

USEPA CHP Webinar: NYSERDA's CHP Program Logic and Format

\$100 Million Budget for CHP Incentives in New York State



Dana Levy

October 31, 2013

Combined Heat and Power (CHP)

Purpose

Accelerate/expand strong CHP installations and enhance:

- Resiliency
- Reliability
- Energy Efficiency
- Environmental Impact
- Energy Security
- Energy Cost Savings

NYSERDA's Market Approach

- Assist with CHP feasibility studies
- Provide incentives to build projects
- Resiliency via black start capability and storm protection
- Support project quality through:
 - Program Format/Program Design
 - Commissioning
 - Re-commissioning
 - Measurement & verification
 - Technology transfer

NYSERDA's Decade of CHP Experience

- Strategy: Portfolio of diverse examples
 - **Size:** 1.2 kW to 40 MW
 - **Sectors:** 56 at Apartment Buildings, 26 at Healthcare, 26 at Farms, 17 at Schools, 6 at Office Buildings
 - **Fuels:** Natural Gas, Biogas, Wood
 - **Machinery:** Engines, Microturbines, Fuel Cells, ORC, Combustion Gas Turbines, Steam Turbines
- Impacts
 - **181 projects to yield 200 MW**
 - Of these, 140 projects are operational = 170 MW installed
 - Funding: NYSERDA ... \$125 Million
 - + Others \$675 Million
 - = **Total \$800 Million**

Program Administration Formats

- **Competitions**

- **Standard Offers:**

- List of pre-qualified measures and their associated specific rebates
- Pseudo-performance (award computed based on analysis and forecast of site-specific performance)
- Performance payments based on measured & verified performance

Increasing Complexity of Project



Increasing Magnitude of Incentive

Market Observation #1

CHP Vendors are Clustered by “Market Size”

Small-to-Medium (50 – 1,300 kW):

- Aegis
- Capstone
- Intelligen
- Tecogen
- Others

Medium-to-Large (greater than 1.3 MW):

- Caterpillar
- GE Jenbacher
- Siemens Turbines
- Solar Turbines
- Others

Market Observation #2

Modular CHP is becoming Prominent

- Widely-available “modular kits” of CHP size 1.3 MW or smaller
- Foundational efforts of USDOE for “component matching” into pre-engineered packages
- Potential to improve comfort of building inspectors & utility personnel via replicable equipment
- Standardized products will help accelerate sales to customers
- Facilitates single-point responsibility:
 - Removes one variable from the equation (harmony among components)
 - Still need to choose proper size module based on the needs of building
 - Still need to properly install the module
 - Still need to properly maintain the module

In Their Own Words

The marketplace is touting “packaged” CHP

DRESSER-RAND.

CHP 250

250kWe Combined Heat and Power System

Dresser-Rand CHP Solutions (a Dresser-Rand strategic business unit) provides a complete range of fully packaged and tested combined heat and power (CHP) systems to commercial, industrial and municipal energy users worldwide. CHP (or cogeneration) systems reduce on-site energy costs and carbon dioxide emissions through the highly efficient delivery of power and heating. Combined cooling, heat and power (CCHP or Trigeneration) systems, provide the high efficiency of CHP, with the added benefit of chilled water output.

CHP systems offer an environmentally-friendly option for the provision of electricity and heat by recovering thermal energy that would typically be wasted in conventional power plants. With standard modular CHP and trigen systems ranging from 250kWe to 2.4MWe, a Dresser-Rand packaged CHP solution increases energy productivity, efficiency and reliability, while substantially lowering clients' greenhouse gas (GHG) emissions.

CHP System Performance

Operating Load		100%	75%	50%
Electrical output [1]	kW	250	188	125
Hot water output [2]	BTU/hr x 1000	1,351	1,073	815
Chilled water output	USRT	76	60	45
Fuel input (LHV) [3]	BTU/hr x 1000	2,451	1,943	1,512
Generating efficiency	%	34.8	32.9	28.2
Heating efficiency [2][3]	%	55.1	55.2	53.9
Plant efficiency (LHV)	%	89.9	88.2	82.1

250kWe of Continuous, On-site Electrical Power

Energy consumers demand high efficiency and reliability in order to minimize operating costs and maximize uptime. Our CHP systems are supplied as a comprehensive factory tested package that can be easily integrated into existing site operations. Items such as synchronizing switchgear, heat recovery equipment, emissions treatment, attenuation, and lube oil systems are included “within the box” dramatically reducing the risk of cost overruns and performance issues associated with traditional “site built” systems.



■ A CHP TR250 trigen unit.

In Their Own Words

The marketplace is touting “packaged” CHP

INTELLIGEN
POWER SYSTEMS LLC
Intelligent Cogeneration

Saving Money Through Efficiency
Is an Efficient way to Save the Globe



[On Site Power](#) | [Capabilities](#) | [Sample Projects](#) | [Product Specifications](#) | [Contacts](#)

- Why Choose Intelligen Power?
- The Intelligen Platform
- Intelligen Product Benefits
- Intelligen Product Line and Specifications
- Custom Equipment Packages
- Operation and Maintenance Services
- Consulting



The Intelligen Platform

Standardized Approach

Intelligen Power Systems has developed a standardized cogeneration platform that can be refined and customized to meet the needs of a particular site. The standardized platform greatly simplifies the design process and leads to significant cost savings. It also improves reliability and the maintenance function.

Pre-Packaged

In order to simplify the installation, Intelligen Power Systems seeks to pre-package as much equipment as possible in its factory which leads to a quick and cost effective installation process.

