

Combined Heat and Power in New York State

CHP Potential – Opportunities and Issues

June 21, 2002

New York, New York

Bruce Hedman

Energy Nexus Group

- Professional services company focusing on distributed energy
- Subsidiary of Onsite Energy Corporation
- Company origins in cogeneration and on-site power
- Active in Distributed Generation and Combined Heat and Power



Agenda

- Review existing CHP in New York
- Profile remaining CHP opportunity
- Explore potential benefits of CHP to New York
- Identify key hurdles to CHP development

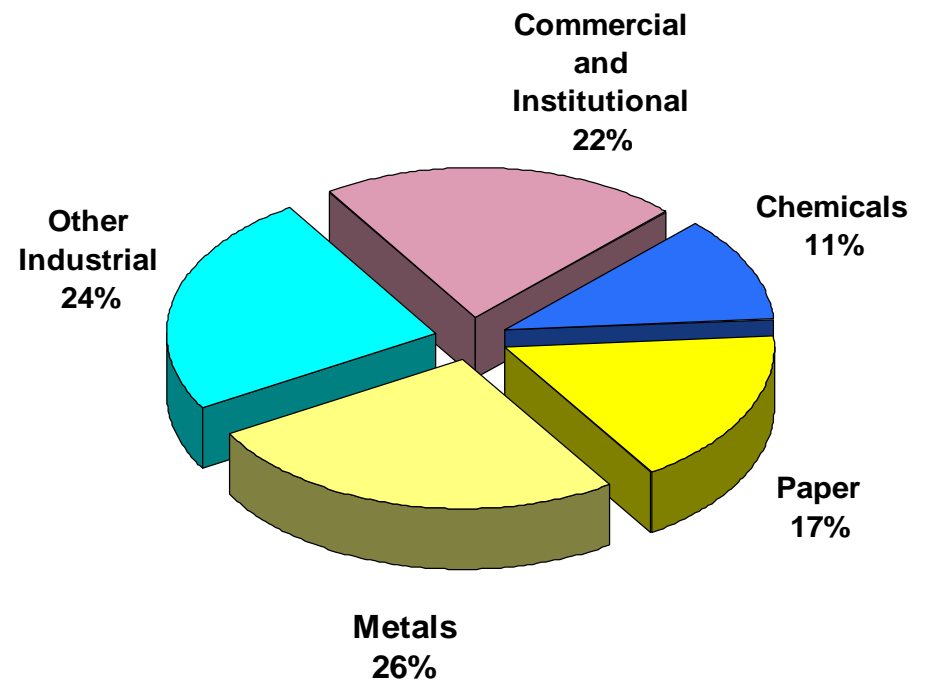
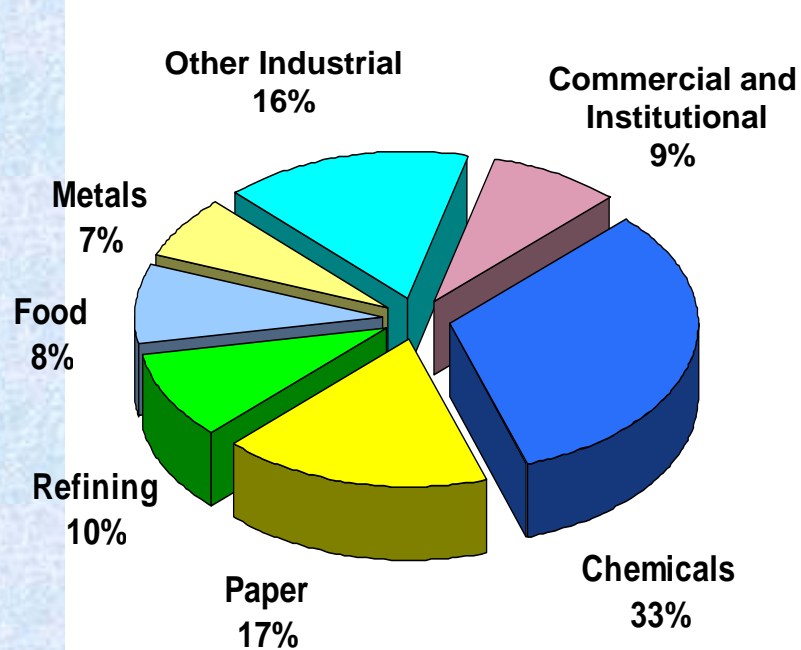
Existing CHP in New York

- 5,070 MW, 210 sites (year 2000)
- Capacity concentrated in a few large “merchant” facilities
- Primarily gas turbine based technologies and natural gas fueled
- Significant activity in commercial and institutional applications

