



# United Technologies

## CONNECTICUT D.E.P.



March 11, 2010

Sean West

Environment, Health & Safety

GHG Program Manager



Environment, Health & Safety

United Technologies Corporation

# Agenda

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UTC at a glance

Essential Elements of Energy Management Plan

- Data Management
- Policy & Goals
- Project Identification
- Energy Management Guidebook
- Project Implementation

# UTC AT A GLANCE

2009



**UTC Fire & Security**

A United Technologies Company



**Pratt & Whitney**

A United Technologies Company



**Hamilton Sundstrand**

A United Technologies Company



**Sikorsky**

A United Technologies



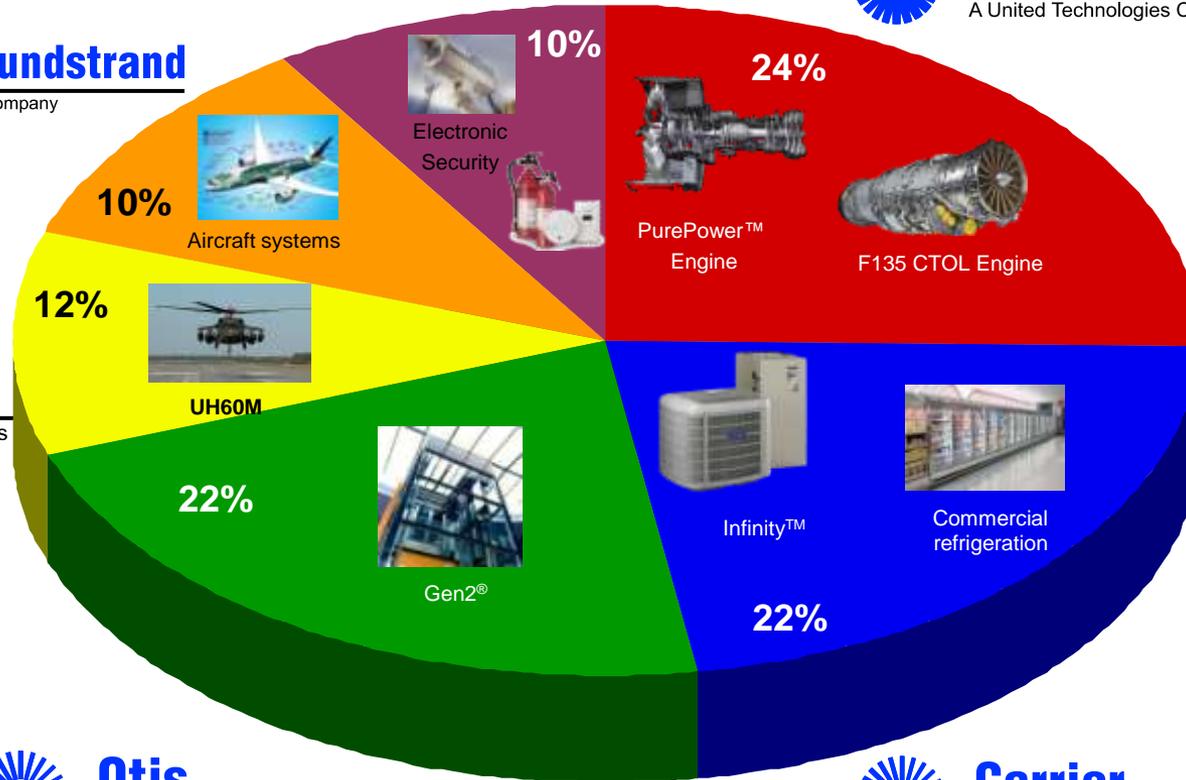
**Otis**

A United Technologies Company



**Carrier**

A United Technologies Company



\$52.9 billion

# UTC BUILDINGS PORTFOLIO

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4,859 Global locations

96.7 million ft<sup>2</sup>

*61.5 MSF Owned    35.2 MSF Leased*

## Reporting Sites

Manufacturing sites + all sites >\$100K annual energy spend

327 sites

66.7 million ft<sup>2</sup>

1.885 million\* metric tons CO<sub>2</sub>e

\* Approximately 360K metric tons reported is direct process emissions, fleet and business travel.

## Non-Reporting Sites

<\$100K annual energy spend

4,532 sites

~30 million ft<sup>2</sup>

286K metric tons CO<sub>2</sub>e

# SUSTAINABILITY

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## Social, environmental and economic performance

“Sustainability is doing things efficiently to preserve resources and minimize environmental impacts. Not everyone broadens the definition to include human capital but I would....”



