



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

Cogeneration Combined Heat and Power (CHP)

Joseph C. Borowiec, NYSERDA

Associate Project Manager

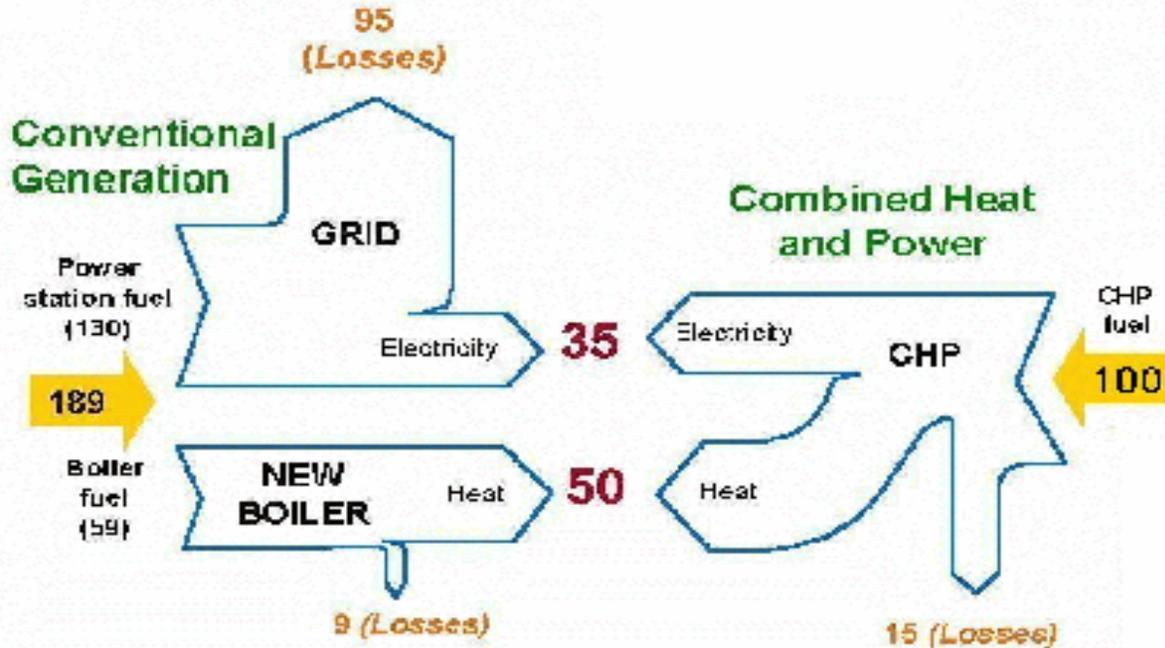
Tel. (518) 384-1524 ext. 3381, Email: jcb@nyserda.org





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



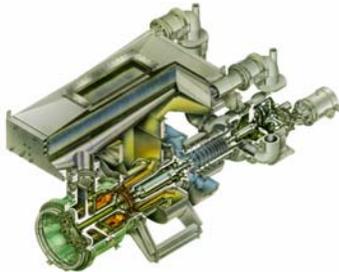
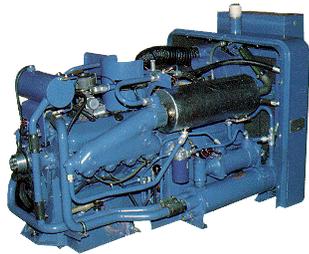


At Present, CHP Systems

- 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)	NO _x 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

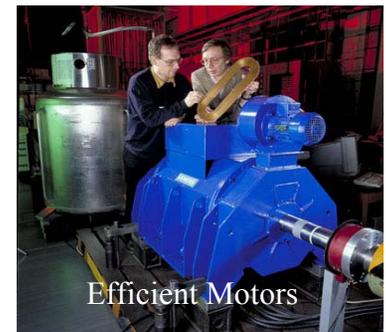


property management

44% Savings when you install the F28 T8 system to replace outdated T-12 technology.



