

An Overview of State Level Distributed Generation (/Fuel Cell) Program

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New York State Energy Research and
Development Authority
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New York State Energy Research and Development Authority (NYSERDA)

- A Public Benefit Corp established in 1975 by State Legislature
- Mission: To identify solutions to State's energy challenges in ways that benefit the State's economy and environment
- Forge public/private partnerships with businesses, municipalities, residents, and other energy stakeholders to accomplish this goal.

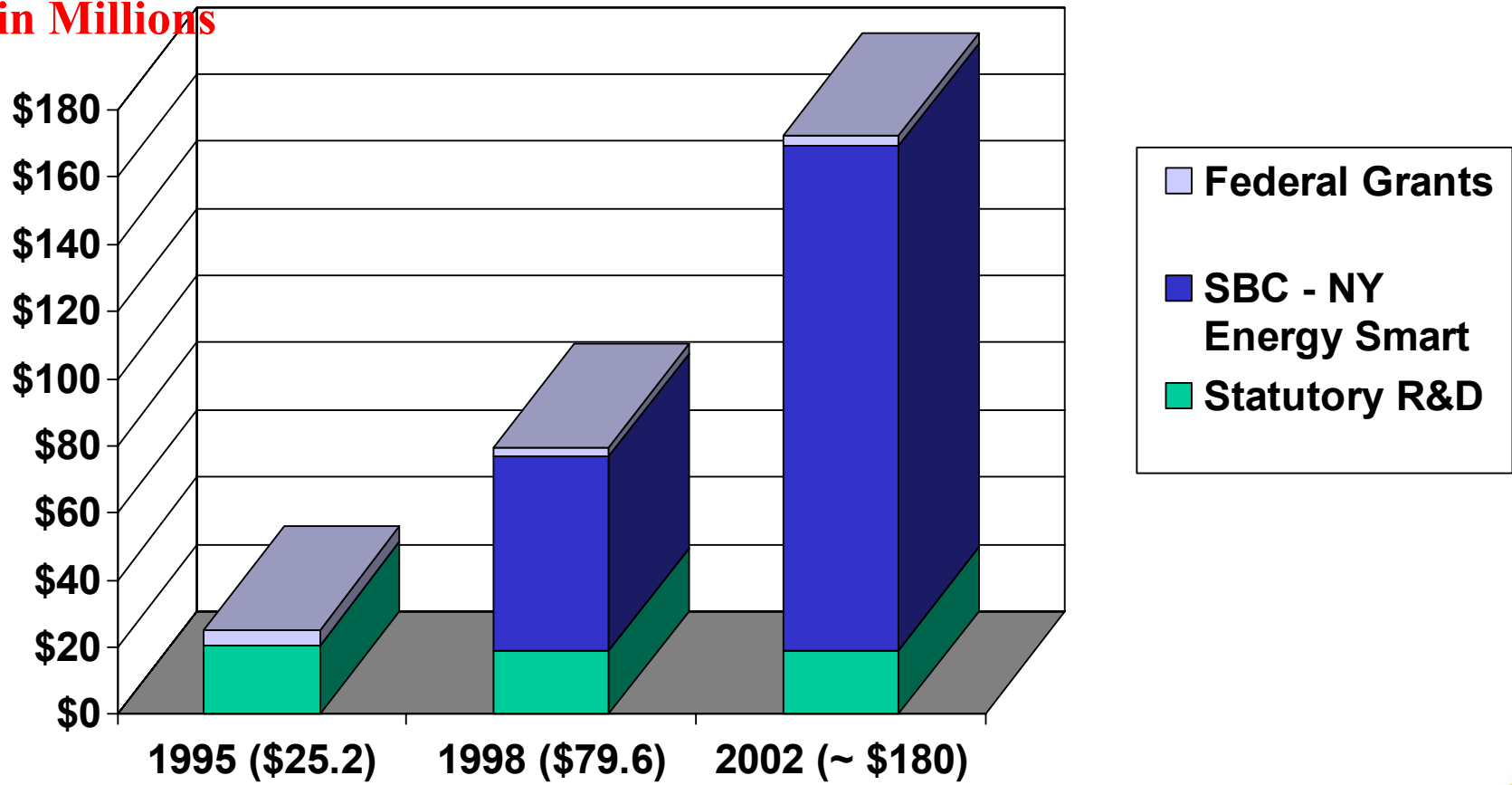
NYSERDA Responsibilities

- Energy Research, Development, and Demonstration
- System Benefits Charge Administrator
- Energy Planning & Analysis
- Power Plant Siting Board Member
- Greenhouse Gas Task Force
- Public Awareness of Energy Efficiency
- West Valley Demonstration Project
- Spearheading EO # 111



