Advanced Manufacturing Office



Energy Efficiency & Renewable Energy



Packaged CHP Accelerator and eCatalog.

Bruce Hedman

Headquarters Support Team

Non-Traditional CHP Markets are an Untapped Resource

- Large CHP potential in commercial, institutional, light manufacturing, government and military applications
- Markets utilize smaller systems (< 10MW)
- 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



U.S. DOE CHP Deployment Program, 2016.



Interest in CHP is growing in these Markets



Source: DOE CHP Installation Database (U.S. installations as of Dec. 31, 2017)



DOE Packaged System CHP eCatalog Program

- Designed to increase deployment of CHP in key markets that have been underdeveloped due to a variety of barriers that increase the perceived risks to both end-users and suppliers.
- These markets are served by smaller systems (generally less than 10 MW), which are conducive to packaging and/or modularization.

Application (no export of electricity)	50-500 kW)	50-500 kW) 0.5 - 1 MW 1 - 5 MW 5 - 10 MW				> 20 MW	Total	
Industrial	6,281	4,351	15,567	9,064	7,971	21,157	65,381	
Commercial	20,068	18,100	20,284	5,504	3,948	8,026	75,930	
Total	26,349	22,451	35,470	14,568	11,919	30,183	140,941	

Source: US DOE CHP Technical Potential in the US, June 2017



Ultimate Objective is to Promote Self-Sustaining Markets

 Build upon the successful CHP model developed by NYSERDA to reach regional/national markets where CHP value streams will eventually develop into a self-sustaining and robust markets.



Reduces risk to customer, and reduce sales, marketing and installation costs for developer



NYSERDA's Packaged CHP Catalog Program

 NYSERDA Packaged CHP Catalog - Reducing perceived risk of installing and operating CHP by offering comparable standardization of CHP systems and field service agreements.



- Requires single-point-responsibility as the basis for customer-vendor relationship and replicability.
- Ramped-up Approved CHP Vendors and their Approved Packages from launch in 2013 (8 Vendors, 36 packages) to end of 2017 (20 Vendors, 219 packages).

NYSERDA's Program Impact

- Reduced project implementation timelines (from project approaching NYSERDA to commissioning) by 44%
- Reduced total project costs by 24% \$3,150/kW).



• Increased project uptake in NYSERDA CHP incentive program



U.S. DOE's Packaged CHP eCatalog



Reducing Risks for End-Users and Vendors

 Combination of web-based Catalog of DOE recognized packaged systems and suppliers, and state/utility partners with CHP market engagement programs is targeted to reduce total project costs and installation times for CHP systems in these markets by 20%.





Reducing Design and Installation Errors

• Creating replicable CHP systems to reduce design errors and limit uncertainty with the associated performance, time, and cost impacts.



Source: Packaged CHP System Catalog - Enrolled Vendor Ally User's Guide



Fostering Competition

Expanding CHP product offerings, improving quality, and controlling costs by promoting increased competition.



New York State Energy Research and Development Authority (NYSERDA)



Wednesday, September 17, 2014 The TimesCenter 242 West 41st Street Manhattan NY Expo Hours - 2:00 p.m. to 7:00 p.m. Register today: chpExpoManhattan.eventbrite.com

There is no cost in attend this event

Manhattan

NYSEFDA's Combined Heat and Power Expo is designed to help commercial, industrial, and multifamily building owners and managers connect with pre-approved Combined Heat and Power (CHP) equipment windows and other cognizations of deriving financial increatives and technical support for the nstallation of CHP systems. NYSERDA's CHP programs offer incentives for systems 50 kW and larger.

Building owners, managers, and other representatives are invited to stop by and speak with CHP system vondors, NYSERDA staff, and U.S. Department of Energy's CHP Technical Assistance Partnership repvalues, in central value, and out opportunities available to capture significant energy savings and improve the resiliency of their buildings.

The Expo will feature:

· Information from vendors of pre-approved CHP systems featured in NYSEBDA's CHP Catalor Information on the in entives available for CHP through NYSEFIDA's complementary pair of CHP
G&A time with representatives from
Con Edison, National Grid, NYCEEC,
 programe: - CHP Acceleration Program (PON 2568) - CHP Performance Program (PON 2701)

 Information on FREE technical assistance and project acreening offered through the U.S. Department of Energy's Northeast CHP Technical Assistance Partnership and the NYC Department of Buildings

Register today: chpExpoManhattan.eventbrite.com

Nee note: This event is intended to address medius ings (those with a monthly electric bill of \$5,000 or mor





November 22, 2013 The TimesCenter - 242 West 41st Street

here is no cost to attend this event

Albany

Tuesday, May 20, 2014 Sheraton Brooklyn New York Hotel 228 Duffield Street, Brooklyn, NY Expo Hours - 10:00 a.m. to 3:00 p.m. . There is no cost to attend this event.

