



• August 15-18, 2010 • Dallas, Texas •
• Dallas Convention Center •



Introduction to Energy Management

Beth Shearer and Millard Carr

Energy 101 Technical Track

1. **Introduction to Energy Management**
2. Facility Evaluations/Surveys/Assessments
3. Economics of Energy Management
4. Operations and Maintenance (O&M)
5. Basic Energy Management Technologies
6. Renewables
7. Web-based Tools
8. Introduction to Commissioning (Cx) & RCx
9. 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: audits, economics, O&M, basics, renewables, web-based tools, Cx, awareness and outreach

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

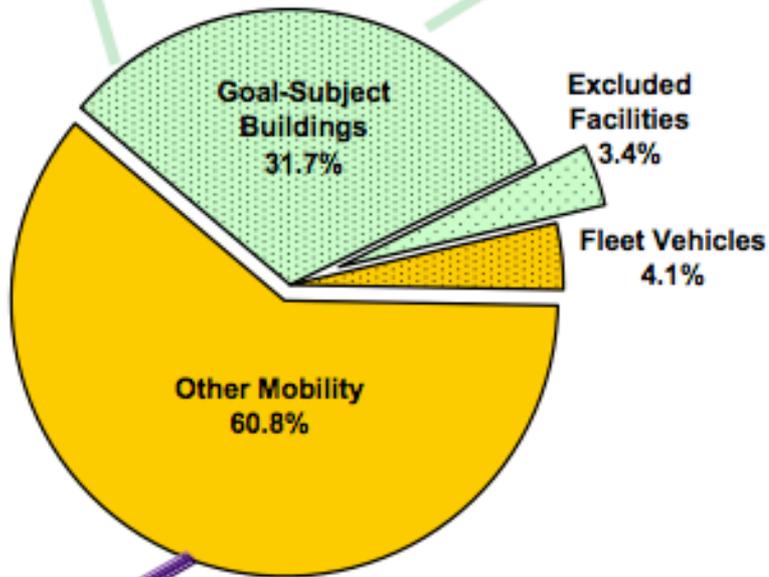
- Office Buildings
- Laboratories
- Housing
- Border stations
- Parks and historic sites
- Post Offices
- Court Houses
- Hospitals
- Warehouses
- Space launch buildings



U.S. Federal Energy Footprint

Building Energy Usage by Type:

- 50% Electricity
- 34% Natural Gas
- 7% Fuel Oil
- 5% Coal
- 4% Other

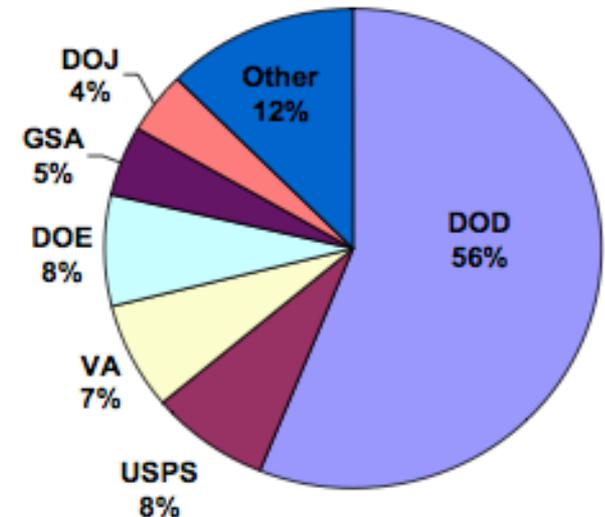


Mobility Energy Usage by Type:

- 70% Jet Fuel
- 14% Navy Special
- 7% Diesel
- 7% Auto Gas
- 2% Other

Facility Energy Usage by agency

Total: 389 trillion Btu

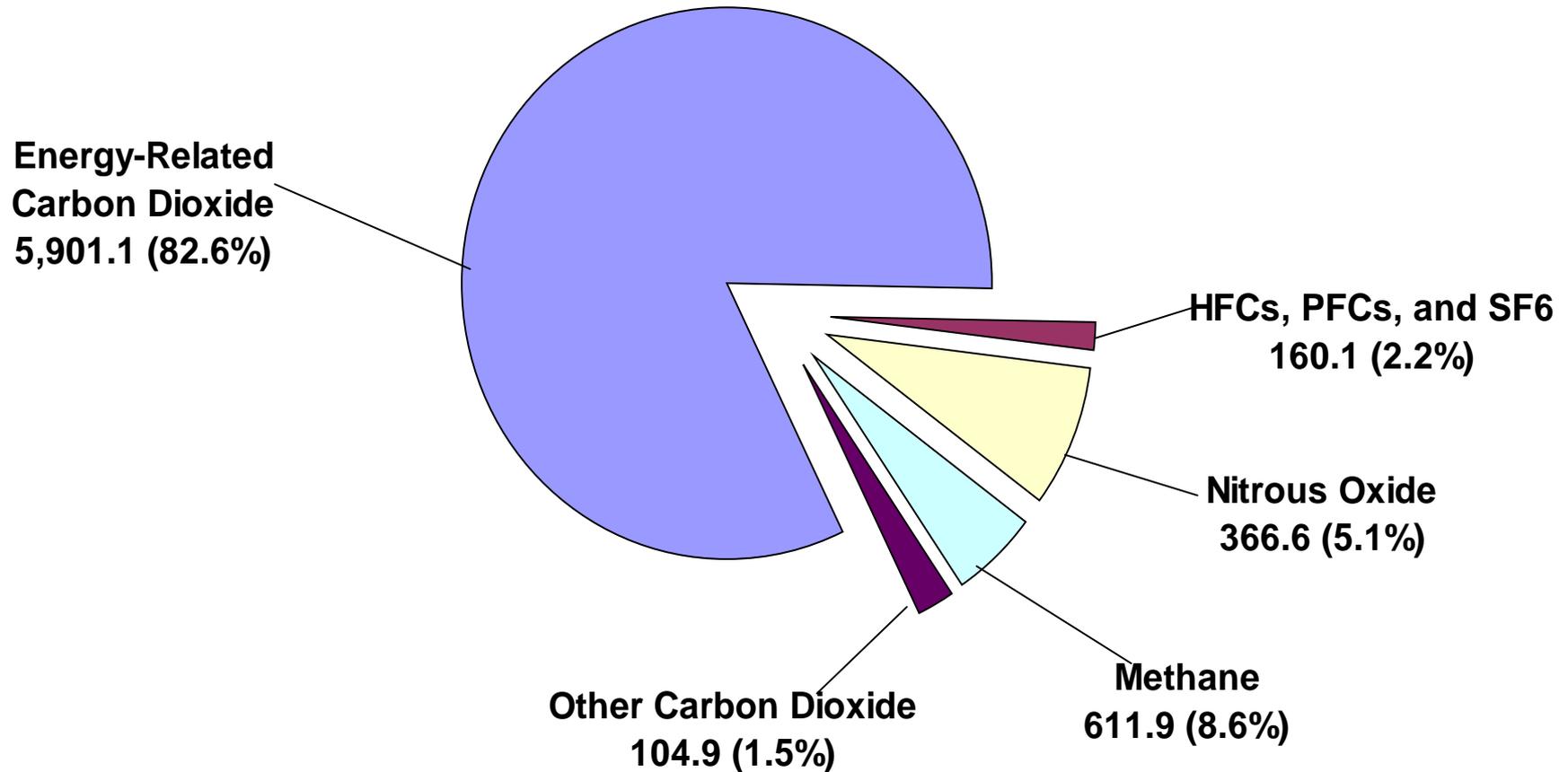


The Federal Government operates over 500,000 facilities (3 billion sq ft) & consumes 1.6% of the nation's total energy use, or \$24.5 billion in annual energy costs

Energy management is growing in importance

- Growing dependence on foreign oil
- Adverse impact from costs
- Potential security risk
- Growing world demand
- Climate change

US GHG Emissions (million metric tons of CO₂-equivalent)



Source: *Emissions of Greenhouse Gases in the United States 2005*. DOE/EIA-0573(2005), Washington, DC, November 2006

Effects of Climate Change



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

ARCTIC SEA
ICE BOUNDARY IN 1979

Administration Energy and Environmental Priorities

- Investing in the Clean Energy Jobs of the Future
- Securing our Energy Future
- Closing the Carbon Loophole and Cracking Down on Polluters



We can't rest until we harness the renewable energy that can create millions of new jobs and new industries. ...That's how we can grow our economy, enhance our security, and protect our planet at the same time.
—President Obama, 29 April 2009

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



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 (EPAct '05)
- Executive Order 13423 (2007)
- Energy Independence and Security Act of 2007 (EISA)
- American Recovery and Reinvestment Act of 2009 (ARRA)
- Executive Order 13514 (2009)



EPAAct, EO 13423, EISA

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

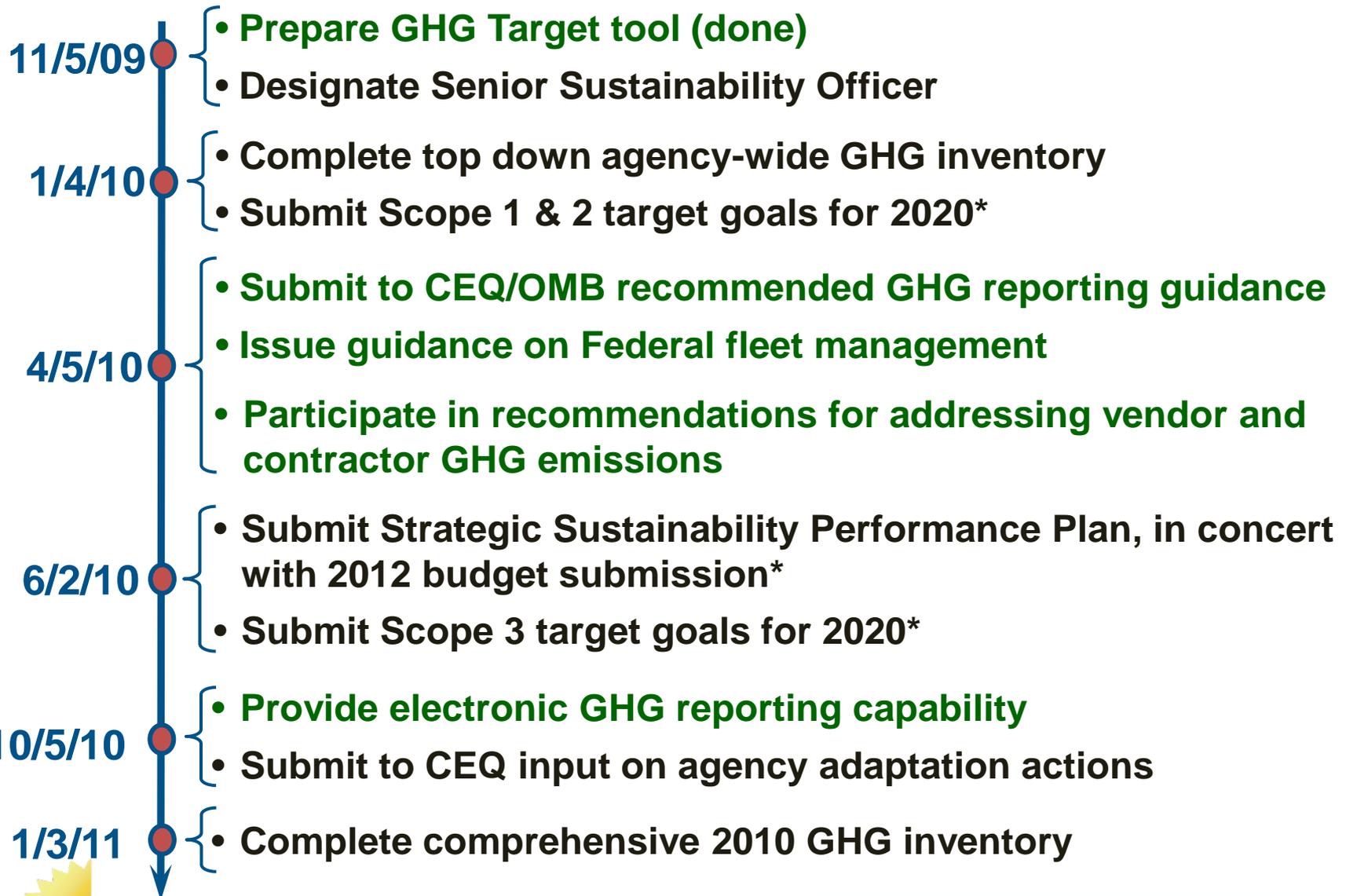
ARRA: Towards the green economy (<http://www.recovery.gov>)