Industrials Represent the Bulk of Existing CHP

United States – 60,200 MW

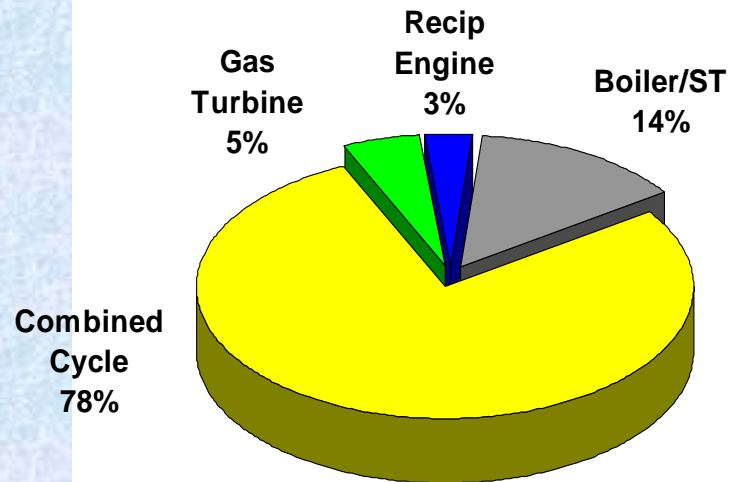
New York – 5,070 MW



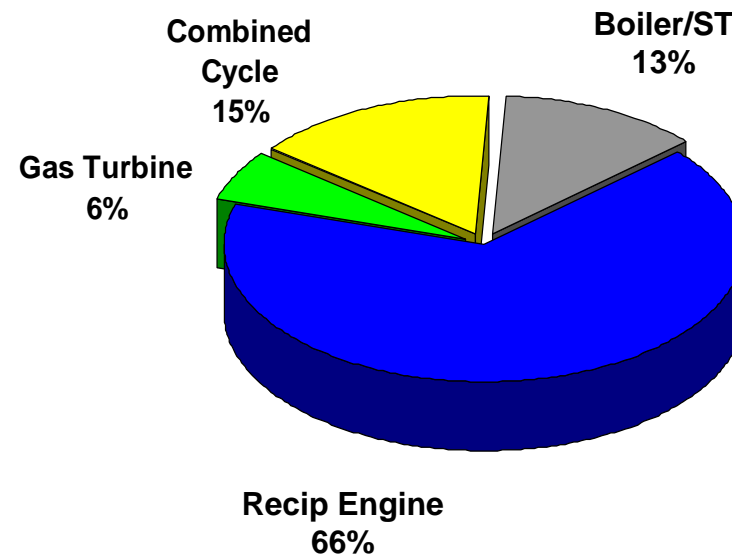
Source: PA Consulting, Energy Nexus

Combined Cycles Dominate Capacity; Reciprocating Engines Dominate Sites

Capacity – 5,070 MW



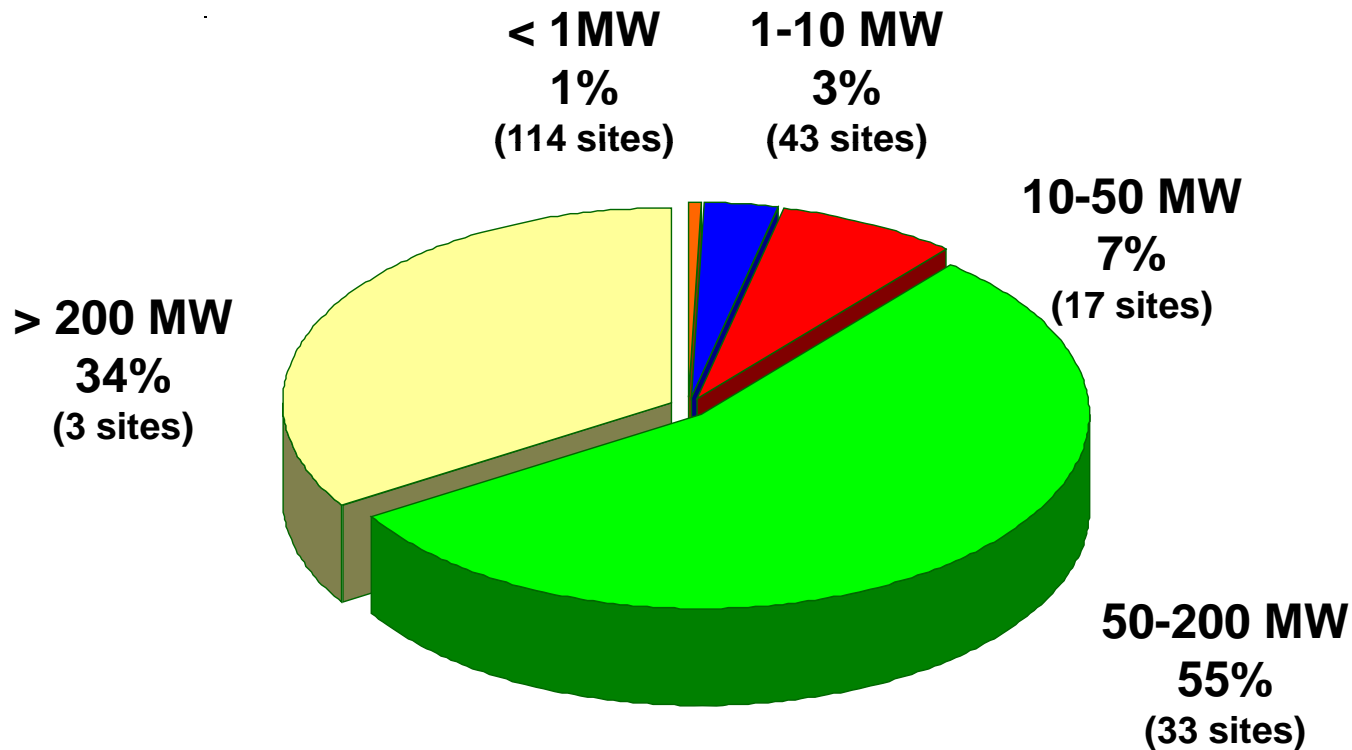
Sites – 210



Source: PA Consulting, Energy Nexus

36 Sites Account for 89% of Existing CHP Capacity

Existing CHP Capacity: 5,070 MW



Source: PA Consulting, Energy Nexus

What Is the Remaining Opportunity?

- Evaluated technical potential at existing facilities - industrial and commercial - that have appropriate energy characteristics
- Assumed systems sized to meet on-site demands only
- Profiled by application, size and utility region

Where Does CHP Make Sense?

- High thermal (steam, hot water, or direct heat) demands
- High electric demands
- Coincident thermal and electric demands
- Extended operating hours (>6000)
- Access to fuels (byproducts, natural gas)

Target Industrial Applications

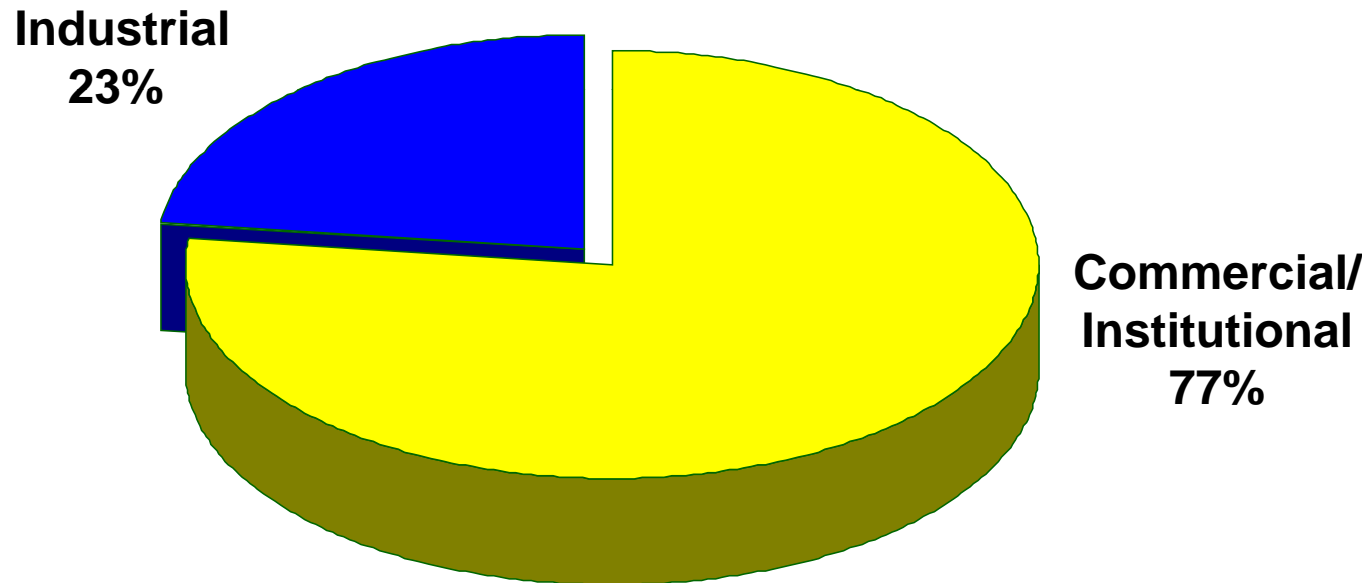
- Food Processing
- Paper
- Chemicals
- Machinery and fabrication
- Lumber