George David  
UTC Chairman

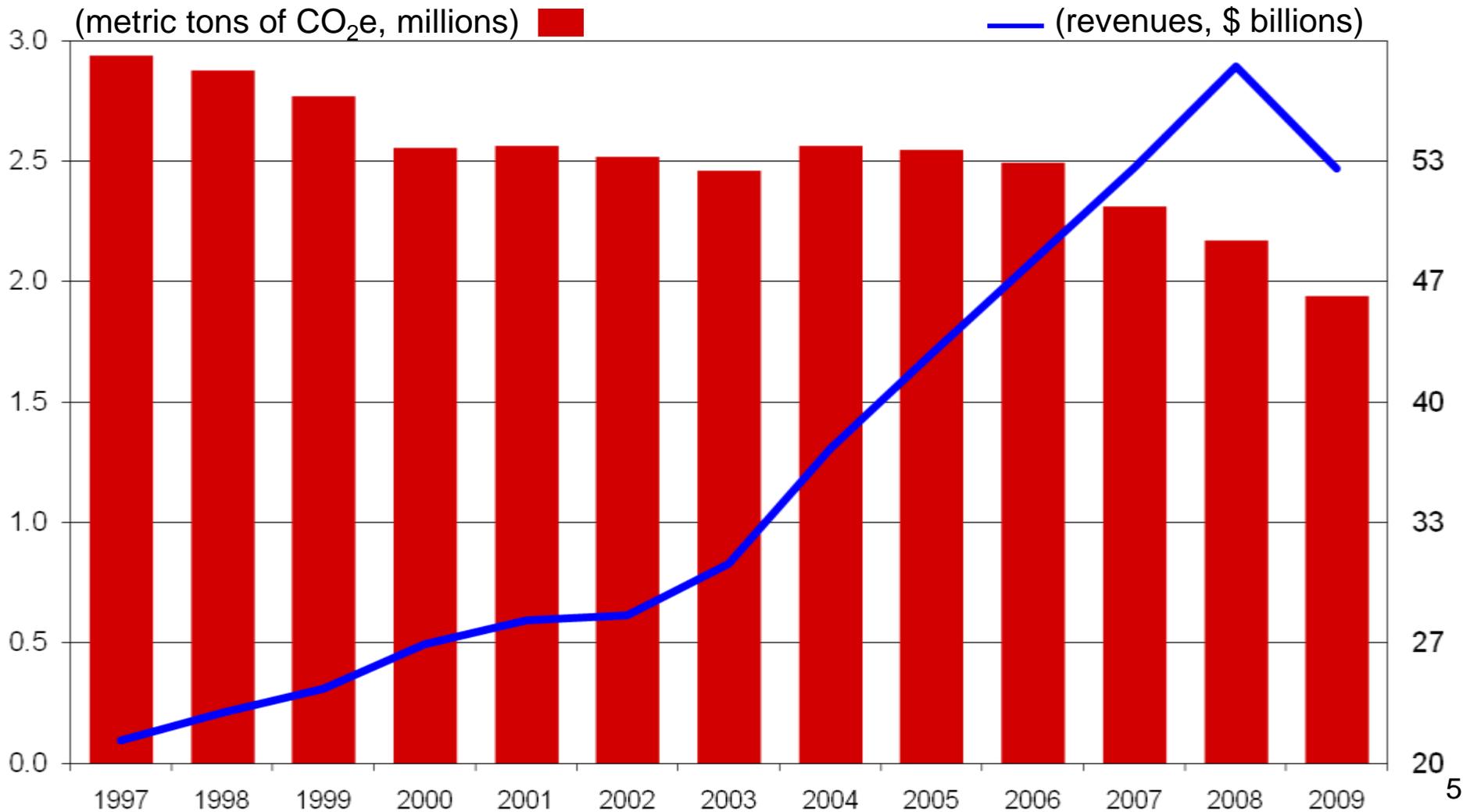


Louis Chênevert,  
UTC President and CEO

“My predecessor, George David, had a vision 15 years ago...that UTC would be an environmental leader, both in our own operations and with our products. This was not a choice between financial and environmental performance. Rather, it was a steadfast commitment to the belief that profitability and environmental responsibility go hand-in-hand.”

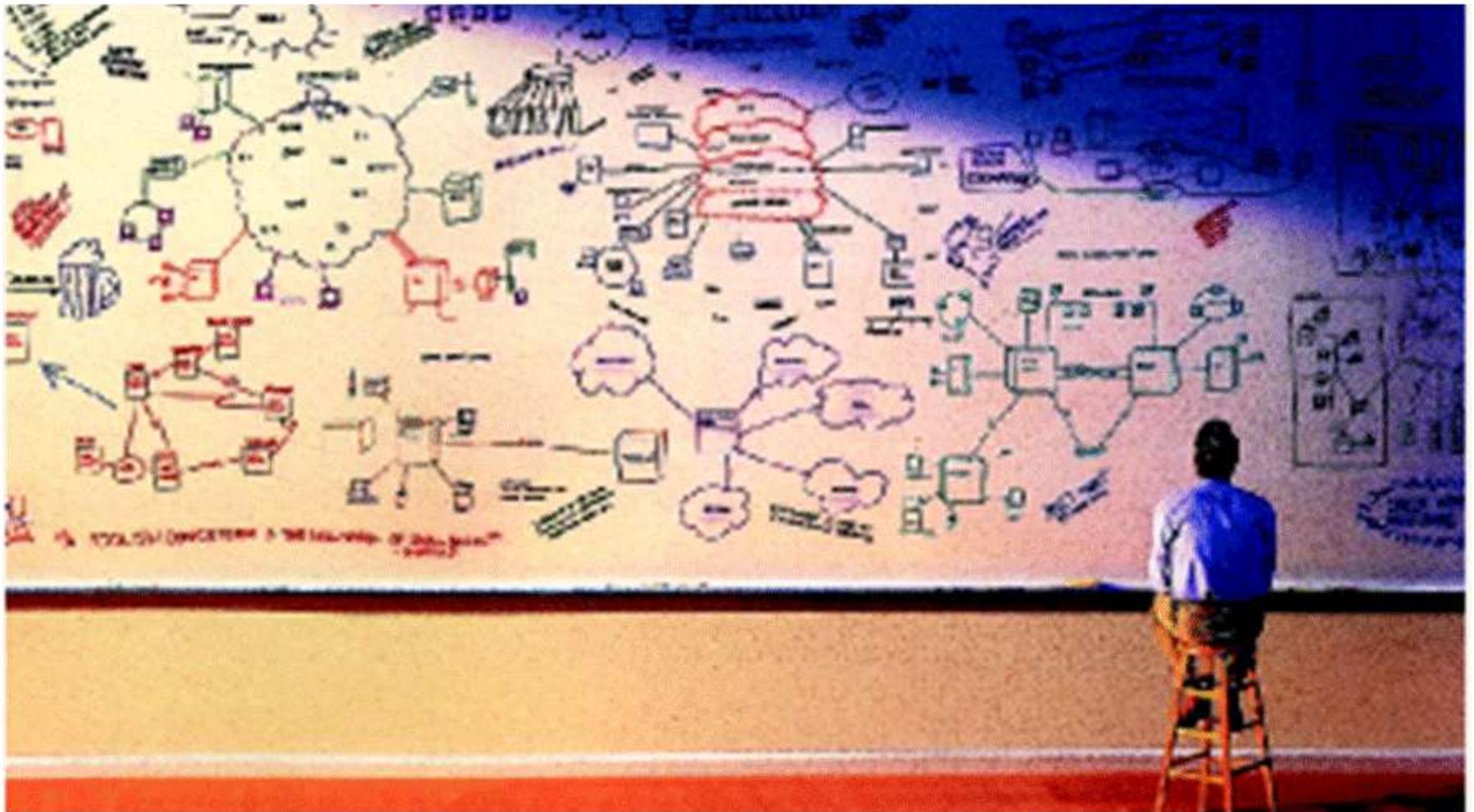
# GREENHOUSE GAS EMISSIONS

## CO<sub>2</sub> equivalents worldwide



# ENERGY & GHG MANAGEMENT, where do I start?

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# ENERGY & GHG MANAGEMENT

Started by doing  
energy audits



UT 500 Energy Audit  
Debrief Meeting  
Sundyne Arvada CO  
Oct. 13, 2005



Audyt Energetyczny UT 500  
UT 500 Energy Audit  
Podsumowanie Audytu  
Fire & Security  
Gloria, GmbH Ropczyce  
Listopad 2007



