



IBM ENERGY EFFICIENCY PROGRAMS



From Policy to Execution

AGENDA

- **IBM's GLOBAL ENVIRONMENTAL MANAGEMENT SYSTEM**
- **ENERGY CORPORATE INSTRUCTION AND RELATED OBJECTIVES**
- **REAL ESTATE AND SITE OPERATIONS ENERGY MANAGEMENT PROCESS**
- **REPORTING AND RESULTS**
- **RESULTS IN OPERATIONS IN CHINA**



IBM GLOBAL ENVIRONMENTAL MANAGEMENT SYSTEM

IBM's History of Commitment to Environmental Protection

- Thomas Watson Jr. first formally established IBM's corporate policy on environmental protection in **1971**
 - Called for IBM to "be continuously on guard against adversely affecting the environment. This effort must include constant attention not only to the waste incident to producing the product but also to the consequences of the processes established during product development."

- Corporate Environmental Policy: A commitment to environmental affairs leadership
 - Providing a safe and healthful workplace
 - Being an environmentally responsible neighbor
 - **Conserving energy and natural resources**
 - Developing, manufacturing and marketing products that are safe for their intended use, energy efficient, protective of the environment, and that can be reused, recycled or disposed of safely
 - **Using development and manufacturing processes that do not adversely affect the environment**
 - **Helping to develop solutions to environmental problems**
 - Meeting or exceeding all government regulations and voluntary requirements to which IBM subscribes
 - **Continual improvement**
 - **Conducting rigorous audits and self-assessments**

Environmental Management System

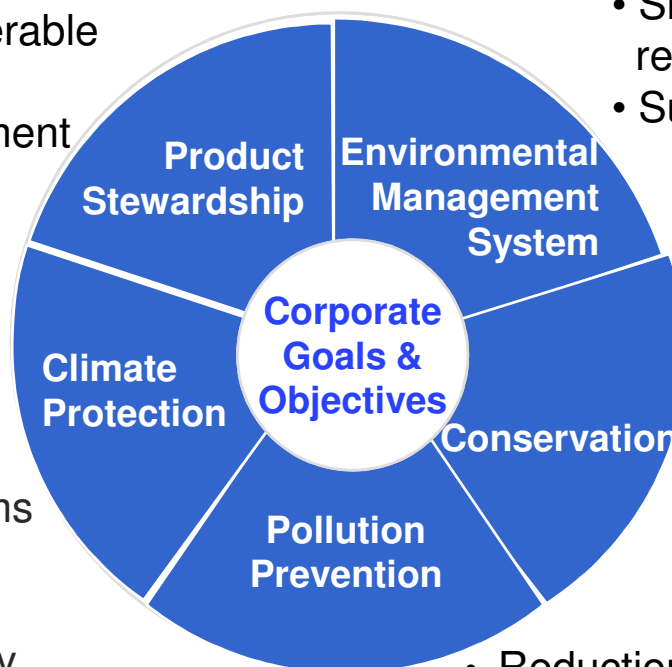
- Global environmental management system supports IBM's corporate policy
- Corporate directives govern IBM's **worldwide**
- Environmental requirements integrated throughout IBM's operations
- Global EMS enabled IBM to become first major multinational to obtain a single global registration to ISO 14001 (1997)
- Annual Corporate Environmental Report since 1990
 - <http://www.ibm.com/ibm/environment/>



IBM's Voluntary Environmental Goals and Objectives

- Materials evaluation and selection for use in products and processes
- Use of environmentally preferable materials and finishes
- Product end-of-life management

- CO2 emissions reduction
- PFC emissions reduction
- Employee commute programs
- Transportation of products
- Product energy efficiency
- Data center energy efficiency



- Single global ISO 14001 registration
- Supplier evaluation

- Energy conservation
- Water conservation
- Sustainable sourcing of paper & paper / wood-based packaging

- Reduction in hazardous waste generation
- Reduction in chemical releases to environment
- Recycling of nonhazardous waste

Management Commitment & Business Controls

- **Corporate Policy on Environmental Affairs issued by CEO**
- **Comprehensive audits & assessments**
 - **Professional Assessments**
 - **ISO 14001 Audits**
 - **Corporate audits**
- **Annual environmental updates to the Directors & Corporate Governance Committee**





CORPORATE INSTRUCTION AND OBJECTIVES GOVERNING ENERGY OPERATIONS

Corporate Instruction Environmental 108: ENERGY MANAGEMENT REQUIREMENTS

- **Key Component of the Corporate Environmental Management Program**
 - **4 Page Document**

- **Sets Requirements for Corporate Energy Programs**
 - **Management Criteria**
 - **Reporting Criteria**
 - **Goals and Objectives**