Target Commercial Applications

- Hospitals
- Hotels
- Nursing homes
- Colleges
- Laundries
- Health clubs
- Schools
- Large office buildings
- Apartments
- Others (car washes, restaurants, cold storage)

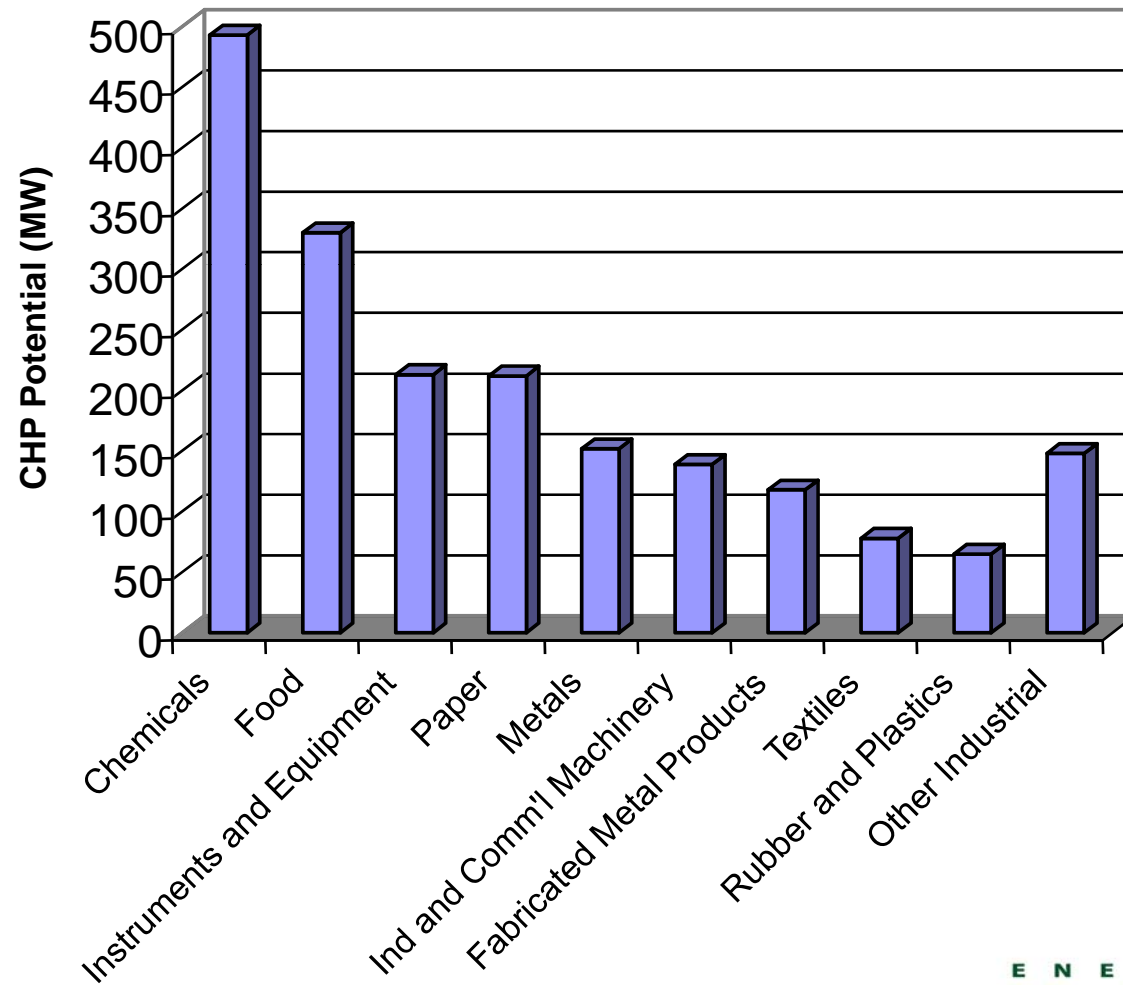
Commercial / Institutional Applications Represent the Greatest Opportunity