Fully Automated Control System

The Intelligen Power Systems control system has been specially designed to provide fully automated operation of the cogeneration system as well as integration with the host facility. The onboard controls package provides full monitoring of system functions to allow for reliable unattended operation.

Remote Monitoring

The Intelligen Power Systems control package provides full remote monitoring functionality which is part of the active ongoing maintenance program that is designed for maximum run-time availability. Intelligen service technicians monitor system performance 24 hours per day and 7 days per week and respond quickly when needed in order to minimize downtime.

Highest Quality Components

Intelligen Power Systems obtains its high levels of availability by incorporating the highest quality components into its equipment. The prime mover is a heavy duty industrial reciprocating engine that is designed for highly reliable continuous operation.

Simplified Utility Connection

Intelligen provides standardized utility interface packages which can simplify the process of obtaining approval for interconnecting with your electrical utility. Intelligen has extensive experience of interfacing with many utilities in a variety of configurations.

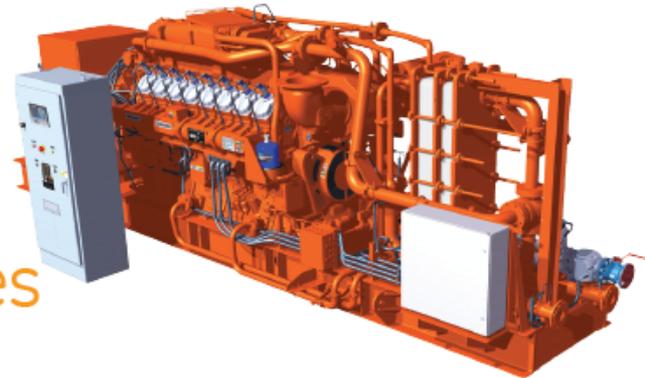
In Their Own Words

The marketplace is touting “packaged” CHP

GE Energy

Waukesha* gas engines APG1000

APG* Gas Enginator* Generating System
1000 kWe @ 50 Hz/1100 kWe @ 60 Hz



CHP

The APG1000 Combined Heat and Power (CHP) package allows for optimized efficiency by maximizing heat recovery. This minimizes packaging cost and time by including CHP components factory mounted. Achieve up to 89.4% total efficiency with the APG1000 CHP package.

With a reputation for rugged durability and ongoing design advancements, Waukesha engines are the sound investment you can depend on in mission-critical applications. Now a part of GE Energy, Waukesha provides enhanced support in the form of parts, service and a network of distributors to make us an even stronger partner for today's global energy industry.

In Their Own Words

The marketplace is touting “packaged” CHP

AEGEN THERMO POWER™ TP-75

The AEGEN THERMO POWER 75 is a compact, modular combined heat and power (CHP) system producing 75 kW of power and 5.23 therms of heat per hour. A three-way non-selective catalyst reduction (NSCR) emissions control package includes a catalytic converter and temperature and oxygen controls designed to reduce emissions of nitrogen oxide, carbon monoxide, and hydrocarbons. The CHP module has a natural gas-fired reciprocating engine, an induction generator, heat recovery system, a sound attenuating enclosure, electrical switchgear, and solid-state controls for automatic and unattended operation. High efficiency heat recovery components consist of oil cooler, engine jacket for heat transfer, marine type exhaust gas manifolds and exhaust gas heat exchangers. The AEGEN THERMO POWER 75 operates in parallel with existing mechanical and electrical systems in the facility. The module includes an advanced utility-grade relay (U.L., C.S.A., and C.E. listed or certified) for electrical protection and redundancy as standard equipment.

Features

- ✦ Reliable, proven technology
- ✦ Highly efficient
- ✦ Environmentally sound with low emissions
- ✦ Quiet operation
- ✦ Modular – scaleable into larger systems
- ✦ Compact – easily fits in most buildings
- ✦ Indoor or outdoor installation
- ✦ Ease of installation – no business disruption
- ✦ U. L. listed
- ✦ Remote monitoring and control
- ✦ Digital display and user-friendly interface
- ✦ Infinite system life with maintenance program
- ✦ Electric and thermal load following
- ✦ Modbus compatible for networking with building automation systems



AEGENCO
AEGIS GENERATOR COMPANY

55 Jackson Street, Holyoke, MA 01040 • (413) 536-1156 • (413) 536-1104 (fax)
Website: www.AegisEnergyServices.com • Email: Aegis@AegisEnergyServices.com

In Their Own Words

The marketplace is touting “packaged” CHP



**C1000 Megawatt Power Package
High-pressure Natural Gas**

1MW of reliable electrical power in one small, ultra-low emission, and highly efficient package.

- High electrical efficiency over a very wide operating range
- Low-maintenance air bearings require no lube oil or coolant
- Ultra-low emissions
- High availability – part load redundancy
- Proven technology with tens of millions of operating hours
- Integrated utility synchronization and protection with a modular design
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Internal fuel gas compressor available for low fuel pressure natural gas applications



C1000 Power Package

In Their Own Words

The marketplace is touting “packaged” CHP



InVerdē Ultra 100

Ultra-Low Emissions Inverter-Based Cogeneration

Key Features & Benefits

- 100 kW Continuous / 125 kW Peaking
- Delivers ultra-low emissions levels compliant with strict “CARB 2007” Standards
- Standardized Interconnection
- Black-Start Grid-Independent Operation
- Microgrid compatible with licensed CERTS¹ power balancing control software
- Premium Quality Wave Form, Voltage and Power Factor for Special Applications
- Power Boost for Demand-Side Response
- Enhanced Efficiency from Variable Speed Operation
- Simplified Inter-Unit Controls for either Mode of Operation (parallel or standby)
- ETL Listed - Labeled for compliance with UL 1741 - Utility Interactive; Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
- Renewable Energy Compatible, a Clean Energy Solution for Today and Tomorrow

