



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Cogeneration Combined Heat and Power (CHP)

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Associate Project Manager

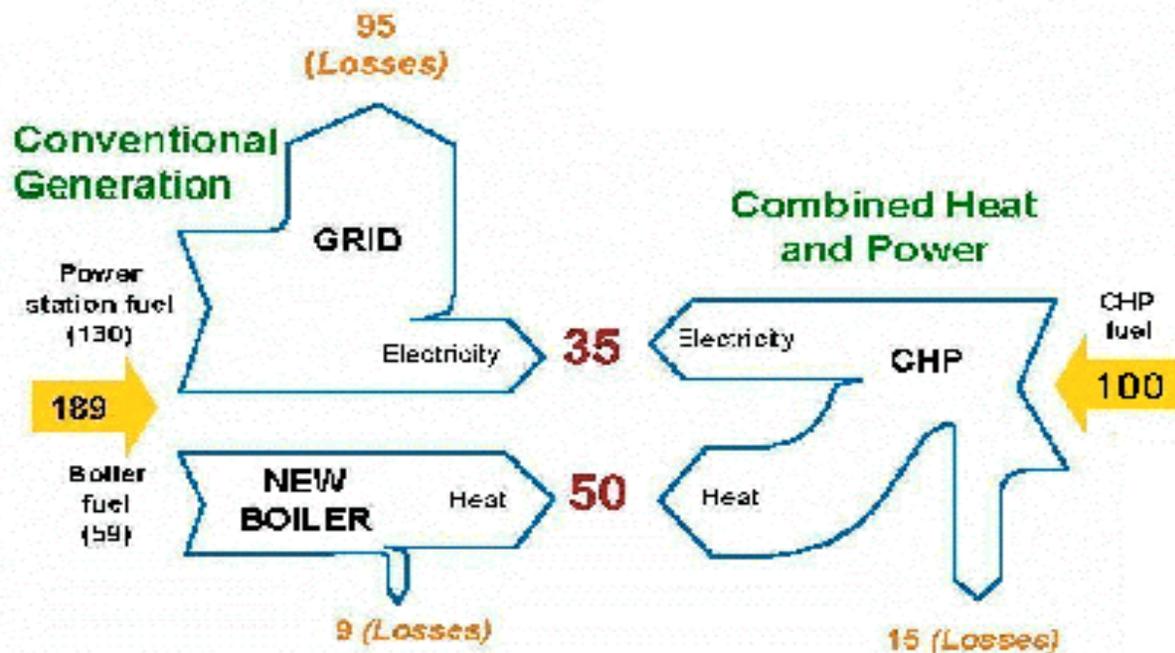
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Combined Heat and Power (CHP)

CHP: Onsite coincident production and use of electrical or mechanical power and thermal energy





Space Conditioning

- Heating
- Cooling

Electrical Power

- Alternator Generates DC Power (Lights, Motors, etc.)



Mechanical Power

- Motion



CHP systems provide many benefits, including:

- **Reduced Energy Costs,**
 - Reduce Demand Charge
 - Reduce Peak Electric Energy Costs
- **Improved power reliability,**
 - Reduced demand provided by CHP will result in increased grid reliability
 - Reducing or eliminating a building's dependence on the electric power grid, and by providing an additional power option to the building
- **Increased energy efficiency, and**
- **Improved environmental quality**
 - Lower Emissions

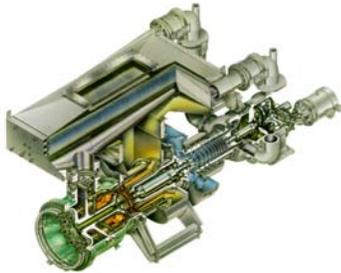
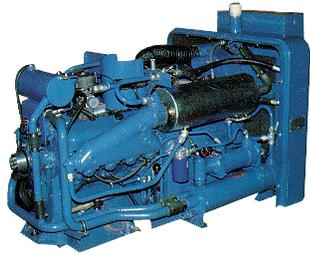


At Present, CHP Systems

- Produce almost 8% of U.S. electric power;
- Still save building and industry owners over \$5 billion/year in energy costs;
- Decrease energy use by almost 1.3 trillion BTUs/year;
- Reduce NO_x emissions by 0.4 million tons/year;
- Reduce SO₂ emissions by over 0.9 million tons/year;
- Prevent release of over 35 million metric tons of carbon equivalent into the atmosphere.