- \$3.6 billion for Department of Defense energy efficiency projects and modernization of facilities
- \$4.5 billion to GSA for measures to convert GSA facilities to High-Performance Green Buildings.
- \$75 million for Defense-Wide funding of research, development, test and evaluation projects, including pilot projects, demonstrations, and energy efficiency manufacturing enhancements
- \$27.2 billion for energy efficiency and renewable energy research & development (block grants, weatherization, state energy programs...)

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
 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.

FEMP and Agency GHG Requirements Milestones



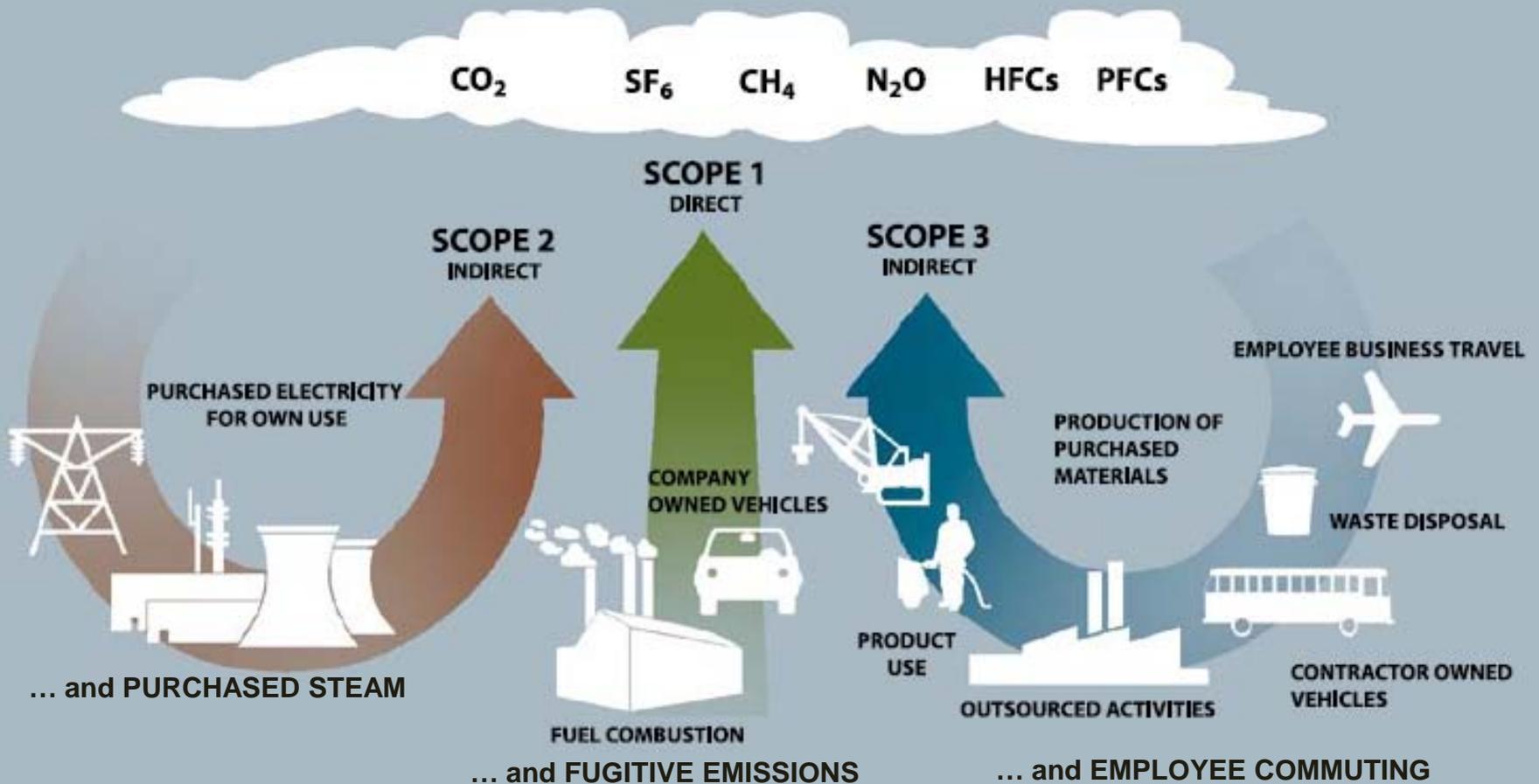
Other EO 13514 Goals

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.