NYSERDA Funding

\$ in Millions



New York Energy SmartSM Program

First Three Years

- \$201 million invested
 - Stimulated private- and public-sector investments of an additional \$618 million
- \$119 million in annual energy savings for participants
- 2,300 jobs created/sustained
- Annual emissions reductions equal to removal of 134,000 vehicles from roads

NYSERDA's R&D Program

Since 1991

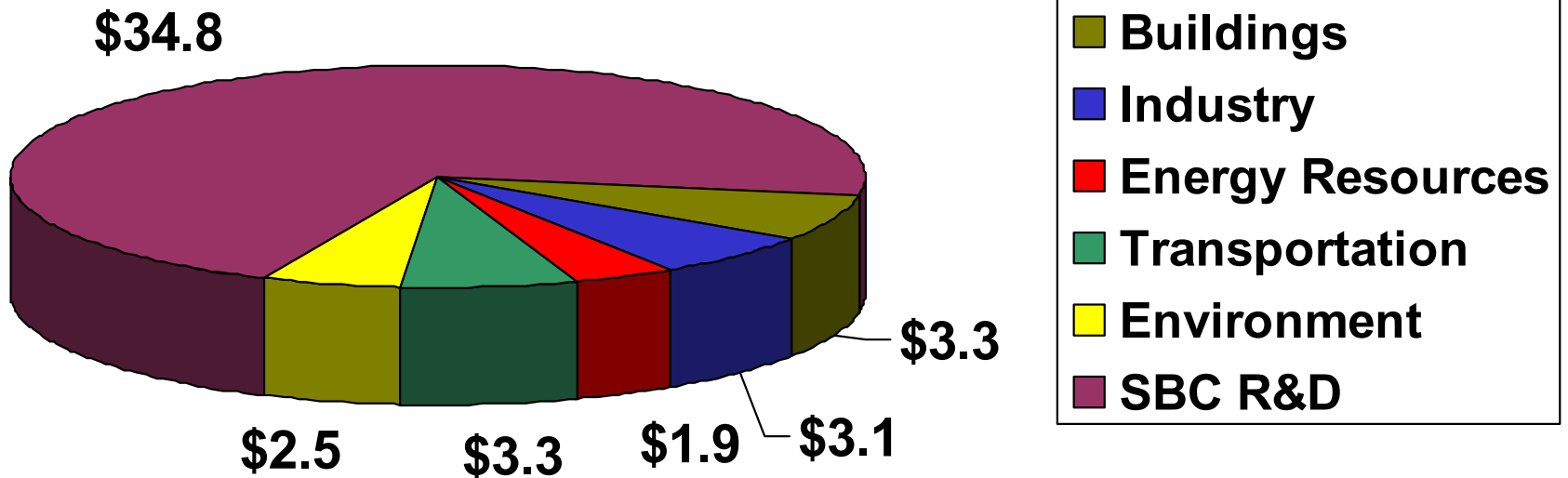
- Created nearly 1200 permanent jobs
- Helping 200+ businesses stay competitive and remain in New York
- Successfully introduced over 140 NYS energy or environmental products/services into commercial use
- \$200 million in cumulative sales for products developed through NYSERDA funding