Total Remaining CHP Potential: 8,500 MW



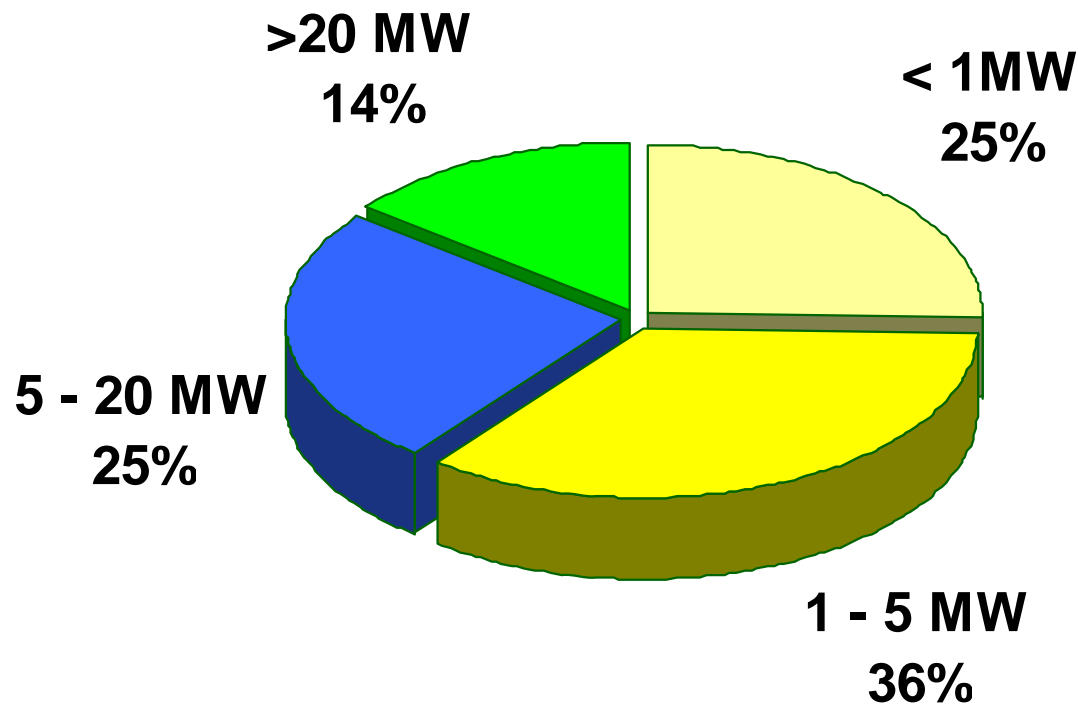
Source

CHP Potential in Industrial Applications



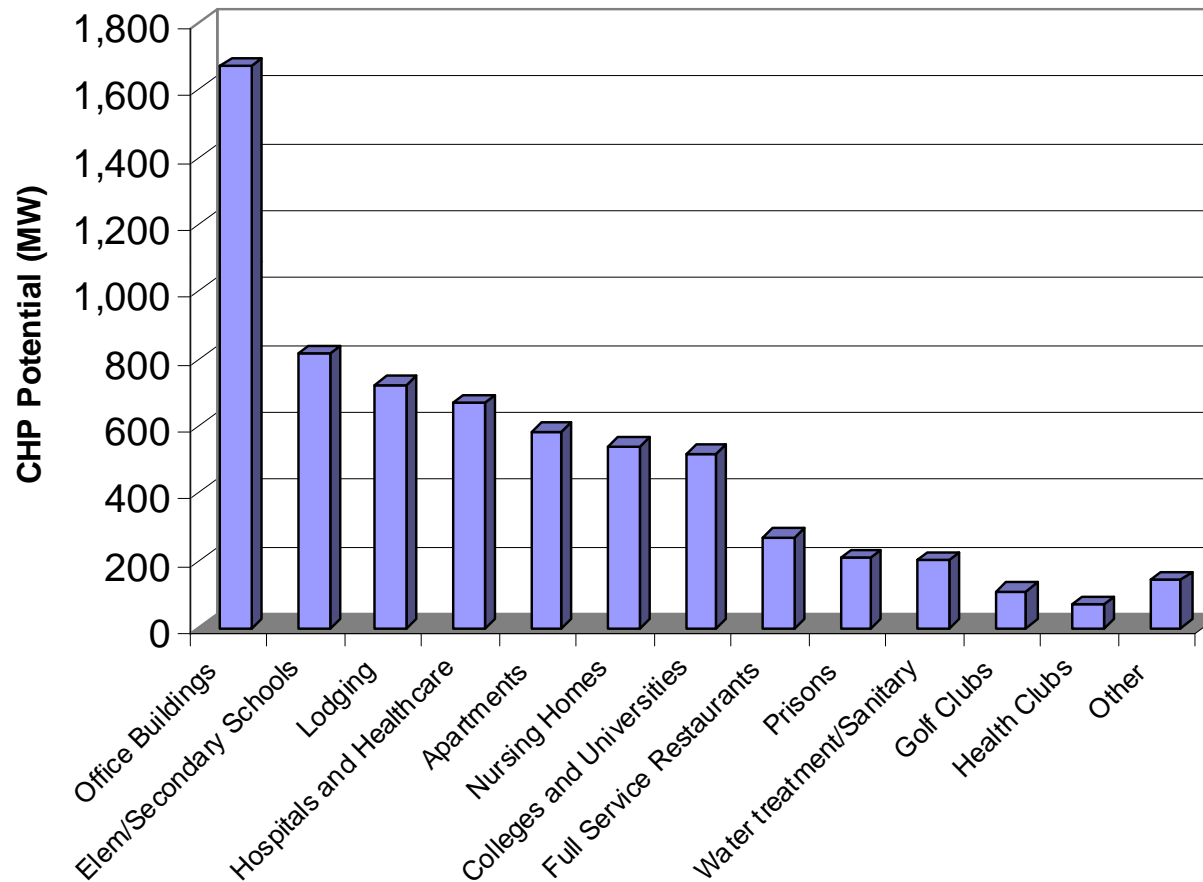
61% of the Remaining Industrial Potential is in Systems Below 5 MW