- **Establishes Base Requirements for IBM Operational Energy Programs**

Energy Conservation

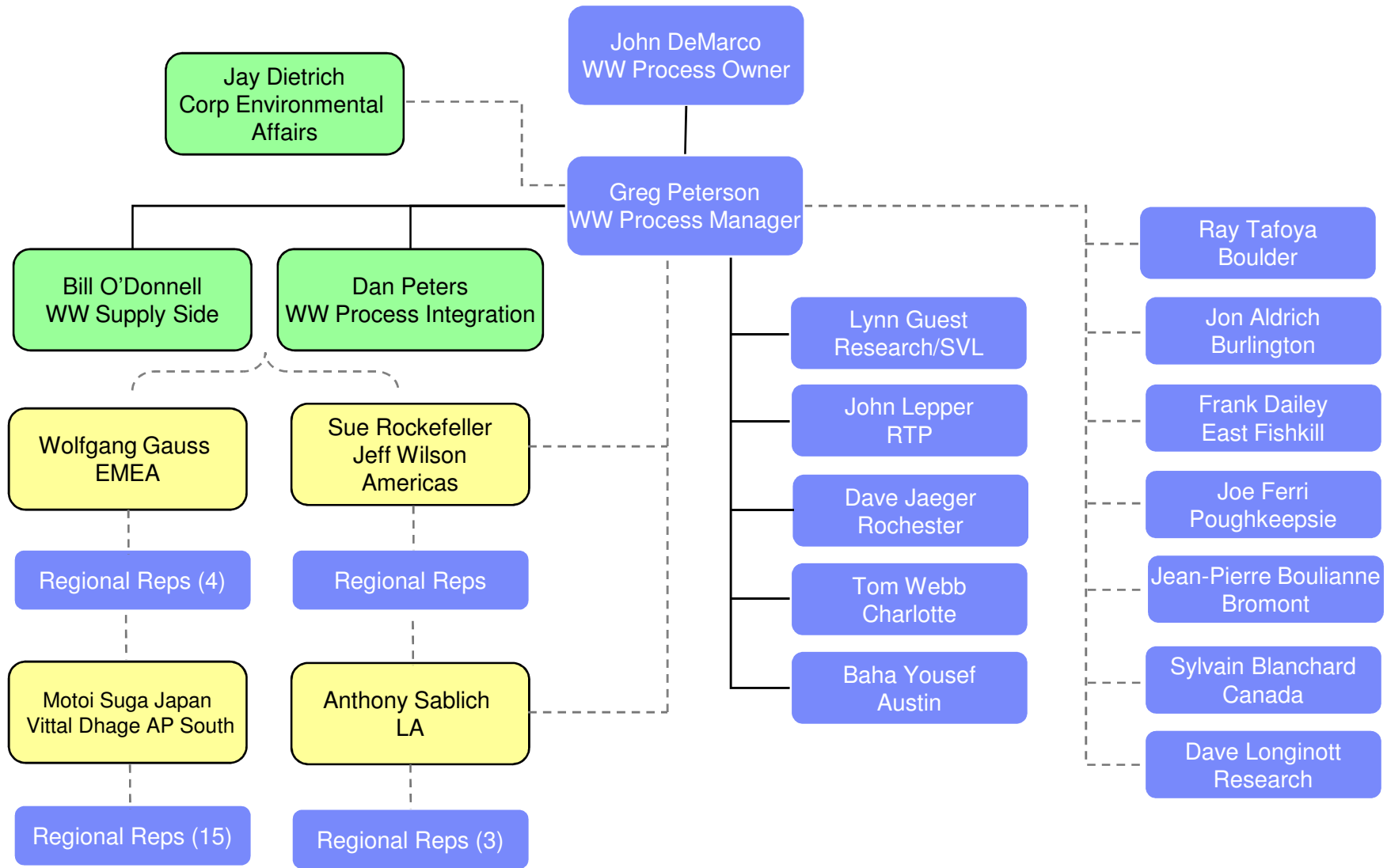
- Conservation
 - ▶ **Highest Priority – generates rate of return**
 - ▶ **Reduces consumption and generates cost savings of \$32.3 M in 2008**
 - ▶ **Generates Credits**
 - **Chicago Climate Exchange (CCX)**
 - **Energy Efficiency Credits (EEC)**

- Energy Conservation and CO2 Emissions: Objectives and Targets
 - ▶ **3.5% (4%) Annual Energy Conservation Target**
 - ▶ **7 % Annual Energy Consumption Reduction Target (RESO target)**
 - ▶ **Reduce CO2 emissions by 12% from 2005 baseline by year 2012**



ENERGY MANAGEMENT PROCESS

Globalized Approach: Owned by Real Estate & Site Operations (RESO)