UT€ 250 Energy Audit  
Debrief Meeting  
Carrier, Villasanta Italy  
October 15, 2007



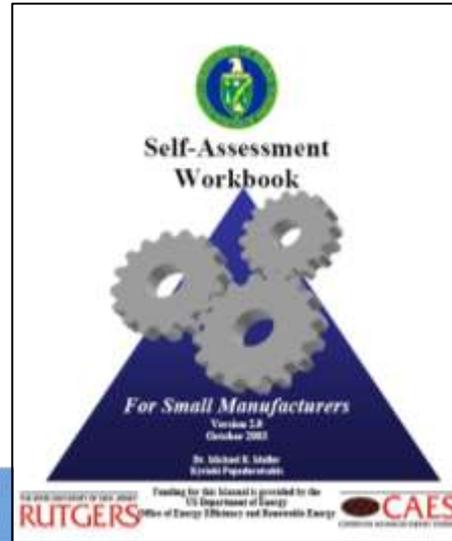
UT 500 Energy Audit  
Debrief Meeting  
Hamilton Sundstrand, Singapore, Bedok  
November 10, 2007



UT 500 Energy Audit  
Debrief Meeting  
Forney Mexico  
Monterrey, Mexico  
November 15, 2007

# ENERGY MANAGEMENT GUIDEBOOK

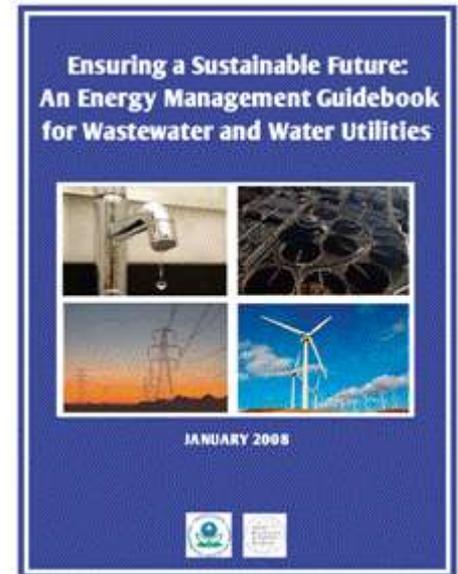
Developed  
“Standard Work”  
Guidebook



**CLIMATE LEADERS**  
U.S. Environmental Protection Agency

**EPA Climate Leaders**

- Over 270 Partners of all sizes in many sectors, with operations in all 50 states
- Half are Fortune 500 companies. Total annual U.S. revenue of the partnership represents 11% of U.S. GDP (2007)
- Climate Leaders started in 2002 with 11 charter partners
- Largest corporate greenhouse gas goal-setting program, with over 8% of U.S. GHG emissions
- Goals pledged in program reduce annual emissions equivalent to 9 million cars



# 5 ESSENTIAL ELEMENTS of GHG PROGRAM

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UTC has developed a world class energy management program that works for our organization,

1. Environmental data management system
2. Established corporate policy and goals
3. Developed an in-house energy audit program (including training, awareness)
4. Developed an Energy Management Guidebook
5. Use an online project tracking system

# CENTRAL EH&S REPORTING SYSTEM *Step 1*

EH&S Reporting System

Newington Data Center [598]

Main Menu

As Required Reporting

- 1 Incident Investigation Report (Due at Time of Incident)
- 2 Compliance Management Menu
- 3 Audit Management Menu
- 4 EHS Project Tracking
- 5 Product Goals
- 6 Contractor Information
- 7 Materials of Concern (MOC) Reports (Update When Changes Occur)

Periodic Reporting

- 8 Monthly Hours Reported (Due Monthly)
- 9 **Air Emissions** Report Summary (Due Quarterly)
- 10 **11. Waste Generated** Report Summary (Due Quarterly)
- 11 **12. Energy (GHG) & Water** Report Summary (Due Quarterly)
- 12 **13. Motor Vehicles** Report Summary (Due Quarterly)
- 13 Motor Vehicle Report - Miles and Energy Usage (Due Quarterly)
- 14 UTC SARA Report (U.S. Only) (Due Annually Quarter 4)
- 15 Environment, Health & Safety Costs - EIS 7.4 (Due Annually Quarter 4)
- 16 Waste Vendor Report (Due Annually Quarter 4)

Standard Reports and Export

- 17 Standard Reports - Discoverer Viewer
- 18 Export Records to Excel

Corporate (Snapshot) Reports

- 19 Corporate (Snapshot) Reports
- 20 Corporate (Snapshot) Data Detail - Export to Excel