DG-CHP Generating Options



[Download Photo](#)



IC Engines

Microturbines

Fuel Cells

Technology

Mature

Latest

Emerging



How Do the DG/CHP Technologies Differ?

Technology	Size Range	Electrical Efficiency (%)	Installed Cost (\$/kW)	NOx Emissions (lbs./MWh)	Total CHP Efficiency (%)
IC Engine	30kW - 6MW	28 - 38	500 - 1200	0.4 - 15	80
Aeroderivative Gas Turbine	500kW - 20 MW	22 - 40	750 - 1500	0.3 - 4	80
Micro-turbine	25kW - 300kW	20 - 30	1000 - 3000	0.4 - 2.2	80
Fuel Cell	3kW - 3 MW	30 - 60	4000 - 10000	< 0.02	80
NG Combined Cycle Power Plant	100 MW - 500 MW	45 - 60	500 - 1000	0.3	70





Where Does CHP Make Sense?

- Capacity constrained/High electric demands.
- High thermal (steam, hot water, direct heat, cooling) demands.
- Coincident thermal and electric demands.
- Extended operating hours.
- Access to fuels (byproducts, natural gas).



When Should CHP Be Considered?

The Design and Installation of CHP System requires a large capital investment and should be considered after the investigation / implementation of other energy efficiency improvements that are less capital intense and have a shorter payback.



retail

27% Savings replacing standard halogen PARs with Halogen IR for accent, merchandising and general lighting.



hospitality

72% Savings when you replace 150-watt incandescent lamps with our 42-watt CFL

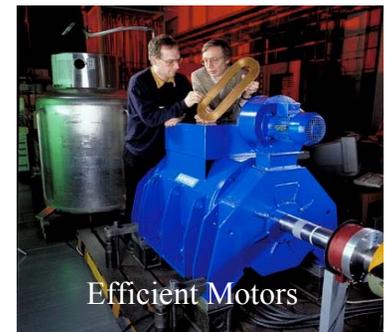


property management

44% Savings when you install the F28 T8 system to replace outdated T-12 technology.



Weatherization



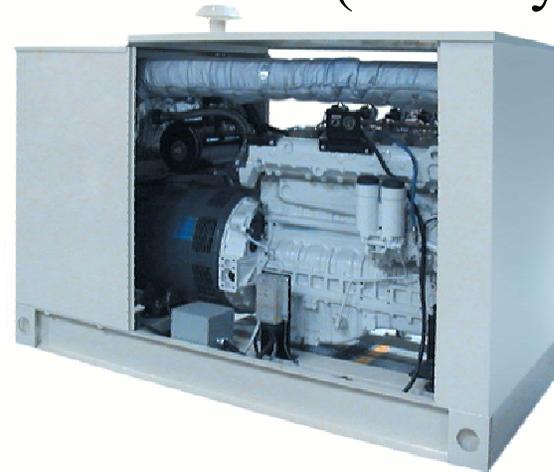
Efficient Motors



MULTIFAMILY BUILINGS – SeaRise I & II Apartments (Brooklyn, NY)



2 Buildings,
each with 334
Apartments



Technology: IC Engines (Four 55 KW Coast Intelligent Cogen Units)

Operating Mode: 24/7, Grid-Interconnected, Operating on Natural Gas

Recovered Thermal Energy Use: Domestic Hot Water

Benefits: Expected net annual utility cost reduction of \$65,000 (Payback-3.7 yrs)

