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The Premier Energy Training Workshop
and Trade Show for Federal Agencies

A River of Energy Solutions

Introduction to Energy Management

Beth Shearer and Millard Carr

Introduction to Energy Concepts

1. Introduction to Energy Management
2. Facility Audits & Evaluations
3. Energy Economics
4. Operations and Maintenance (O&M)
5. Technologies
6. Renewable Opportunities
7. Steam
8. Commissioning & Retro-Commissioning (Cx) & RCx
9. Behavior - Energy Awareness and Outreach

Introduction to Energy Management

- Why energy management in the public sector?
- Energy management's growing importance
- Legislative history and Executive Orders
- The Federal model for Energy Management
- Energy 101 sessions overview: audits, economics, O&M, technologies, renewables, Steam, Cx RCx, Behavior

Why energy management in the public sector?

- Government is the largest energy user
- Lead by example
- Save energy and money
- Pull the market for energy efficient, renewable energy, and water-conserving products

Federal buildings

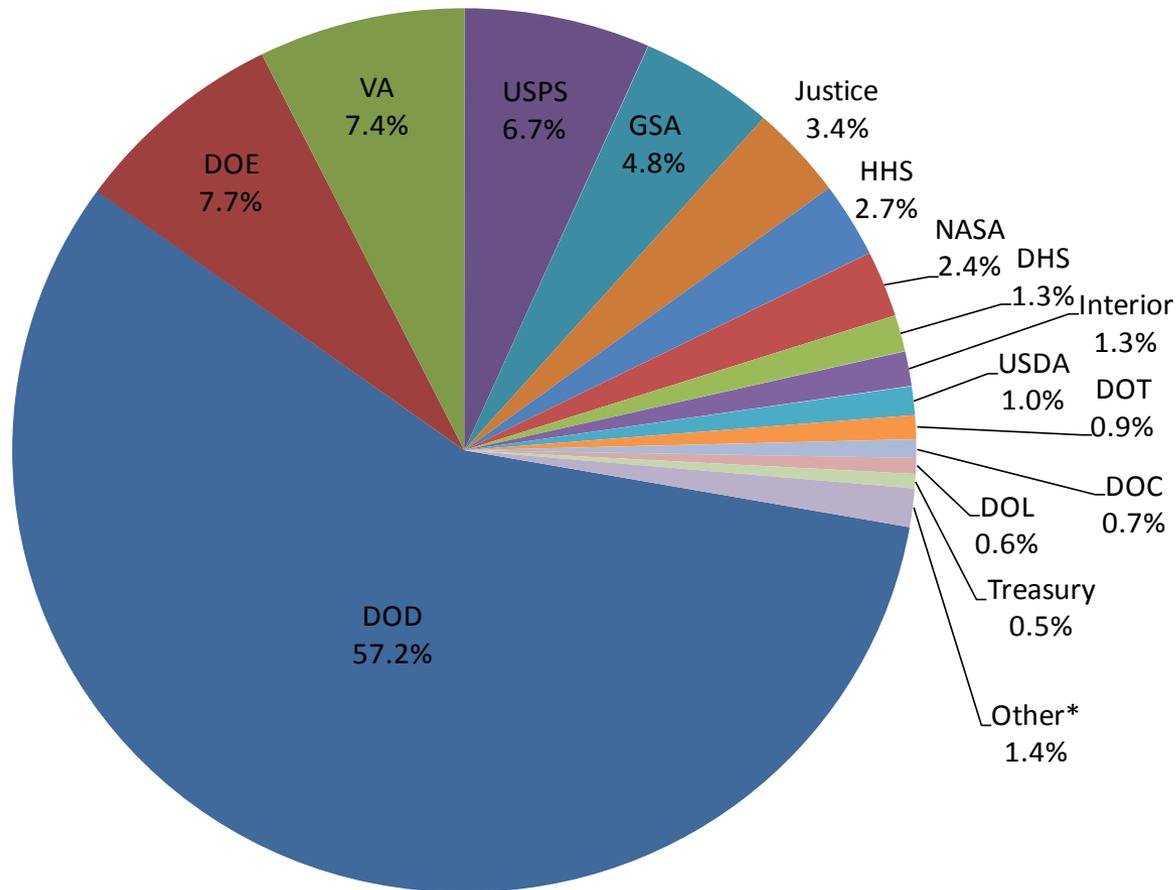
- Office Buildings
- Laboratories
- Data centers
- Housing
- Border stations
- Parks and historic sites
- Post Offices
- Court Houses
- Hospitals
- Warehouses
- Space launch buildings



Total Facility Energy Use

Building Energy Use by Agency: 388 Trillion Btu

--50% electricity, 34% natural gas, 7% fuel oil, 5% coal, 4% other



*Other includes:

- EPA
- TVA
- SSA
- Archives
- State
- HUD
- NRC
- RRB

U.S. Federal Energy Footprint

- Buildings consume 35.1% of Federal energy
- Fleet vehicles consume 4.1% of Federal energy
- “Other Mobility” uses consume 60.8% of energy
 - 70% Jet Fuel
 - 14% Navy Special
 - 7% Diesel
 - 7% Auto Gas
 - 2% Other

Energy management is growing in importance

- Growing dependence on foreign oil
- Adverse impact from costs
- **Security risk in forward operating bases**
- Growing world demand
- **Climate change**

Energy Security

- The DoD 2010 Quadrennial Defense Review described energy security as “having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational needs”.



“Energy for the War Fighter: Operational Energy Strategy” (March 1, 2011)

- More fight, less fuel: Reduce the demand for energy in military operations
- More options, less risk: Expand and secure the supply of energy to military operations
- More capability, less cost: Build energy security into the future force



CNA: “National Security and the Threat of Climate Change” – Findings:

- Projected climate change poses a serious threat to America’s national security
- Climate change acts as a threat multiplier for instability in some of the most volatile regions of the world
- Projected climate change will add to tensions in even stable regions of the world
- Climate change, national security, and energy dependence are a related set of global challenges

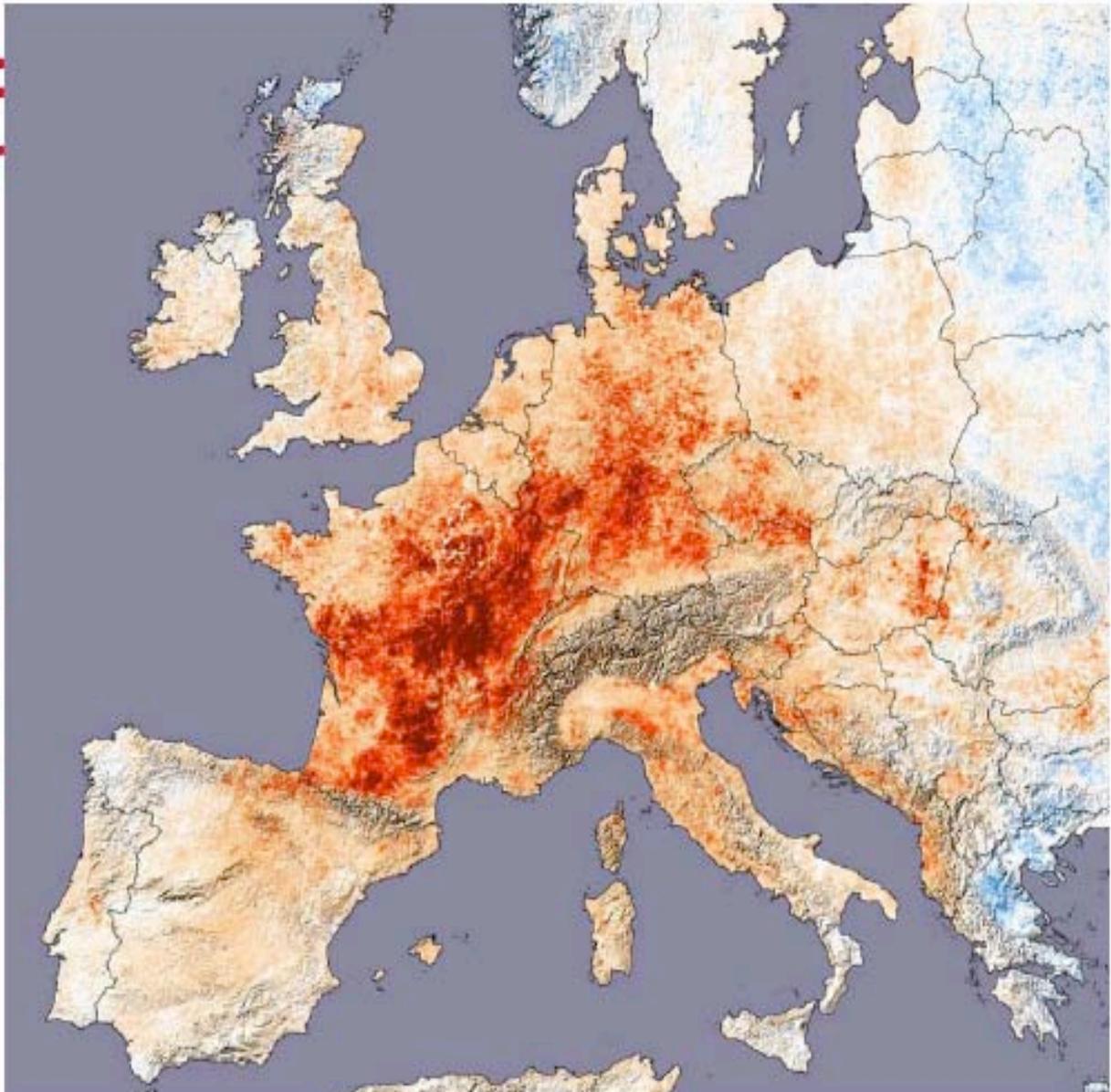
Climate Change: Increased carbon = increased temperatures with these observed impacts:

- Precipitation patterns have changed
- Extreme weather events are more frequent
- Ice and snow cover is disappearing
- Oceans are warming
- Sea levels are rising
- Ocean salinity has changed