Brooklyn



Reducing Customer Acquisition Costs

• Reducing customer acquisition costs for CHP vendors, and lower costs for the user.





DOE Packaged CHP eCatalog – Key Definitions

- User
- Packager
- Solutions Provider
- Recognized Packaged System
- Customer Engagement Partner







ABOUT eCATALOG

ABOUT CHP & PACKAGED SYSTEMS



SEARCH eCATALOG

Installation and Assurance Plan offered in this location _____

kW

POWER OUTPUT

Help Me Choose

PRIME MOVERS

- Reciprocating engines
- Combustion turbines
- O Microturbine
- O Fuel Cell

THERMAL OUTPUT

- Hot Water Only
- □ Chilled Water Only
- Hot Water and Chilled Water
- O Steam Only
- O Steam and Hot Water
- Steam and Chilled Water
- □ Steam, Hot Water, and Chilled Water

FUEL TYPE (1)

- O Natural Gas
- Propane
- Digester Gas
- Landfill Gas

GRID CONNECTION TYPE

- □ Grid Parallel Only
- Grid Island, Black Start, Manual Transfer
- □ Grid Island, Black Start, Auto Transfer

FIND PACKAGES

or SHOP ENTIRE eCATALOG



FOR PACKAGERS & SOLUTION PROVIDERS MARKET ENGAGEMENT PROGRAMS

PACKAGED CHP SYSTEMS. RIGOROUS RECOGNITION PROCESS.

UPDATES

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 responsibility.

MARKET ENGAGEMENT PROGRAMS: INCENTIVIZING CHP IN YOUR AREA MAXIMIZE YOU CHP INVESTMENT WHEN YOU INSTALL QUALIFYING SYSTEMS

State, local and utility programs are designed to remove barriers and or incentivize technologies that improve energy efficiency, reduce electric demand, improve resiliency and/or reduce emissions. CHP systems often qualify for these programs. State and local agencies, as well as utilities with CHP programs that have selected to use the eCatalog an integral part of their program have entered their locations where their programs are in effect. When you search the eCatalog, using your site ZIP code, the equipment cards will show an icon indicating that the equipment is eligible for a program. Also the specific program entity will appear on the right margin of the equipment detail sheets.

ABOUT CHP & PACKAGE SYSTEMS

SHOP THE ECATALOG

BECOME A PACKAGER OR SOLUTION PROVIDER

FOCUS YOUR RESULTS o

DISPLAYING: 500 Packages ordered by Relevance

reset | save search | view favorites

PRIMARY SITE LOCATION

22307

Selected: Alexandria, VA

ASSURANCE PLAN OFFERED

Prioritize systems that offer an assurance plan.

CUSTOMER ENGAGEMENT PARTNER

Prioritize program-aligible packaged systems.

POWER OUTPUT (kw) 0

1000 Size

APPLY Help Me Choose

Target Range: 700 km to 1200 km

"Default includes a max, of 120% of unit size and a min. of 70% of unit size.

Consider Multiple Units

PRIME MOVERS 0

- Reciproceting engines (125)
- Combustion turbines (158)
- Microturbine (159)
- Evel Cell (128)

THERMAL OUTPUTS 0

- Hot Water Only (76)
- Chilled Water Only (139)
- Hot Water and Chilled Water (72)
- Steam Only (129)
- Steam and Hot Water (t)
- Steem and Chilled Water (152)
- Steam, Hot Water, and Chilled Water (c)

FUEL TYPE 0

- Netural Gas (155)
- Propene (157)
- Digester Gas (129)
- Landfill Gas (129)











922 kw

dog kw

Hot Weter Only

Natural Gas

Hot Weter Only

Naturel Gas

Percilei Only

fake.ecatalog.industrialenergytools.com



O Rack to Search Results

MCLAUGHLIN-WIEGAND: TEMPORA-260-Z15

OVERVIEW

1



PACKAGED CHP SYSTEM HIGHLIGHTS

KEY PERFORMANCE DATA

58.6%

2

922

Reciproceting engines

Feest, Toy and Kahlerim 899

KesslenLongworth

Solution Provider	McLaughlin-Wegand	CHP Design Efficiency 1
Nodel	TEMPORA-260-215	Prime Mover
Thermal Outputs	Hot Water	
Assurance Plan	Depends on location	Number of Prime Mover
and Connection Type	Grid Perellel Only	Net Power Output (kW)2