¹CERTS - Consortium for Electric Reliability Technology Solutions



- Over 25 years experience in packaged co-generation, chillers and refrigeration systems
- More than 1,400 operating units in the field
- Extensive service network with factory-trained technicians exclusively servicing Tecogen products

Tecogen Inc. • 45 First Avenue, Waltham, MA 02451 • 781-466-6400 • 781-466-6466 (fax) • www.tecogen.com

In Their Own Words

The marketplace is touting “packaged” CHP



KRAFT ENERGY SYSTEMS
COMBINED HEAT AND POWER

Home | Products | Installations | Technical Info | Service & Support | Contact Us

Specialists in Combined *HEAT & POWER*

Kraft Energy Systems LLC is dedicated to providing reliable onsite combined heat & power (CHP) systems. We have over 40 years experience in the power generation field, combining a sales force that possesses outstanding engineering knowledge and a service team that is expertly trained in the power generation field. We are responsive to your needs, providing customers with highly dependable power systems suitable to a wide variety of industry needs.

Our products supply power ranging from 50kW - 3 Mw. We offer prepackaged plug-and-play modular systems and customizable power components, meeting the needs of your unique power requirements.

Kraft Energy System stands apart from the rest in terms of providing clean efficient energy for good reason:

- The performance of our high quality products
- The value of purchasing environmentally sound CHP systems
- The expertise our service technicians bring, keeping your equipment running for decades to come

With CHP you can rest assured that you are getting the most cost-efficient power system, achieving several industry needs from one well engineered system that either meets or exceeds environmental standards.

Call one of our expert sales people today to learn how Kraft Energy Systems can provide you with a power producing system geared towards peak performance. **TEL: 800-969-6121**



In Their Own Words

The marketplace is touting “packaged” CHP



**NATURAL GAS CHP COGENERATION MODULE
PRODUCT LINE DATA SHEET**

Natural Gas Cogeneration CHP Modules
34kVA / 27ekW up to 3750kVA / 3000ekW* – 60Hz – U.S. 
*(*Larger Plants are available. Please contact us for more information.)*

- Especially designed for NG CHP
- Proven Technology
- Professionally Engineered
- Factory Tested
- Lean Burn with optimum AFR
- Compact Standardized Design
- Extended Life Cycle
- Higher Reliability
- All-In-One (Plug & Play)
- Decreased Operating Expenses
- Optimized Combustion Geometry
- More than 1500 Units in Operation
- Production Line Manufactured
- Reliable & Fuel Efficient
- Economical Rich Burn Options
- Low Service & Maintenance Cost
- Fully Automated User Friendly
- Connection Ready
- Best In Class Technology
- Increased ROI

No other CHP Systems are manufactured more thoroughly. 2G® delivers the ultimate Solution in High Efficiency, Performance and Design. Unmatched Quality and Reliability like nothing Else.

In Their Own Words

The marketplace is touting “packaged” CHP

Elite Energy Systems, LLC
20 Industrial Parkway
Carson City, Nevada 89706
Tel (775) 246-8111 Fax (775) 246-8116

ELITE ENERGY

Combined Heat and Power

Cut energy expenses and reduce emissions with a packaged combined heat and power (CHP) EnviroGen® Energy Module powered by a Caterpillar natural gas or diesel engine.

- Standard Natural Gas CHP Modules:
 - 100 kW
 - 157 kW
 - 250 kW
 - 375 kW
- Standard Diesel CHP Modules:
 - 250 kW
 - 400 kW
- Digester Gas CHP Modules
- Custom CHP Systems