Industrial CHP Potential: 1,950 MW



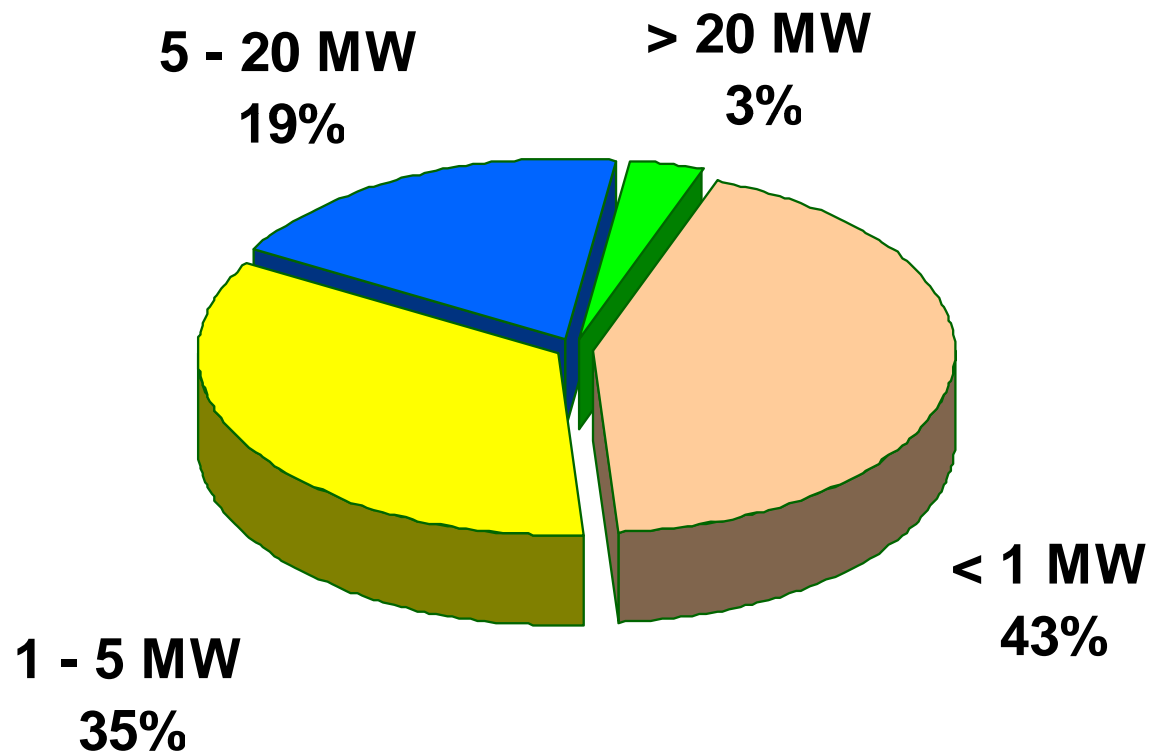
Source

CHP Potential in Commercial and Institutional Applications



78% of Commercial / Institutional Potential is in Systems Below 5 MW

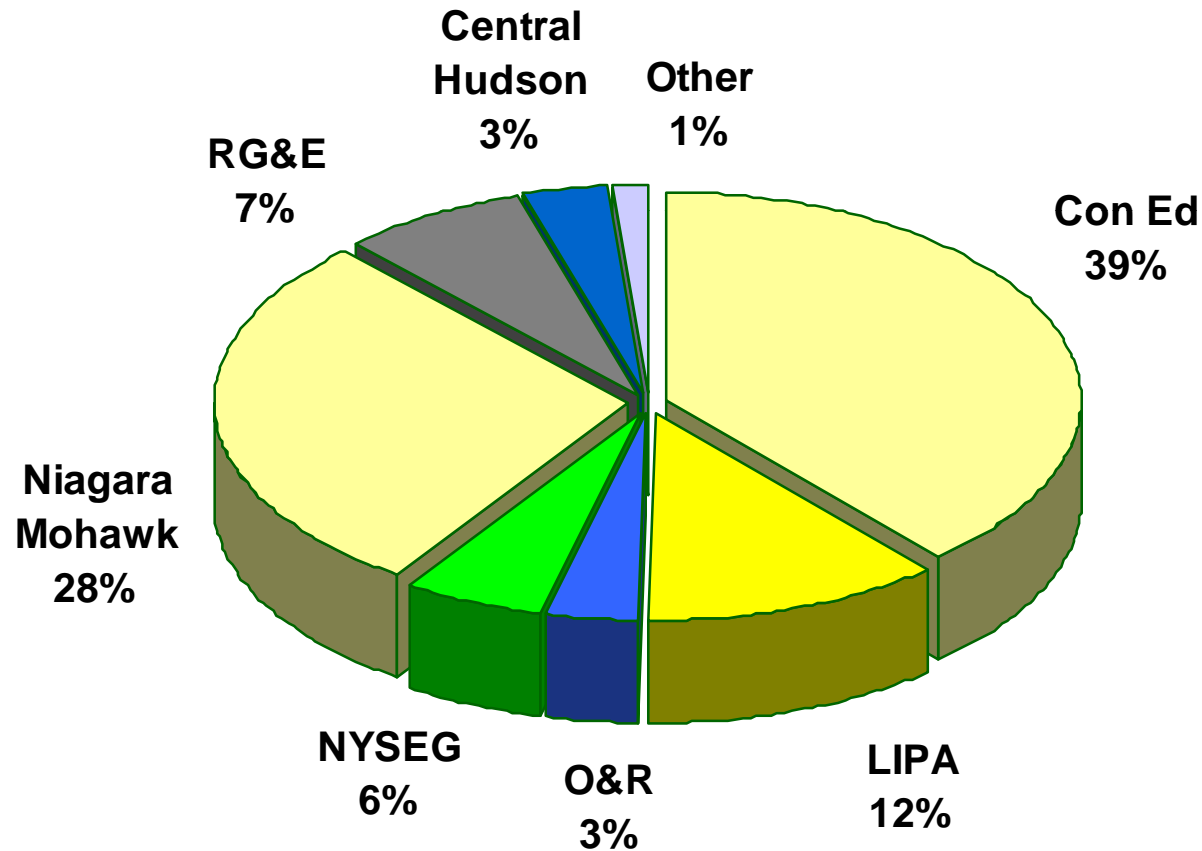
Comm'l/Inst'l CHP Potential: 6,500 MW



Source

79% of CHP Potential is in Three Utility Areas

CHP Potential: 8,500 MW



Source

What is the Remaining Opportunity?

