Emission Reduction Credits and Smaller-Sized Combined Heat & Power Projects in New York State

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Distributed Energy Resources (DER)

or

Distributed generation (DG)

Small, modular electricity generators sited close to the customer load that can enable utilities to defer or eliminate costly investments in transmission and distribution (T&D) system upgrades, and provide customers with better quality, more reliable energy supplies and a cleaner environment

Combined heat and power (CHP)

Is the simultaneous production of electrical or mechanical power and thermal energy from a single process. CHP is an application of distributed generation.

The environmental importance of CHP is made evident by the fact that total system efficiencies can reach 80% and more. Each unit of fossil fuel input can be employed for useful cooling, heating and power with only a fraction of the waste inherent in separately provided cooling, heating and power configurations.

NYSERDA’ s CHP PROGRAM:
A NATIONAL LEADER
NEARLY 100 FUNDED CHP
PROJECTS

NYSERDA CHP PROGRAM DEMO PROJECTS SELECTED

- 95 SELECTED
- $46.5 Million Earmarked
- 105 MW's Installed or to be Installed

SECTOR	PROJECTS
Industrial	35
Institutional	25
Commercial	17
Residential	18

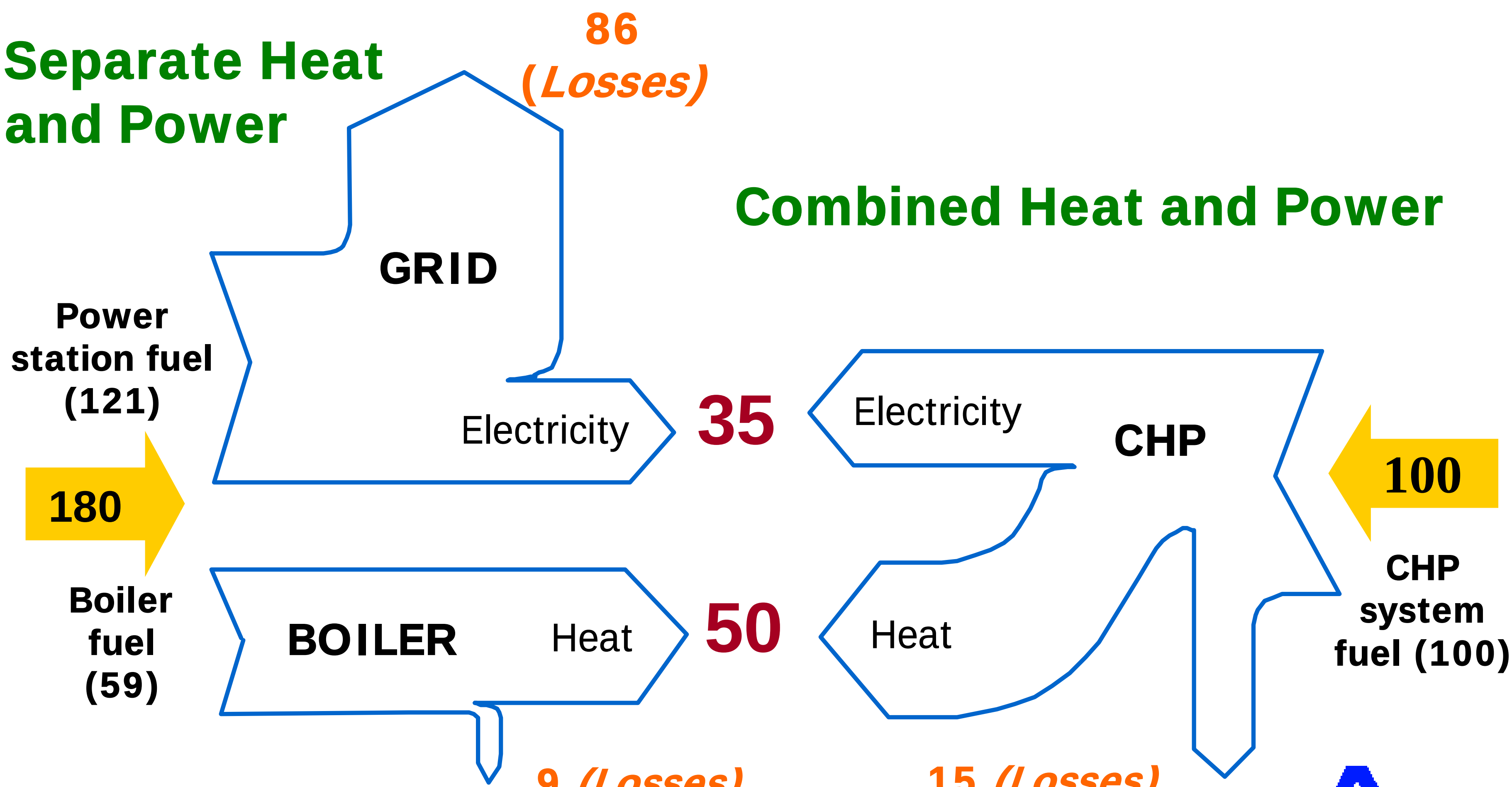
WHY SUPORT CHP?