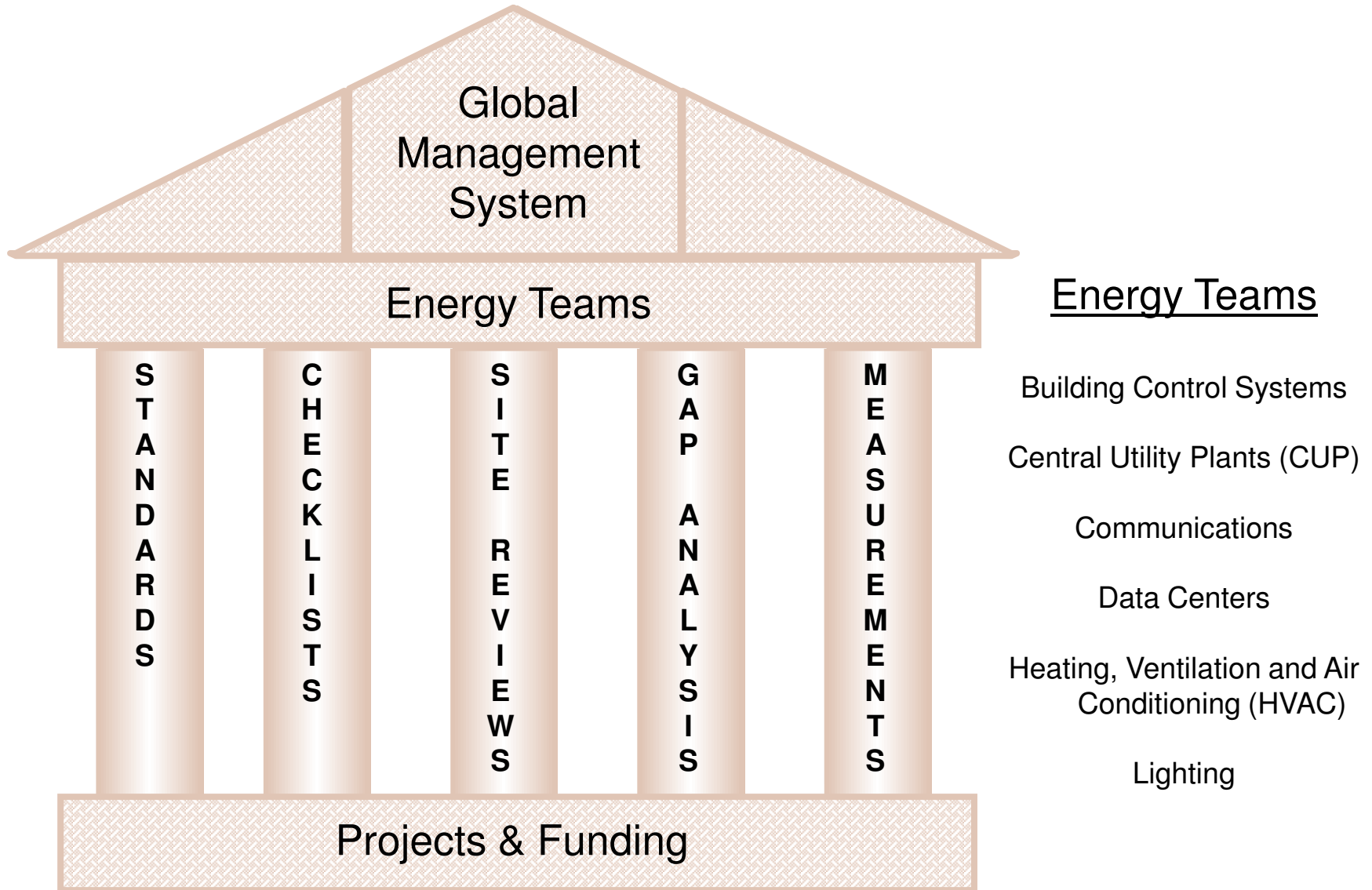
Energy Drivers by Cluster

Energy Drivers	Clusters: Space Types				Total Spend
	Manufacturing	Data Centers	Office Spaces	Labs & Research	
HVAC	20 %	10 %	50 %	30 %	27 %
Data Center Equipment	- - -	65 %	- - -	25 %	22 %
Central Utility Plant (CUP)	25 %	20 %	- - -	20 %	16 %
Manufacturing Processes and Tools	45 %	- - -	- - -	- - -	14 %
Lighting	10 %	5 %	25 %	10 %	13 %
Plug Load	- - -	- - -	25 %	15 %	8 %
Total Spend	30 %	28 %	28 %	13 %	



ENERGY CONSERVATION EVALUATION AND ENERGY USE TRACKING

Energy Conservation Strategy



On-line Global Database – Everyone Participates!!