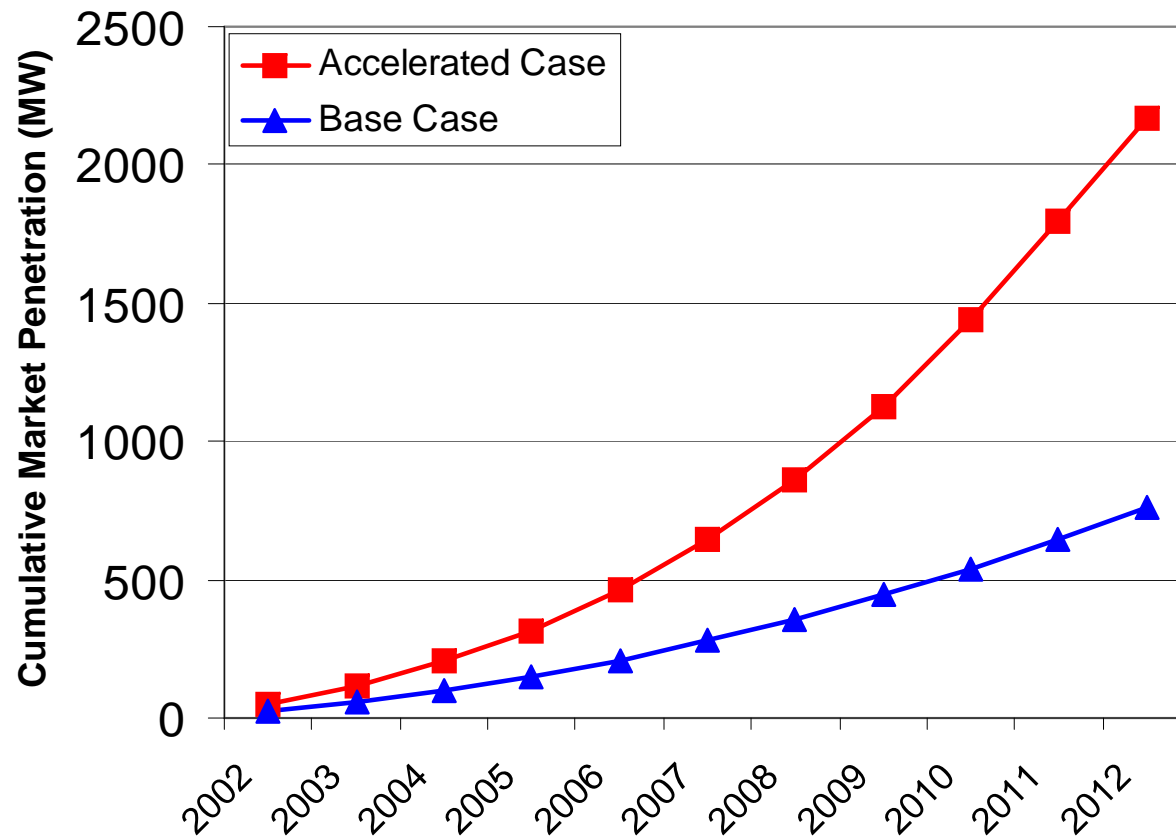
- 8,500 MW at 26,000 sites
- 77% is in commercial/institutional markets
- 74% is below 5 MW
- 79% is in three utility service areas
- Existing market penetration is small except in large sizes

What Will Affect Future Market Development?

- Base Case
 - ✓ Existing technology
 - ✓ Existing utility rate structures (standby)
- Accelerated Case
 - ✓ Continued advances in technology
 - ✓ Reduction in standby charges (one third of existing)
 - ✓ Streamlined permitting and siting
 - ✓ Increased customer awareness and adoption
 - ✓ CHP tax incentive (10% of initial cost)