Weatherization



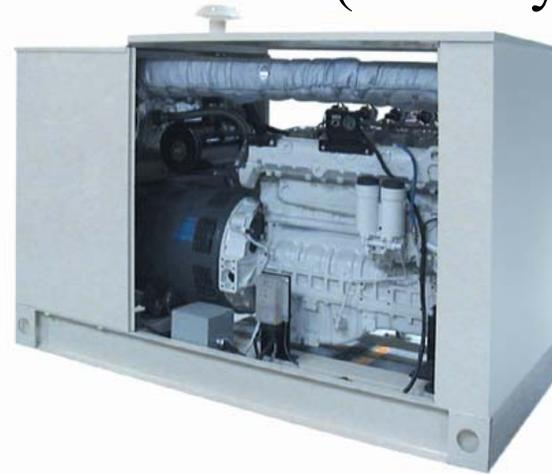
Efficient Motors



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



SUPERMARKETS – 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

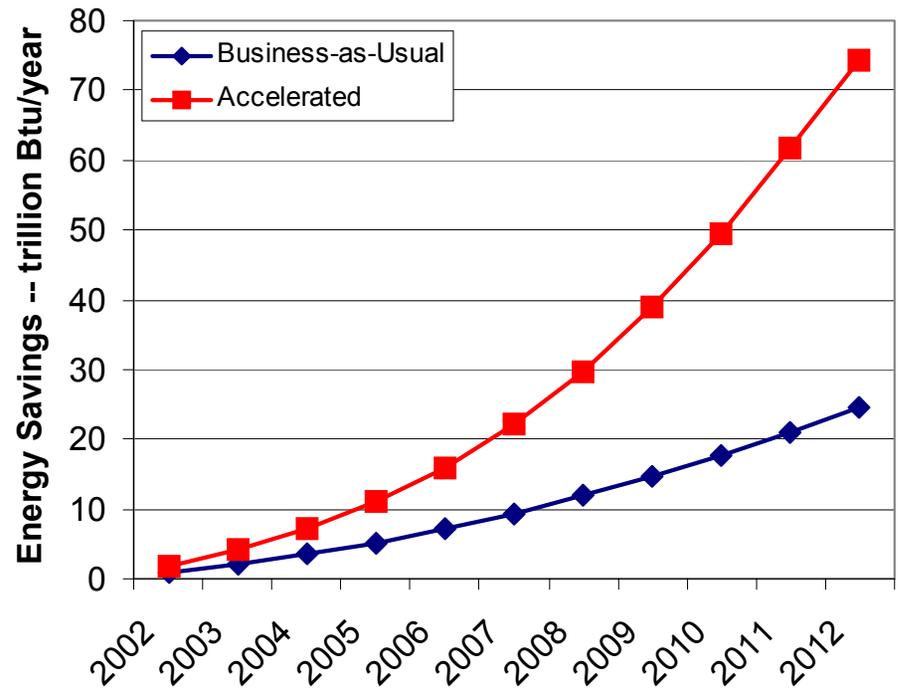
- Provide approximately \$15 Million per year for support of CHP to bolster NYS economy.
- Encourage the installation of clean and efficient technologies and applications.
- Establish a broad portfolio covering various technologies and various end-use sectors.
- Document hurdles and lessons learned from 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

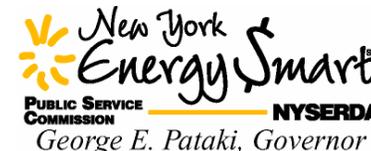
Applications accepted for Round I: November 20, 2003 through February 25, 2004 and;
Applications accepted for Round II: February 26, 2004 through June 9, 2004

- 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



NYSERDA



A Conference on

Combined Heat and Power (CHP) in New York State

Save The Date

June 23 –25, 2004

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



Equipment & Technologies
Recip Engines
Microturbines
Fuel Cells
Gas/Steam Turbines

Site Tours
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Issues & Answers
Interconnection
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Tariffs

Case Studies

Industrial
Papermill
Plastics Processing
Food Packaging

Residential
Multifamily Highrise
Multibuilding Complex

Commercial and Institutional
Supermarkets
Office Buildings
College Campuses



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