NYSERDA's R&D Program

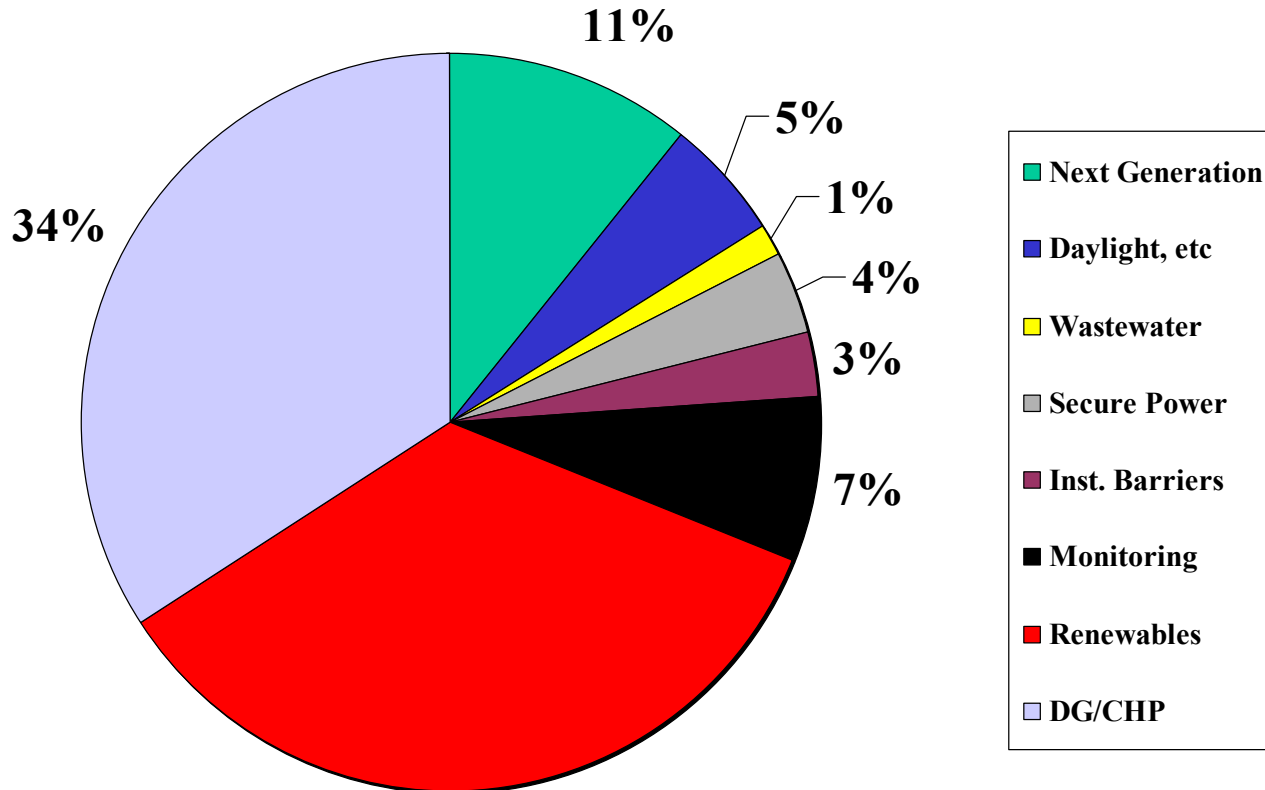
- U.S. DOE cited NYSERDA as 1 of 10 best R&D organizations (along with NASA, DARPA, Research Institute of Canada) and best in its class.
- More than 92% of program selected competitively
- Leverage about \$3 in co-funding for every \$1 of NYSERDA funding
- 95% of projects co-funded by potential users of technology

2003 R&D Funding

Total: \$48.9 Million



New York Energy \$martSM Budget for Renewables, Distributed Generation and Combined Heat & Power