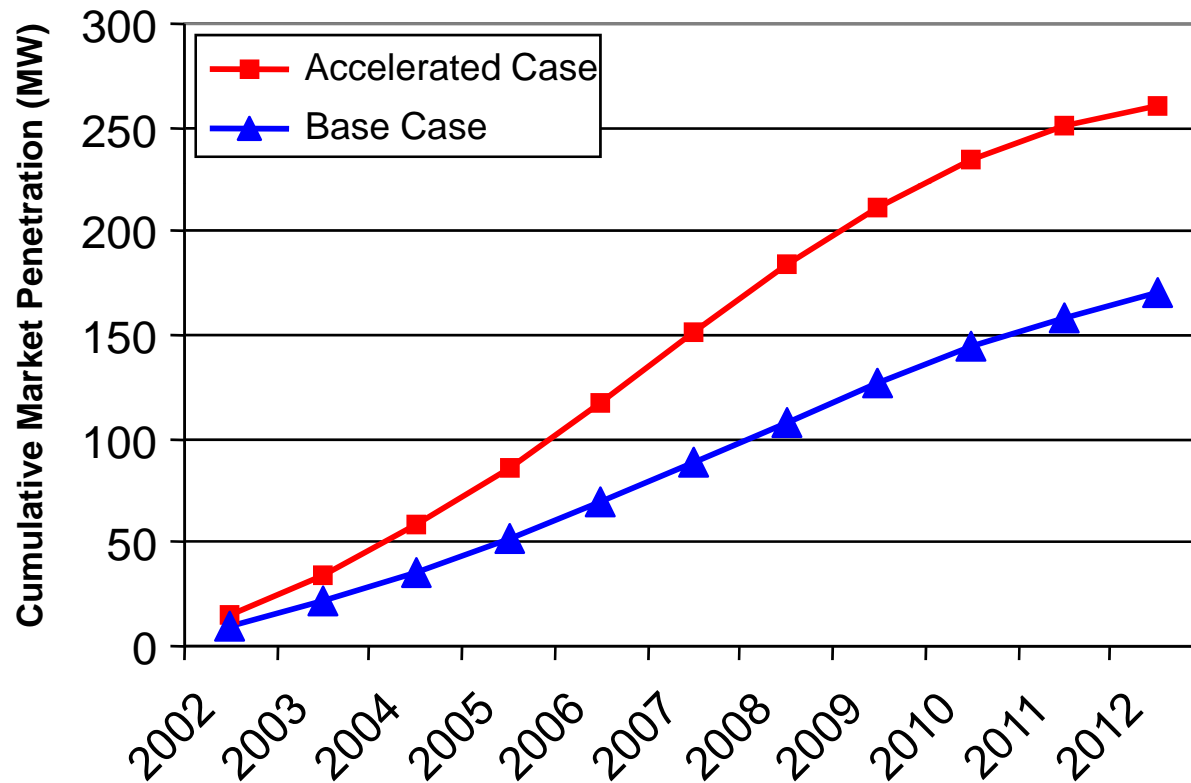
Total Cumulative Market Penetration

Market Penetration Comparison
Base vs. Accelerated



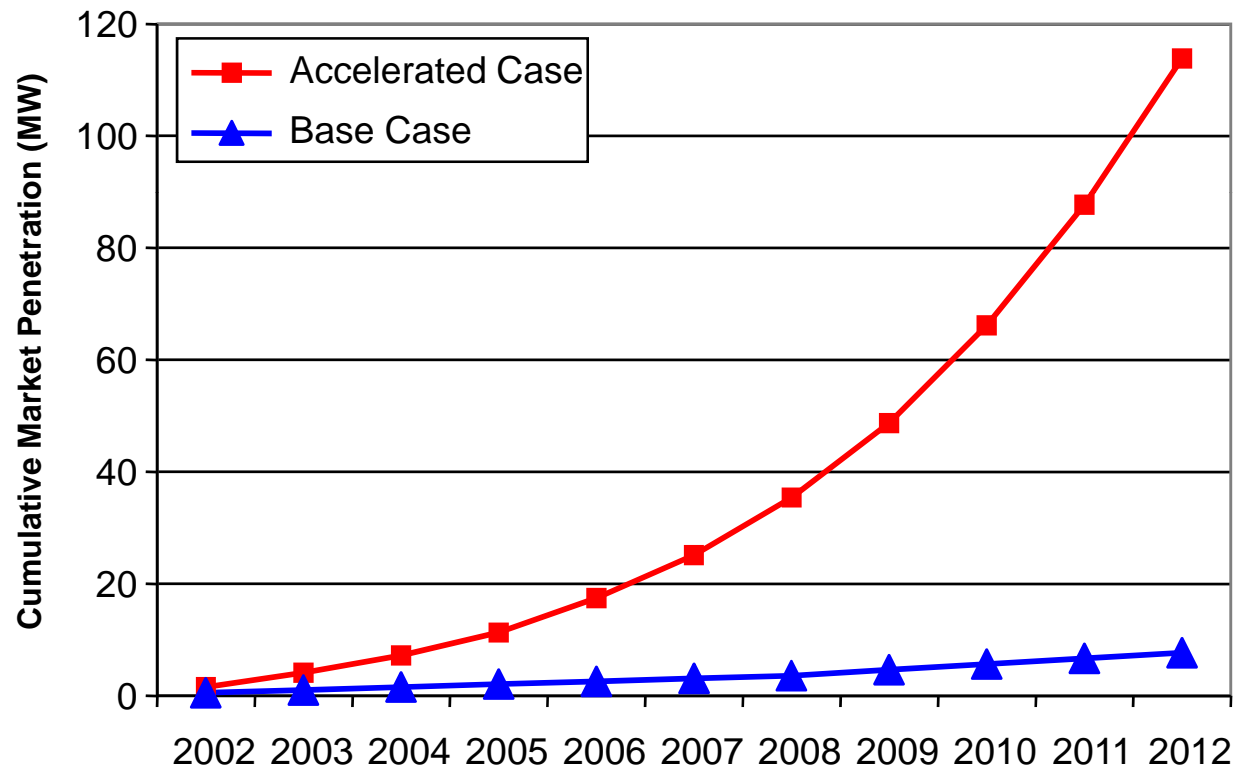
Market Penetration for Large Systems

Greater than 20 MW, Upstate



Market Penetration for Small Systems

500kW to 1 MW, Upstate



CHP Market Penetration

- Market penetration increased from 760 MW (Base Case) to 2170 MW (Accelerated Case)
- Increase in market penetration is primarily the result of regulatory and institutional factors
- Technology advances are key to long-term growth
- Greatest impact is on smaller systems

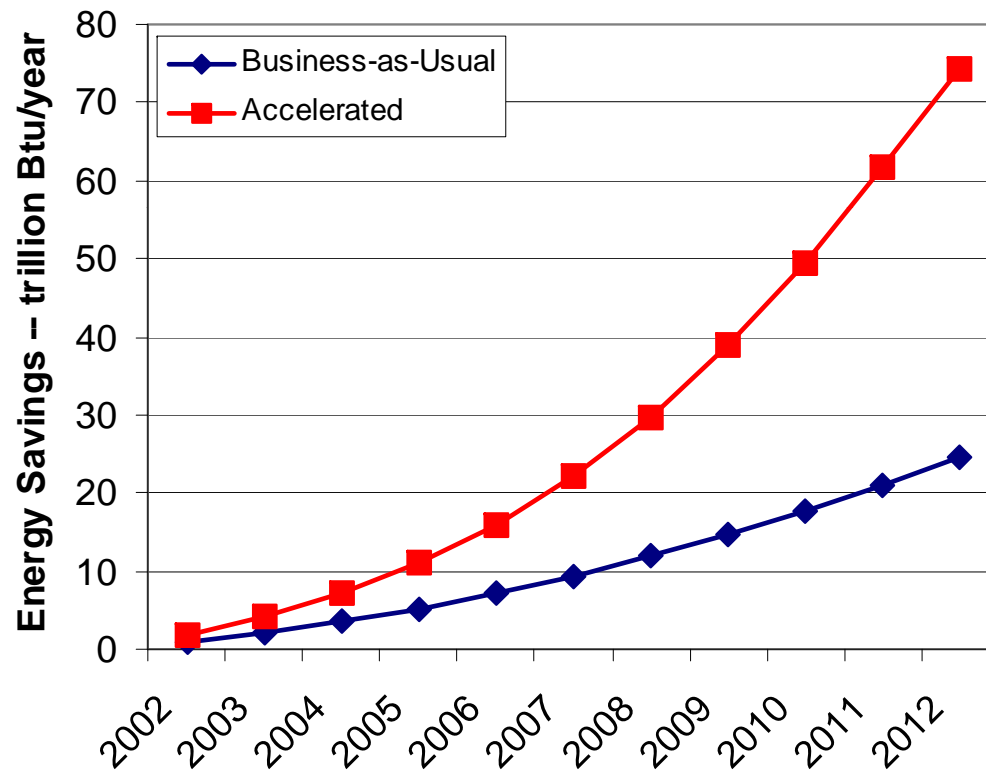
What Benefits does CHP offer New York?

- Greater energy productivity (the same economic output requiring less energy input)
- Lower energy costs for owner/operators
- Potential for reduced emissions (NO_x, SO_x, CO₂)
- Other measures -- power quality, reliability, utility independence, security

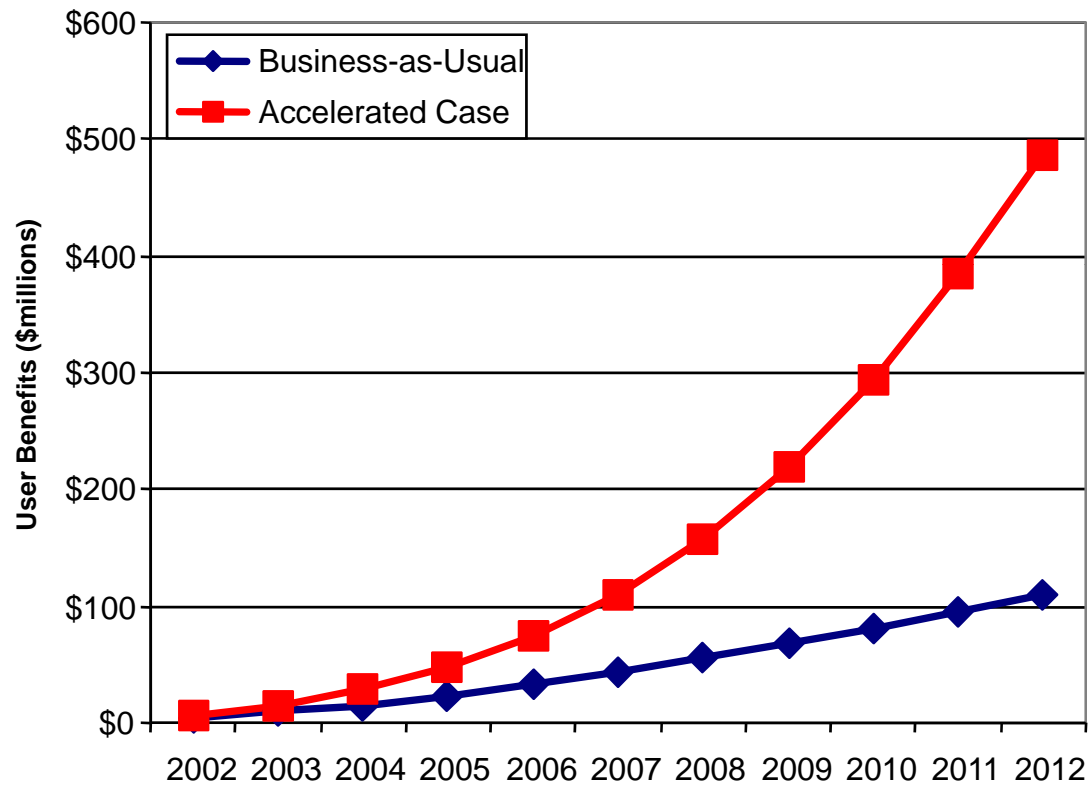
Benefits Depend On:

- Electric and natural gas rates
- The generation mix that CHP displaces
- Emissions and performance profiles of central station generation and CHP systems
- Market penetration of CHP

CHP Can Save 300 TBtu Through 2012



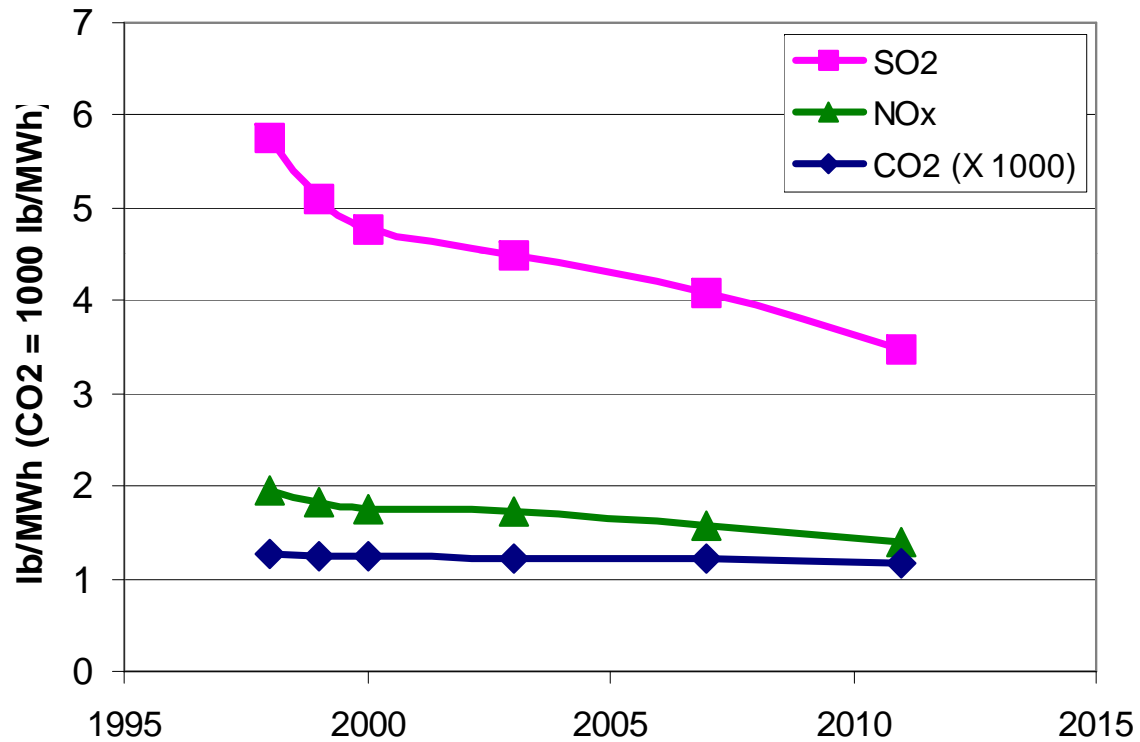
CHP Can Save Consumers \$1.8 Billion Through 2012



CHP System Assumptions

Size Range MW	Representative Technology	Electric Effic. %	Emissions		
			Value	Units	lbs/MWh
Base Case					
0.1-0.5	Recip. Engine	28.1%	0.15	g-bhp-hr	0.443
0.5-1	Recip. Engine	30.9%	0.7	g-bhp-hr	2.070
1-5	Gas Turbine	27.6%	25	ppmv 15% O2	1.139
5-20	Gas Turbine	29.0%	25	ppmv 15% O2	1.082
>20	Gas Turbine	37.0%	9	ppmv 15% O2	0.306
Accelerated Case					
0.1-0.5	Microturbine	36.0%	9	ppmv 15% O2	0.314
0.5-1	Recip. Engine	36.4%	0.5	g-bhp-hr	1.478
1-5	Gas Turbine	35.5%	15	ppmv 15% O2	0.531
5-20	Gas Turbine	37.7%	15	ppmv 15% O2	0.500
>20	Gas Turbine	40.0%	3	ppmv 15% O2	0.094

New York Power Grid Emissions



New York Central Station Emissions – Existing plus New Generation (Fossil Only)

Potential Emissions Reductions Due to CHP

	Base Case	Accelerated Case
NOx, Tons/yr	3,210	10,282
SOx, Tons/yr	9,778	27,766
CO2, 1000 Tons,yr	1,259	3,854

- Savings compared to 2012 New York State Average Fossil Fueled Generation:
 - ✓ 1.386 lb/MWh NOx
 - ✓ 3.484 lb/MWh SOx
 - ✓ 1.159 1000 lbs/MWh

What are the Hurdles to more Robust CHP Markets in New York?

- Interconnection
- Tariff Design
 - ✓ Standby / Back-up Power Rates
- Utility Interface
- Air Permitting
- Financial and Economic Concerns
- Local Codes, Siting and Permitting
- Market Issues



Bruce Hedman

1401 Wilson Blvd
Suite 1101
Arlington, VA 22209

703-243-4306
202-251-0017 cell

Email: bhedman@energynexusgroup.com