Finding: Tensions Even in Stable Regions

**Serious Threat:
Extreme weather**

**2003 European
heat wave killed
more than
35,000 people**

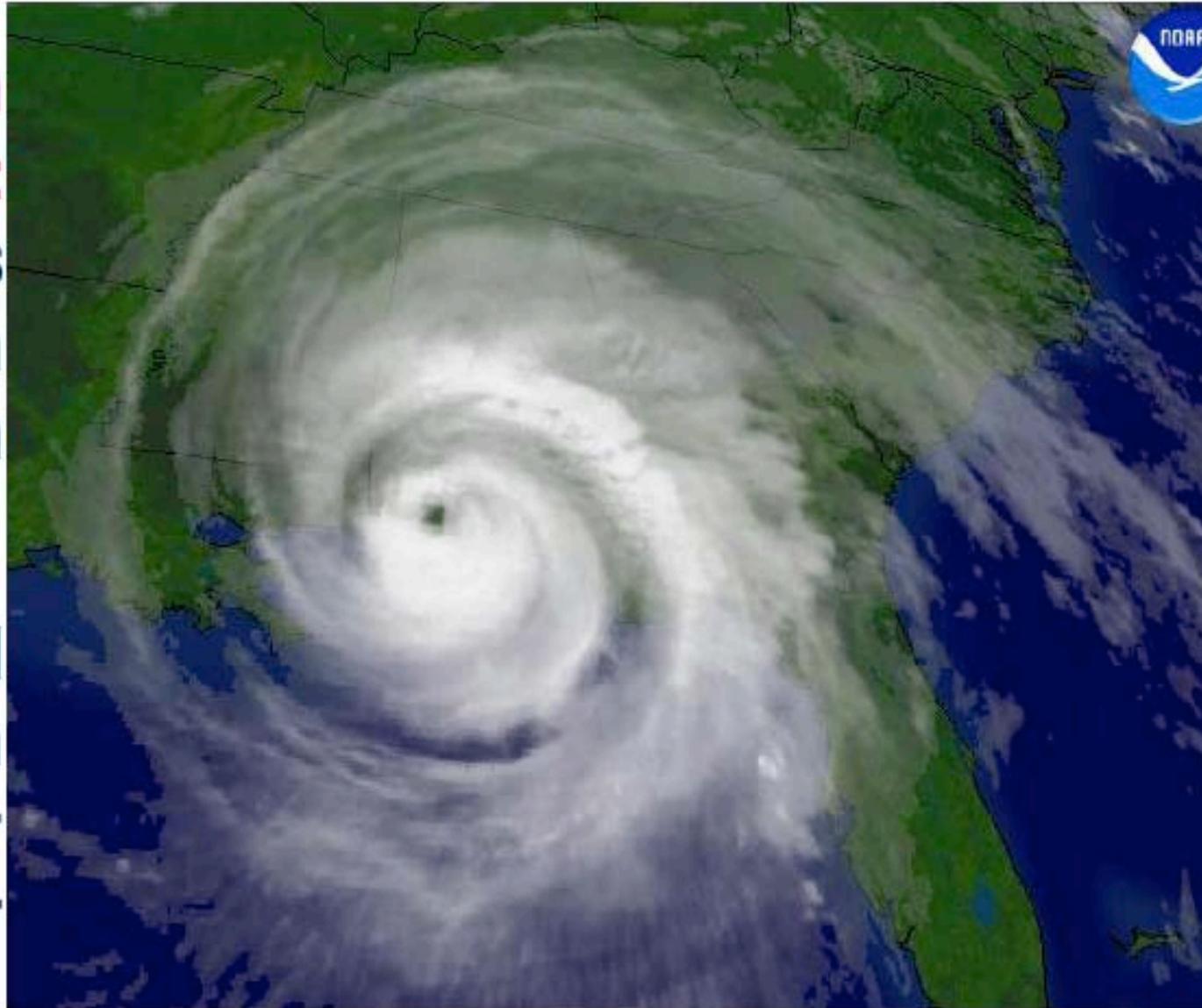


Bases Threatened by Rising Sea Levels

**Hurricane Ivan
2004:**

**Windspeeds
greater than
100 mph**

**Closed Naval
Air Station
Pensacola for
nearly a year**



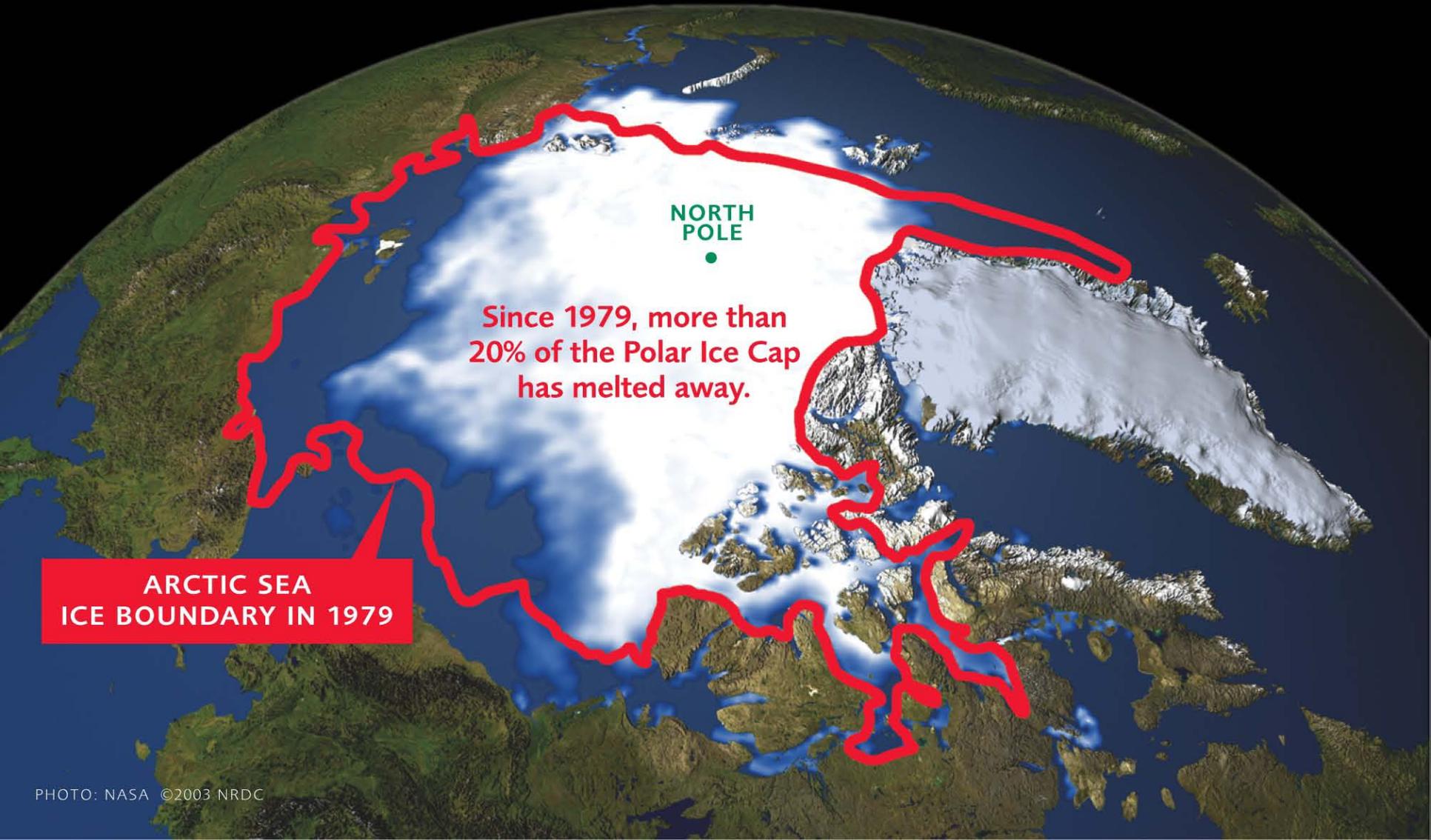
Bases Threatened by Rising Sea Levels

Diego Garcia:
Major
logistics hub
for U.S. and
Britain

Average
Elevation:
4 Feet



Effects of Climate Change



Since 1979, more than
20% of the Polar Ice Cap
has melted away.

ARCTIC SEA
ICE BOUNDARY IN 1979

“What should be the new name of
Glacier National Park after the
last glacier is gone?”

--Steve Butterworth, Regional Energy
Manager, National Park Service

Agencies are incorporating
sustainability into their mission and
vision

Army Energy Vision

“An effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, Civilians and their Families through Leadership, Partnership, and Ownership and also serves as a model for the nation.”

--Reduced energy consumption

--**Increased energy efficiency across platforms and facilities**

--**Increased use of renewable/alternative energy**

--Assured access to sufficient energy supplies

--**Reduced adverse impacts on the environment**

Navy Energy Vision

“Our Energy Vision is a Navy that values energy as a strategic is fundamental to executing our mission afloat and ashore; and a Navy that is resilient to any potential energy future.”

--Assure Mobility and Protect Critical Infrastructure

--Lighten the Load and Expand Tactical Reach

--**Green the Footprint**

(May, 2011 USGBC Federal Summit: Secretary of the Navy Mabus announced LEED gold as the standard and that biofuels (from non-food sources) will replace fossil fuel for the Navy)

Air Force Energy Vision

“Make Energy a Consideration In All We Do. Achieving the Air Force energy vision involves establishing a clear picture of how energy impacts the Air Force’s critical capabilities: Global Vigilance, Global Reach, and Global Power. Energy must be recognized as the base ingredient for Air Force missions and operations. By considering energy in every mission and organization, the Air Force can leverage energy as a combat enabler and increase its energy security posture.”

- Reduce Demand
- Increase Supply
- Culture Change

Marine Corps Energy Vision

“To be the premier self-sufficient expeditionary force, instilled with a warrior ethos that equates the efficient use of vital resources with increased combat effectiveness.”

- Instill an Ethos

- Increase Energy Efficiency in USMC Equipment and Installations

- Increase Use of Renewable and Alternative Energy

GSA: Strategically Sustainable

- GSA will eliminate its impact on the natural environment and use its government-wide influence to reduce the environmental impact of the federal government.
 - Goal: **Zero Environmental Footprint**

Legislative History and Executive Orders

- Energy Policy and Conservation Act (1975)
- DOE Organization Act (1977)
- National Energy Conservation Policy Act (1978)
- Federal Energy Management Improvement Act (1988)
- Executive Order 12759 (1991)
- Energy Policy Act (1992)
- Executive Order 12902 (1994)
- Executive Order 13123 (1999)
- Executive Order 13221 (2001)
- Energy Policy Act of 2005 (EPAAct '05)
- Executive Order 13423 (2007)
- Energy Independence and Security Act of 2007 (EISA)
- Executive Order 13514 (2009)



EPAAct, EO 13423, EISA

- Establish goals for energy and water reductions
- Require building evaluations
- Establish a Federal renewable goal
- Require the purchase of environmentally preferable and energy efficient products

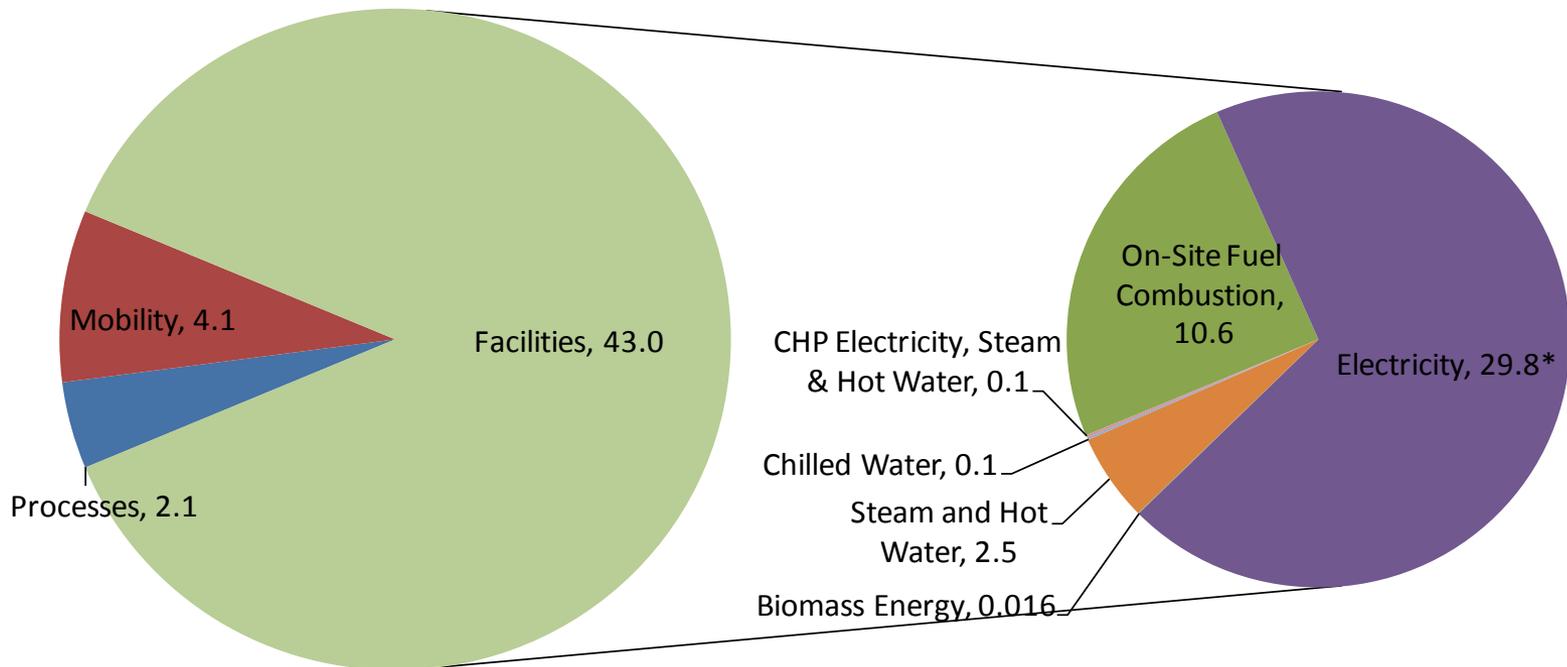
On October 5, 2009, President Obama Signed Executive Order 13514,
*Federal Leadership in Environmental, Energy, and Economic
Performance.*



EO 13514 Framework

- Executive Order 13514 establishes numerous goals for Federal agencies.
- EO 13514 represents a transformative shift in the way the government operates by:
 1. **establishing GHGs as the integrating metric for tracking progress in Federal sustainability -- energy efficiency is the best method to reduce GHG emissions**
 2. requiring a deliberative planning process: Agencies have developed and are implementing their "Strategic Sustainability Performance Plans."
 3. linking to budget allocations and OMB scorecards to ensure goal achievement.
- E.O. 13423 *Strengthening Federal Environmental, Energy, and Transportation Management* (January 29, 2007) is not revoked by the new E.O.; the requirements of that Order remain in effect.