Interior Lighting	* Answer	Comments
Have all corridors/aisles, offices, common areas and lobbies been delampd as much as possible?	Yes	
Has a process been implemented to prevent installation of lamps in light fixtures that have been delampd for conservation?	Yes	Low to no cost items are written in Red
Have all incandescent bulbs/lamps been replaced?	Yes	
Have lighting fixture lenses been cleaned (during bulb replacement) to provide maximum illumination?	Yes	
Are exterior window aisle fixtures off during the day to take maximum advantage of daylight harvesting?	Yes	
Do all maintenance areas have lighting timers or sensors installed?	No (in progress)	No. In process. Partially complete.
Have all lighted Exit signs been changed to light emitting diode (LED) type?	Yes	
Is the emergency lighting systems for the site designed and operating with the minimum number of fixtures on the emergency system?	Yes	
Do all raised floor and/or lab spaces have lighting control systems or occupancy sensors?	No (not feasible)	No. 24x7 operation
Are lights on to the minimum degree during "after hours cleaning"?	Yes	
Specific to Europe, Asia-Pacific - Have all fixtures with T8 lamps been retrofit with electronic ballasts?	Not Applicable	
Specific to Europe - Have all old T8 fixtures been replaced with new T5 fixtures during recent construction projects. Is this T8 to T5 retrofit the standard?	Not Applicable	

NOTE: The conversion of Exit signs to LED types saves \$25 per year per sign.

Exterior Lighting	* Answer	Comments
Are exterior/parking lot lights scheduled for the minimum hours? List the current hours of operation.	Yes	Astronomical timer, hours vary throughout the year. 30 minute buffer.
Have parking lot lighting levels been reviewed recently?	Yes	Reviewed lighting & usage. Disconnected several fixtures.
Are photocells and/or modern astronomical timers installed and working correctly on all exterior parking lot lighting?	Yes	
Have parking lots been consolidated and closed when possible?	Yes	

Global Reports: Everyone Evaluated

Quarterly Global Conservation

Monthly Top 100 Conservation | Monthly Top 100 DQR | **Quarterly Global Conservation** | Quarterly Global DQR | Closed Sites With Bills

EDGE
Enabling Decisions for Global Execution

RESO Energy Conservation Report
Quarterly Global Energy Conservation Report

Geographies / IOTs	Countries	Electric Use (MWh)	Electric Use (\$K)	Electric Savings (MWh)	Electric Savings (\$K)	Fossil Fuel Use (MMBtu)	Fossil Fuel Use (\$K)	Fossil Fuel Savings (MMBtu)	Fossil Fuel Savings (\$K)	CEA Blended Conservation Formula (%)
ASIA PACIFIC	AUSTRALIA	23,217	\$1,279	1,614	\$81	2,670	\$11	0	\$0	6.9%
	CHINA	14,184	\$1,962	1,216	\$163	0	\$0	0	\$0	8.6%
	HONG KONG	574	\$93	301	\$47	0	\$0	0	\$0	52.5%
	INDIA	50,678	\$6,323	4,955	\$627	11,346	\$300	0	\$0	9.3%
	INDONESIA	126	\$11	23	\$2	0	\$0	0	\$0	17.9%
	KOREA, REPUBLIC OF	219	\$14	10	\$1	0	\$0	0	\$0	4.8%
	MALAYSIA	1,510	\$164	0	\$0	2,325	\$55	0	\$0	0.0%
	NEW ZEALAND	3,071	\$142	102	\$3	39	\$1	0	\$0	3.3%
	PHILIPPINES	4,781	\$675	40	\$6	0	\$0	0	\$0	0.8%
	SINGAPORE	6,934	\$878	20	\$3	98	\$6	0	\$0	0.3%
	SRI LANKA	94	\$18	0	\$0	0	\$0	0	\$0	0.0%
	TAWAN	4,289	\$308	228	\$15	0	\$0	0	\$0	5.3%
	THAILAND	897	\$103	65	\$6	0	\$0	0	\$0	7.2%
VIET NAM	255	\$27	0	\$0	0	\$0	0	\$0	0.0%	