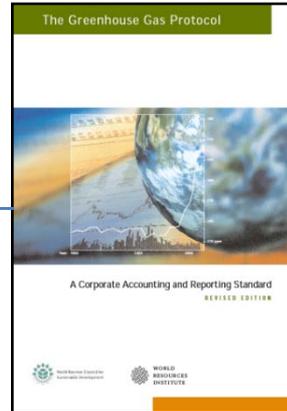
GHG Emissions by Scope

Compliance with EO 13514 means agencies will have to gather data on Scopes 1, 2 and 3 emissions from a number of sources.

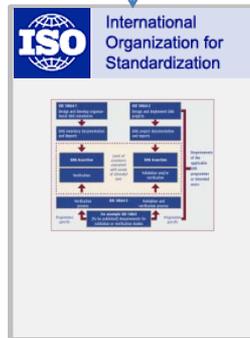


GHG Inventory Protocols / Guidance

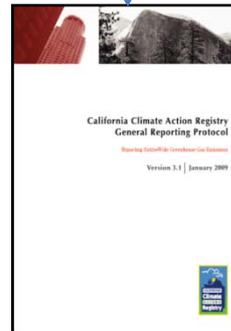
WBCSD/WRI
GHG Protocol



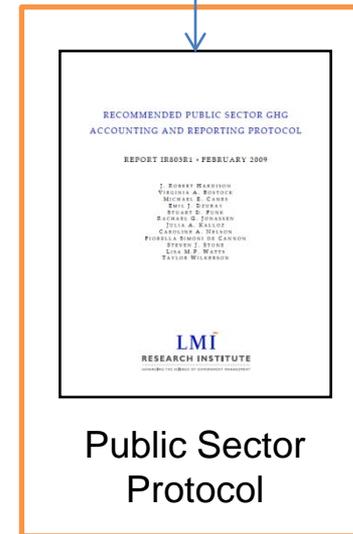
EPA Climate
Leaders
Guidance



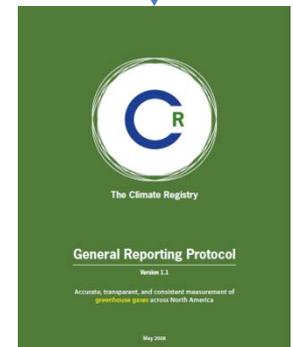
ISO 14064
Standards



CCAR
Reporting
Protocol

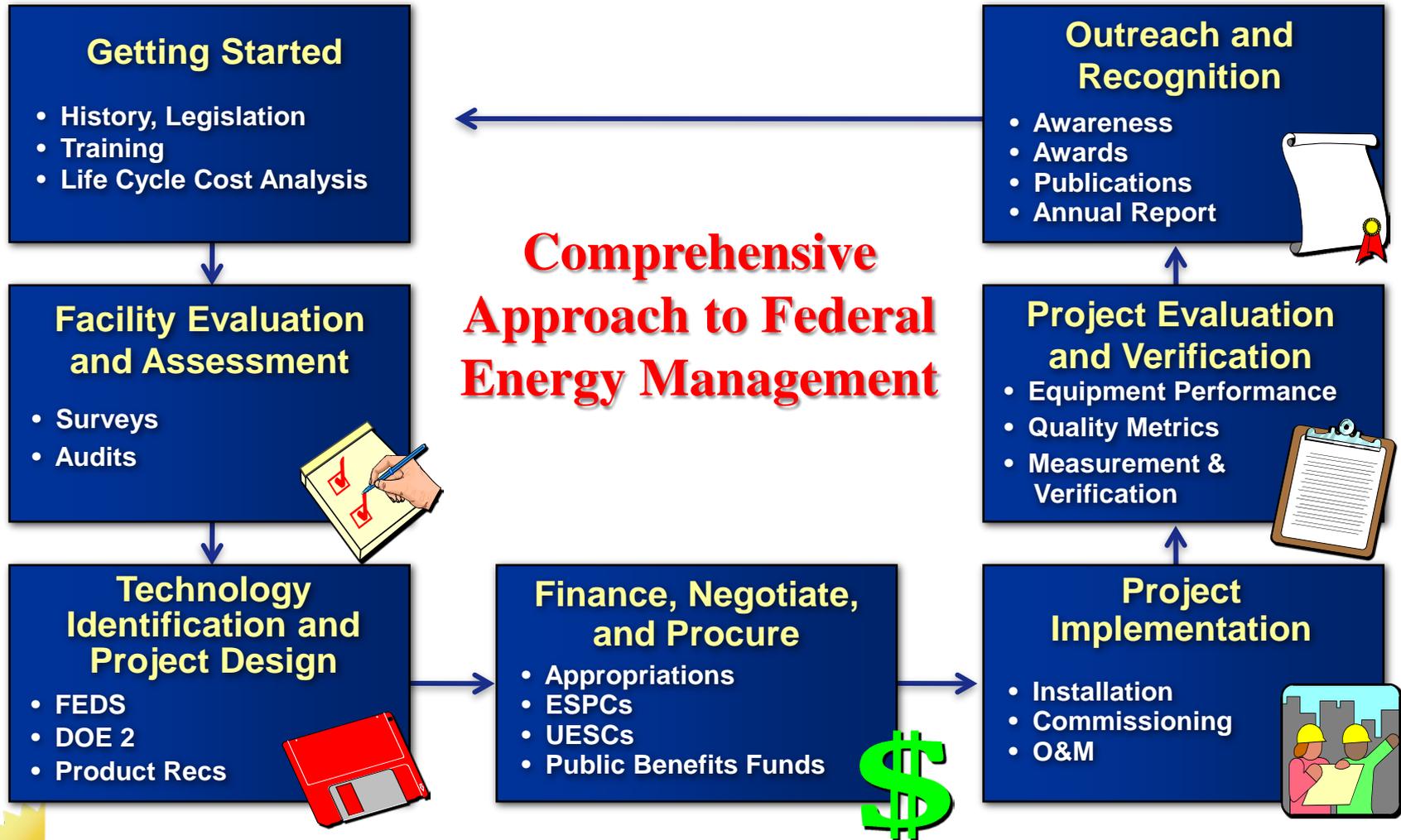


Public Sector
Protocol



The Climate
Registry
Protocol

The Federal Model for Energy Management



The Federal model for energy management

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

SET GOALS: Federal energy management goals

- Reduce greenhouse gas (GHG) emissions by 28%**
- Reduce energy consumption by 3% per year (30% by end of FY2015)