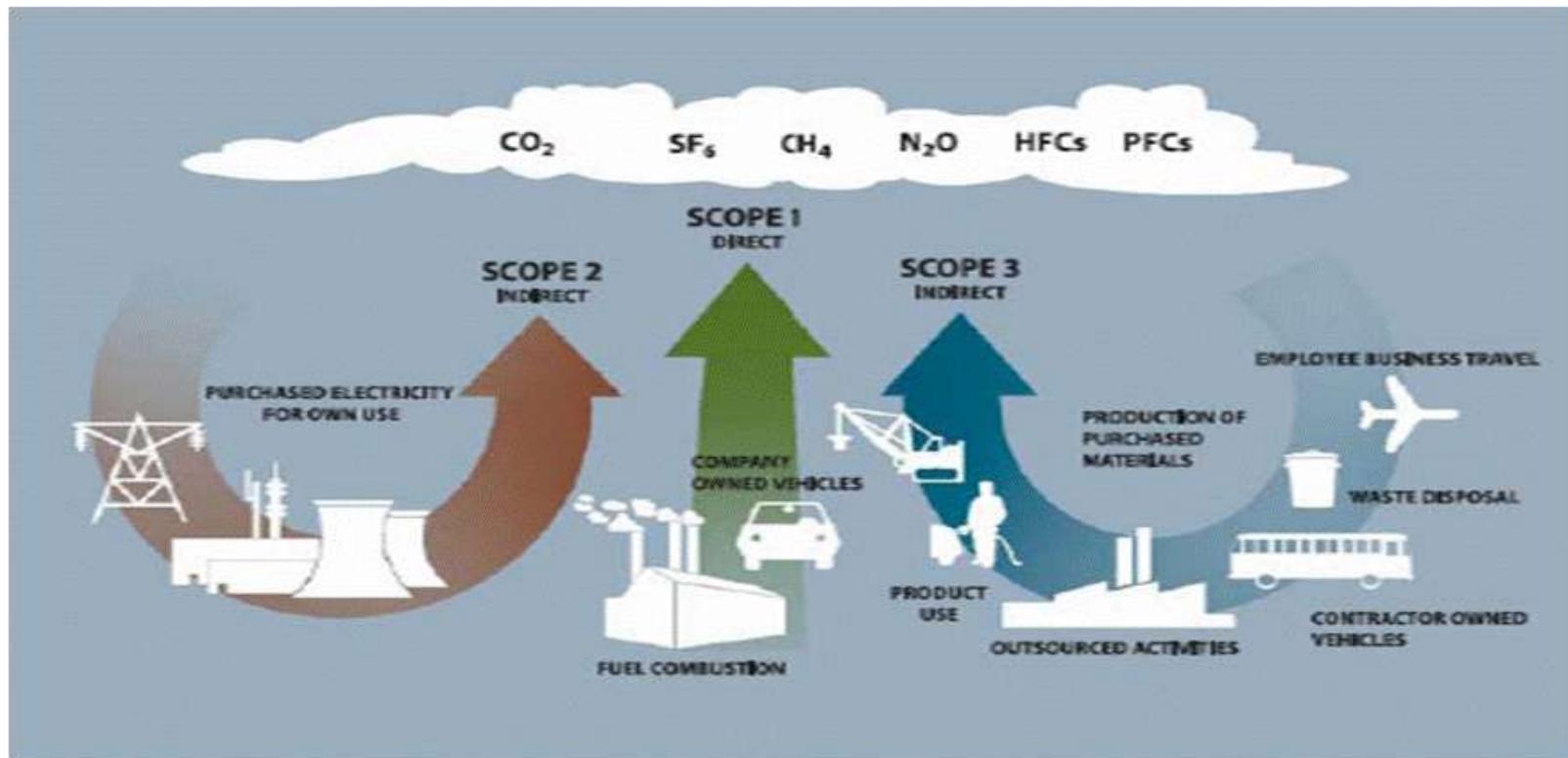
Other Modules

- 21 Survey
- 22 Training
- 23 Tools Menu
- 24 Tracking Menu
- 25 Record Turnback (Bug) and Provide Feedback



# GREENHOUSE GAS PROTOCOL

- **Carbon Dioxide (CO<sub>2</sub>)**: Emitted mainly from the burning of fossil fuels
- **Methane (CH<sub>4</sub>)**, **Nitrous Oxide (N<sub>2</sub>O)**, **Hydrofluorocarbons (HFCs)**, **Perfluorocarbons (PFCs)**, and **Sulphur Hexafluoride (SF<sub>6</sub>)**: Emitted mainly from waste disposal, air conditioning and refrigeration, and specific industrial processes.



WRI/WBCSD GHG Protocol  
Corporate Accounting and Reporting Standard

# ENERGY and GHG REDUCTION PLAN

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## EH&S Standard Practice SP-017\*

*“SP-017 outlines the elements necessary to manage energy and reduce GHG emissions.”*

*“This standard applies to all UTC business units worldwide.”*

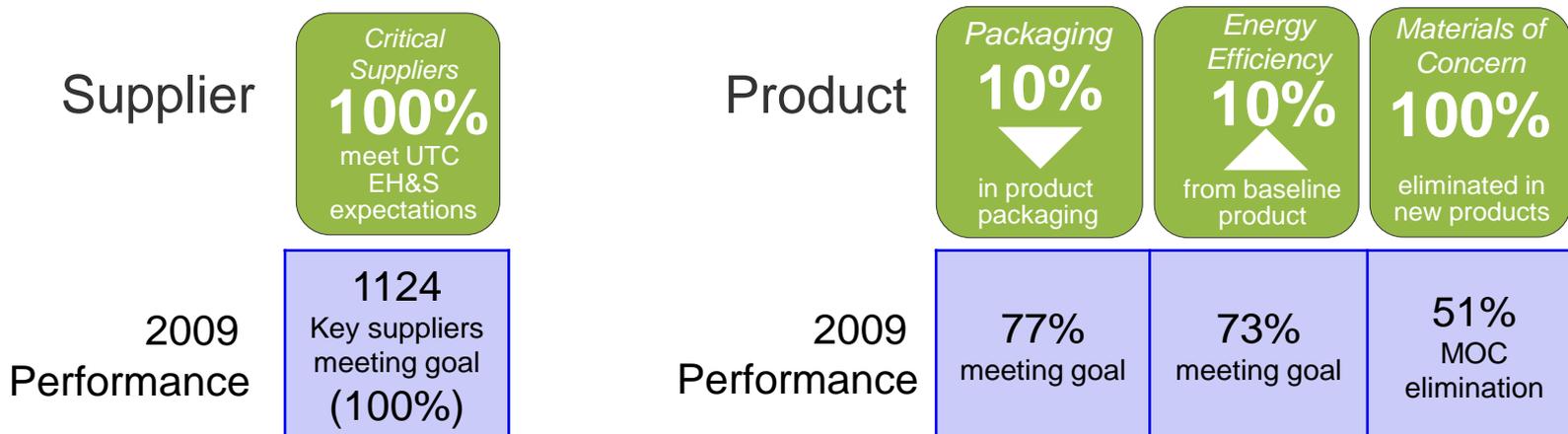
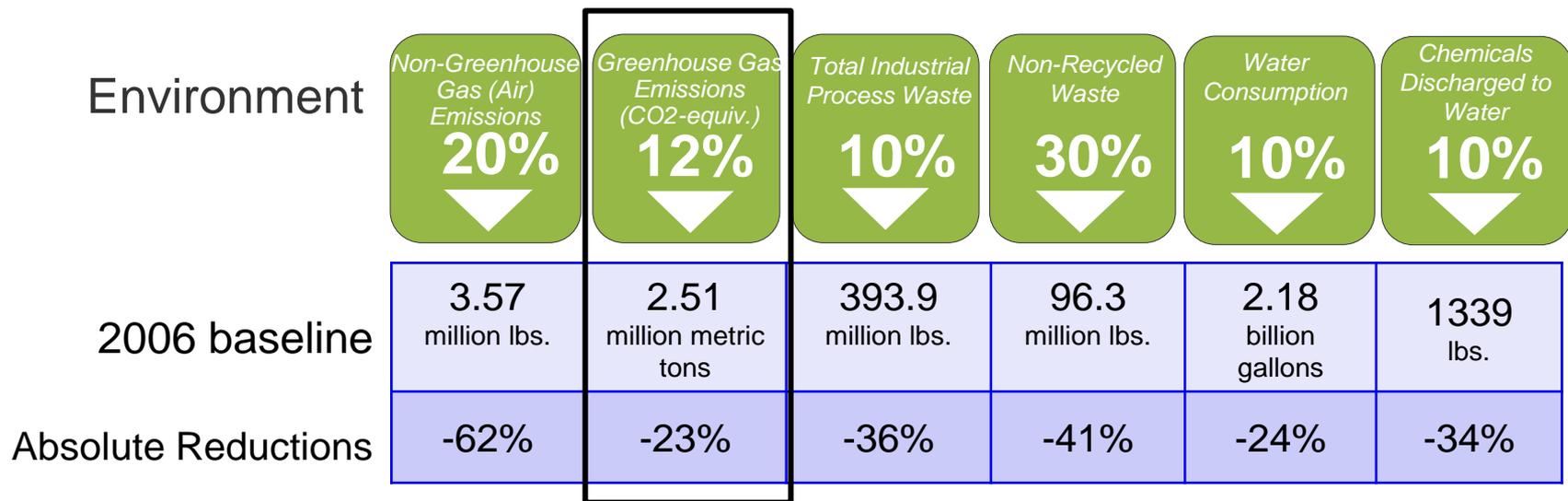
***“The minimum expectation is that each site has a documented plan that demonstrates identification, assessment, an actionable implementation plan and completed project list.”***