ENERGY

ENVIRONMENT

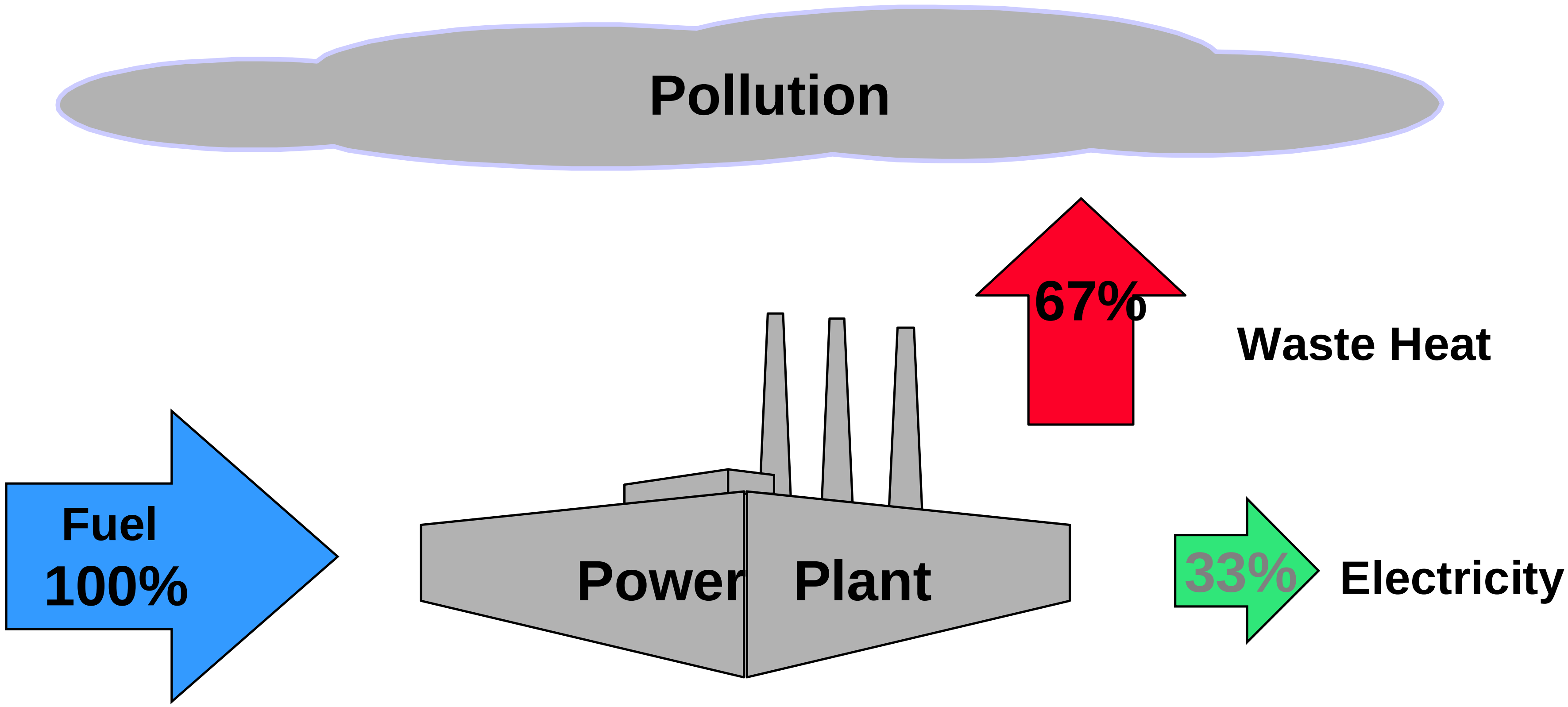
ECONOMIC DEVELOPMENT

CHP: an Efficiency Strategy



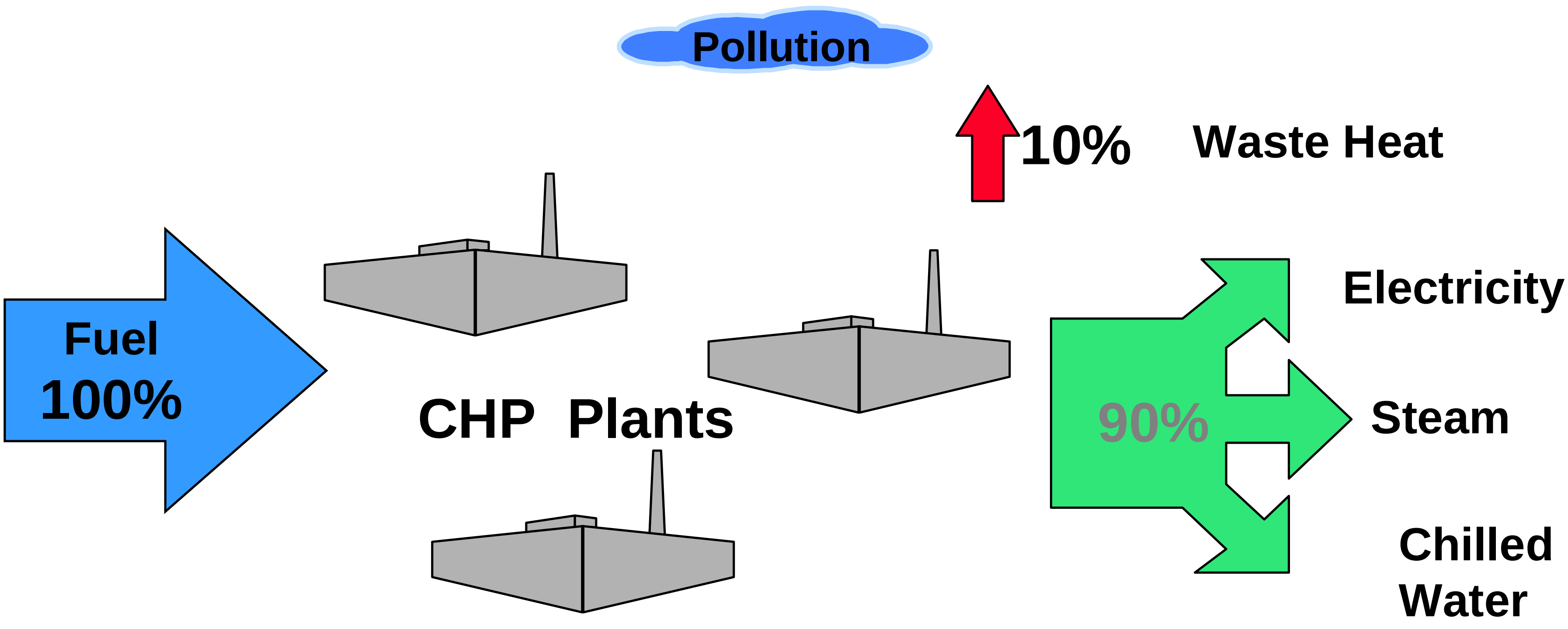
Source: Kaarsberg 1998

Conventional Thermal Generation



(Remote from thermal users)

Combined Heat and Power (CHP)



(On or near thermal user sites)

UNCONTROLLED NOX EMISSIONS RATES (lbs/MWH)	
RICH BURN IC ENGINES	40.0
DIESEL ENGINES	18.0
LEAN BURN IC ENGINES	1.5 - 7.0
GAS TURBINES	0.8 - 2.4
MICROTURBINE	0.45 - 1.25
FUEL CELLS	0.03 - 0.1

UNCONTROLLED VOC EMISSIONS RATES (lbs/MWH)	
RICH BURN IC ENGINES	4.0 - 8.0
LEAN BURN IC ENGINES	1.5 - 5.0
GAS TURBINES	0.1 - 0.5
MICROTURBINE	0.04 - 0.25
FUEL CELLS	0.01 - 0.02