- Install advanced metering
- Evaluate 25% of covered buildings annually
- Obtain increasing amounts of renewable energy (7.5% by 2013)
- Reduce petroleum use by 2% per year
- Reduce potable water consumption intensity by 2% per year (26% by end of FY2020, relative to a 2007 baseline)
- Reduce industrial, landscaping, and agricultural water consumption by 2% per year (20% by 2020, relative to a 2010 baseline)
- Use sustainable design principles
- Reduce fossil fuel based energy by 100% by 2030 against a 2003 baseline
- Agencies must purchase Energy Star or FEMP designated efficient products

The Federal model for energy management

- Set goals
- Plan and implement projects
- Measure performance
- Report progress
- Reward Federal leadership

Plan and implement projects

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



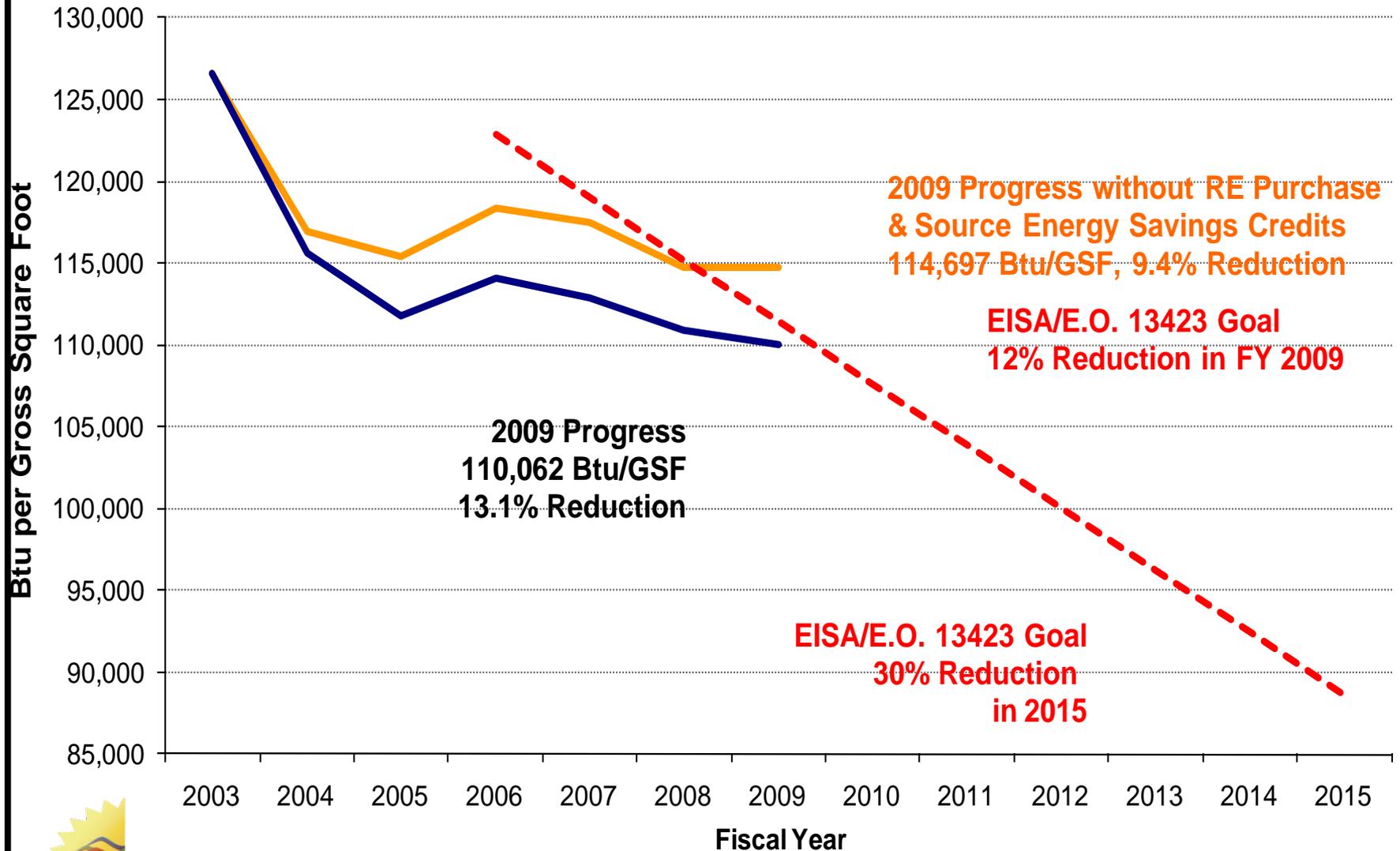
Investments in building energy efficiency