ENERGY CONSERVATION RESULTS

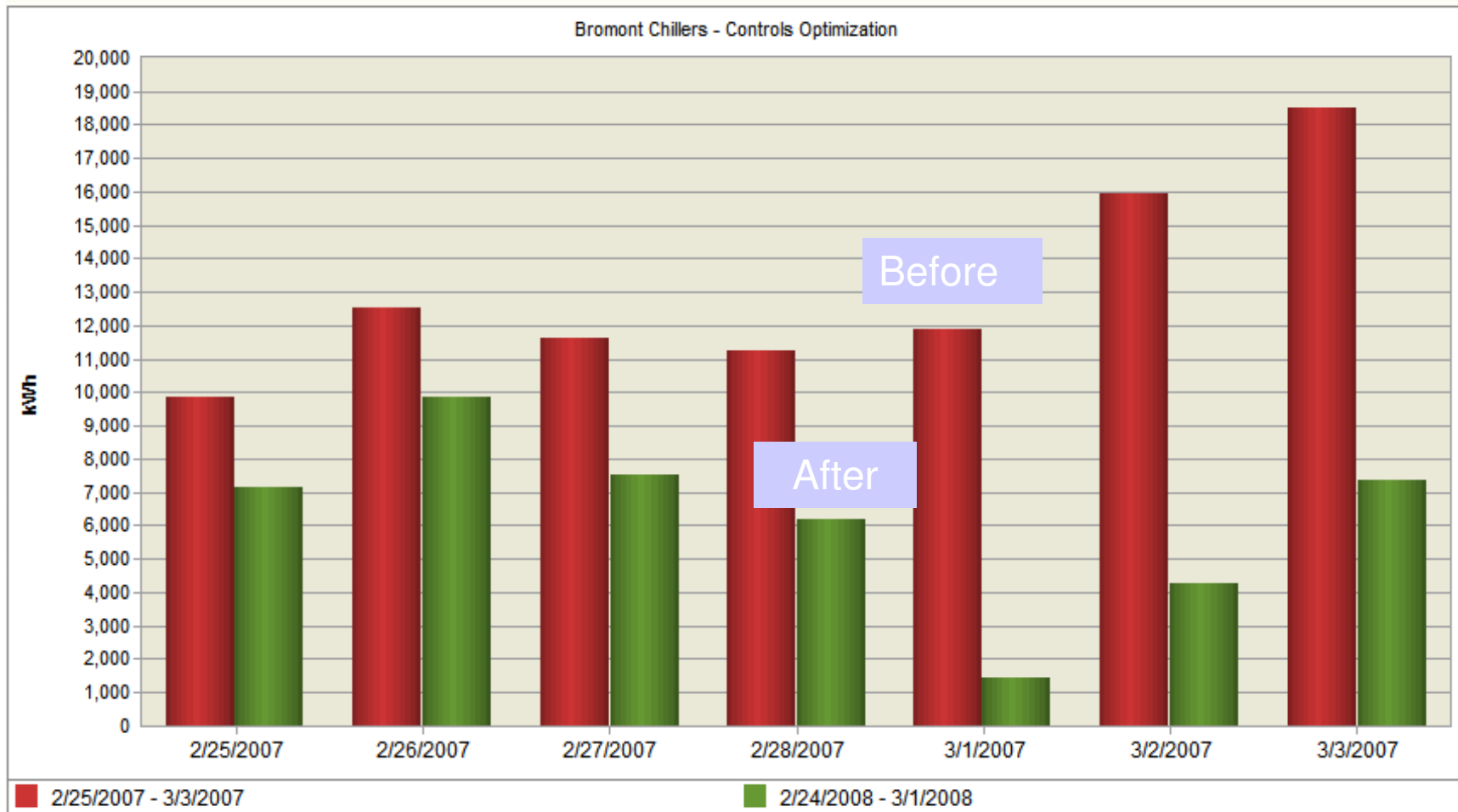
Energy Conservation/Efficiency Initiatives: 2008 Results

- **Lighting and HVAC Upgrades, Scheduling, & Delamping**
 - **Lighting Modifications: 38,000 MWH, \$3.9 M, 214 Locations**
 - **Air Handling Unit Modifications: 45,700 MWH, 5.6 M, 125 Locations**

- **Recommissioning Program:**
 - **“Tune-up” for Existing Buildings**
 - **Identified 23,600 MWH/yr, 136,000 MMBTU/yr of fuel and \$4.2 M/yr in Potential Savings @ 20 Locations**

- **Data Center Best Practices and Equipment Consolidations**
 - **Average Electricity Use Savings at 11 Data centers: 10%**
 - **19 Consolidation Projects Saved 10,000 MWH/year of electricity**