PM-10 EMISSIONS RATES (lbs/MWH)	
RICH BURN IC ENGINES	0.03
DIESEL ENGINES	0.78
LEAN BURN IC ENGINES	0.03
SMALL GAS TURBINES	0.08
MICROTURBINE	0.08
MEDIUM GAS TURBINE	0.07
LARGE GAS COMBINED CYCLE	0.04
1998 AVERAGE COAL BOILER	0.30

EMISSION REDUCTION CREDIT (ERC)

A CERTIFIED EMISSION REDUCTION THAT IS

CREATED BY ELIMINATING FUTURE EMISSIONS,

QUANTIFIED DURING OR BEFORE THE PERIOD IN WHICH THE EMISSION REDUCTIONS ARE MADE, AND

EXPRESSED IN TONS PER YEAR

Criteria for Creating Creditable Emissions Reductions

- Real
- Quantifiable
- Surplus
- Permanent
- Enforceable

QUANTIFIABLE

Setting the Baseline Period

Establishing Prior Actual or Prior Allowable Annual Emissions (Whichever is lower)

Establishing Future Maximum Allowable Emissions

QUANTIFIABLE (cont.)

Baseline time period:

the most recent two consecutive year period immediately proceeding the reduction,

or with the review and approval of DEC

A representative two consecutive year period within the last 5 years

Representative based upon actual operating hours, production rates, and material input

1. Compute Prior Actual Annual Emissions

2. Compute Prior Allowable Annual Emissions

3. Take the lesser of Actual or Allowable

4. Compute Future Maximum Annual Potential

Subtract Line 4 from Line 3 to obtain ERC

SURPLUS

Example: An 1100 HP ENGINE,

Actual Emissions Rate = 6 g/BHP-Hr.

Regulatory Emissions Rate = 3.0 g/BHP-Hr

Activity Level:

1999 – 6500 hours, 47.5 Tons

2000 – 7200 hours, 52.6 tons

Two Year Average Emissions 50 Tons

SURPLUS (cont.)

Actual Emissions (previous page) 50 TPY

contrast with

Emissions At Regulatory Rate 3.0 g/BHP-Hr

1999 – 6500 hours, 23.8 Tons

2000 – 7200 hours, 26.3 tons

Two Year Average Emissions 25 T **25 TPY**

ALLOWABLE BASELINE EMISSIONS

SURPLUS (cont.)

Baseline Emissions 25 TPY

New Emissions At 0.5 g/BHP-Hr

6500 hours, 4.0 Tons

7200 hours, 4.4 tons

Two Year Average Emissions 4.2 Tons

CREDITABLE EMISSIONS = 25 – 4

= **21 TPY**

EMISSION REDUCTION CREDITS (ERC'c)

DEFINITION: *6 NYCRR 231-2.1(b)(14)*

Emission reduction credit, ERC. Any decrease in emissions of a nonattainment contaminant in tons per year, occurring on or after November 15, 1990:

(i) which is surplus, quantifiable, permanent, and enforceable; and

(ii) which results from a physical change in, or a change in the method of operation of an emission unit subject to Part 201 of this Title; and

Emission Reduction Credit (cont.)

(*a*) is quantified as the difference between prior actual annual emissions or prior allowable annual emissions, whichever is less, and the subsequent maximum annual potential; and

(*b*) is certified in accordance with the provisions of section 231-2.6 of this Subpart; or

(iii) which results from a physical change in, or a change in the method of operation of an air contamination source not subject to Part 201 of this Title, and is certified in accordance with the provisions of section 231-2.6 of this Subpart.

Illustrative Examples of Potential NOX Reductions at Multi-Family Sites

Multi-Family Site	Estimated Tons of NOX Reductions
Clinton Hill	10 – 12
Ebbets Field	14 - 16
Rego Park	6 - 8

ILLUSTRATIVE PM_{10} REDUCTION AT MULTI-FAMILY SITE

- Clinton Hill Project 7 tons per year
- A 12 building residential complex located in Brooklyn, NY
- was using about 700,000 gal/year
- NYSERDA grant to install numerous microturbines

OBJECTIVES

LOWER THE TRANSACTION COSTS AND THE TIME DURATION TO CERTIFY REAL, SURPLUS, PERMANENT AND ENFORCEABLE ERC'S FROM SMALLER-SCALE CHP PROJECTS

REDUCE THE COST ($ / TON OF ERC CERTIFIED)

SHORTEN THE TIME DURATION

WHILE PROTECTING THE INTEGRITY OF THE PROGRAM

Policy Issues

OBJECTIVE: How can the ERC creation process be streamlined in a manner that

- protects the integrity and rigor of the process,

and

(b) minimizes additional transaction costs and time burdens for small projects

Issues to be addressed

1. The cost of the process (stack testing, engineering certification, etc)

2. Complexity (protocols)

3. Time duration

4. Methods for assessing/crediting CHP reductions

Pre-Certification

Pre-Certification might provide a tool for

Expediting the certification of ERC's from smaller-scale CHP projects, while protecting the integrity and rigor of the program

In California, the Air Resources Board has certified the NOx emissions of the Capstone microturbine.