- Federal agencies have three primary 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

FEMP Model

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

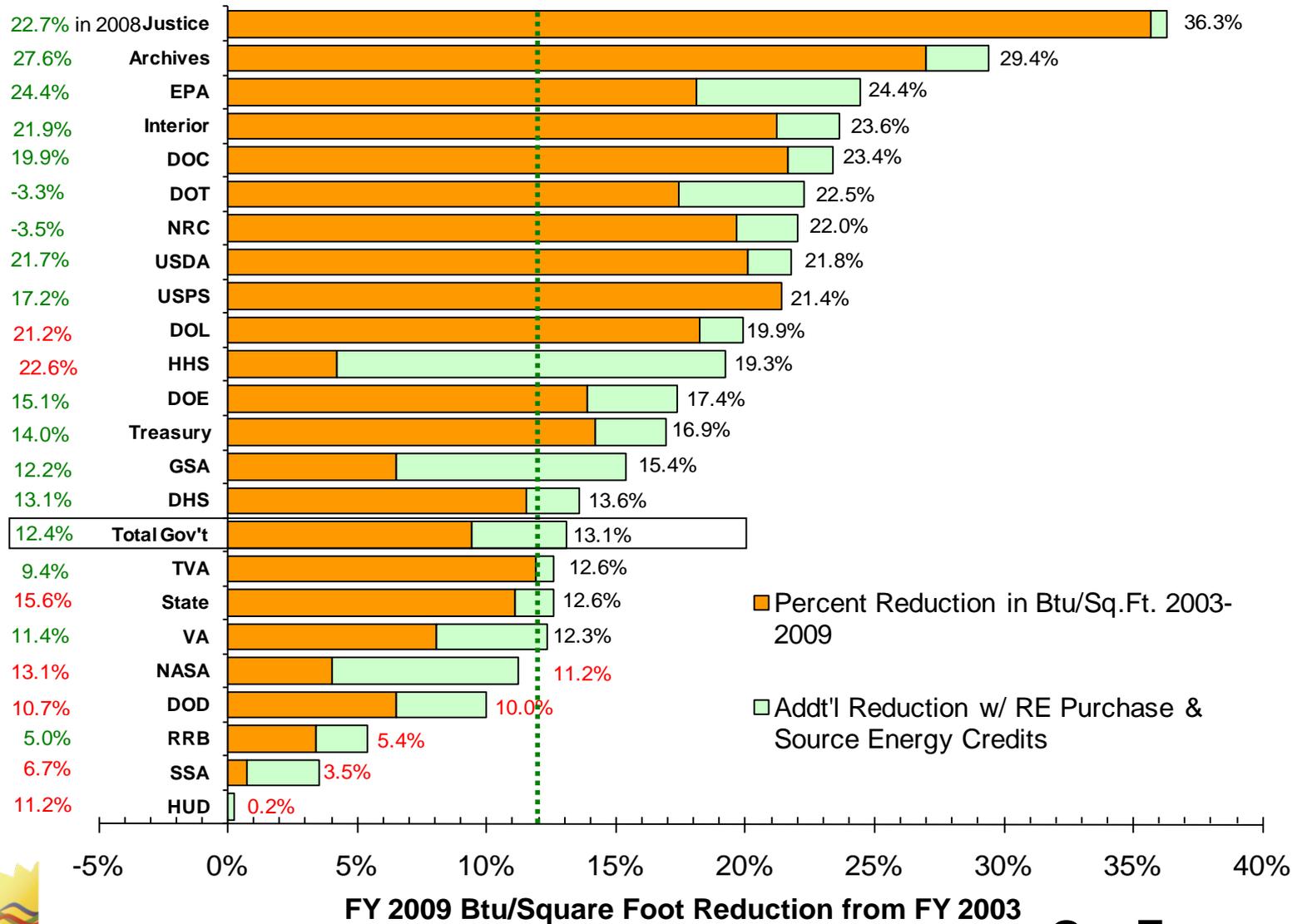
Government Building Energy Intensity FY 2003 - FY 2009