Results to Date: Equipment Installed and in the Process of Being Commissioned



SUPERMARKARKETS – Waldbaums (Hauppauge, NY)



Technology: One Capstone 60KW Microturbine

Operating Mode: 24/7, Grid-Interconnected, Operating on Natural Gas

Recovered Thermal Energy Use: Space Heating, Desiccant Cooling (Dehumidification)

Benefits: Annual Utility Reduction of over \$50,000 with a 6-yr payback period

Results to Date: Project is Fully Operational



Manufacturing Facilities – Allied Converters (New Rochelle, NY)



Technology: Two Capstone 30KW Microturbines

Operating Mode: 8am-9pm Monday-Friday and 5 hours on Saturday;
Grid-Interconnected; Stand-Alone Operation During a Power Failure; Natural Gas

Recovered Thermal Energy Use: Space Heating (Winter), Air Conditioning via Absorption Chillers (Summer)

Benefits: Annual Energy Saving of \$16,400 (Payback: 15+ years); Power Reliability

Results to Date: Project is Fully Operational



Objectives of NYSERDA's CHP Program

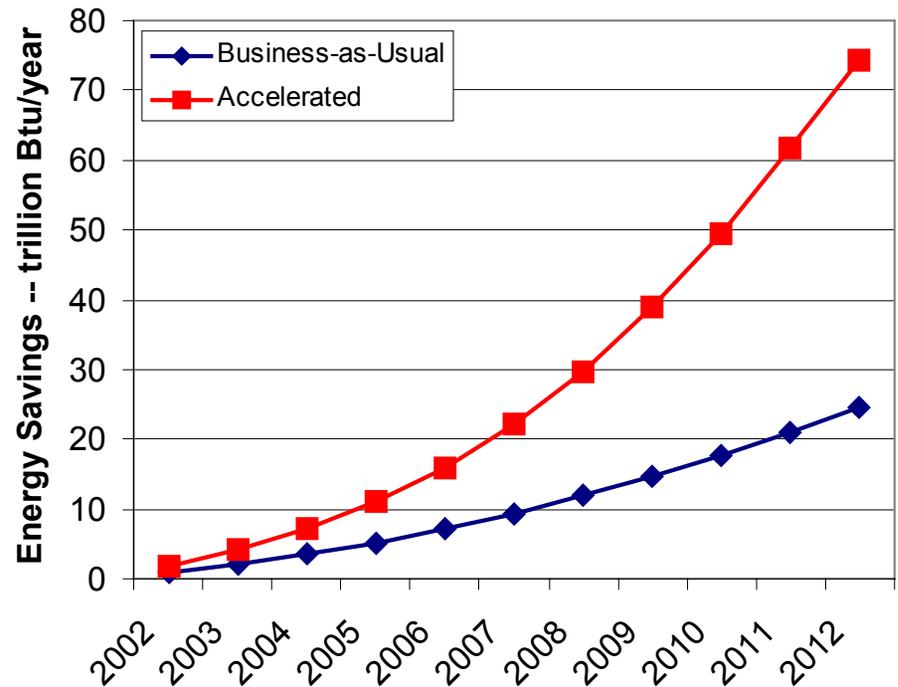
- Provide approximately \$15 Million per year for support of CHP to bolster NYS economy.
- Encourage the installation of clean and efficient technologies and applications.
- Establish a broad portfolio covering various technologies and various end-use sectors.
- Document hurdles and lessons learned from design through implementation.
- **Identify “Role Model” systems so they can be replicated faster, better, and cheaper.**



Likely Market Penetration of CHP

Forecasted new CHP over the next decade
in NYS:

- Base-case scenario
746 MW
- Accelerated-case scenario
2,200 MW





CHP Demonstration Projects Selected

<u>Sector</u>	<u># Selected</u>	<u>\$ Earmarked</u>	<u>Aggregate kW</u>
Industrial	35	\$18,195,897	33,619
Institutional	25	\$10,673,190	51,358
Commercial	17	\$9,268,780	11,216
Residential	18	\$8,359,345	8,668
Total	95	\$46,497,212*	104,861