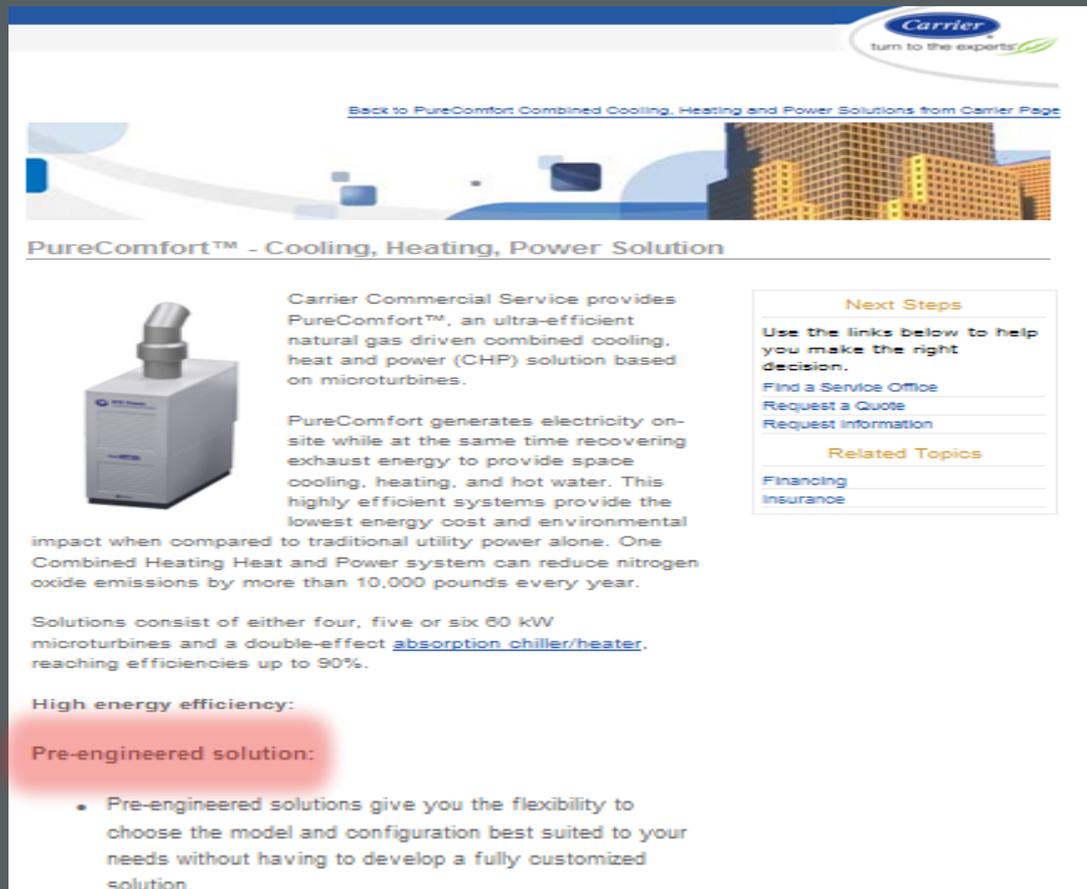


Integrated Control System

Manage your CHP system anytime and from anywhere with our advanced GenView™ Control System.

In Their Own Words

The marketplace is touting “packaged” CHP



The screenshot shows a Carrier website page for the PureComfort™ solution. At the top right is the Carrier logo with the tagline "turn to the experts". Below it is a navigation link: "Back to PureComfort Combined Cooling, Heating and Power Solutions from Carrier Page". The main heading is "PureComfort™ - Cooling, Heating, Power Solution". On the left is an image of the PureComfort unit. The text describes it as an ultra-efficient natural gas driven combined cooling, heat and power (CHP) solution based on microturbines. It highlights that the system generates electricity on-site while recovering exhaust energy for space cooling, heating, and hot water, resulting in lower energy costs and reduced environmental impact. A sidebar on the right contains "Next Steps" (Find a Service Office, Request a Quote, Request Information) and "Related Topics" (Financing, Insurance). A red highlight is placed over the "Pre-engineered solution:" section, which includes a bullet point stating that pre-engineered solutions offer flexibility in model and configuration.

Carrier Commercial Service provides PureComfort™, an ultra-efficient natural gas driven combined cooling, heat and power (CHP) solution based on microturbines.

PureComfort generates electricity on-site while at the same time recovering exhaust energy to provide space cooling, heating, and hot water. This highly efficient systems provide the lowest energy cost and environmental impact when compared to traditional utility power alone. One Combined Heating Heat and Power system can reduce nitrogen oxide emissions by more than 10,000 pounds every year.

Solutions consist of either four, five or six 80 kW microturbines and a double-effect [absorption chiller/heater](#), reaching efficiencies up to 90%.

High energy efficiency:

Pre-engineered solution:

- Pre-engineered solutions give you the flexibility to choose the model and configuration best suited to your needs without having to develop a fully customized solution.

Next Steps

Use the links below to help you make the right decision.

[Find a Service Office](#)

[Request a Quote](#)

[Request Information](#)

Related Topics

[Financing](#)

[Insurance](#)

CHP Acceleration “Catalog” Program

Program Mechanism:

- Created a catalog of “pre-qualified” systems (systems in the catalog have been evaluated for reasonable component sizing and are comprised of reputable components; this protects use of public funds)

Use of Best Professional Judgment, in absence of availability of Industry Standard Certification Process

- Assigned a specific “rebate” to each system
- Inviting customers to shop from catalog
 - Streamlined approach to system sizing*
 - Customized approach to system sizing

<u>Size kW</u>	<u>Downstate Incentive</u>	<u>Rate \$/kW</u>
100	\$180,000	\$1,800
300	\$510,000	\$1,700
600	\$930,000	\$1,550
900	\$1,260,000	\$1,400
1,200	\$1,500,000	\$1,250

Chillers are credited at their equivalent kW displacement

* Via Rules-of-Thumb (for example):

- a hotel with 300 guest rooms should buy 60 kW system
- an apartment building with 300 housing units should buy 100 kW system
- a hospital with 300 beds should buy 600 kW system

Right-size is Key to Success

Example: Two Seemingly Similar Hotels

300 Guest Rooms

- No Grand Ballroom
- No Health Club
- No Linens Laundry

Rule-of Thumb

recommends 60 kW,
probably right size

300 Guest Rooms

- Yes Grand Ballroom
- Yes Health Club
- Yes Linens Laundry

Rule-of Thumb

recommends 60 kW,
probably could go bigger

CHP Acceleration “Catalog” Program

Catalog Items:

- **Pre-qualified (fully-qualified):**
 - Has demonstrated actual performance based on testing of the fully-integrated system
- **Conditionally qualified:**
 - Each component and subsystem has been individually performance tested
 - The integration of the complete system has been designed and performance rated using accepted engineering methods

Conditionally-qualified systems can eventually be upgraded to pre-qualified status, until then, at NYSERDA’s discretion, each conditionally-qualified system may be required to undergo high-scrutiny factory testing prior to ship and may garner incentive funds only for a limited roll-out

CHP Acceleration “Catalog” Program

Catalog Items:

- Clean and Efficient CHP
- Integrated Controls Package
- Built-in Data Monitoring Features
- Bumper-to-Bumper Warrantee
- 5-year Service Plan
- Capable of “stand-alone” Operability

Attention CHP Vendors: Instructions at RFI 2568 for how to get your products added to the Catalog

CHP Acceleration “Catalog” Program

CHP System Catalog

CHP Acceleration Program

(PON 2568 Attachment C)

Release date: December 2012
Updated August 2013

CHP Acceleration Program
Program Opportunity Notice (PON) 2568

~~\$20M Available~~

\$60 million Available

Applications accepted
through 5:00 PM Eastern Time* on December 30, 2016

CHP Acceleration “Catalog” Program

Eligible CHP Vendors and Systems

Vendor	Model	kW	50 to 100	101 to 300	301 to 500	501 to 700	701 to 900	901 to 1300
Aegis Energy Services	Agen Power Sync 75	75						
	Agen Power Verter 75	75						
	Agen Power Sync 150	150						
	Agen Power Verter 150	150						
GEM Energy	IPS-65-CHP	65						
	IPS-130-CHP	130						
	IPS-195-CHP	195						
	IPS-260-CHP	260						
	IPS-390-CHP	390						
	IPS-1000-CHP	1,000						
	MCPS-260-CHP	260						
	MCPS-390-CHP	390						
IntelliGen Power Systems	IntelliGen 150	150						
	IntelliGen 150 Inverter	150						
	IntelliGen 250	250						
	IntelliGen 250 Inverter	250						
Kraft Power Corporation	KMGR-55-4SH	55						
	KMGR-80-4SH	80						
	KMGR-150-4SH	150						
	KMGR-250-4SH	250						
RSP Systems	C65-DM-iCHP	65						
	C200-DM	200						
	C400-DM	400						
	C600-DM	600						
	C800-DM	800						
	C1000-DM	1,000						
Tecogen, Inc	InVerde INV-100	100						
	InVerde Ultra INV-100	100						
Unison Energy	UE-600-H	600						
Veolia Energy	CGC-080MA-080-NG-60-3WY	80						
	CGC-0160MA-080-NG-60-3WY	160						
	CGC-0260MA-080-NG-60-3WY	260						
	CGC-0310GU-080-NG-60-OXY	310						
	CGC-0400GU-080-NG-60-OXY	400						
	CGC-0620GU-080-NG-60-OXY	620						
	CGC-1300CU-078-NG-60-OXY	1,300						

All of these systems are capable of running during a grid outage.

To receive an incentive, the system must be installed and commissioned showing it runs during a grid outage, and systems must be sited “high and dry” at buildings located in flood prone areas.

Annual conferences for vendors and consultants, periodic expos for potential customers.

CHP Acceleration "Catalog" Program



Aegis Energy Services, Inc. Aegen PowerSync 150 150 kW

Description

Type of prime mover	Number of prime mover units	Synchronous or Inverter	Chiller	Eligible for N+1 installation	Qualification Status
RICE	2	Synchronous	No	Yes	Conditionally qualified

NYSERDA Incentives

ISO Zones I and J	150 Zones A through H
\$266,250	\$221,250

Performance at Full Load

Ambient	Fuel in MBTU/hr	Net kW	Hot Water to Building @ 120°F		Hot Water to Building @ 180°F		NOx lbs/MWhr	Chilled Water to Building		
			MBTU/hr	Return °F	MBTU/hr	Return °F		MBTU/hr	Supply °F	Return °F
0°F	1897.2	150	1048	170°F	1048	170°F	0.177			
50°F	1897.2	150	1048	170°F	1048	170°F	0.177			
95°F	1897.2	150	1048	170°F	1048	170°F	0.177	N/A	N/A	N/A

Footprint

	Width ft	Length ft	Height ft	Weight lbs
Core system based on minimum area*	16FT	13FT	4FT	6,100
Core system based on minimum width*	8FT	26FT	4FT	
Heat Rejection subsystem*	4.5FT	9FT	5FT	1,400
Largest part for delivery	2.67FT	2.67FT	2.5FT	850
Heaviest part for delivery	2.67FT	2.67FT	2.5FT	850

*Includes maintenance clearances.

Vendor Statement

The Leader in Combined Heat & Power since 1985

Made in the USA

Reducing Energy Costs with Onsite Combined Heat and Power

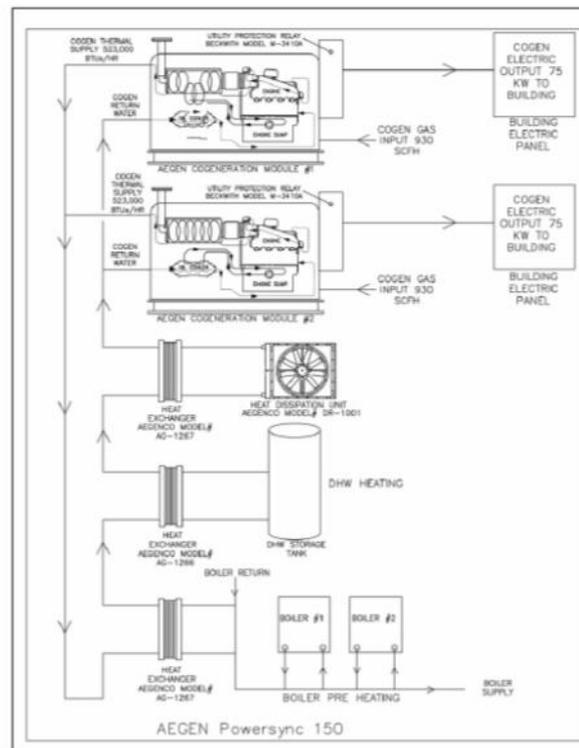
Vendor Information

Aegis Energy Services, Inc.
55 Jackson St.
Holyoke, MA 01040
(415) 536-1156
LeeV@aegisennergyservices.com
www.aegisennergyservices.com