**FY 2010 Federal Government Scopes 1 & 2 GHG Emissions Covered by Reduction Target
(49.1 MMTCO₂e)**



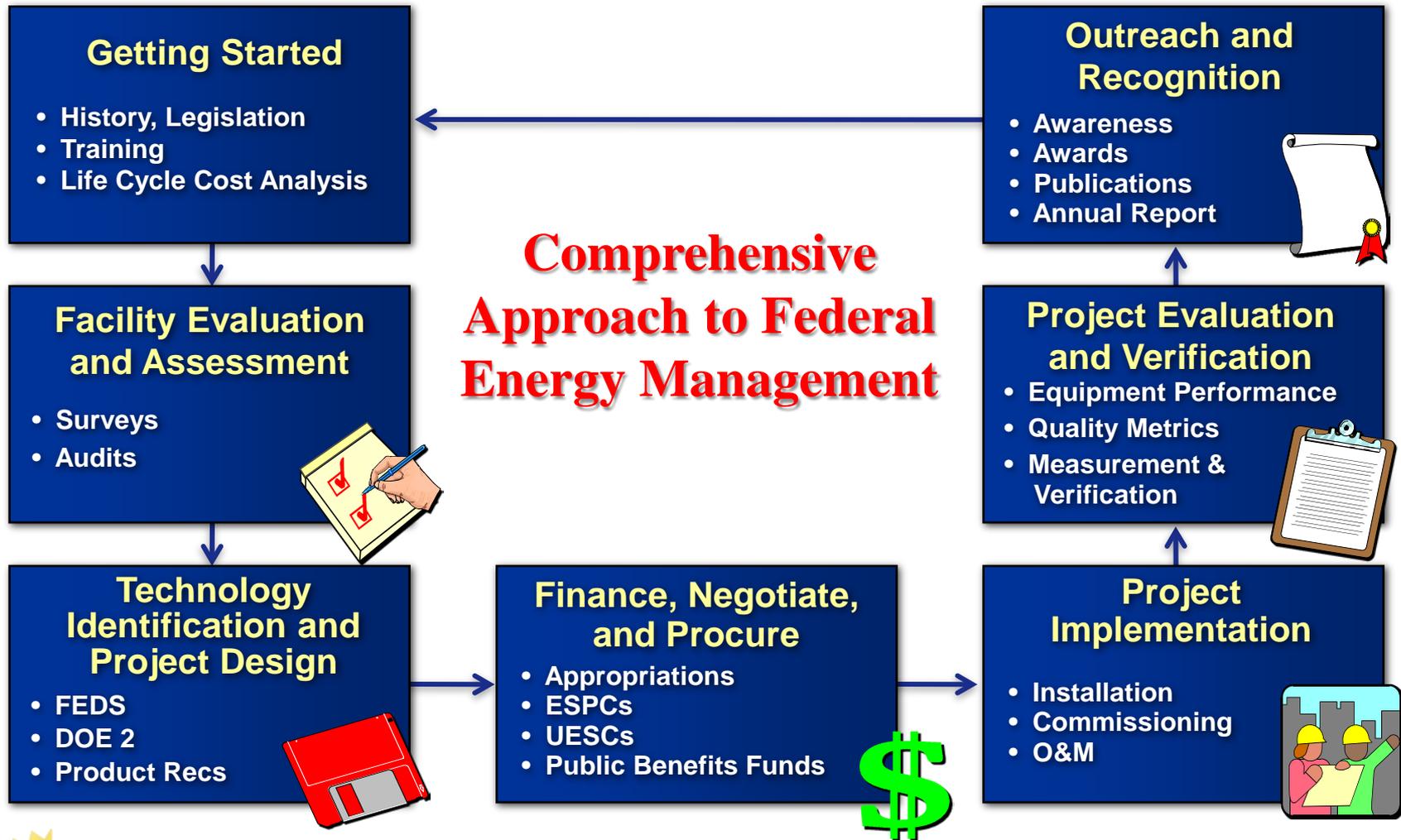
*Includes reductions from purchases of renewable energy attributes

Other EO 13514 Goals

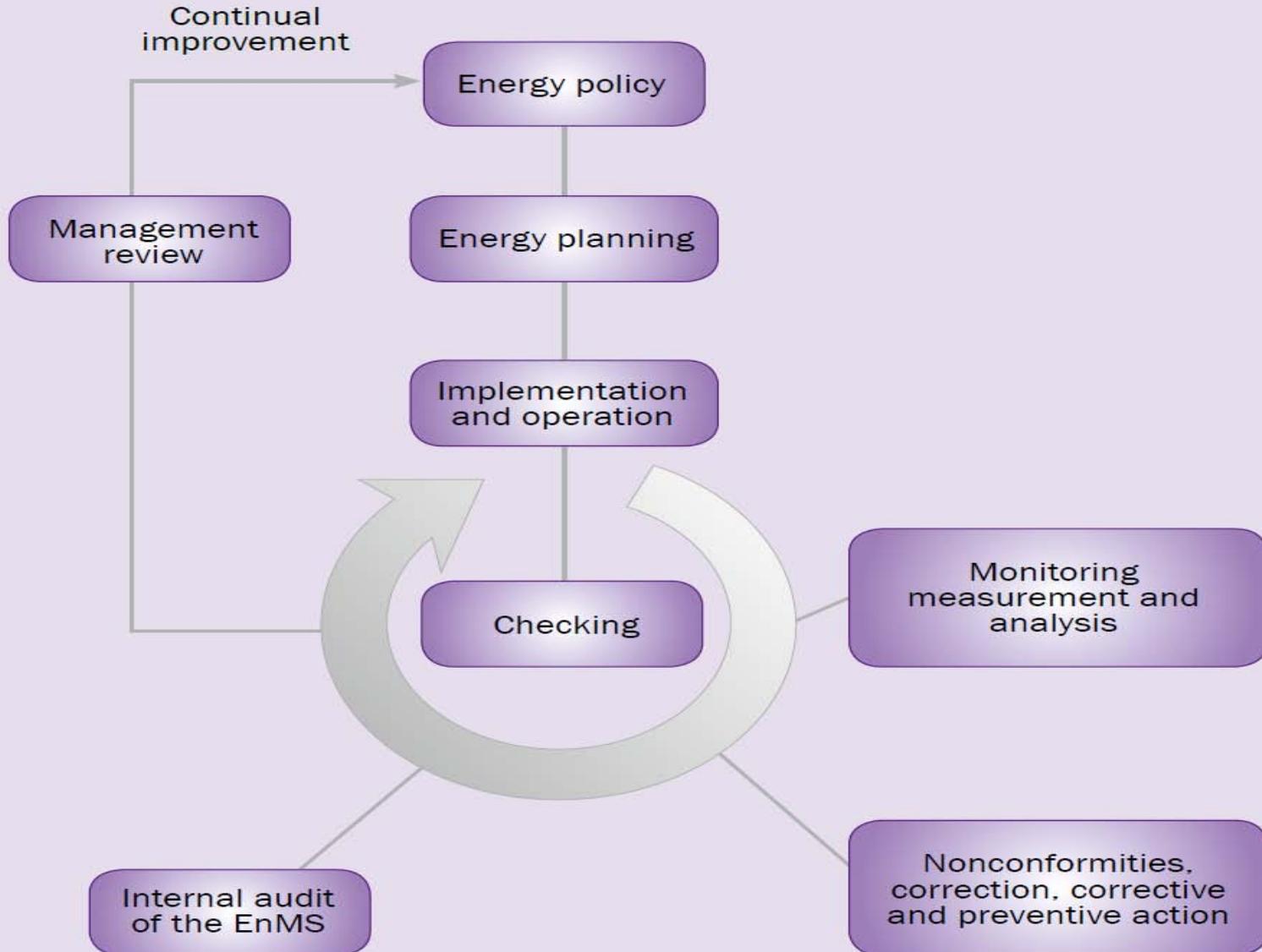
The new Executive Order also requires agencies to meet sustainability targets, including:

- Achieve 30% reduction in vehicle fleet **petroleum** use by 2020
- Achieve 26% reduction in potable & 20% reduction in industrial, landscaping, & agricultural **water** consumption by 2020
- Comply with new EPA stormwater management guidance
- Achieve 50% recycling & **waste diversion** by 2015
- Requires that 95% of all applicable procurement contracts will meet **sustainability** requirements
- Requires 15% of buildings meet the *Guiding Principles for High Performance and Sustainable Buildings* by 2015
- Design all new Federal buildings which begin the planning process by 2020 to achieve zero-net energy by 2030
- Click on “Sustainability Crosswalk” at <http://www1.eere.energy.gov/femp/regulations/regulations.html> to see all requirements.

The Federal Approach to Energy Management



ISO 50001 Energy Management Systems



The Federal Model for Energy Management

- Set goals (legislation and EOs)
- Plan and implement projects
- Measure performance
- Report progress
- Reward Federal leadership

Federal Government Goals and Status

- **Reduce energy intensity** (Btu/square foot) by 15% in FY 2010 compared to FY 2003; 30% reduction required in FY 2015.
 - **Goal met: 15.0% reduction (only 11.0% without additional credits)**
- **Use Renewable *Electric* Energy** equivalent to a least 5% of total electricity use; at least half of which must come from sources developed after January 1, 1999. Must be at least 7.5% in FY 2013 and thereafter.
 - **Goal Met: 5.2% overall**
- **Reduce water consumption intensity** (Gal/square foot) by 6% relative to 2007 baseline; 16% by the end of FY 2015; 26% by FY 2020.
 - **Goal Met: 10.4% reduction**
- **Reduce Government-wide GHG emissions** by 28% for Scope 1&2 emissions and 13% for Scope 3 emissions by 2020 (from 2008 levels)