* \$46M is NYSERDA funds, when added to project partner funds this represents nearly \$200M investment in NYS



Current NYSERDA Funding Opportunities for CHP

Combined Heat & Power and Renewable Generation Technical Assistance Program Opportunity Notice (PON) No. 795

Applications accepted for Round I: November 20, 2003 through February 25, 2004 and;
Applications accepted for Round II: February 26, 2004 through June 9, 2004

- NYSERDA will contribute 50% to the cost of selected Technical Assistance Study, up to \$50,000.
- Projects must include cost-sharing in the form of matching cash support

Website for Additional Information



www.nyserda.org





**Program Opportunity Notice (PON 800): \$12 Million Available
Power Systems (PS), Distributed Generation (DG), Combined Heat and Power (CHP),
and Web-based Data Integrator**



**Invitation for Proposals
Proposals Due: April 20, 2004 (by 3 PM Eastern Time*)**

The New York State Energy Research and Development Authority (NYSERDA) announces a program to support:

Category A: *Demonstration* of DG/CHP systems at industrial/commercial/residential facilities
 Category B: *Feasibility studies* to define the baseline design of a DG/CHP system for a specific facility
 Category C: *Technology transfer studies* to broaden the market penetration of DG/CHP systems
 Category D: *Product development* of new DG power systems and/or related components
 Category E: *Feasibility studies* to assess the viability of new DG product designs/concepts
 Category F: *Request For Proposals (RFP)* to provide technical assistance to NYSERDA as a Data Integrator

Category	NYSERDA Cost Share	Maximum NYSERDA Award
A: DG/CHP Demonstration Projects (A1 & A2)	15% to 60%	\$1,000,000
B: DG/CHP Feasibility Studies	50%	\$100,000
C: DG/CHP Technology Transfer Studies	75%	\$100,000
D: New Product Development	50%	\$500,000
E: New Product Feasibility Studies	50%	\$100,000
F: Request For Proposals (RFP) for Technical Assistance to NYSERDA as a Data Integrator	100%	to be negotiated

NOTE: Each project will be considered for only one category of funding

A series of informational workshops will be held at various NYSERDA offices to answer questions regarding this PON as follows (all workshops run from 10:00 AM to Noon, pre-registration is not required):

Location: Albany Office (17 Columbia Circle - (518) 862-1090). Dates: Feb 9th; Feb 24th; Mar 10th; Mar 25th

Location: Manhattan Office (485 Seventh Avenue, Suite 1006 - (212) 971-5342). Dates: Feb 10th; Mar 24th

Location: Buffalo Office (617 Main Street, Suite 105 - (716) 842-1522). Dates: Feb 12th; Mar 22nd



NYSEIDA



A Conference on
Combined Heat and Power (CHP)
in New York State

Save The Date

June 23 –25, 2004



Issues & Answers

Interconnection
Project Financing
Siting & Permitting
Emissions
Tariffs

Equipment & Technologies

Recip Engines
Microturbines
Fuel Cells
Gas/Steam Turbines

Site Tours

Five Locations

Exhibits

Display Units
Poster Boards

Case Studies

Industrial

Papermill
Plastics Processing
Food Packaging

Residential

Multifamily Highrise
Multibuilding Complex

Commercial and Institutional

Supermarkets
Office Buildings
College Campuses

Crowne Plaza Hotel & Resort
1605 Broadway
between 48th and 49th streets
MANHATTAN, NY 10019



Websites for Additional Information

- www.uschpa.org U.S. Combined Heat and Power Association
- www.doe.gov U.S. Dept. Energy
- www.nyserda.org NYSERDA
- www.northeastchp.org Northeast Combined Heat and Power Institute
- www.cogenerationonline.com Cogeneration for Residential Buildings