NYSERDA CHP Acceleration Program PON 2568
Version 1.0 Revised 12/20/2012
For the most recent version go to
<http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2568-CHP-Acceleration-Program.aspx>



Aegis Energy Services, Inc. Aegen PowerSync 150 150 kW



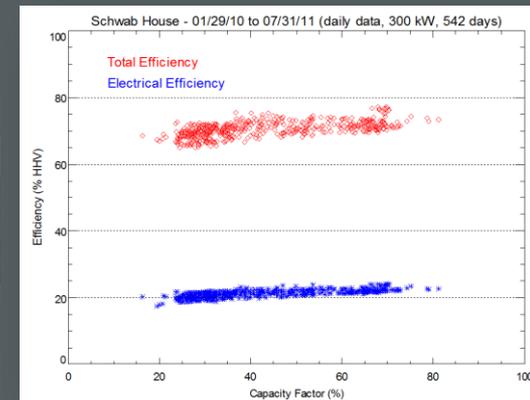
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Case Study - Aegis

Schwab House at 11 Riverside Drive NYC

- Apartment building with 654 housing units
- CHP System: 300 kW consisting of four (4) engines at 75 kW each
 - Installed September 2009
 - Thermal output serves DHW, hydronic space heating, and chilled water air conditioning via absorption chiller



CHP Acceleration "Catalog" Program



Tecogen, Inc

InVerde Ultra (INV-100)

100 kW

Description

Type of prime mover	Number of prime mover units	Synchronous or Inverter	Chiller	Eligible for N-1 Installation	Qualification Status
RICE	1	Inverter	No	No	Conditionally qualified

NYSERDA Incentives

ISO Zones I and J	ISO Zones A through H
\$180,000	\$150,000

Performance at Full Load

Ambient	Fuel in MBTU/hr	Net kW	Hot Water to Building @ 120°F		Hot Water to Building @ 180°F		NOx lbs/MWhr	Chilled Water to Building	
			MBTU/hr	Return °F	MBTU/hr	Return °F		MBTU/hr	Supply °F
0°F	1263	100	697,000	97 °F	670,000	135 °F	0.07		
50°F	1263	100	697,000	97 °F	670,000	135 °F	0.07		
85°F	1263	100	697,000	97 °F	670,000	135 °F	0.07	NA	NA

Heat exchangers provided in schematic below are sized to deliver 100 °F water to the building. However, alternative heat exchangers can be selected to supply 120°F or 180°F as required.

Footprint

	Width ft	Length ft	Height ft	Weight lbs
Core system based on minimum area ¹	10'	14' 4"	5' 9"	3850
Core system based on minimum width ¹	10'	14' 4"	5' 9"	3850
Heat Rejection sub-system ²	4'	22' 4"	4' 3"	2730
Largest part for delivery	4'	22' 4"	4' 3"	2730
Heaviest part for delivery	4'	7' 4"	5' 9"	3850

¹Includes maintenance clearances.

Vendor Statement

The InVerde Ultra (INV-100) is an inverter-based natural gas engine driven CHP system providing 100 kW of premium quality power, with up to 697,000 Btu/hr of hot water. The CHP benefits of energy savings and reduced GHG emissions are further enhanced with inverter technology as a result of improved part load performance from variable speed operation. The INV-100 is NYSIR listed for certified grid interconnection and has no reactive power draw and a low fault current contribution. It is configured with black start capability for convenience power during an outage and since it is fueled with pipeline gas, power is available indefinitely for the duration of the outage, unlike typical standby generators. The InVerde is equipped with unique licensed CERTS software for microgrid operation that allows a cluster of units to effortlessly and seamlessly align themselves to share the load (both real and reactive power) and control frequency without complex controls and switchgear. When equipped with the Ultra emissions option, the INV-100 can meet extremely low levels of regulated pollutants, comparable to a fuel cell.

Vendor Information

Tecogen, Inc.
45 First Avenue
Waltham, MA 02451
(781) 466-6400

Jeffrey.glick@tecogen.com
www.tecogen.com

NYSERDA CHP Acceleration Program PON 2568
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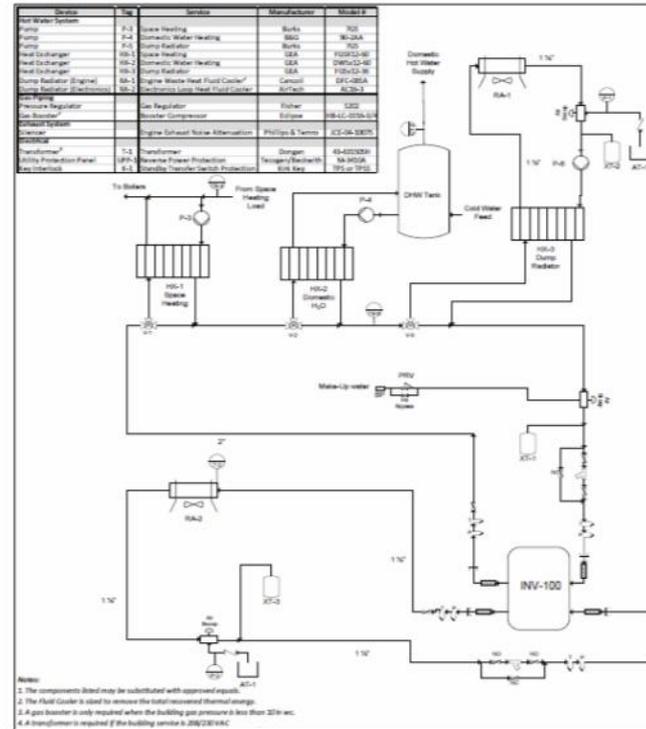
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Tecogen, Inc