Plan and Implement Projects

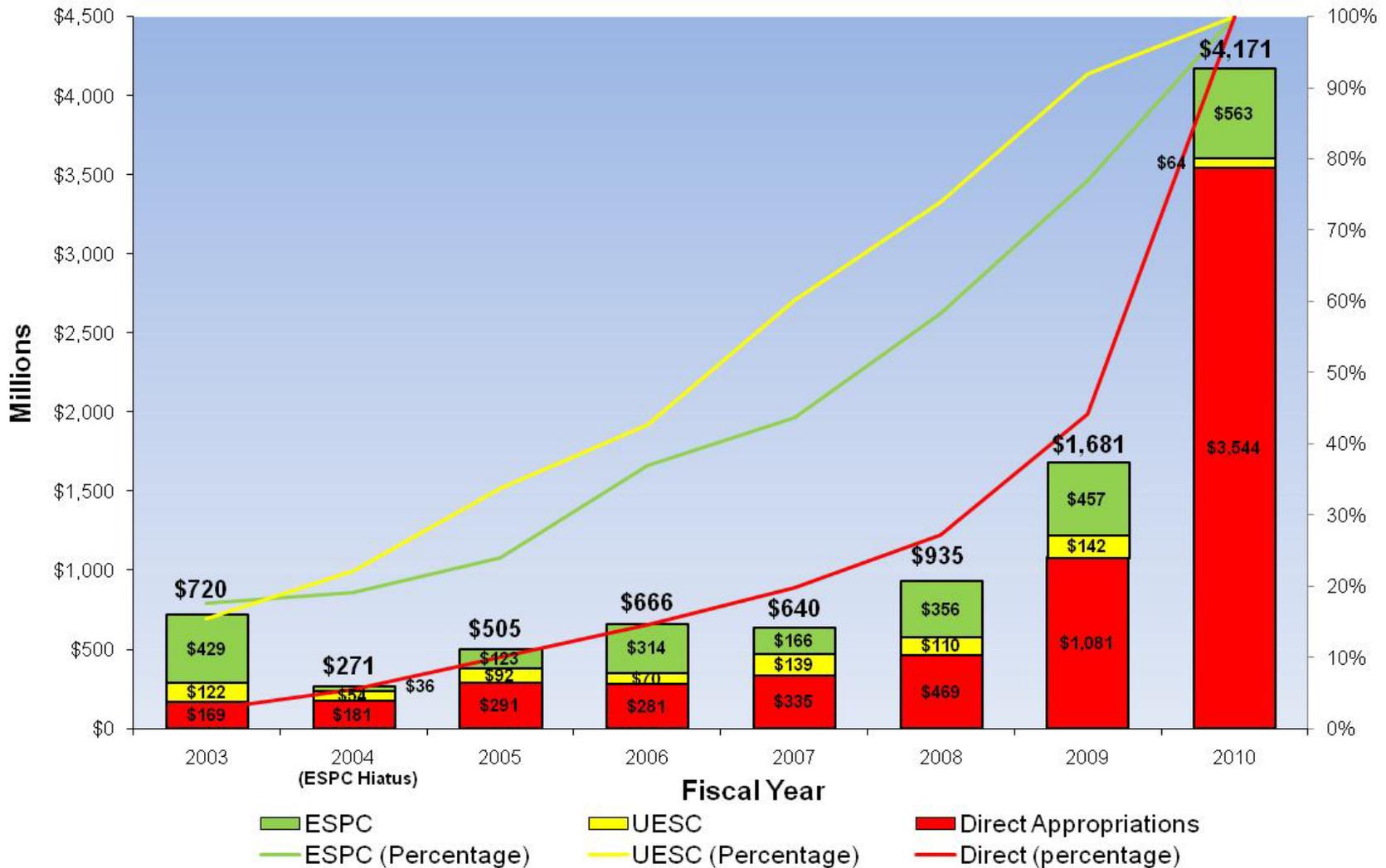
- How agencies will meet the goals:
 - Whole building life-cycle cost-effective projects
 - Technology breakthroughs



Investments in Building Energy Efficiency

- Federal agencies have options for financing energy efficiency, water conservation, and renewable energy projects in buildings and facilities:
 - Direct appropriated funding, and
 - Alternative financing: energy savings performance contracts (ESPCs), utility energy service contracts (UESCs), and enhanced use leases (EUL); and
 - Public benefit funds.
 - Power Purchase Agreements (PPA) are increasingly beneficial

Federal Facilities: Investment in Energy Efficiency Projects

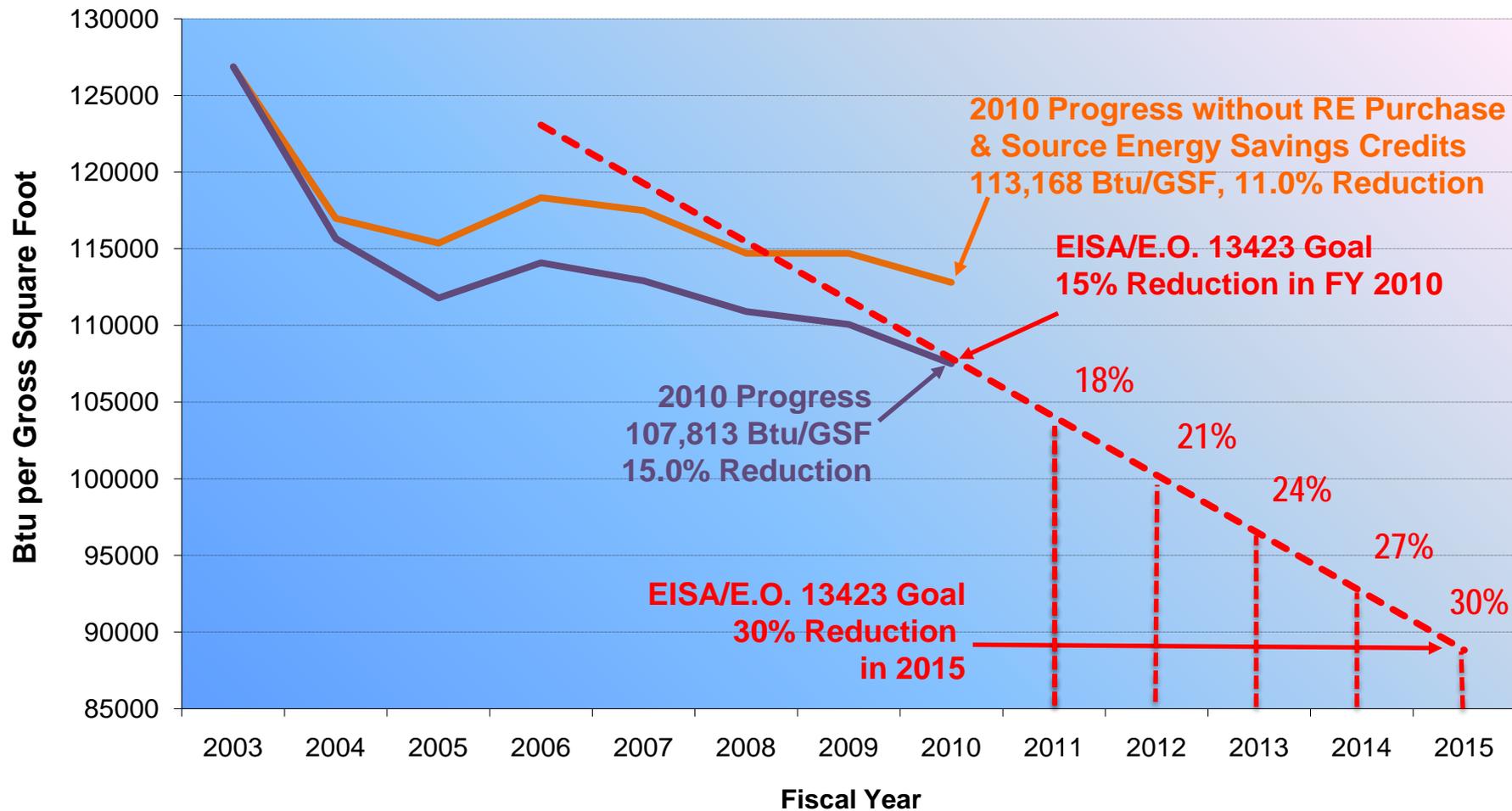


FEMP Model

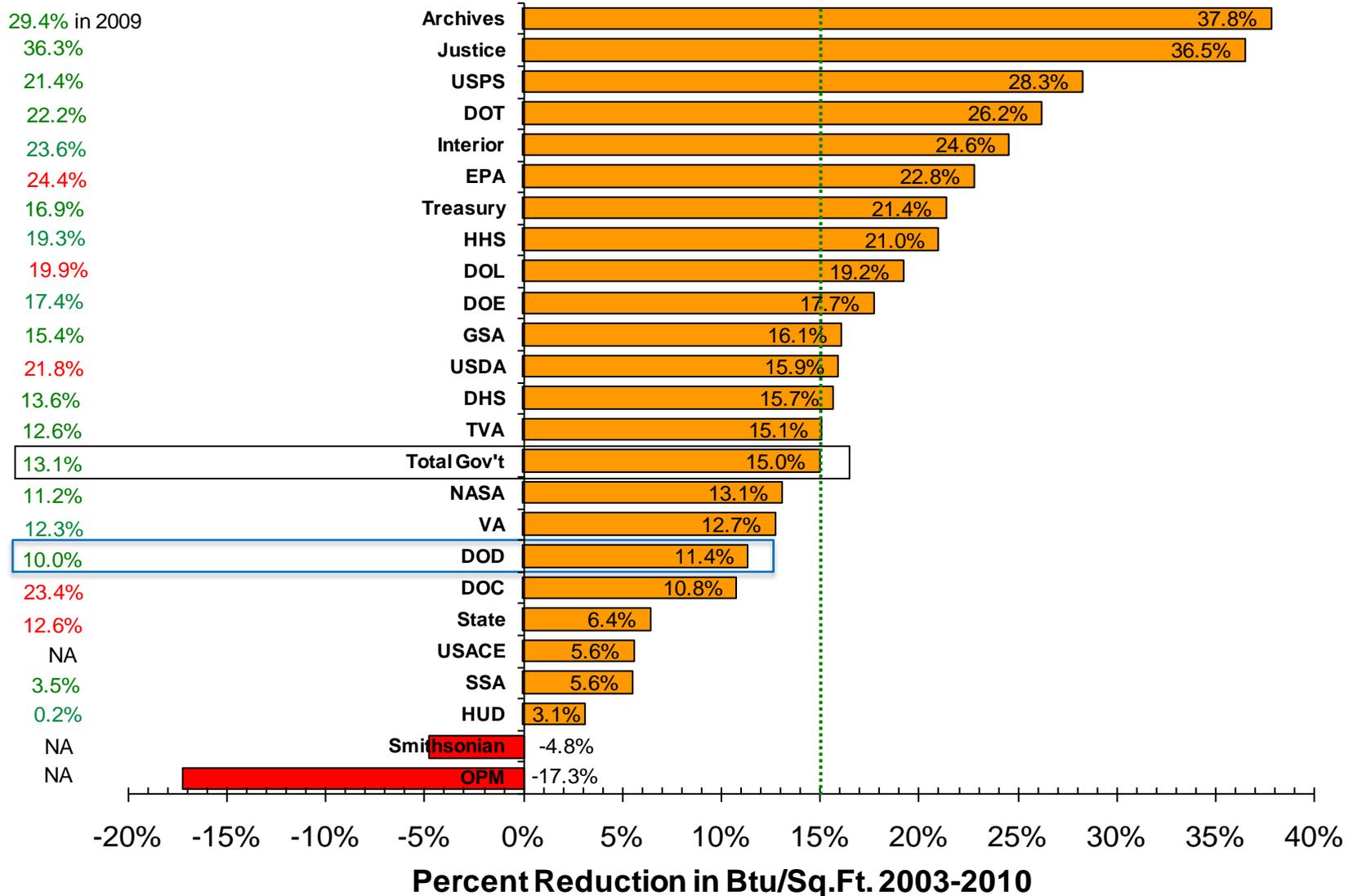
- Set goals
- Plan and implement projects (Later)
- ✓ **Measure performance**
- ✓ **Report progress**
- Reward Federal leadership

Federal Government Energy Progress

Government Building Energy Intensity FY 2003 - FY 2010 (preliminary data)