In 2001, CARB confirmed that NOx emissions of the 30-kW Capstone HEV microturbine were 0.53 grams per brake horsepower-hour.

Pre-Certification (cont.)

WHEREAS, Capstone Turbine Corporation has demonstrated, according to test methods specified in Title 17, California Code of Regulations (CCR), section 94207, that its natural gas-fueled C60 MicroTurbine has complied with the following emission standards:

1. Emissions of oxides of nitrogen no greater than 0.5 pound per megawatt hour;
2. Emissions of carbon monoxide no greater than 6.0 pound per megawatt hour;
3. Emissions of volatile organic compounds no greater than 1.0 pound per megawatt hour; and
4. Emissions of particulate matter no greater than an emission limit corresponding to natural gas with a fuel sulfur content of no more than 1 grain per 100 standard cubic feet;

CARB Certification of C60 MicroTurbine

as of 2/21/2003

OTHER PRE-CERTIFICATION MECHANISMS

EPA’S ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM (ETV) MIGHT SERVE AS A BASIS FOR A PRE-CERTIFICATION PROGRAM THAT WOULD BE RECOGNIZED NATIONALLY

POTENTIAL BENEFITS FROM THIS RESEARCH

IMPROVE THE ECONOMICS OF CLEAN DG PROJECTS AND INCREASE THE NUMBERS OF THESE APPLICATIONS THAT GET SITED.

CREATE SIGNIFICANT AIR QUALITY IMPROVEMENTS ON THE SITE

INCREASE THE SUPPLY OF ERC'S THAT ARE AVAILABLE FOR NEW SOURCE USES

INCREASE THE NUMBER OF PARTICIPANTS SUPPLYING CREDITS IN THE ERC MARKET

IMPROVE ERC MARKET LIQUIDITY AND MARKET PERFORMANCE

The Value of NOx ERC's

$29,000 per ton was the highest trading price

$3,800 per ton was the lowest trading price

At the height of demand for new power plant construction, prices were typically $13,000, $14,000, $15000 per ton