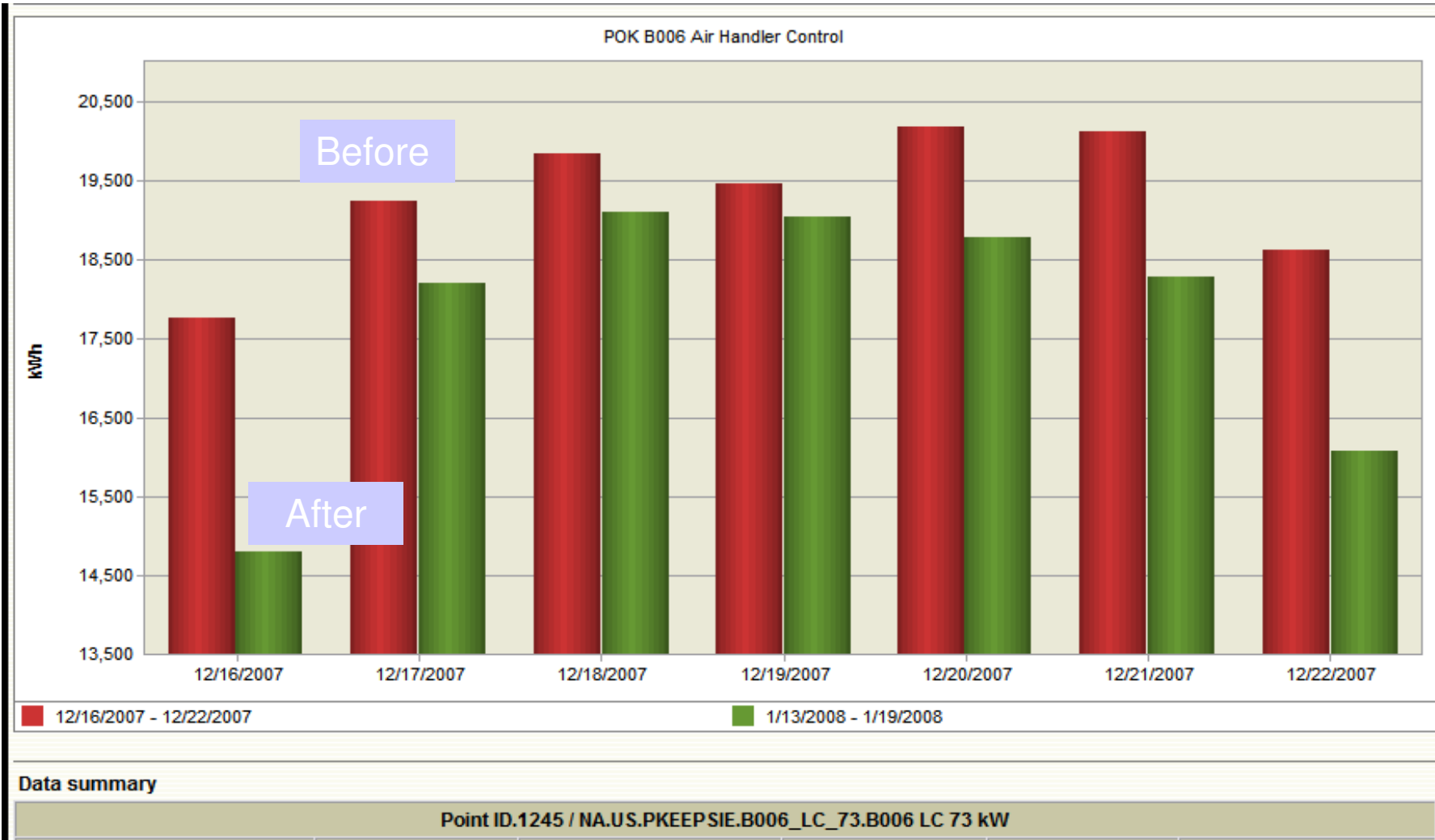
Bromont Controls Optimization on Central Plant Chillers