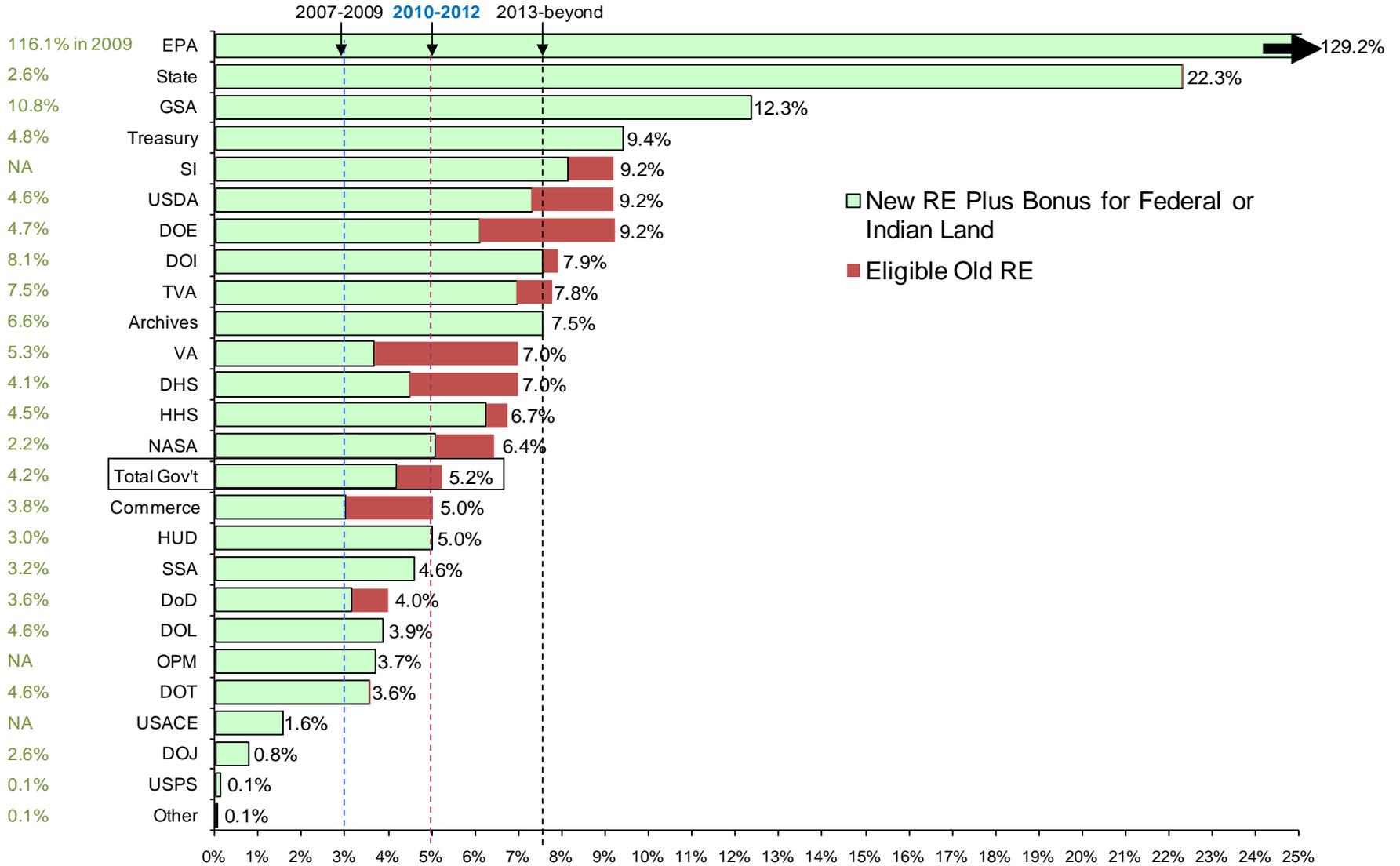


Federal Facilities: Agency Progress Toward Energy Reduction Goal



PRELIMINARY DATA

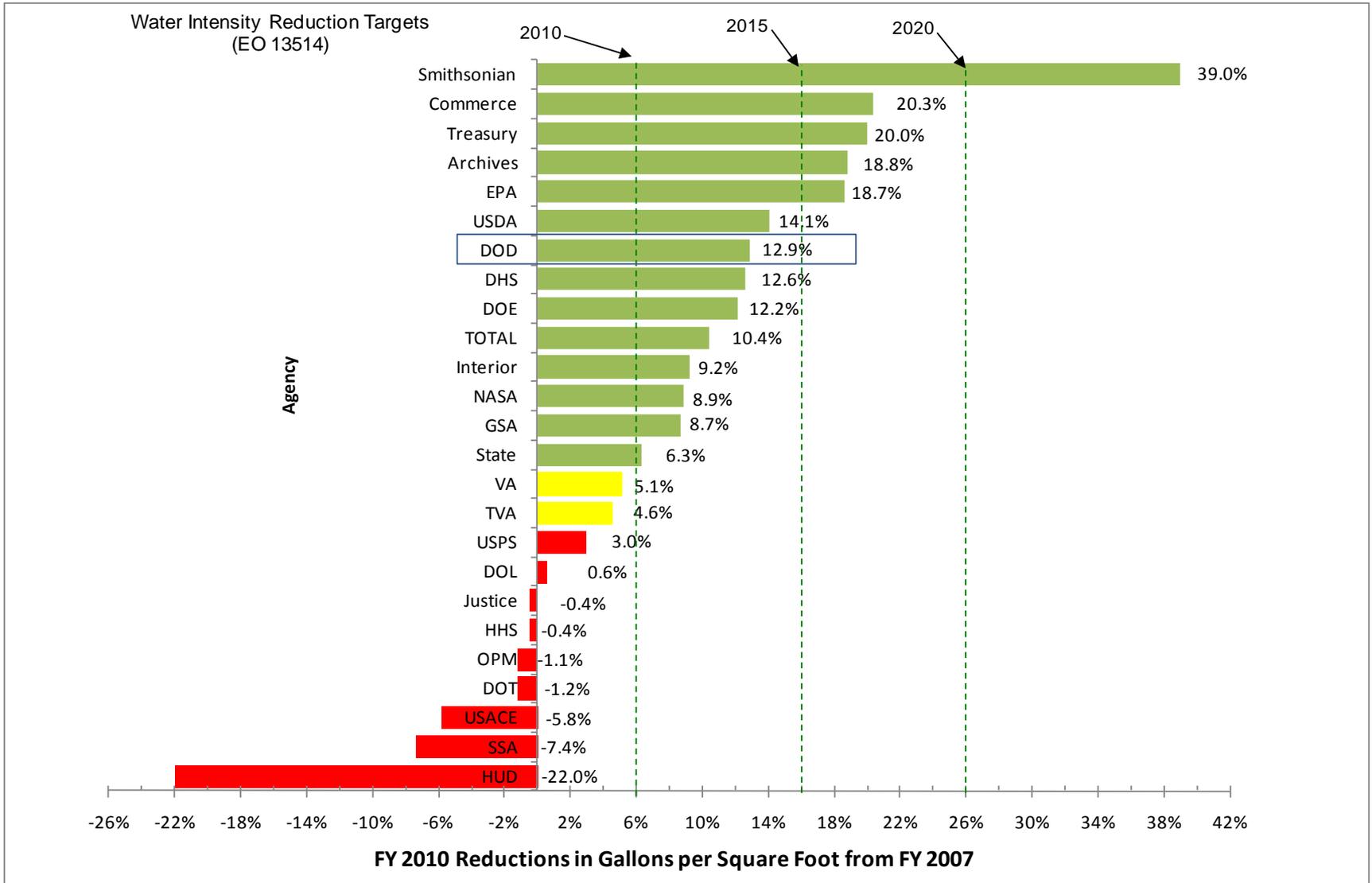
Federal Facilities: Progress Toward Renewable Energy Goal



PRELIMINARY DATA

FY 2010 Renewable Electric Energy as a % of Electricity Use

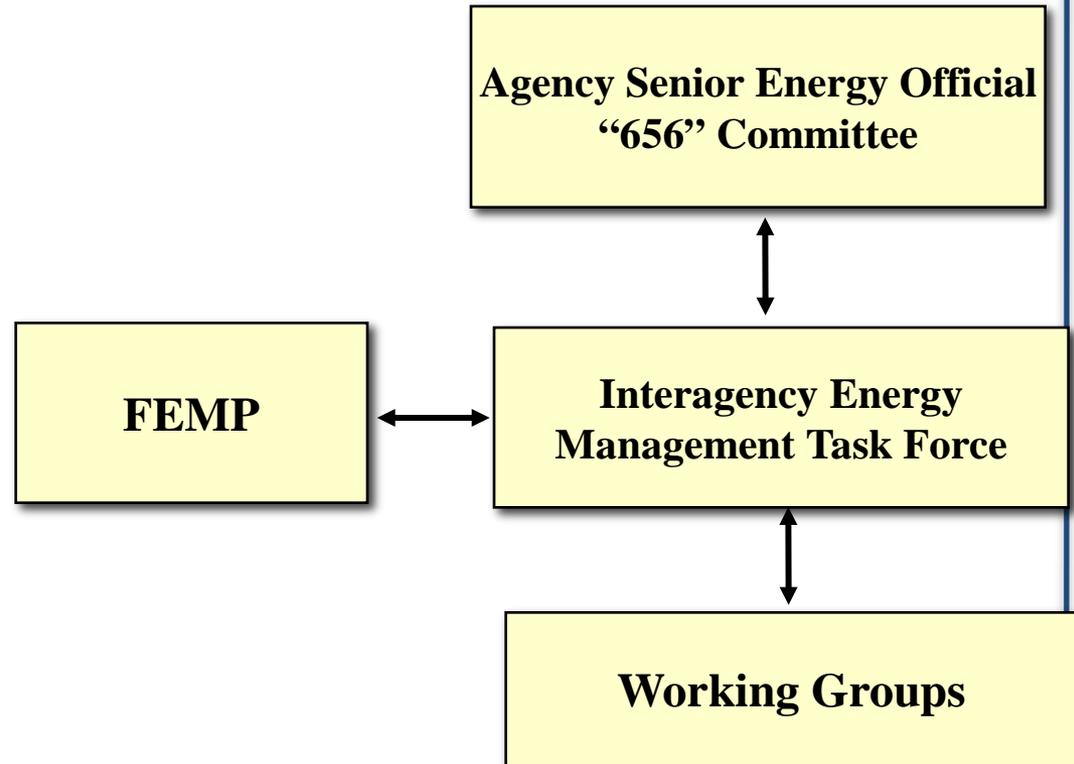
Federal Facilities: Performance Toward Water Reduction Goal



PRELIMINARY DATA

Report Progress

- Annual Report to Congress and the President
- Agency Sustainability Score Cards
- FEMP Interagency coordination



2010 OMB Scorecard: Standards for Success

- **Scope 1&2 GHG Emission Reduction Target:** GREEN: Developed a base year and a complete, comprehensive 2010 GHG inventory for Scopes 1&2 and submitted to CEQ and OMB by 1/31/2011.
- **Scope 3 GHG Emission Reduction Target:** GREEN: Developed a base year and a complete, comprehensive 2010 GHG inventory for Scope 3 and submitted to CEQ and OMB by 1/31/11.
- **Reduction in Energy Intensity:** GREEN: Reduced energy intensity (Btu/GSF*) in EISA goal-subject facilities by at least 15 percent compared with 2003 and is on track for 30 percent reduction by 2015.
- **Use of Renewable Energy:** GREEN: Uses at least 5 percent electricity from renewable sources as a percentage of facility electricity use & at least 2.5 percent of facility electricity use comes from new sources (post-1999).

OMB Scorecard Standards (cont.)

- **Reduction in Potable Water Intensity:** GREEN: Reduced water intensity by at least 6 percent from final approved 2007 baseline and is on track for 26 percent reduction by 2020.
- **Reduction in Fleet Petroleum Use:** GREEN: Achieved a 10 percent reduction in petroleum use in its entire vehicle fleet compared to 2005 and is on track for 20 percent reduction by 2015.
- **Green Buildings:** GREEN: on track to meet 15% goal by 2015 by reporting that at least 5% of buildings >5,000 GSF meet GP as reported in the Federal Real Property Profile (FRPP).

FEMP Model

- Set goals
- Plan and implement projects
- Measure performance
- Report progress
- **Reward Federal leadership**
 - Agency-Specific awards
 - FEMP awards
 - Presidential awards

Awards



Energy 101 Sessions Overview

Introduction to Energy Concepts

- Introduction to Energy Management
- **Facility Evaluations/Surveys/Assessments**
- Economics of Energy Management
- Operations and Maintenance (O&M)
- Basic Energy Management Technologies
- Renewables
- Steam
- Introduction to Commissioning (Cx) & RCx
- Energy Awareness and Outreach
- Web-based Tools

Facility Evaluations/Surveys/Assessments

- EISA Section 432 requires agencies to conduct energy and water evaluations in 25% of its covered facilities each year so that 100% of the covered buildings are evaluated every 4 years
- Covered buildings use 75% of the agency's total energy
- FEMP Guidance: “Facility Energy Management Guidelines and Criteria for Energy and Water Evaluations in Covered Facilities (42 U.S.C. 8253 Subsection (f), *Use of Energy and Water Efficiency Measures in Federal Buildings*)” 25 November 2008

Options for Obtaining Audits

- Expert in-house agency teams
- Expert contract teams
e.g. those available under GSA schedule 871-201
Energy Audit Services
- Utility teams under Utility Energy Services Contracts
- Energy Services Companies under Energy Savings Performance Contracts
- FEMP technical assistance

Goals of the Energy Audit

- Identify the types and costs of energy use
- Understand how energy is being used
- Identify and analyze
 - improved operational techniques
 - new equipment, processes, or technology
- Identify variables that impact energy usage
- Perform an economic analysis on those alternatives and determine which are cost-effective for your situation

Types of Audits: Preliminary

- Also called simple audit, screening audit or walk-through audit
- Simplest and quickest
- Identify no-cost/low cost opportunities
- Includes review of facility utility bills and operating data and some interviews with site personnel
- Helpful for prioritizing energy efficiency projects and to determine the need for a more detailed audit.