Average price since trading began is in the $8000 per ton range

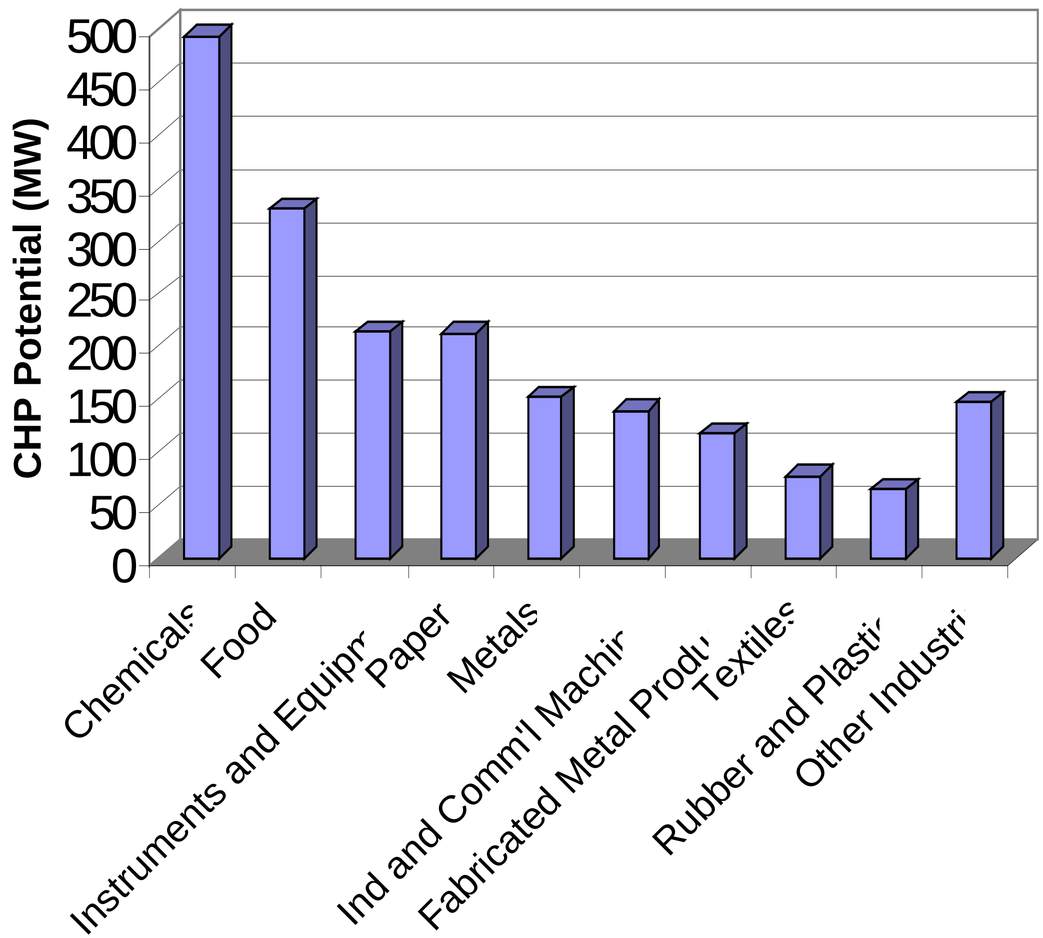
INDUSTRIAL AND COMMERCIAL TECHNICAL POTENTIAL FOR CHP NEW YORK STATE TOTAL

Size Range	Industrial		Commercial		Total	
	Sites	MW	Sites	MW	Sites	MW
State Total						
50 to 500 kW	3,894	300	16,048	1,240	19,942	1,540
500 kW to 1 MW	428	195	3,867	1,584	4,295	1,779
1 MW to 5 MW	434	685	1,280	2,256	1,714	2,941
5 MW to 20 MW	63	488	149	1,240	212	1,728
> 20 MW	9	280	7	210	16	490
Total	4,828	1,948	21,351	6,530	26,179	8,478

TECHNICAL POTENTIAL FOR CHP DOWNSTATE

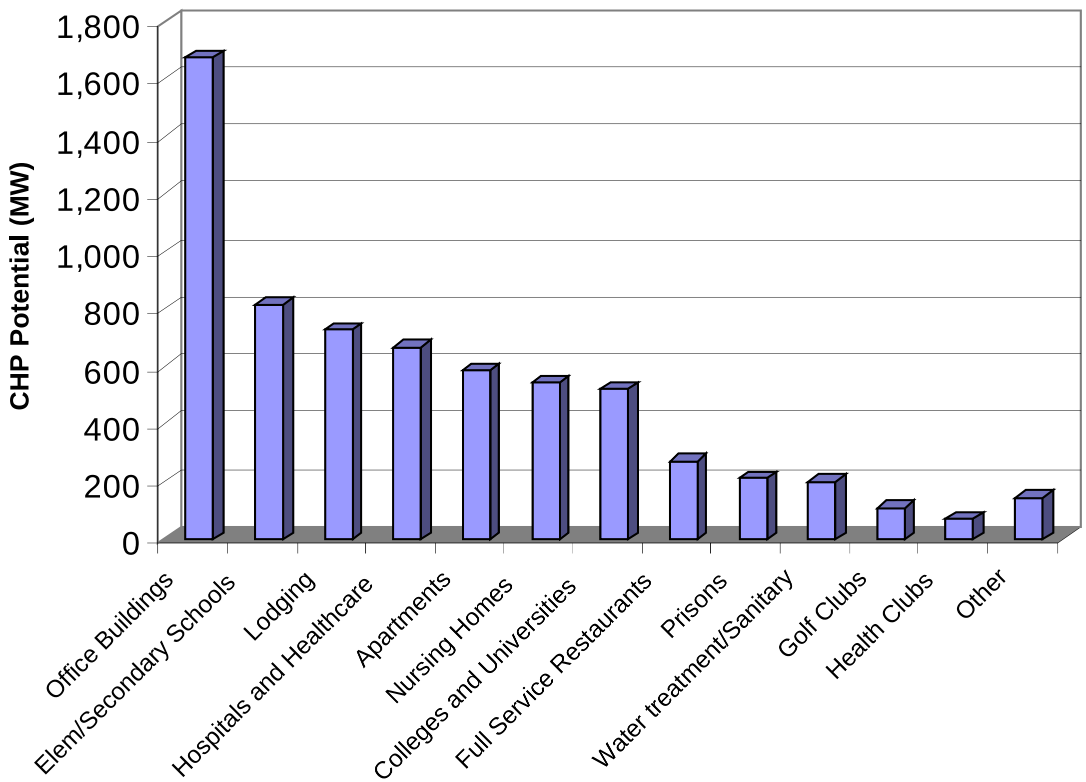
Size Range	Industrial		Commercial		Total	
	Sites	MW	Sites	MW	Sites	MW
Downstate*						
50 to 500 kW	2,160	185	9,919	723	12,079	908
500 kW to 1 MW	143	73	2,520	977	2,663	1,050
1 MW to 5 MW	111	211	804	1,335	915	1,546
5 MW to 20 MW	10	88	108	848	118	936
> 20 MW	0	0	5	150	5	150
Total	2,424	557	13,356	4,033	15,780	4,586

