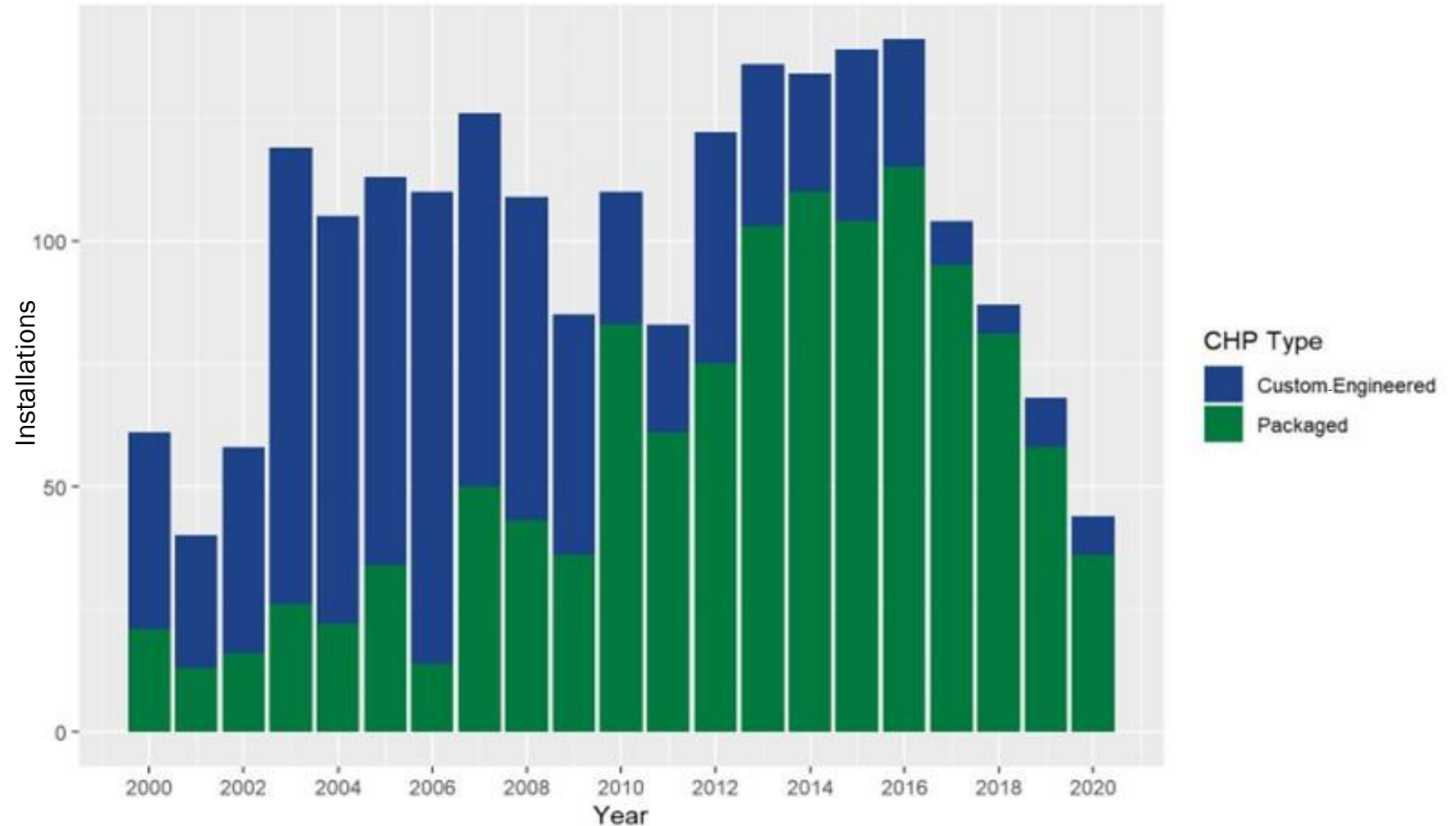


Growth in Packaged CHP Systems Over Time

Steam turbines and gas turbines have traditionally been custom-engineered for large industrial and institutional applications.