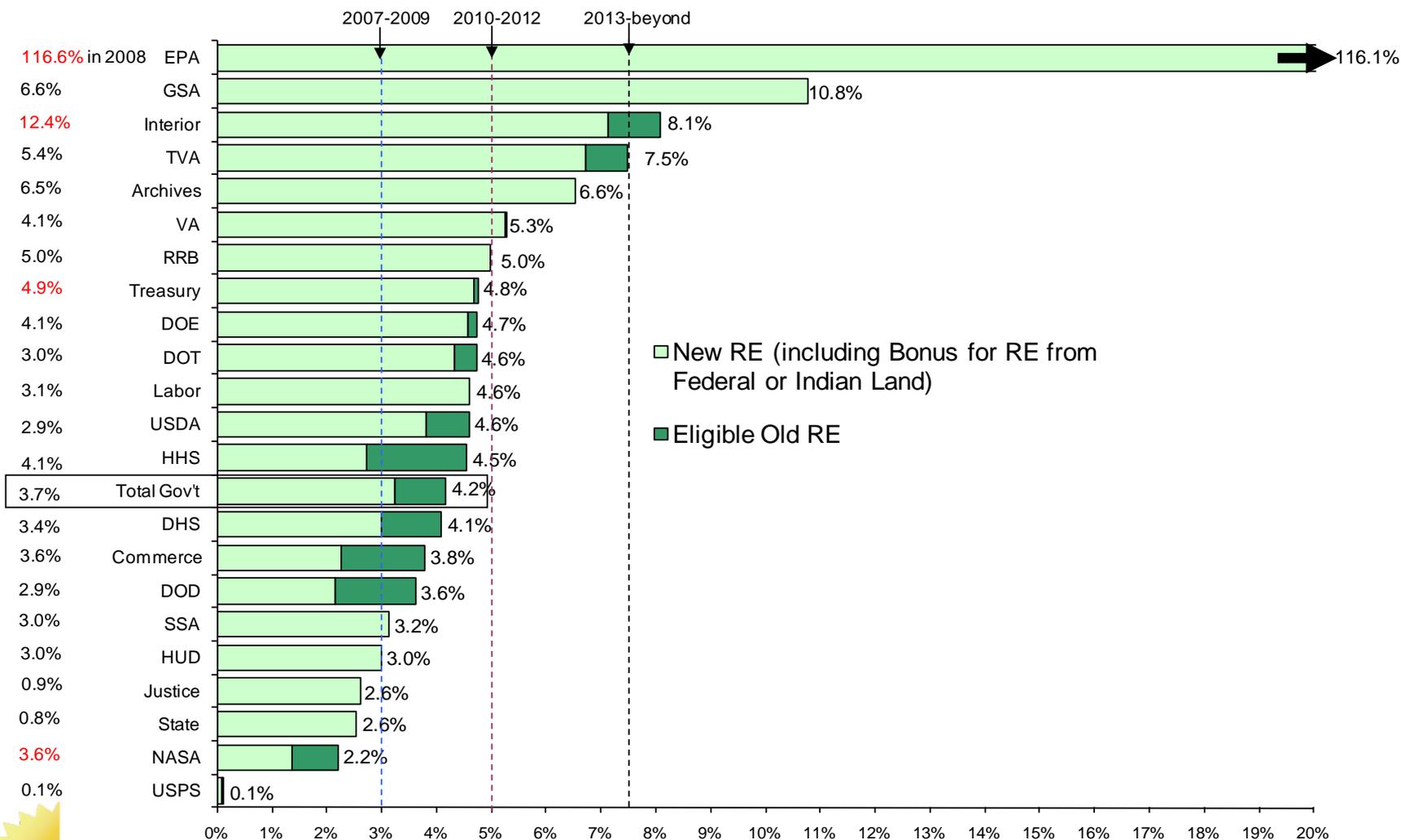
Federal Facility Performance under EPACT and E.O. 13423, FY 2009

Goal/Requirement	FY 2009 Federal Performance (Preliminary)
<p>EO 13514/13423/EISA: Reduce energy intensity (Btu/SF) by 3 percent annually compared to FY 2003 to 30 percent reduction required in FY 2015. FY 2009 Goal: 12 percent</p>	<p>18 of 23 covered agencies met the goal.</p> <p>The government decreased energy use per square foot by 13.1 percent in FY 2009 relative to FY 2003. (9.4 percent without additional credits)</p>
<p>EPAct 2005/EO 13423: Use renewable electric energy equivalent to at least 3 percent of total electricity use, at least half of which must come from sources developed after January 1, 1999.</p>	<p>19 of 24 agencies met the goal.</p> <p>The government purchased or produced renewable energy in FY 2009 equivalent to 4.2 percent of electricity use.</p>
<p>E.O. 13514: Reduce water consumption intensity (gallon/SF) relative to FY 2007 baseline by 2 percent annually to 20 percent by the end of FY 2020. FY 2009 Goal: 4 percent</p>	<p>16 of 24 agencies met the goal.</p> <p>The government reduced water use per square foot by 4.6 percent in FY 2009 compare to FY 2007.</p>