\* ANSI / MSE 2000:2005

# 2010 GOAL STATUS

Step 2

## Environment, supplier, and product metrics



# GHG Mgt. TRAINING AND AUDITS

Training: over 200 employees trained worldwide

2006 Energy Workshops held in Charlotte and Paris

2007 Energy Workshops held in Atlantic City,

Villasanta (Italy), and Singapore →



Audits of *Top 60* sites worldwide

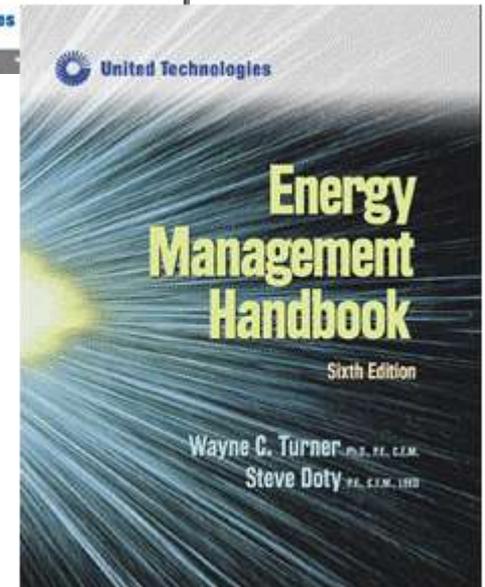
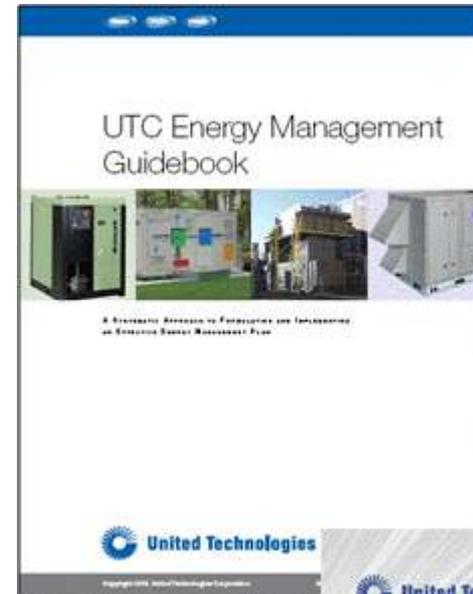
ECM	Project < 2 year Payback	Investment	\$ Savings	kWh or MMBTU Savings	CO <sub>2</sub> e Reduction	Payback
1	Exhaust fan controls- Firewire & welding	\$600	\$16,000	100,000	47	0.04
2	Shut it off	\$0	\$6,900	43,125	20	0.00
3	Energy efficient motors	\$2,390	\$3,859	24,000	11	0.62
3a	Selective fixture removal in office area	\$3,200	\$6,500	40,625	19	0.49
4a	Office lighting- remove lamps	\$12,000	\$16,000	100,000	47	0.75
4b	Wire office lights for "dual level" control	\$24,000	\$16,000	100,000	47	1.50
5	Replace shop HSP S light fixtures	\$20,000	\$10,000	62,500	30	2.00
6	Install HVAC controls for shut off	\$40,000	\$71,000	443,750	209	0.56
7	Install "zero loss drains" on air system	\$400	\$540	3,375	2	0.74
8	Convert lab AHU to gas heating	\$14,000	\$19,000		42	0.74
9	Combine compressed air systems	\$12,000	\$12,000	75,000	35	1.00
10	Conduct air leak audit, repair program	\$2,700	\$2,700	16,875	8	1.00
11	Upgrade hot water system	\$40,000	\$33,000	206,250	97	1.21
	<b>Total &lt; 2 Years</b>	<b>135,290</b>	<b>181,499</b>	<b>1,015,500</b>	<b>521</b>	<b>0.75</b>
ECM	Project > 2 Year Payback	Investment	\$ Savings	kWh Savings	CO <sub>2</sub> e Reduction	Payback
12		\$2,000	\$700	4,375	2	2.86
	<b>Total &gt; 2 Years</b>	<b>\$2,000</b>	<b>700</b>	<b>4,375</b>	<b>2</b>	
	<b>Total</b>	<b>\$ 137,290</b>	<b>\$ 182,199</b>	<b>1,019,875</b>	<b>523</b>	
ECM	Requires Further Investigation	Investment	\$ Savings	kWh Savings	CO <sub>2</sub> e Reduction	Payback
13	De-stratification fans	TBD	TBD	TBD	TBD	TBD
14	Detail study of HVAC systems	TBD	TBD	TBD	TBD	TBD
15	Sub-meter tenant data center	TBD	TBD	TBD	TBD	TBD