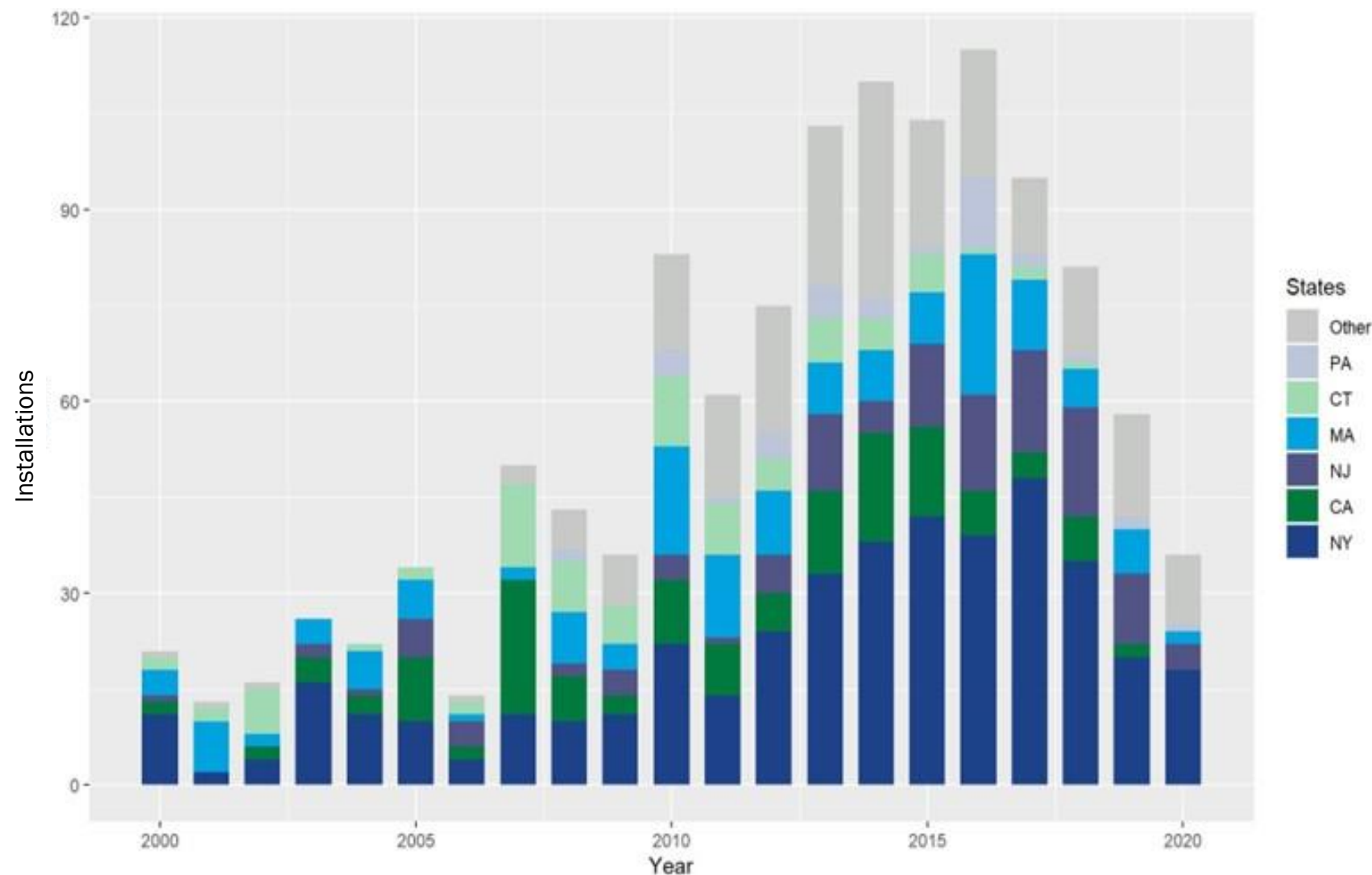
Microturbines and fuel cells have consistently been installed as Packaged CHP systems throughout the 2000s.

Reciprocating engines – the most common CHP prime mover – have experienced a dramatic shift from Custom-Engineered to Packaged CHP from 2000 to 2020



Top States for Packaged CHP Reciprocating Engine Installations

California and the Northeastern states dominated the market for packaged CHP engines in the early 2000s, with increased deployment taking hold in other states by 2010 and further increasing throughout the 2010s.



Packaged CHP Market Profile Summary

- Packaged CHP systems **reduce installation cost and time** compared to custom-engineered systems
- Packaged CHP offerings have **opened the CHP market for smaller and non-traditional sectors**
- DOE Packaged CHP eCatalog has expanded to include a wide breadth of packaged CHP offerings
- Packaged CHP system installations have been increasing in non-traditional sectors, gaining market share compared to custom-engineered systems
 - From 2016 to 2020, over 70% of all CHP installations, and 85% of CHP engine installations were packaged CHP systems
- In the future, packaged CHP will continue enabling more facilities in traditional and non-traditional sectors to realize the benefits of CHP

DOE Onsite Energy Program

Meegan Kelly, Technology Manager

Industrial Efficiency and Decarbonization Office

Office of Energy Efficiency and Renewable Energy

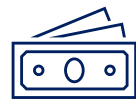
January 26, 2023 | Packaged CHP Accelerator



Onsite Clean Energy in the Industrial Sector

- Manufacturers are increasingly seeking to integrate clean energy at their facilities and identify clean technology solutions that can **replace onsite fossil-fueled equipment**
- Companies encounter **considerable barriers** to deploying onsite technologies needed to meet GHG reduction goals and renewable energy targets
- Independent analytical tools, technical assistance, and other resources are needed to support industry in **identifying and installing cost-effective onsite technology options**

Key Barriers to Onsite Energy Deployment



cost of new equipment



high-temperature processes



policy and regulation



space availability



utility engagement



workforce issues

Adapting to Support Partners' Decarbonization Goals

Leverage CHP program model and expand to include a broad range of clean on-site energy and storage technologies to meet decarbonization goals.