Energy Audit by Walking Around

Whats wrong with this picture?



Energy Audit by Walking Around

Whats wrong with this picture?



Energy Audit by Walking Around

Whats wrong with this picture?



Types of Audits: Site Energy Audit

- Expands on the preliminary audit and is used in initial proposals for alternative financing
- Analyze 12-36 months of utility bills to evaluate rate structures and usage profiles
- Meter systems to supplement utility data
- Conduct in-depth interviews with site personnel
- Identify appropriate energy conservation measures (ECM)
- Conduct life cycle cost analysis of ECMs

Types of Audits: Investment Grade

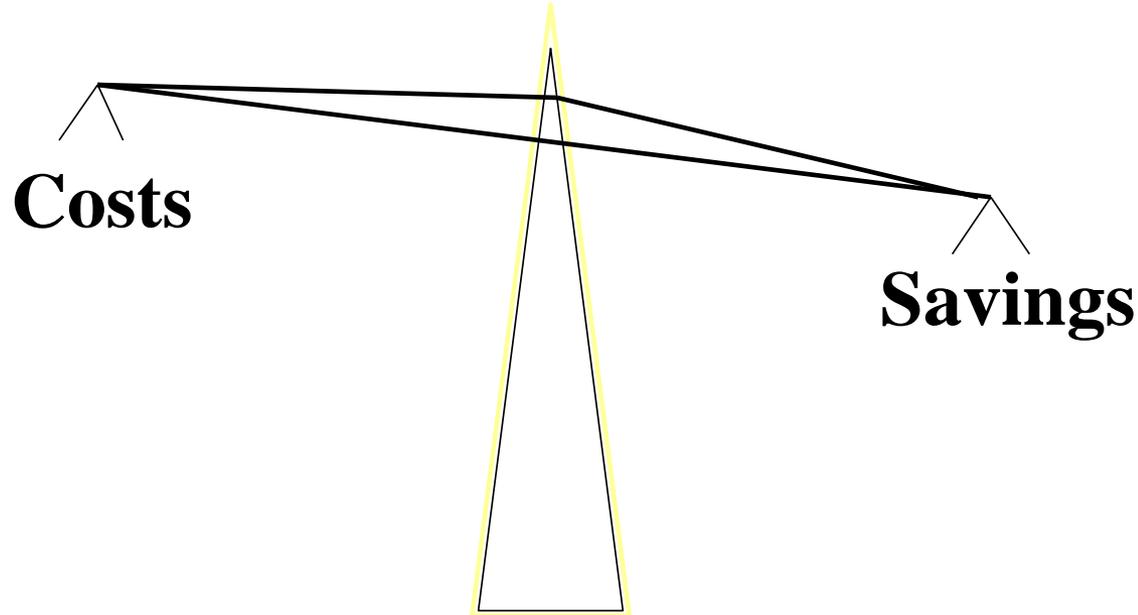
- Comprehensive audits include:
 - detailed study of the entire facility
 - recommendations for energy and water efficiency improvement projects
 - reliable cost and savings estimates
 - project documentation
- Required for final proposal for alternative financing
- May include building modeling or infrared thermography (O&M Best Practices Guide)

Introduction to Energy Concepts

- Introduction to Energy Management
- Facility Evaluations/Surveys/Assessments
- **Economics of Energy Management**
- Operations and Maintenance (O&M)
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Economics of Energy Management

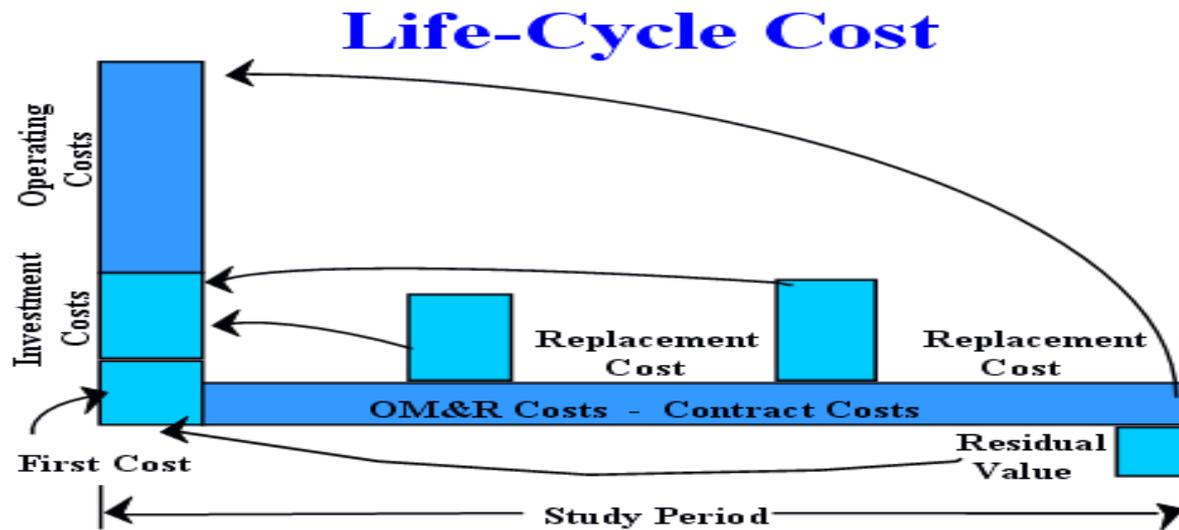
Savings must be greater than costs - over the life of the project!



Life Cycle costing takes into consideration the time value of money.

Life-Cycle Cost Analysis

- a method of economic analysis that sums all *relevant* project costs over a *given study period* in *present-value* terms.
- most relevant when selecting among *mutually exclusive project alternatives* that provide the same functional performance but have different initial costs, OM&R costs, and/or expected lives.



Uses of Life Cycle Cost Analysis

Accept/reject projects

Optimal energy efficiency level

Optimal system selection or design

Optimal combination of interdependent systems

Prioritization of independent projects

It only looks scary



www1.eere.energy.gov/femp/information/download_blcc.html

Federal Energy Management Program: Building Life-Cycle Cost (BLCC) Programs - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www1.eere.energy.gov/femp/information/download_blcc.html

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Building Life-Cycle Cost (BLCC) Programs

The National Institute of Standards and Technology (NIST) developed the Building Life-Cycle Cost (BLCC) Program to provide computational support for the analysis of capital investments in buildings. BLCC features several components, including:

- [Building Life-Cycle Cost Program](#)
- [Energy Escalation Rate Calculator](#)
- [Handbook 135](#)
- [Annual Supplement to Handbook 135](#)

Some of the following documents are available as Adobe Acrobat PDFs. [Download Adobe Reader.](#)

Building Life-Cycle Cost Program

[Register and download](#).BLCC 5.3-09 (for PC only).

BLCC is programmed in Java with an XML file format. The user's guide is part of the BLCC Help system. BLCC version 5.3-09 contains the following six modules:

1. **FEMP Analysis; Energy Project:** For energy and water conservation and renewable energy projects under the FEMP rules based on 10 CFR 436.
2. **Federal Analysis; Financed Project:** For Federal projects financed through energy savings performance contracts (ESPCs) or utility energy services contracts (UESCs).

Done

Start

Inbox -... 2010_G... GovEne... get_pd... Federa...

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10:56

Federal and State Incentives

www.dsireusa.org/

[NC Solar Center](#)

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DSIRE

Database of State Incentives for Renewables & Efficiency

[FAQs](#)

[Summary Maps](#)

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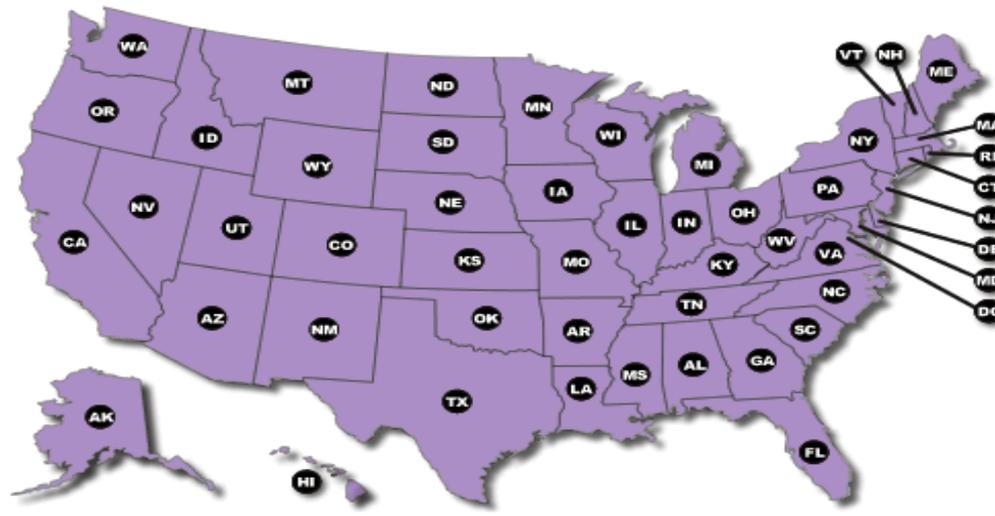
[New / Updated Incentives](#)

DSIRE is a comprehensive source of information on state, local, utility, and federal incentives that promote renewable energy and energy efficiency. Choose one or both databases to search:

Renewable Energy Energy Efficiency



Federal Incentives



US Territory Incentives

Last Updated: 03/06/07

[FAQs](#) | [Summary Maps](#) | [Summary Tables](#) | [Search By](#) | [Glossary](#) | [Links](#)

Help is Available

NIST Handbook 135 provides complete guidance is at

www.nist.gov/customcf/get_pdf.cfm?pub_id=860017

DOE publishes updated discount factors and price escalation factors annually

price escalation rates vary by

census region,

fuel type,

rate class (residential, commercial, industrial)

and year

DOE provides training

The Guidance on Life-Cycle Analysis Required by EO 13123 is at

www1.eere.energy.gov/femp/pdfs/lcc_guide_05.pdf

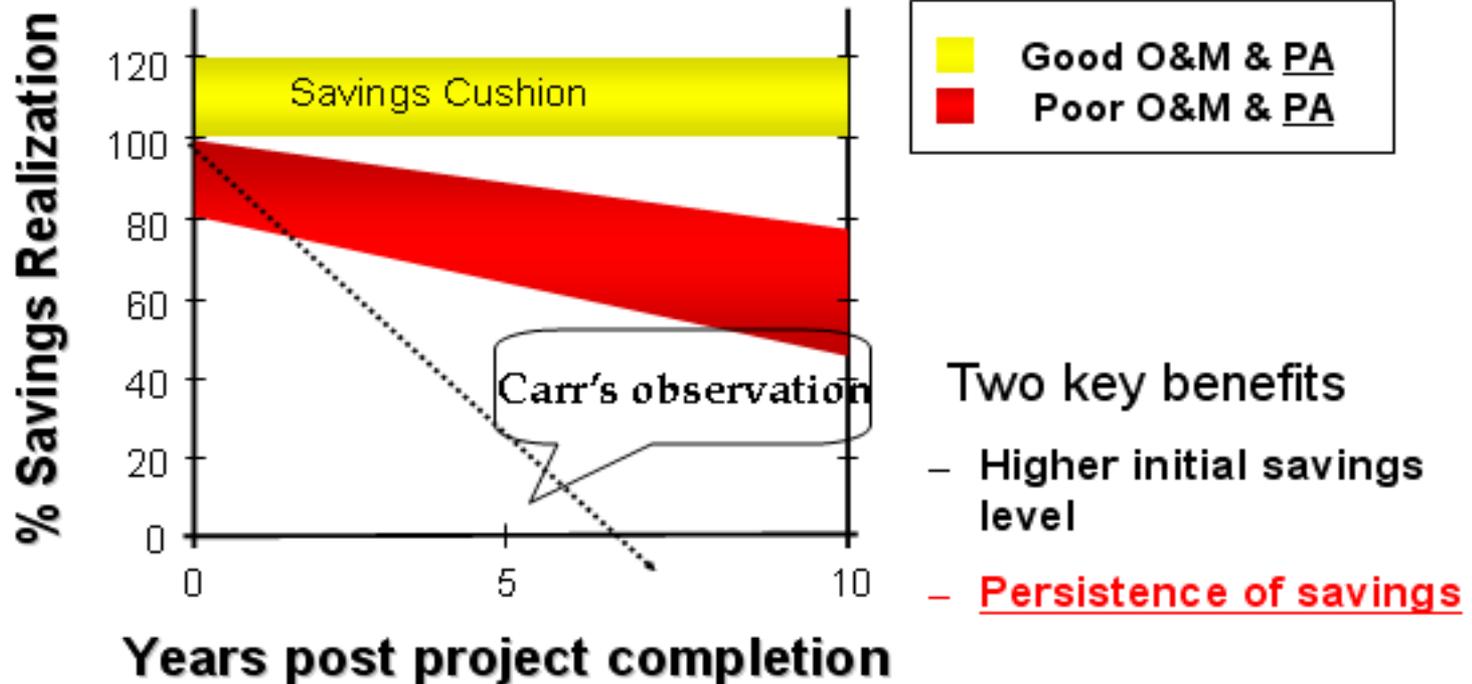
The session on Economics of Energy Management will make it clearer.