Financially sound investment and CO<sub>2</sub> reductions

# ENERGY MANAGEMENT GUIDEBOOK

## UTC Energy Team - Tools

- Energy Team Guidebook
- Energy Management Handbook
- Sullair Compressed Air Guidelines
- UTC Lighting Guidelines
- Workshops
- Audits
- Self Assessment Tools
- Standard Work Documents
  - Steam Trap Maintenance
  - Shut it Off
  - Compressed Air Leak Management
  - Rate Management



# UTC ENERGY MANAGEMENT GUIDEBOOK

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## Table of Contents

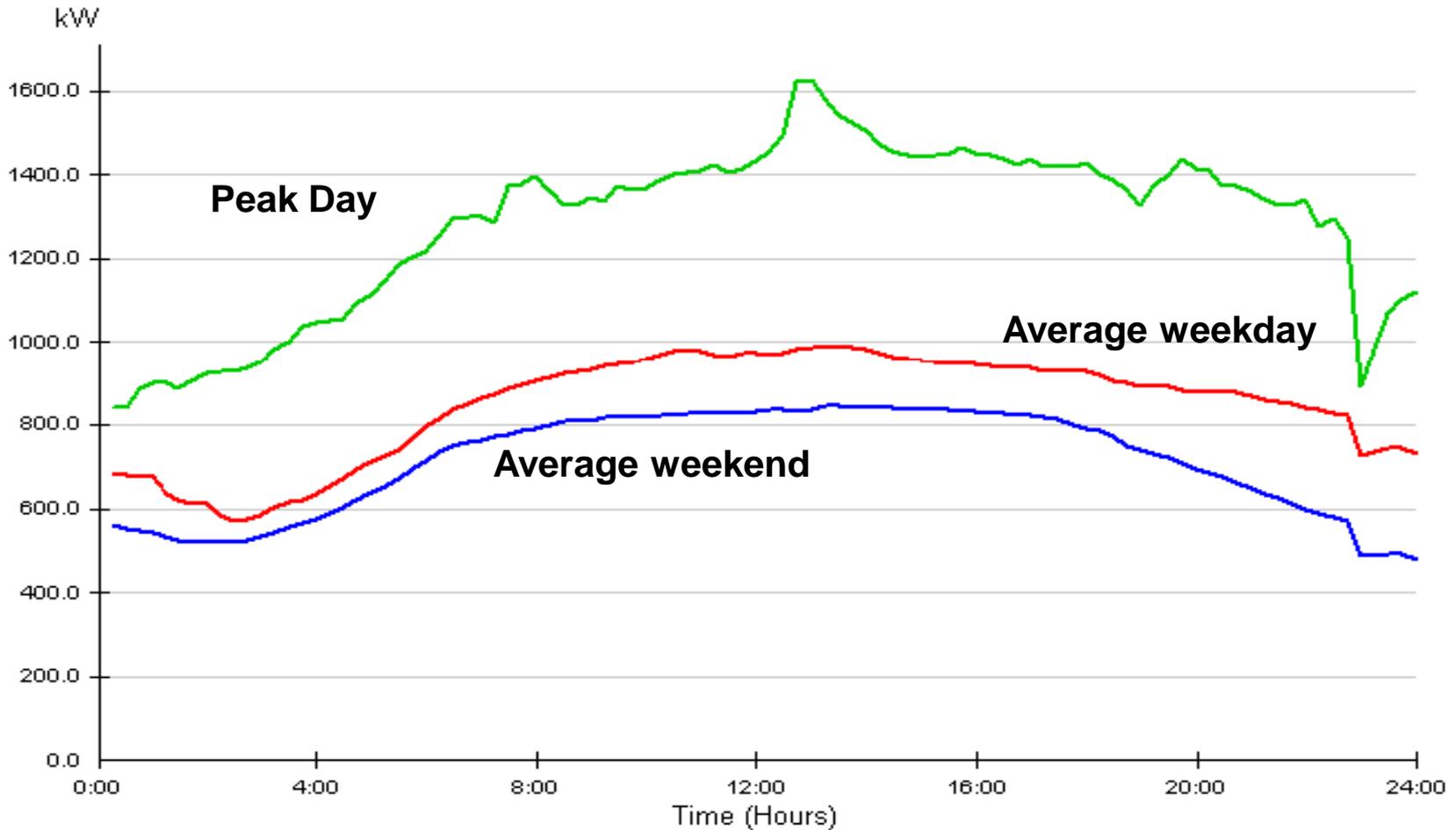
1. **Energy Data Management**
2. **Utility Rate Review**
3. **Load Management**
4. **Energy Procurement**
5. **Shut it Off**
6. Lighting
7. Compressed Air
8. Boilers and Steam
9. HVAC
10. Cogeneration
11. Building Envelope
12. Self Assessment
13. Rules of Thumb
14. Conversion Factors
15. Recommended Toolkit