InVerde Ultra (INV-100)

100 kW



Notes:
1. The components listed may be substituted with approved equals.
2. The Fluid Cooler is used to remove the total-released thermal energy.
3. A gas booster is only required when the building gas pressure is less than 20" w.c.
4. A transformer is required if the building service is 208/230V/3-W.

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<http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2568-CHP-Acceleration-Program.aspx>

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Case Study - Tecogen

Madison-Oneida Board of Cooperative Educational Services (BOCES)

- Vocational tech school with 250,000 ft² of occupied buildings
- CHP System: 600 kW consisting of six (6) engines at 100 kW each
 - Installed July 2008, replaces a decade-old 300 kW system, adds stand-alone capability (site is now a Red Cross Facility of Refuge)
 - Thermal output serves DHW, hydronic space heating, and chilled water air conditioning via absorption chiller



CHP Acceleration “Catalog” Program



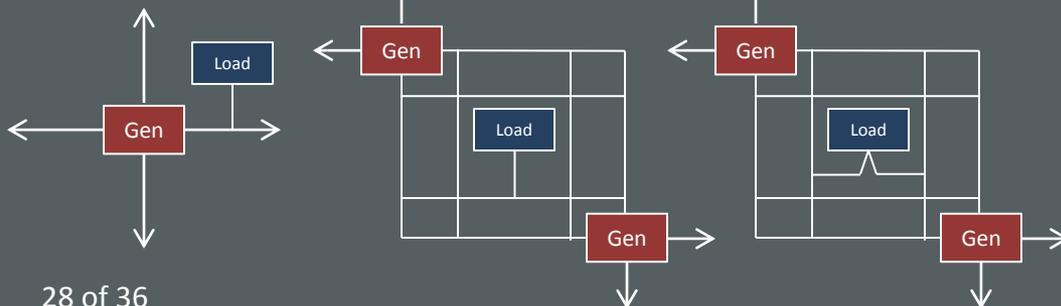
**PON 2568 Incentives
(Max \$1.5 Million per Site):**

- Incentive for Upstate
- ~ 20% Higher Incentive for Downstate
- 10% Bonus for Critical Infrastructure such as Facility of Refuge
- 10% Bonus for ConEdison Targeted Zone

Radial Feed

Area Network

Spot Network



Configurations: (N) or (N+1) or (Nx2)

Example: Sizing Recommends 600 kW

(N)

- Package has a single 600 kW generator, or -----> Gets \$930,000
- Package has a pair of 300 kW generators -----> Gets \$930,000

(N+1)

- Package has a pair of 600 kW generators, or -----> Gets \$1,500,000
- Package has three 300 kW generators -----> Gets \$1,260,000
- Thus, one extra prime mover (alternate whichever one sits idle)

(Nx2)

- Two fully-redundant packages where each package has a single 600 kW generator, or -----> Gets \$1,395,000
- Two fully-redundant packages where each package has a pair of 300 kW generators -----> Gets \$1,395,000
- Thus, two fully redundant packages (alternate whichever one sits idle)
- First package gets full incentive, second gets 50% incentive
- Sum of both packages capped at 1.3 MW
- Total incentive capped at \$1.5 million

CHP Acceleration “Catalog” Program



CHP Acceleration Program PON 2568 Incentive Application (Attachment A)

CHP System Vendor	CHP System Owner	Site Owner
Company Name	Company Name	Company Name
Address	Address	Address
Contact Name	Contact Name	Contact Name
Phone	Phone	Phone
email	email	email

Site	
Name	
Address	
Geo Code (Longitude and Latitude)	ISO Zone
Targeted Zone Identifier (if applicable)	Target Year
Is site a Facility of Refuge?	

CHP System	
Model	
Nameplate	
Is this an N+1 or 2N installation?	

Incentive	
Base Incentive	
Facility of Refuge bonus (10% of Base Incentive if applicable)	
Targeted Location bonus (10% of Base Incentive if applicable)	
Total Incentive	0

Schedule	
Final Design Approval	
All Major Components of CHP System Delivered to Site or Approved Staging Area (Invoice #1)	
CHP System Fully Operational and Final Utility Approval Received (Invoice #2)	
CHP System Fully Commissioned, Performance Data Flowing to NYSERDA's Data Agent and Commissioning Report Submitted (Invoice #3)	

Applicant (CHP System Vendor) Signature

I certify that the above information, and all information submitted in connection with State Finance Law §130-j and §130-k, is complete, true, and accurate, that I have read and reviewed the Standard Terms and Conditions set forth in the attached Sample Agreement, and that I accept all terms unless otherwise noted herein, and that the application requirements noted have been completed and are enclosed or will be submitted electronically. I affirm that I understand and will comply with NYSERDA's procedures under §130-j(3) and §130-j(6)(b) of the State Finance Law. I understand that this application may be disqualified if the solicitation requirements are not met. I, the undersigned, am authorized to commit my organization to this application.