\$203.5 Million over 5.5 years
\$37 Million per year

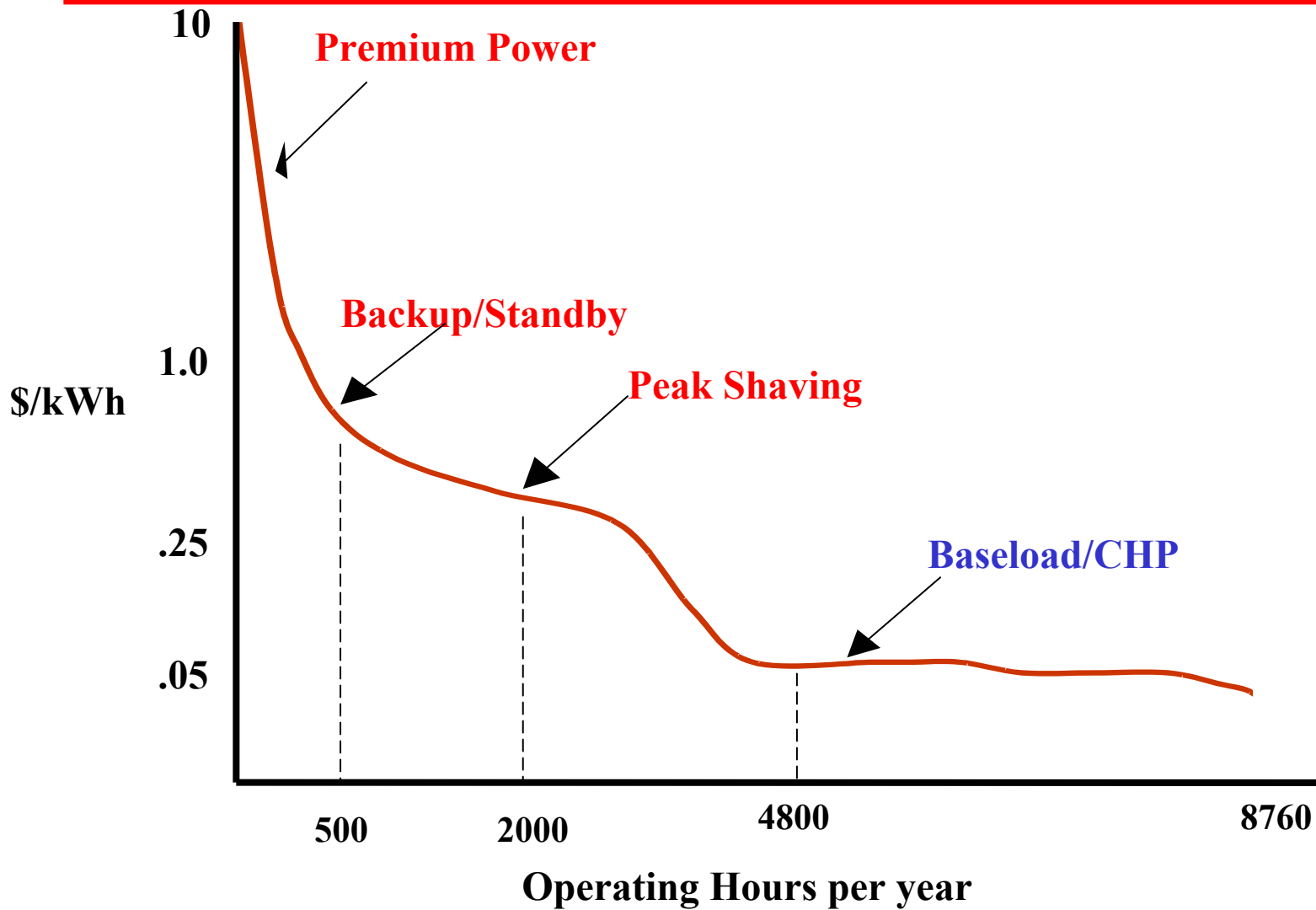
NYSERDA's DG-CHP Program

- Develop & Demonstrate Innovative DG Technologies & CHP Applications
- Promote Clean & Efficient Available Systems
- Reduce Hurdles through Shared Knowledge
- Install Megawatts of Generation Capacity
- Funding: \$15 million per year

How DG Technologies Compare?

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

Cost of DG Power



Cumulative CHP Market Penetration Projection by 2012 (MW)

CHP System Size	Business As Usual	Accelerated
50 to 500 kW	0	61
500 kW to 1 MW	92	331
1 MW to 5 MW	204	699
5 MW to 20 MW	208	704
> 20 MW	260	374
Total	764	2,169

CHP Benefits At Full Market Penetration

CHP Benefits	Business As Usual	Accelerated
Economic Savings (\$ million)		
2012 Annual	\$109	\$487
Cumulative (02-12)	\$536	\$1,825
Net Present Value	\$253	\$808
Energy Savings (trillion Btu)		
2012 Annual	25	74
Cumulative (02-12)	118	316
Annual Emissions Savings After 2012(tons/year)		
NO_x	3,210	10,282
CO₂	1,259,000	3,854,000
SO₂	9,778	27,766

NYSERDA's CHP Demonstration Program Installations (kW)

Technology	No. of Projects	Total Capacity	Typical Size
Engines	54	56,714	1,000
Turbines (Gas/Steam)	7	26,309	3,000
Microturbines	13	1,500	120
Fuel Cells	7 (10 sites)	4,050	200
Hybrids	4	4,598	1,000
Totals	84	93,171	1,000

NYSERDA's Fuel Cell Demonstrations

Type	Application	Capacity	NYSERDA \$	Comments
PAFC	Municipal WWT	1.6 MW	\$1,000,000	8 fuel cells @ 4 Sites
PAFC	Bronx Zoo	200 kW	\$584,030	WCS
PAFC	East Rochester K-12	200 kW	\$833,430	ATSI Engineering
PAFC	Verizon - TeleCom.	1.4 MW	\$425,000	7 fuel cells + Engines
MOFC	Sheraton Hotel	250 kW	\$920,000	PPL
MOFC	Syracuse Univ-ESF	250 kW	\$1,000,000	EO111
PEM	Albany NanoTech	150 kW	\$614,250	UTC
PEM	Various Product Demos			Next Presenter
SOFC	Verizon – Rome	250 kW	\$1,000,000	Terminated – Unavail
PAFC	Multi-family	200 kW	\$600,000	Terminated - Uneconomic