* Downstate market is made up of LIPA, Consolidated Edison and Orange and Rockland distribution service areas.



Industrial CHP Technical Potential (MW)

Commercial Sector Technical Potential



Which Sectors Represent the Key Target Markets?

Industrial

Four Industries Represent 66% of the Total Remaining Capacity

- Chemicals ~ 575 MW's (30%)
- Food Processing ~ 315 MW's (16%)
- Pulp &Paper ~ 200 MW's (10%)
- Instruments ~ 200 MW's (10%)

Commercial / Institutional

Three Industries Represent about 50% of the Total Remaining Capacity

- Office Buildings ~ 1620 MW's
- Elementary & Secondary Schools ~ 790 MW's (12%)
- Hotels / Motels ~ 720 MW's (11%)

Five Additional Industries Represent Another 40% of Total

- Hospitals ~ 650 MW's (10%) / Multi-Family Housing
- Nursing Homes / Colleges
- Restaurants

END-USE SECTOR	MW's	PCT	CUMULATIVE PCT
COMMERCIAL OFFICE	1620	24.8%	
SCHOOLS	790	12.1%	36.9%
LODGING	720	11.0%	47.9%
HOSPITALS	650	10.0%	57.9%
APARTMENTS	585	9.0%	66.8%
NURSING HOMES	550	8.4%	75.3%
COLLEGES	525	8.0%	83.3%
RESTAURANTS	240	3.7%	87.0%
ALL OTHER	850	13.0%	
TOTAL COMMERC/INST.	6530		

TECHNICAL VS REALIZED CHP POTENTIAL

26% (2170 MW's) in Accelerated Case	9% of Technical Potential in Base Case
Upstate Large Sites Predominate; 31% (261 MW's) of Upstate Total	Only 9% of Downstate Total in Large Sites
Downstate 1MW to 5MW Sites Account for 39% Of Total	Upstate 1MW to 5MW Sites Account for 22% of Total
Downstate 1320 MW's	Upstate 850 MW's

PUBLIC HOUSING INVENTORY

Consists of more than 1 Million units owned by 3,200 Public Housing Authorities

7100 Properties have over 50 units

Wooster Manor, Danbury VT
7 Story, 100 unit complex
60 kW gas engine installed in 1998
Energy Costs Dropped by ~ 50%

ECONOMIC & ENVIRONMENTAL BENEFITS OF CHP DEPLOYMENT

2200 MW's of CHP installed over the 10 Year period 2002-2012 has the following benefits:

$1.825 Billion in User Savings

$808 Million in net present value savings

Annual Emission Reductions in 2012

- 10,282 tons of NOx
- 27,766 tons of SO_2
- 3,854,000 tons of CO_2

EXPECTED BENEFITS FROM THIS REASERCH

ENVIRONMENTAL: Significant onsite pollution reduction

ECONOMIC: Increase the supply of ERC's. Creating more liquidity in the market, reduce market power

CHP MARKET DEVELOPMENT: Improve the economics of high efficiency CHP

PM-10 EMISSIONS RATES (lbs/MWH)	
NATGAS RECIP ENGINES	0.1 - 0.3
SMALL GAS TURBINES	0.3 - 0.6
MICROTURBINE	0.55 - 0.65