## Low Cost – No Cost

# UT500 ENERGY TEAM

## 1. Energy Data Management

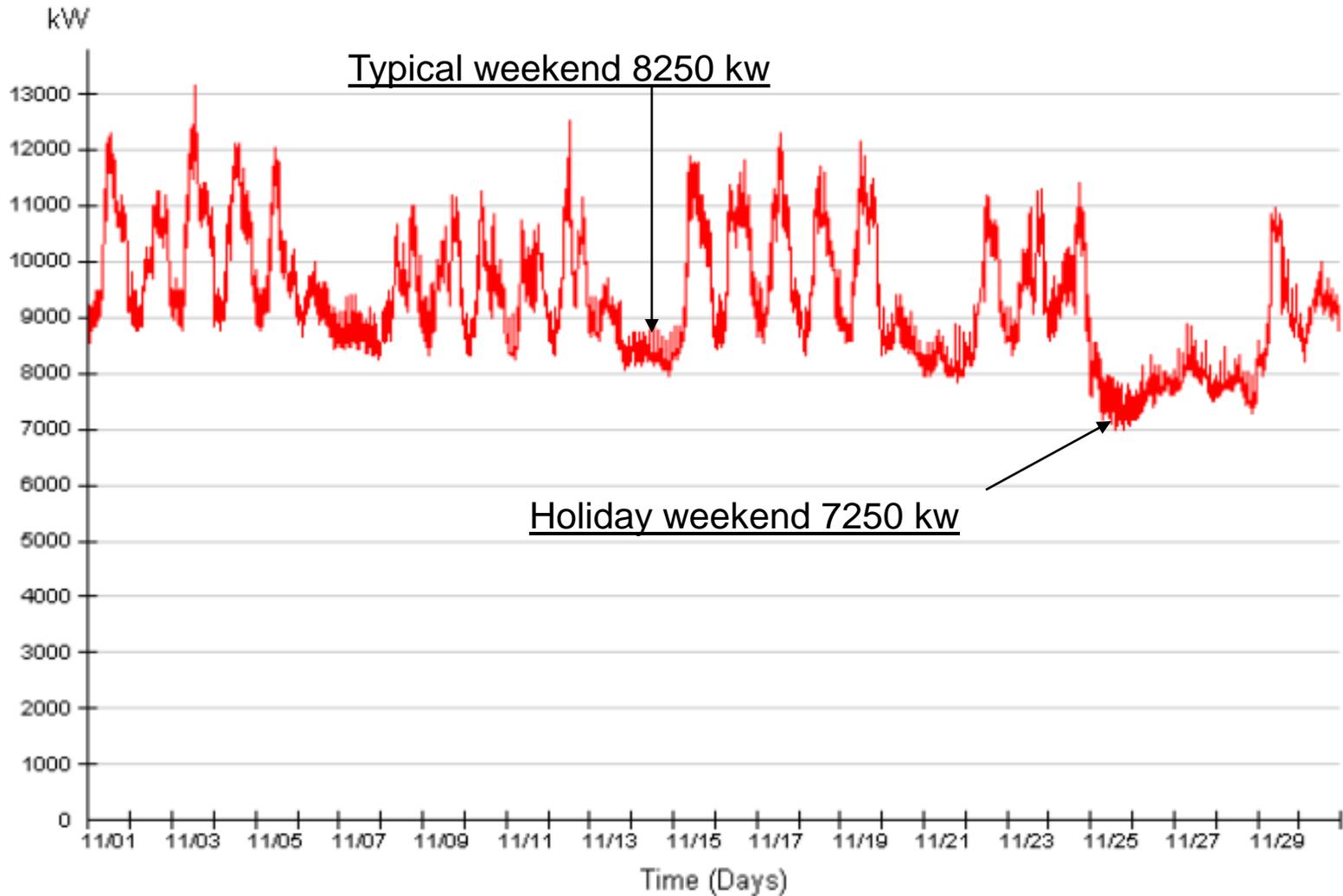
### Daily Electric Profile



Calculate Load Factor

# UT500 ENERGY TEAM

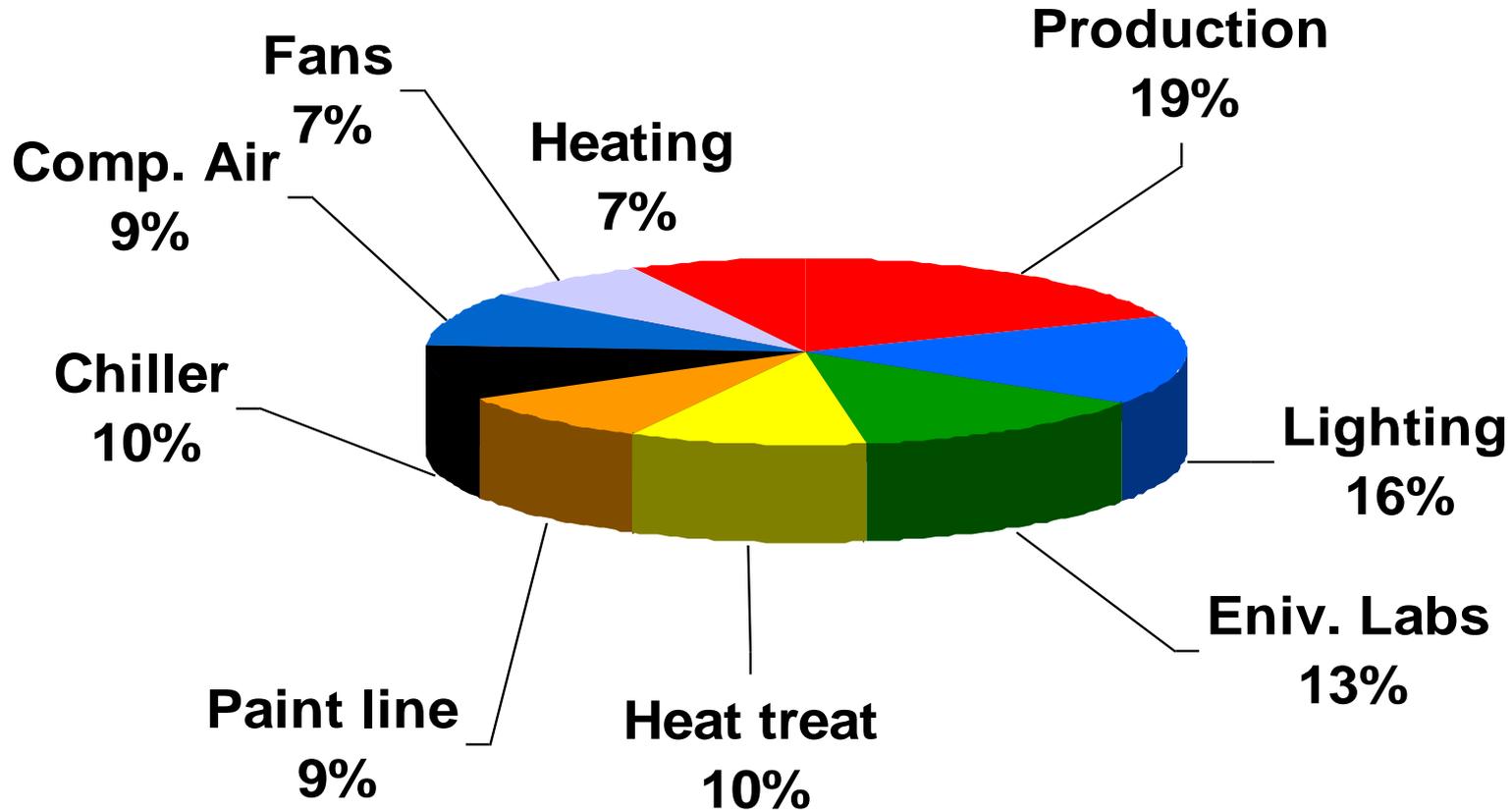
## 5. Shut-it-Off program



# UT500 ENERGY TEAM

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## 3. Load Management



Identify top energy users

# Web based EH&S reporting system

**EH&S Reporting System**

Newington Data Center [598]