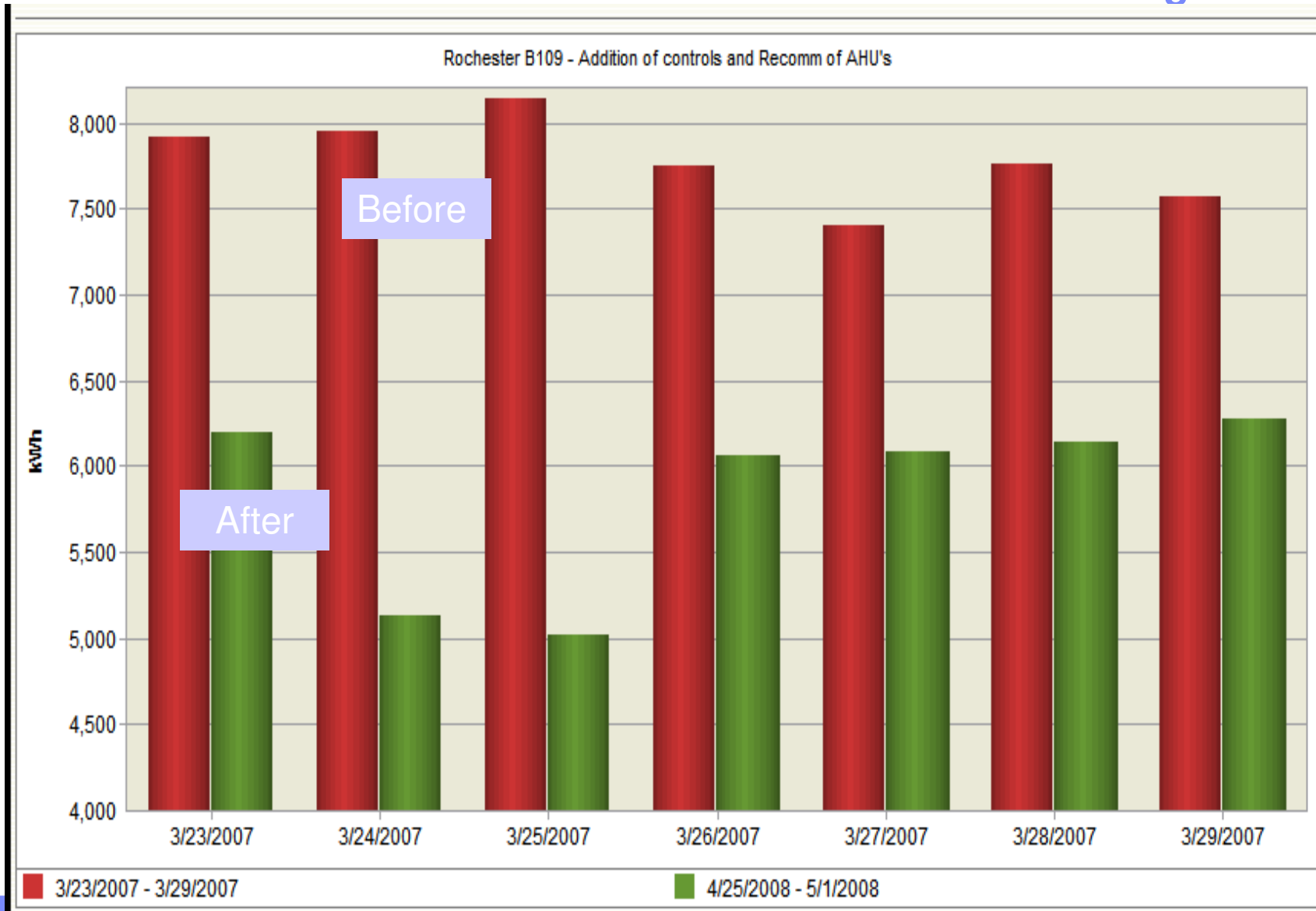
Data summary

Point ID.1226 / NA.CA.Bromont.BLDGCUPCHILLERS.BRMT CHILLERS 800/802/803/804/805/807/808/809 AGG. KW