battery storage | combined heat and power | district energy | fuel cells | geothermal
industrial heat pumps | renewable fuels | solar PV | solar thermal | thermal storage | wind

Near-Term Goals

- Decrease emissions as quickly as possible
- Minimize the use of fossil fuels
- Complement increased use of wind, solar, and storage
- Provide long-duration resilience

Long-Term Goals

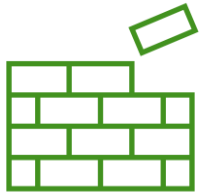
- Use renewable fuels in high-impact applications as efficiently as possible
 - hard to decarbonize industries
 - critical facilities that need long duration resilience and operational reliability
- Support a resilient, renewable energy sector and economy

Onsite Energy Program

Future Focus Areas

- Support deployment of clean onsite energy technologies
- Assist industry in identifying cost-effective options for achieving targets
- Highlight pathways for accelerating the integration of onsite technologies
- Reduce GHG emissions in industry while prioritizing disadvantaged communities

Key Planning Considerations



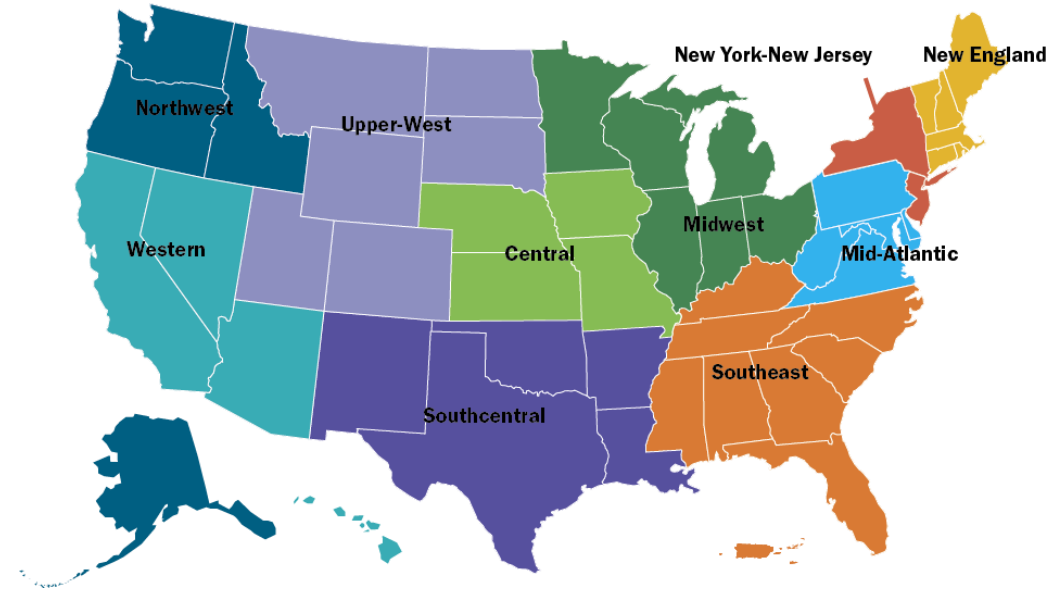
Build on existing program models to maintain key components while delivering new, expanded solutions



Ensure resources and technical support are designed to have impact and meet stakeholder needs



Design activities to fill gaps and avoid duplicating what the market is already adequately addressing



CHP TAPs Program Regional Structure

Additional Information

Department of Energy Issues Notice of Intent to Fund Onsite Energy Technical Assistance Partnerships

<https://www.energy.gov/eere/amo/articles/department-energy-issues-notice-intent-fund-onsite-energy-technical-assistance>

Onsite Energy Technical Assistance Partnerships Funding Opportunity Notice of Intent

<https://www.energy.gov/eere/amo/onsite-energy-technical-assistance-partnerships-funding-opportunity-notice-intent>

Onsite Energy Teaming Partner List

<https://eere-exchange.energy.gov/TeamingPartners.aspx?foaid=defdc203-6b11-45db-a6cc-39a5bb592ad9>





Thank you

Email: Meegan.Kelly@ee.doe.gov

For additional information and to subscribe for updates:

manufacturing.energy.gov



Questions / Discussion

Questions



DOE CHP Team

Anne Hampson, Program Manager, U.S. DOE Industrial Efficiency and Decarbonization Office

Anne.hampson@ee.doe.gov

Meegan Kelly, Technology Manager, U.S. DOE Industrial Efficiency and Decarbonization Office

Anne.hampson@ee.doe.gov

Packaged CHP Network Coordinator	eCatalog Coordinator	CHP TAP Coordinator
Bruce Hedman	Rich Sweetser	Patti Garland
Entropy Research	Exergy Partners	DOE (Contractor)
202-251-0017	703-819-3203	240-474-2567
bhedman.entropyresearch@gmail.com	rsweetser@exergypartners.com	patricia.garland@ee.doe.gov

<https://chp.ecatalog.ornl.gov/>

<https://betterbuildingssolutioncenter.energy.gov/accelerators/packaged-chp>