**Main Menu**

**As Required Reporting**

- 1 Incident Investigation Report (Due at Time of Incident)
- 2 Compliance Management Menu
- 3 Audit Management Menu
- 4 EHS Project Tracking
- 5 Product Goals
- 6 Contractor Information
- 7 Materials of Concern (MOC) Reports (Update When Changes Occur)

**Periodic Reporting**

- 8 Monthly Hours Reported (Due Monthly)
- 9 Air Emission Report Summary (Due Quarterly)
- 10 Chemicals Discharged in Water (Due Quarterly)
- 11 Waste Generation Report Summary (Due Quarterly)
- 12 Energy and Water Data Sheet - EIS 7.3 (Due Quarterly)
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**Project Implementation & Performance Tracking**



# GHG DATA COLLECTION

## Project Tracking

**EH&S Project Tracking Form**

Add a Record

Target Year \* 2009

Project Title \* Gold Building lighting

Project Contact (Last Name, First Name) \* West, Sean

Project Category \* Energy Efficiency

Project Type \* Lighting

Project Identification \* UT500 Energy Team Audit

Project Description \* Retrofit common area lights to 25 watt T8 lamps and timers

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Capital Cost (USD) \$25,000

Expenses (USD) \$0

Utility Company Incentive (USD) \$8,500

Annual Cost Saving (USD) \$12,000

IRR or ROI (%) 82.00

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Energy Type \* Electricity

Units of Measure \* Kilowatt-Hour (KwH)

Reduction Amount \* 80,000

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Carbon Dioxide Equivalent (metric tonnes) 32.79

MMBTU 800

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Target Completion Date \* AUG-25-2009

Current Year Savings (%) \* 35%

Status Update \* 75% complete 8-15-09

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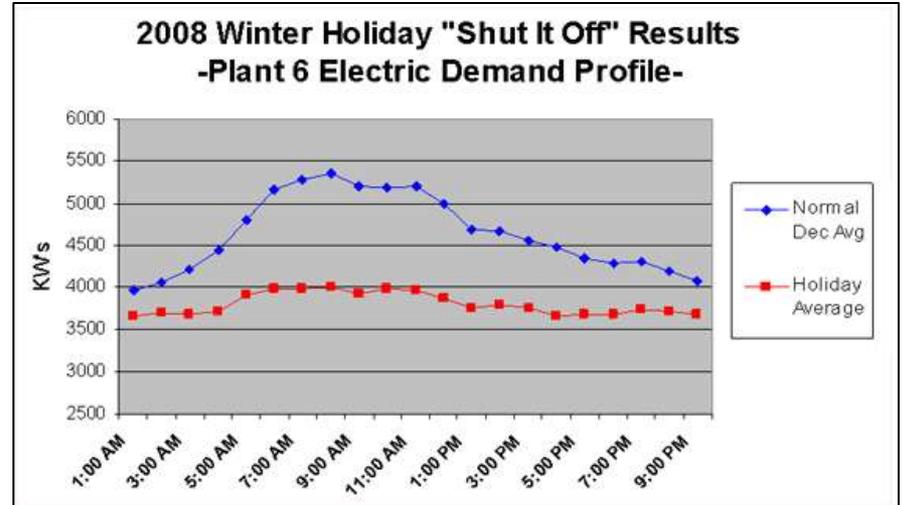
Risk \* Low

Capital Funding Status \* Approved

Project Schedule Status \* Green

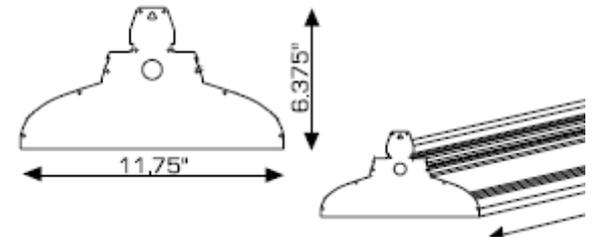
# EXAMPLE PROJECTS

## Step 5



## PW LIGHTING PROJECT

Light levels Up – Costs Down



Typical Lighting Fixtures



- Lighting projects approved for 2 PW facilities
- GHG reduction ~ 9,000 metric tons (12%)
- Buildings – L, J, K in EH, Building 150, 220 and 220M in Middletown

# HS CHILLER REPLACEMENT



## Original Chiller

1100 ton, 1967 vintage Carrier unit

### Consumption

2,000,000 KWH

### Emission

1128 MT CO<sub>2</sub>e

## Replacement

800 ton, energy efficient Carrier, w/VFD

### Consumption

800,000 KWH

### Emission

451 MT CO<sub>2</sub>e



## Energy and GHG Reductions

1,200,000 KWH

677 Metric Tons CO<sub>2</sub>e

3 year payback



# Sustainability - Factories

Step 5



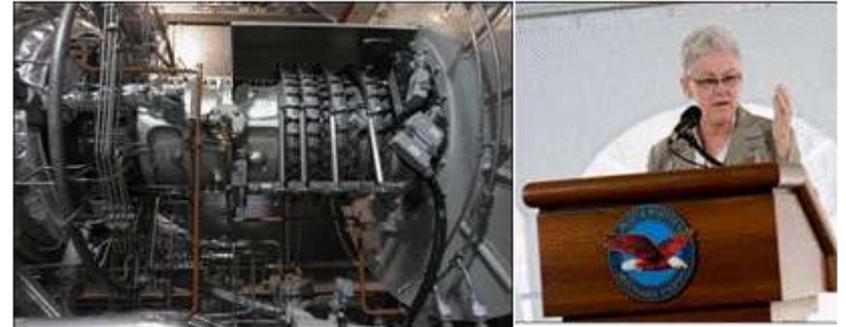
Shanghai Engine Center – LEED Platinum



Power Systems Headquarters – LEED Silver



Turkish Engine Center – LEED Gold



Middletown Engine Center – Cogeneration

# FIVE ESSENTIAL ELEMENTS of GHG PROGRAM

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Summary, must do all five

1. Environmental data management system
2. Established corporate policy and goals
3. Developed an in-house cross-divisional Energy Team (audits, provide training, build awareness)
4. Developed an Energy Management Guidebook
5. Use an online project tracking system

# Q&A

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Environment, Health & Safety

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United Technologies Corporation