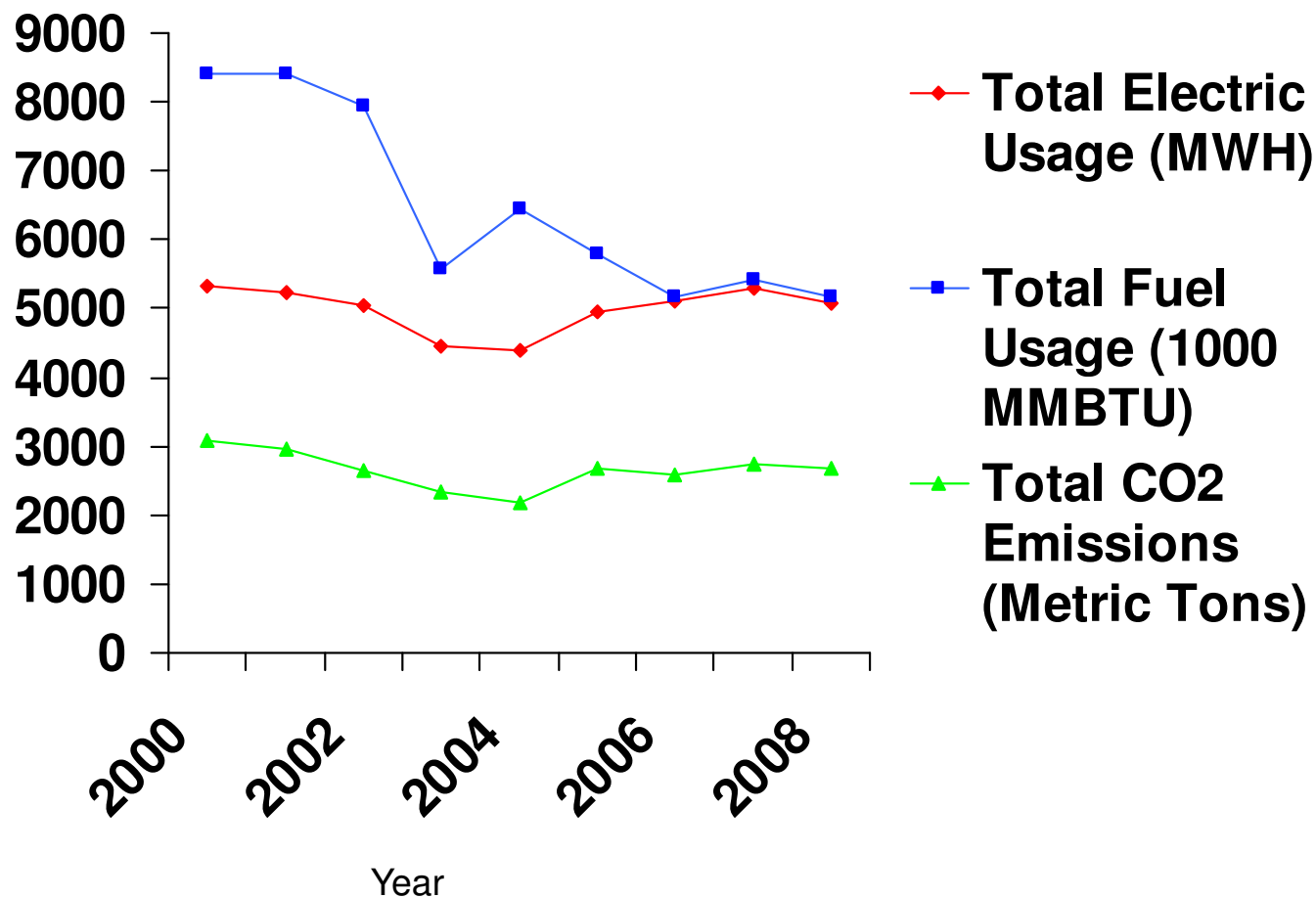
POK B006 Air Handler Controls Project



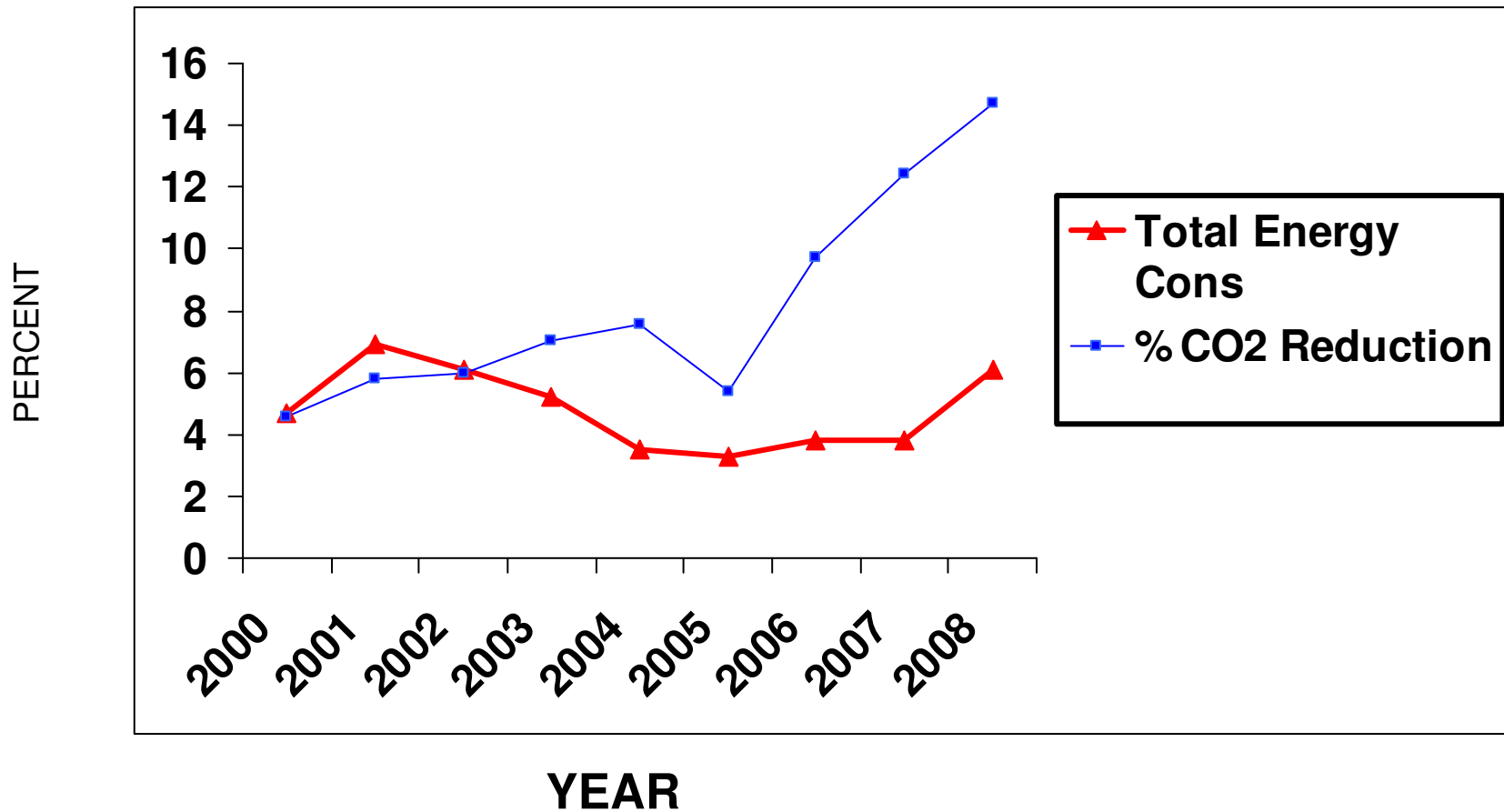
Roch MN B109 Addition of Controls and Recommissioning of



WW ENERGY USAGE & CO2 EMISSIONS



ENERGY CONSERVATION & CO2 AVOIDANCE



CHALLENGES

- **Availability of Funding**
 - **Often Competes with Other Business Projects**
 - **Good Projects May Have Paybacks Beyond Internal Financial Hurdles**
 - **Various Approaches to Address**

- **Communications Between Business Units**
 - **RESO Pays Energy Bills**
 - **Other Business Units Run Operations**
 - **Communicating on Shared Opportunities**

- **Granularity of Measurement Data**
 - **Meter Installations at Necessary Level of Detail**
 - **Real Time Meter & Data Display**