1. (Net Power Output + Thermal Output) / Energy Input at 591F and 100% gross power

2. Net Power Output is Gross Prime Mover Power less CHP system percentics, less fuel gas booster if required and less chiller percentics during chiller operation

Hot water capacity is usable energy assuming 180F supply and minimum allowable return temperature to the Packaged CHP System

MCLAUGHLIN-WIEGAND | COMPANY DESCRIPTION

Quo cupiditate accusantium voluptas tempora voluptates. Esse lusto dolorem odit a corporis. Maxime ratione excepturi quasi.



Installs Of This Company Installs Of Total Company Installs Package This Package Total number of Total CHP ayatema inateli by McLeughlim allad this model Peckeoed CHP Installs of this model by McLeughlin Wegend Magand ayatem instelled

22307: ALEXANDRIA, VA

22307

ZIP CODE

Print Results as PDF

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UPDATE

Assurance Plan

McLaughlin-Wiegand Velt mogni alt ast deleniti adipiadi recuzendes. Colorem dolor vel facere voluptas occesosti molittic. Voluptates voluptatem porro vel est. Velt porro alt unde leudentium est.

Technical Assistance in Your Zip Code

DOE'S CHP TECHNICAL ASSISTANCE PARTNERSHIPS (CHP TAPS)

MID-ATLANTIC REGION

Jim Preihout, Ph.D. Pennsylvonio State University 814-863-0083



PERFORMANCE DATA

		100% GROSS POWER		75%	GROSS P	KOSS POWER 50		50% GROSS POWER		45% GROSS POWER		WIER	
	Amblent Temperature	951F	591F	OTE	951F	59'F	OTE	951F	591F	016	951F	591F	01F
	CHP Fuel Input (MMRtu per hour HHV)	14.25	15.25	15.70	10.00	11.66	11.90	7.95	7.71	7.23	6.09	6.68	6.75
	Gross Electricity Output (kW)	1,169	1,073	1,059	1,078	1,162	1,295	465	859	558	525	568	771
POWER	Net Electricity Output (kW)	971	922	900	1,022	1,050	1,297	626	696	491	483	688	686
	Net Electric Efficiency S. (HHV) 0	22.2	20.6	19.6	32.3	30.9	27.2	10.2	30.0	22.9	22.9	24.9	24.7
	Supply Temp to Site ("F)	180	180	180	180	180	180	180	180	180	100	45% GROSS POWE 5°F 97°F 07 69 6.68 6.3 5 568 77 6 408 60 19 20.9 30 10 100 10 10 100 10 10 27.0 27 10 27.0 27 10 27.0 27	180
	Return Temp from Site ("F)	32	78	11	12	2	100	47	3	83	72	98	59
r water	Hot Water Capacity (MMBtu/hr)	3.85	5.79	5.03	3.56	2.57	2.06	2.54	1.93	2.78	2.75	2.47	2.50
P	Thermal Efficiency % (HHV) 0	27.0	30.0	32.0	33.0	22.0	20.0	32.0	25.0	30.0	40.0	37.0	37.0
	CHP Fuel Use Eff % (Hot Water Operation) 0	50.2	58.6	51.6	65.3	52.9	61.2	50.2	55.0	60.9	63.9	61.9	71.7
8	NOx Emissions without At	tertrestme	ent (Ib/MW	he) 21	7.0								
	CO ₂ Emissions without At	ftertrestme	int (b/MW	ha) O	2.0								
	TVOC Emissions without /	Aftertreatn	nent (lb/W)	Vhe) O	0.0								
			_										
3	Fuel Gas Pressure to Pack (paig)	caged CHP	System		1		2		3		4		5

Ζ.

22

55

2

45

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(kW)

Fuel Gas Booster Compressor Power Required

GENERATOR/INTERCONNECTION							
	MANUFACTURER	MODEL	ТҮРЕ	CAPACITY			
Generator - Optiona	LongYeat	Wise PLC-568					
	Donnelly Group	Noder Group 778					
	Glesson-Heckett	Mante, Veum and Quitzon: 614	Induction	a kw			
	Greenfelder Ltd	Bolistreri-Abshirer057					
	Smmarich PLC	Runolfsdottir and Sonar808					
Grid Interconnection			Grid Perellel Only				