Fuel Cells at WWTP in NYC

- Eight UTC PAFC Fuel Cells at Four Municipal Waste Water Treatment Facilities in New York City (NYCDEP)
- Heat Recovered to Support Anearobic Digester
- Reduced On-site Emissions by Eliminating Flare
- NYSERDA: \$1,000,000; NYPA: \$12,000,000
- Two currently Operational, six more on-line by Fall '03



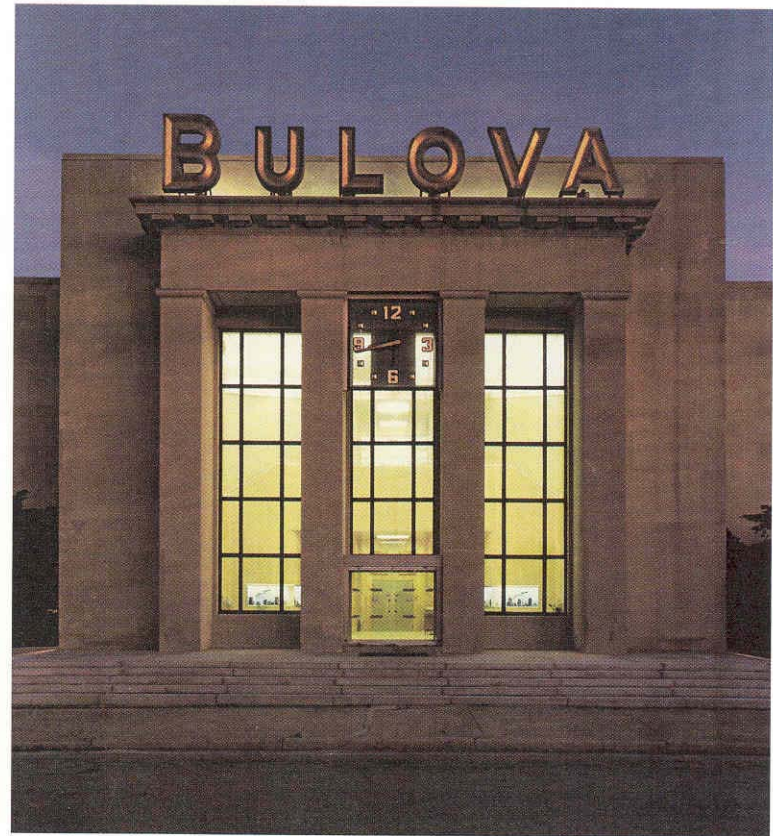
Waldbaums Supermarket

- Utilize (1) 75 kW engine driven generator.
- Utilizing a 40-ton Absorption Chiller.
- Annual energy savings of over \$50,000.
- Good opportunity for technology transfer.
- Decrease in emissions.



Bulova

- Building has been converted from the headquarters of Bulova Watch Co. to a state of the art office building.
- Utilizing (2) 350-ton gas engine driven chillers.
- Peak Demand Reduction of 526 kW
- Excellent thermal efficiency.



Greater Rochester International Airport

- Two 750 kW Ngas Recip. engines
- Heat recovered for space and DHW heating and a 300 ton absorber
- NYSERDA: \$500,000; GRIA \$2,000,000
- Status: Fully Operational since this summer.



CHP Program Challenges

- **Standby Rates** - NYS PSC is in the process of developing tariffs for all electric utilities.
- **Emissions Standard** - NYS DEC is in the process of developing air emissions standards.
- **Interconnection** - NYS PSC has set standards for systems up to 300 kVa on radial grid.
- **Utility Buy-In** - Grid support, congestion mitigation, alternative to grid expansion/upgrade, utility ownership or access to excess capacity

DG-CHP Program Summary

- Supporting 84 demo projects, 15 feasibility studies, and 10 technology/programmatic studies
 - NYSERDA funding of \$45 million (in ~\$140 M)
 - Demonstration projects will install 30 MW of capacity for a peak demand reduction of 26 MW in 2003
 - Additional capacity of 26 MW and 35 MW to be installed in '04 and '05, respectively
- CHP applications in industrial, agricultural, municipal, institutional, commercial, and residential sectors
- Field-Performance: Monitoring and Data Collection is Underway