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Operations and Maintenance

Continuous High Quality O&M is Critical to Energy Efficiency



Constant Battle With Management Short Term Attention Span

Operation and Maintenance is an easy annual budget target because the damage isn't seen for a while.

O&M isn't seen as a core mission need in many instances.

But if neglected it causes decreased efficiency, poor living and working conditions, environmental impact, increased costs and mission degradation.

Improved O&M Has Many Other Benefits

Economic, Environmental, Mission Support, Health, and Safety



Improved O&M Can Provide No/Low Cost Energy Savings

Management must have demonstrated mission and cost reduction benefits

O&M Personnel Training in efficiency improvement has serious ROI

O&M personnel know where the greatest potential for energy improvement is, i.e. trouble calls.

Experience is the Best Teacher

DOE has an O&M Best Practices Guide at
www1.eere.energy.gov/femp/program/om_bestpractices.html

Following these best practices can help agencies gain management buy-in for O&M programs and save an estimated 5% to 20% on energy bills without a significant capital investment. Depending on the facility, these savings can represent thousands to hundreds-of-thousands of dollars each year.

and other related help at
www1.eere.energy.gov/femp/program/om_resources.html

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Basic (Facility) Energy Efficiency Technologies

- Metering and metering analysis
- Improved envelope – insulation, fenestration, roofing
- Sustainable design and rehabilitation
- Integrated building automation and energy management
- Combined heat and power, cogeneration/distributed generation
- Fuel cell technologies
- Efficient lighting products and lighting controls
- Boilers and combustion controls
- High-performance HVAC systems and controls
- Thermal storage and load management
- Geexchange technologies
- Energy services and project financing

Metering and Analysis

- Advanced meters and analysis will allow
 - Base-lining, trending and identification of opportunities
- Fine-tuning of technologies
 - Performance assurance
 - O&M quality control
 - Predictive maintenance
 - Re-commissioning
 - In short - management

Improved Envelope

- Reflective and green roofs
- IR heat leak detection
- Improved insulation
- Improved window materials and techniques
- Air leak detection and controlled IAQ

Sustainable Design

- LEED and sustainable design principles will
 - Result in energy efficient facilities
 - Improve productivity and quality of life
 - Improve health of occupants
 - Extend usable lives of facilities
 - Contribute to environmental improvement

Automation and Management

- Energy Monitoring and Control Systems and the information that they provide allow optimization of system parameters and efficiency and comfort of the building systems
- Using the appropriate controls allows building engineers the ability to understand the interaction of effects on the building systems and take appropriate action to maintain mission support, efficiency and comfort

CHP/CoGen/DistGen

- Central heating and cooling plants,
- Combined Electric Co-generation, and
- Distributed thermal generation systems – all
- Can be designed to improve overall system efficiency and reduce energy use and costs –
- But – thermal and electric loads, energy costs, available area, local requirements, and future constraints all must be evaluated.

Fuel Cell

- Fuel cells have been evaluated in DoD facilities
- They offer the hope of environmentally benign energy transformation and high efficiency
- Technological issues and economics must be evaluated

Lighting

- Lighting technology has been evolving at “light speed”
- Improved fluorescent lamps and ballasts
- LED lamps in traffic signs and taxiways
- High efficient high bay lighting
- Scotopic lighting

Boilers and Combustion Equipment

- Improved boiler design
- Improved boiler controls
- Improved system equipment – motors, heat exchangers, etc
- Fluidized bed boilers
- Plasma arc waste combustion

HVAC and Controls

- Significantly improved SEER and EERs
- Improved controls and strategies
- Improved system configuration and designs

Thermal Storage and Load Management

- Chilled water and Ice storage can allow off peak thermal generation to offset on peak cooling needs
- Various electrical storage (pumped hydro, flywheel, etc.) can augment peak demand and load shifting and rolling curtailment can save significant electrical energy while maintaining comfort conditions.

Geo-Exchange

- Geothermal heat pump systems can significantly improve heating and cooling efficiency by using the relatively moderate temperature of the earth (or water source) as a source and sink of thermal energy.

Services and Financing

- Expert Assistance for all types of needs through the GSA schedule – e.g. REMs
- Alternative Financing and assistance is available to accomplish projects
 - UESC
 - ESPC
 - EUL
 - Renewable energy purchase
 - Incentives www.dsireusa.org/

DOE's Emerging Technologies Matrix

Microsoft Excel - emerging_tech_matrix.xls [Read-Only]

File Edit View Insert Format Tools Data Window Help Adobe PDF Type a question for help

100% Arial

08/25/2009

Emerging Technology Evaluation for Application in the Federal Sector									
Technology	Federal (Market) Leverage	Savings Potential Federal	Potential US economy	Cost Effectiveness	Retrofit Applicability	Special Benefits	Sub-Categories		
Scotopic Lighting	▲	▲	▶	▲	▲				
Addressable Dimming Fluorescent Ballasts	▲	▲	▶	▶	▲				
Daylighting Systems and Integrated Daylighting Controls	▲	▲	▲	▶	▶	Occupant comfort and performance	a) Hybrid solar lighting b) Daylight harvesting and controls		
CFL Adapter for Recessed Downlights	▶	▶	▲	▲	▲				
LED & Solid State Lighting	▲	▼	▶	▶	▲	Low maintenance			
High Output T5 High Bay Lighting	▼	▶	▶	▲	▲				
HVAC									
Technology	Federal (Market) Leverage	Savings Potential Federal	Potential US economy	Cost Effectiveness	Retrofit Applicability	Special Benefits	Sub-Categories		

Ready NUM

Start Federal ... 2010_G... Itinerary... Sain Eng... Downloads Microso... 09:56

www1.eere.energy.gov/femp/technologies/new_technologies.html

Facility Energy Efficiency Technologies

- Introduction to Energy Management
- Facility Evaluations/Surveys/Assessments
- Economics of Energy Management
- Operations and Maintenance (O&M)
- Basic Energy Management Technologies
- **Renewables**
- Steam
- Introduction to Commissioning (Cx) & RCx
- Energy Awareness and Outreach
- Web-based Tools

Renewable Energy

Renewable electricity requirements

- EPLA 05 requires agencies obtain the following amounts of electricity from renewable resources:
 - Not less than 5% in FY 2010 - 2012
 - Not less than 7.5% in FY 2013 and thereafter
 - Renewable energy generated and used on site receives double credit
 - DOD - 25% of facility energy renewable by 2025
- EO 13423 requires that half must come from new renewable sources (after 1/1/1999)
- EISA 2007 requires 30% of hot water demand in new construction be met with solar hot water equipment

Renewable energy comes from:

- [Solar](#)
- [Wind](#)
- [Geothermal](#)
- [Biomass](#)
- [Landfill Gas](#)
- [Municipal Solid Waste](#)
- [Ocean \(tidal, wave, current, and thermal\)](#)
- [New hydroelectric from increased efficiency](#)

www1.eere.energy.gov/femp/technologies/renewable_energy.html

Dynamic Maps, GIS Data, & Analysis Tools


[More Search Options](#) [SEARCH](#)
[Site Map](#)

[NREL GIS Home](#)

About NREL GIS

Maps

- [MapSearch](#)
- [Biomass](#)
- [Federal Energy Management Program](#)
- [Geothermal](#)
- [Hydrogen](#)
- [Solar](#)
- [Wind](#)

Data & Analysis Tools

Maps

NREL's GIS team develops maps for various renewable resources and for specific projects using an ESRI product called [ArcIMS](#). All maps, except for the Renewable Energy Atlas of the West, are stored on a map server. Once you choose the map you would like to see, you will be connected to our map server and be able to view maps in a live-interactive session. Using this map server you have the opportunity to click map themes on and off, query, zoom in and out, and pan.

For further help, you can access a [video tutorial](#) that will show you how the dynamic map sites work. The tutorial features the "United States Atlas of Renewable Resources" but the concepts and tools work for most of the other dynamic map sites. [Text Version](#).

Available maps are listed below. If you have difficulty accessing these maps because of a disability, please contact the [Webmaster](#).

Biomass Maps ▶

Maps showing the biomass resources available in the United States by county. Feedstock categories include crop residues; forest residues; primary and secondary mill residues; urban wood waste; and methane emissions from manure management, landfills, and domestic wastewater treatment.

Federal Energy Management Program Maps ▶

The Federal Energy Management Program (FEMP) teams with Resource Assessment staff at the National Renewable Energy Laboratory (NREL) to create federal energy management program maps showing the market potential for various solar technologies at federal facilities throughout the country.

[Printable Version](#)

MapSearch ▶

Searching for maps has never been easier.



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Steam

The production and use of steam in large buildings and industrial processes is a significant source of energy efficiency opportunities. This session will discuss the various uses and equipment configurations and suggest simple and complex strategies for making the most economical use of this working fluid.

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Introduction to Commissioning (Cx) & RCx

- A systematic process to ensure building systems perform according to:
 - contract documents
 - design intent and
 - operational needs
- EISA section 432 requires commissioning on all ECMs
- Commissioning is required for LEED certification

Commissioning:

- Increases energy efficiency 5 – 10%
- Reduces indirect costs from:
 - Lost productivity
 - Employee illness
 - Liability related to indoor air quality
 - Premature equipment failure