THERMAL RECOVERY SYSTEMS

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	MANUFACTURER	TYPE		
	Kunce PLC	Schneider McClurer 122		
	Hermon-Goodwin	Schroeder, Hegmann and Watalcar678		
Hot Water Heat Recovery - Equipment Optiona	Moen LLC	CollinarWegand 835		
	Thiel, Klocko and Monshan	Jecobi PLC-378		
	McGlynn, Pagec and Roberts	Buckridge Inc-286		

SOUND

System Sound @ 1m height and 10m distance (dBA)

a.o daA

FOOTPRINT

		WIDTH IN FEET	LENGTH IN FEET	HEIGHT IN FEET	WEIGHT IN POUNDS
	Prime Mover/Generator system (Includes maintenance clearances)	25.0	44.0	85.0	48
STEM / COMPONENT	Heat Recovery subsystem If separate (includes maintenance clearances)	76.0	28.0	55.0	σ
	Chiller If separate (includes maintenance clearances)	19.0	63.0	12.0	45

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eCatalog Program Plan





The eCatalog alone is not enough – success requires state/utility market engagement programs to promote CHP deployment, publicize the eCatalog, and provide technical and market assistance:

- Incorporate the eCatalog into CHP programs
- Actively engage with vendors, end-users and other stakeholders to promote the program
- Create a "friendly" environment for CHP with streamlined processes
- Improve end-user confidence with performance verification



DOE Packaged CHP Accelerator

- Better Buildings Accelerators demonstrate, catalyze and validate innovative approaches to increase investment in efficient energy technologies.
- **Objective** Validate packaged CHP technologies appropriate for commercial, institutional, multi-family, light manufacturing and government (civilian and military)
- CHP Supplier Partners CHP system packagers and solution providers participating in the national *eCatalog* of packaged CHP systems
- **CHP Engagement Partners** Utilities, federal agencies, states, cities or other market entities committed to promoting packaged CHP (via the *eCatalog*)



Goals and Expected Outcomes

- Validate the installations and performance of packaged CHP systems nationally
- Analyze the project development time and costs of packaged CHP systems enabled through the *eCatalog*
- Evaluate the integration of new technologies with packaged CHP systems (hybrid systems)
- Identify R&D challenges and opportunities around packaged CHP and related technologies

The overarching goal of the **Packaged CHP Accelerator** is to research and validate that total project costs and installation times for packaged CHP systems can be reduced by 20% or more, and that expected performance is achieved through the use of pre-engineered, technically validated systems that <u>reduce risk for both the CHP user and supplier.</u>



Current Accelerator Partners

CHP Engagement Partners

- Baltimore Gas and Electric (MD)
- ONE Gas (TX/KS/OK)
- Peoples Gas (Pittsburgh)
- National Grid (NY/MA/RI)
- LIPA/PSEG-LI (Long Island)
- Commonwealth Edison (IL)
- AEP Ohio (OH)
- Maryland Energy Administration (MD)
- Missouri Division of Energy

CHP Suppliers Partners

- Kraft Power
- 2G Energy
- Stewart and Stevenson Power, Atlantic Division
- GEM Energy
- Martin Energy Group
- GE Distributed Power
- Sterling and Wilson
- Northeast Energy
- Caterpillar
- Capstone Turbine Corp
- Unison Energy
- MacAllister Power Systems
- Centrica Business Solutions
- Aegis Energy Services



Questions

fake.ecatalog.industrialenergytools.com



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202-251-0017



DOE Commitment

- Develop and provide support for a national, web-based *eCatalog* of DOE-validated CHP packaged systems
- Provide tools and resources to the CHP Engagement Partners to assist in the development and installation of packaged CHP
- Provide technical assistance support to CHP Engagement Partners and facility owners/operators through the CHP Technical Assistance Partnerships (CHP TAPs)
- 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
- Provide national recognition to Partners



CHP Engagement Partner Commitment

- Provide feedback to DOE on the technical elements of packaged CHP systems within the *eCatalog*
- Engage potential CHP customers on applications of packaged CHP systems and use of the *eCatalog*
- Provide technical and programmatic support to promote packaged CHP to potential end-users
- Coordinate with CHP Supplier Partners to validate packaged CHP installation, cost and performance data
- Document and share lessons learned and best practices



CHP Supplier Partner Commitment

- Become a qualified *eCatalog* CHP Packager or CHP Solution Provider
- Provide feedback to DOE on the technical elements of the eCatalog development
- Submit packaged CHP systems for inclusion in the *eCatalog*
- Provide packaged CHP installation validation, which may include data on location, development time, performance and costs
- Identify potential R&D opportunities and emerging packaged CHP technologies and solutions