Name	Signature	Date

Signatory must be legally able to bind the organization.

This application is not considered received by NYSERDA until all required documentation has been submitted and the application has been deemed full and complete by NYSERDA.

CHP Acceleration Program PON 2568 Incentive Application (Attachment A)
Version 1.0 12/20/2012
<http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2568-CHP-Acceleration-Program.aspx>



Site Owner and CHP System Owner

The Site Owner and CHP System Owner do hereby acknowledge and support this application for a CHP Acceleration Program incentive being submitted by the Applicant (CHP System Vendor). The Site Owner and CHP System owner understand that if this application is approved, NYSERDA will negotiate a contract with the Applicant and all subsequent incentive payments will be made to the Applicant. The Site Owner and CHP System Owner agree to facilitate reasonable pre- and post-installation site visits and inspections, including re-commissioning activities by NYSERDA or NYSERDA's agents as described in PON 2568. The Site Owner and CHP System Owner agree to permit NYSERDA or NYSERDA's agent to collect CHP System performance data as described in PON 2568 and RFI 2568 for a period of at least 3 years and to facilitate automated data communications through an internet connection or phone line. The Site Owner and CHP System Owner will allow NYSERDA or NYSERDA's agents to take photographs of the CHP System and exterior views of the site with explicit permission for NYSERDA to use, reproduce, distribute, exhibit, alter, publish or otherwise use such photographs in all forms, manner, including composite or distorted representations, and media, including electronic, print, digital, or electronic publishing via the Internet, and for all purposes, including advertising, trade, or any other lawful purposes.

The Site Owner and CHP System Owner hereby acknowledge that NYSERDA's role in this installation is that of a funder, and that NYSERDA would not fund the incentive payments to the Applicants without Site Owner and CHP System Owner agreeing to indemnify and hold NYSERDA harmless from all liability. Therefore, the Site Owner and CHP System Owner hereby agree to protect, indemnify and hold harmless NYSERDA and the State of New York from and against all liabilities, losses, claims, damages, judgments, penalties, causes of action, costs and expenses (including, without limitation, attorneys' fees and expenses) imposed upon or incurred by or asserted against NYSERDA or the State of New York resulting from, arising out of or relating to the installation and performance of the CHP System.

Site Owner Signature

Name	Signature
Title	
Signatory must be legally able to bind the organization.	
Sworn to before me this ___ day of _____, 2___	
Notary Public Signature	Stamp of Notary Public

CHP System Owner Signature (Must be signed if the CHP System Owner is not the Site Owner)

Name	Signature
Title	
Signatory must be legally able to bind the organization.	
Sworn to before me this ___ day of _____, 2___	
Notary Public Signature	Stamp of Notary Public

CHP Acceleration Program PON 2568 Incentive Application (Attachment A)
Version 1.0 12/20/2012
<http://www.nyserda.ny.gov/Funding-Opportunities/Current-Funding-Opportunities/PON-2568-CHP-Acceleration-Program.aspx>

Plus:

- Financial Plan
- Schedule (max 12 months to operation)
- List of Necessary Permits
- Electrical Inter-connection
- CESIR Cost Estimate
- Utility Gas Availability
- Feasibility Study

Must apply BEFORE equipment is delivered to site or staging area



CHP Acceleration “Catalog” Program

System “re-commissioning” in sophomore year

Win-Win-Win-Win-Win Outcomes:

- **Customer:** confidence, “vetted” system
- **Developer*:** transparency of program
- **Equipment Vendor:** marketing edge
- **Auth-having-Juris:** familiarity & comfort
- **NYSERDA:** acceleration of uptake

* Re-alignment of role in projects ... now serve as “Owner’s Engineer”

NYSERDA's Current CHP Programs

- **Strategy #1: Simplicity is most important**
 - Small-to-medium (50 kW – 1.3 MW)
 - Identify replicable designs/opportunities
 - Promote standardization for streamlining



Like "Modular" Housing



Like "Shopping Off The Rack"

- **Strategy #2: Efficiency is most important**
 - Medium-to-large (greater than 1.3 MW)
 - Promote custom design to maximize efficiency



Like "Stick-built" Housing



Like "Custom Tailored"

CHP Larger Than 1.3 MW – PON 2701

Program Format (max incentive = \$2.6 million per site):

- Engineering study demonstrating system will meet site needs and program requirements
- Performance-based incentive payments
 - Payment of funds scaled to kWh and peak time kW as determined throughout 2-years of measurement & verification (this protects use of public funds)
- Performance criteria
 - Fuel conversion efficiency
 - Exhaust emissions
 - Operation during summer peak

Pending Additional CHP Funding

Indian Point Energy Center Contingency Plan Possible Closure of Central Station 2,000 MW near NYC

- Requested \$56 million for CHP incentives & outreach
- Plan filed 6/19/2013 and approved by NYSPSC on 10/17/2013
- Peak demand reduction 25 MW

- NYSPSC Case 12-E-0503

<http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=12-E-0503&submit=Search+by+Case+Number>

Combined Heat and Power (CHP)

Incentives Budget (2011 – 2015)

PON 2568 CHP Acceleration	less than 1.3 MW	\$60 Million*
PON 2701 CHP Performance	greater than 1.3 MW	\$40 Million**
<hr/>		
Total	All Sizes	\$100 Million

* \$60 million = \$20 million via SBC4 T&MD + \$40 million via IPEC

** \$40 million is via SBC4 T&MD

Thank You!

www.nyserda.ny.gov



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