The more complex the more Cx is needed

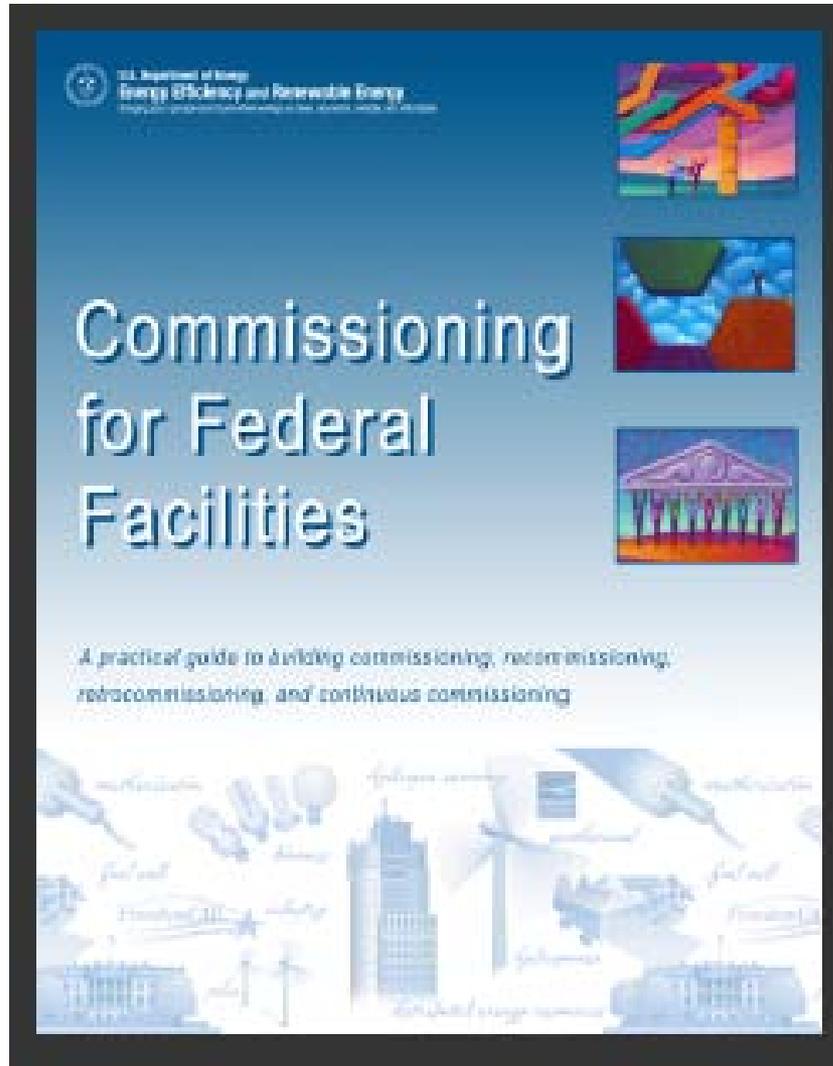
- HVAC
- Controls
- Duct work & pipe insulation
- Renewable technologies
- Lighting controls
- Day-lighting systems
- Waste heat recovery
- Advanced technologies

Experience

Depends on Bldg Type and Condition

Building Type	Number of Buildings	Savings (\$/1000 ft²/yr)	Labor Cost (\$/1000 ft²/yr)	Simple Payback (Years)
<i>Hospitals</i>	6	\$430	\$474	1.1
<i>Laboratory/Offices</i>	7	\$1260	\$368	0.3
<i>Classroom/Offices</i>	5	\$430	\$226	0.5
<i>Offices</i>	8	\$220	\$329	1.5
<i>Schools</i>	2	\$170	\$336	2.0
<i>Averages/Total</i>	28	\$540	\$359	0.7

www1.eere.energy.gov/femp/pdfs/commissioning_fed_facilities.pdf



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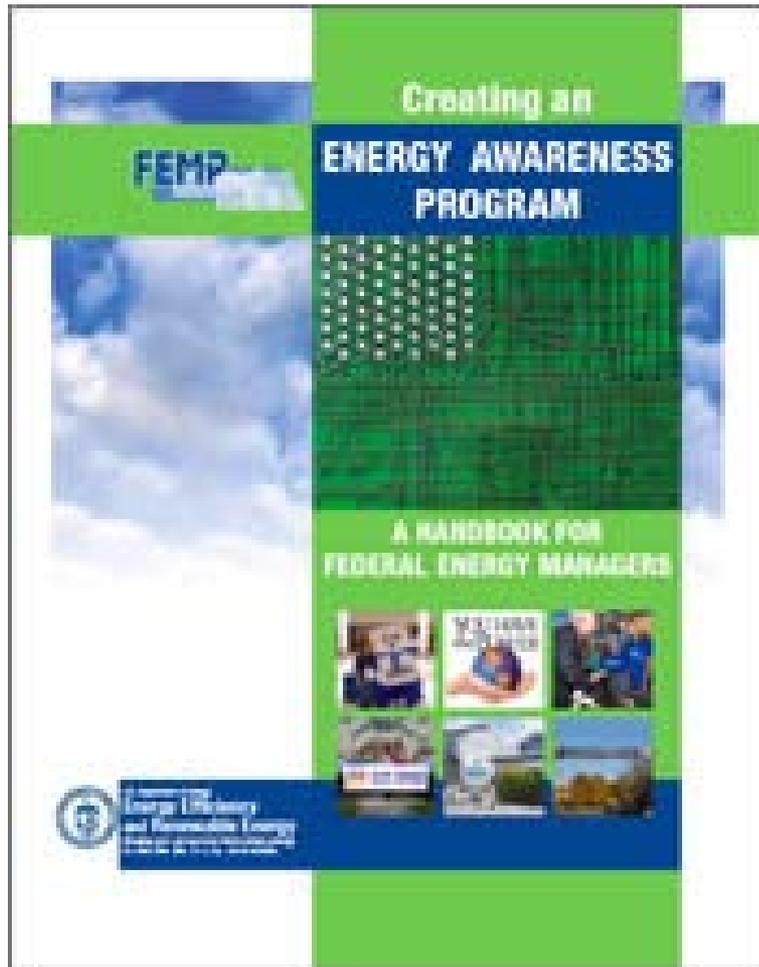
Awareness and Outreach

Federal personnel will do the right thing if they know what that is.

The Air Force Energy Plan has “Culture Change” as one of its basic pillars.

Energy efficiency goals are necessary, but everyone should understand the real benefits of cost savings, improved productivity, mission support, environment, health and comfort.

Components of an Awareness Program



- Awareness materials, such as bookmarks, posters
- Training
- Competition
- Recognition programs:
 - Energy champions
 - FEMP awards

Awareness and Outreach

www1.eere.energy.gov/femp/services/outreach.html

Federal Energy Management Program: Outreach - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www1.eere.energy.gov/femp/services/outreach.html

Federal Energy Management Progra...

About the Program Program Areas Laws & Regulations Information Resources Financing Mechanisms Technologies **Services** Home

Services

Project Assistance

Training

Outreach

- Awards for Saving Energy
- Earth Day
- Energy Awareness Month
- You Have the Power
- Create Your Own Campaign

Printable Version

Outreach

FEMP outreach and awareness campaigns cover energy efficiency, renewable energy, and water efficiency through a wide variety of activities and resources. These efforts provide ideas, materials, and encouragement to all Federal agencies striving to save energy and lead by example.

FEMP outreach activities and resources include:

- Award Programs:** Annual awards include the Federal Energy and Water Management, Presidential Awards for Leadership in Federal Energy Management, and Department of Energy (DOE) Management programs.
- Earth Day:** Celebrated April 22 of each year, FEMP offers Earth Day themes and materials for use by Federal agencies.
- Energy Awareness Month:** Observed in October of each year, FEMP Energy Awareness Month themes and campaign materials encourage Federal agencies to lead by example in energy management activities.
- You Have the Power Campaigns:** Awareness campaigns and materials created to honor, inspire, and encourage Federal energy leadership and projects.
- FEMP Focus:** Housed in the News and Events section, the FEMP Focus newsletter showcases Federal energy management issues, resources, and successes.

Federal agencies can also [create their own awareness campaigns](#) using You Have the Power [materials and resources](#) provided by FEMP.

Printable Version

Search

Search Help More Search Options

Site Map
EERE Information Center
Programs and Offices

Done

Start

Micr... 8bO... Inbo... I 20... F 20... G 20... Fede... 11:36

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Web Based Tools

Start at DOE FEMP

www1.eere.energy.gov/femp/

The screenshot shows a Mozilla Firefox browser window displaying the EERE Federal Energy Management Program Home Page. The browser's address bar shows the URL www1.eere.energy.gov/femp/. The page header features the U.S. Department of Energy logo and the text "Energy Efficiency & Renewable Energy". Below this is a green banner with the text "Federal Energy Management Program". A navigation menu includes links for "About the Program", "Program Areas", "Laws & Regulations", "Information Resources", "Financing Mechanisms", "Technologies", and "Services". A large photograph of the Edward R. Roybal Campus in Atlanta, Georgia, is displayed. A search bar is located in the top right corner, and a "Site Map" link is visible below it.

The Department of Energy's Federal Energy Management Program's (FEMP) mission is to facilitate the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

Federal Energy Management Resources

FEMP provides assistance through project transaction services, applied technology services, and decisions support services. These service areas help Federal agencies:



Meet Energy Goals and Regulatory Requirements



Design, Operate, and Maintain High-Performance Buildings



Purchase Energy-Efficient Products



Deploy Renewable Energy Technologies



Manage Energy-



Finance and



GovEnergy 2010: Federal Energy Training Workshop and Tradeshow

Search Help | More Search Options

Site Map
EERE Information Center
Programs and Offices

NEWS

Call for Manufacturer Updates: FEMP Standby Power Data Center Product Lists
July 1, 2010

Obama Administration and The George Washington University Announce 2010 GreenGov Symposium
June 25, 2010

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EVENTS

ESPC Pricing and Financing Webinar
July 7, 2010

FedFleet 2010
July 12-15, 2010

[More Events](#)

Agency Specific Sites

Office of the Secretary of Defense

www.acq.osd.mil/ie/energy/mgr_support.shtml

DUSD(I&E) - Facilities Energy - Facilities Energy Directorate Energy Manager Program Support - Mozilla Firefox

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http://www.acq.osd.mil/ie/energy/mgr_support.shtml

DUSD(I&E) - Facilities Energy - Facilit... Site Map | A-Z Index | Contact

OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE INSTALLATIONS AND ENVIRONMENT



Seabees from Naval Mobile Construction Battalion 10 drilled three 800- to 1,000-foot holes to assist the U.S. Navy Geothermal Program in their research of local geothermal energy.

[I&E Home](#) > [Facilities Energy](#)

This area provides technical support and resources for all DoD Installations and Facilities Energy Managers.

- [DoD Energy Manager's Handbook \(Aug 2005 update\)](#) (MS Word, 1.2MB)

[Federal Energy Management Program](#) (FEMP): The mission of the U.S. Department of Energy's Federal Energy Management Program (FEMP) is to reduce the cost and environmental impact of the federal government by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy and improving utility management decisions at federal sites.

- [Energy Project Financing Mechanisms](#)
- [Technologies](#)

I&E Home

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DoD Goes Green

DoD Open Government

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Search

Energy Home

Energy Programs

- Reference
- ECIP
- Energy Management Report
- Renewable Energy
- Energy Manager Program Support
- Vendor/Service Provider Support
- Utilities Privatization



expert assistance to federal agencies working to reduce their energy use and costs. The various labs play prominent roles in FEMP's programs focused on technical assistance; project financing; Price Reasonableness; energy security and EUL for DG/CHP; geothermal heat pumps; new technology demonstration; combined cooling, heat and power; industrial facilities and training/outreach.

- [Oak Ridge National Laboratory](#)
- [Pacific Northwest National Laboratory](#)
- [Lawrence Berkeley National Laboratory](#)
- [Sandia National Laboratory](#)
- [National Renewable Energy Laboratory](#)

The mission of the [General Services Administration](#) (GSA) is to secure the buildings, products, services, technology, and other workplace essentials for federal agencies.

- [Energy Efficient Products](#)

The mission of the [Environmental Protection Agency](#) (EPA) is to protect human health and the environment.

- [EPA Energy Star® Program](#)

The [Defense Energy Support Center's](#) (DESC) mission is to provide the Department of Defense and other government agencies with comprehensive energy solutions in the most effective and economical manner possible. DESC is a component of the [Defense Logistics Agency](#) (DLA).

Other Resources:

- [Global Green](#)
- [Whole Building Design Guide](#)
- [U.S. Green Building Council](#)
- [Leadership in Energy and Environmental Design \(LEED\)](#)
- [Greenbuild](#)
- [The Association of Energy Engineers](#)
- [Resource Energy Manager Guide](#)

Other Sources of Help

Association of Energy Engineers

www.aeecenter.org/i4a/pages/index.cfm?pageid=1

Alliance to Save Energy

<http://ase.org/>

GeoExchange

www.geoexchange.org/

ASHRAE

www.ashrae.org/

Whole Building Design Guide

www.wbdg.org

Private Sector Information

Guide to the use of data loggers

www.onsetcomp.com/aee2

Solar Thermal Opportunities

www.americansolar.com/

And many others

But obviously they have an agenda.

Sustainable Transportation



Sustainable Transportation



Questions?



INSPIRATION

GENIUS IS ONE PERCENT INSPIRATION AND 99 PERCENT PERSPIRATION,
WHICH IS WHY ENGINEERS SOMETIMES SMELL REALLY BAD.