Agency progress towards energy reduction goal



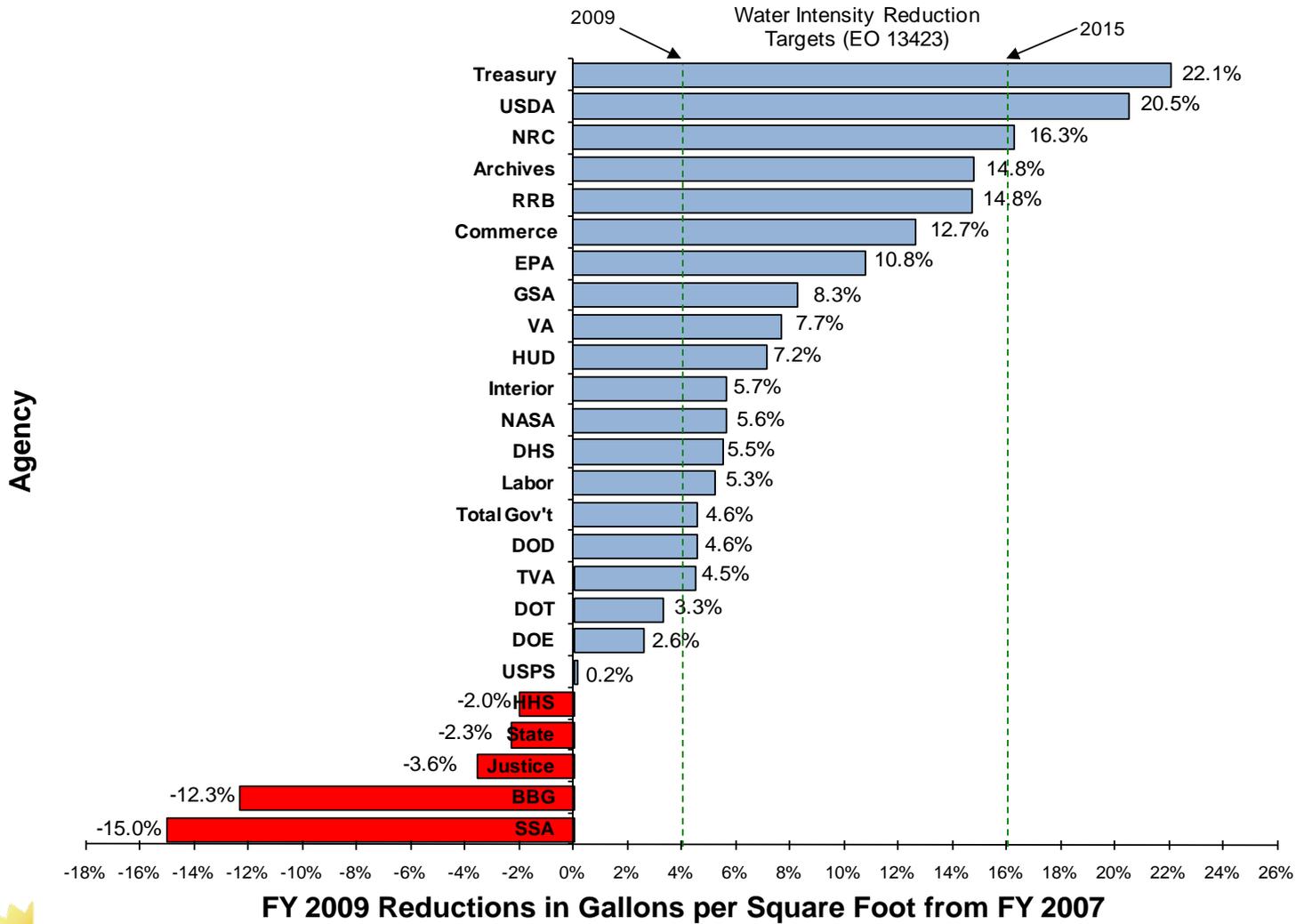
Progress towards renewable energy goal



FY 2009 Renewable Electric Energy as a % of Electricity Use

GovEnergy 2010

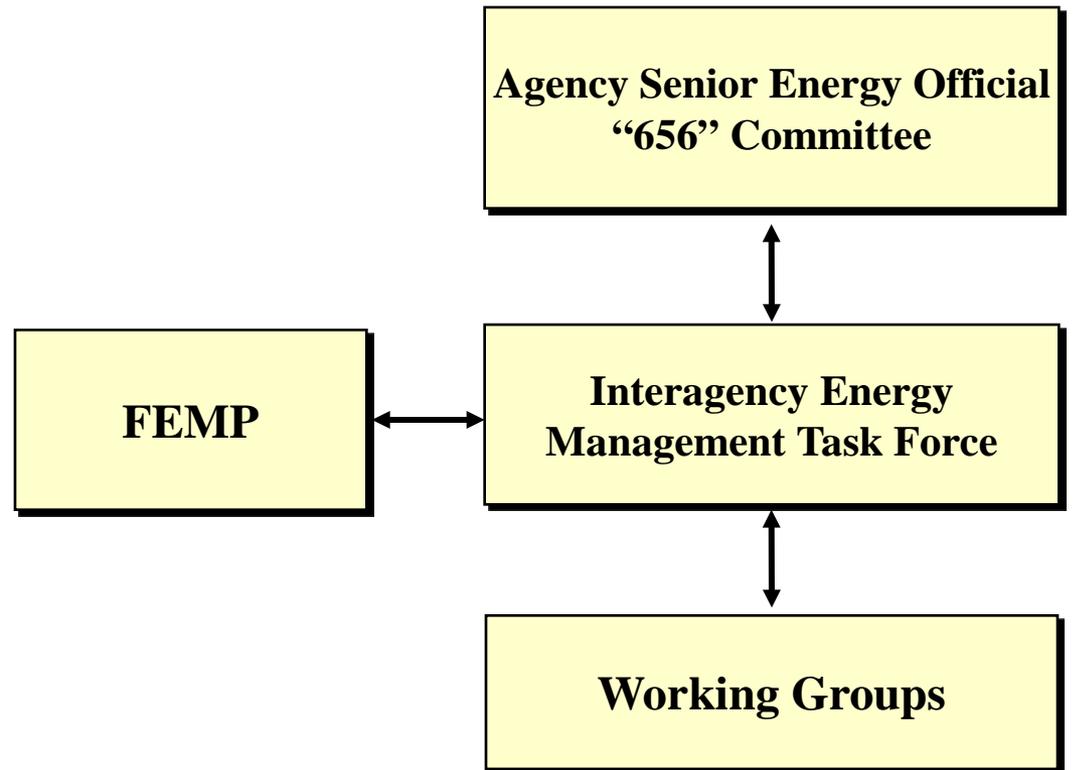
Progress towards water reduction goal



FY 2009 Reductions in Gallons per Square Foot from FY 2007

Report Progress

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



OMB Energy Status Scores by Agency: January 2010

Agency	Reduction in Energy Intensity	Use of Renewable Energy	On Track to Meter Facilities	Reduction in Water Intensity	New Building Designs	OVERALL Status SCORE	Progress
Department of Agriculture	●	●	●	●	●	●	●
Department of Commerce	●	●	●	●	●	●	●
Department of Defense	●	●	●	●	●	●	●
Department of Energy	●	●	●	●	●	● ↓	●
Department of Health and Human Services	●	●	●	●	●	● ↓	●
Department of Homeland Security	●	●	●	●	●	● ↓	●
Department of Housing and Urban Development	●	●	●	●	●	● ↓↓	●
Department of Justice	●	●	●	●	●	●	●
Department of Labor	●	●	●	●	●	● ↑	●
Department of State	●	●	●	●	●	●	● ↑
Department of the Interior	●	●	●	●	●	●	●
Department of Transportation	●	●	●	●	●	● ↑	● ↑
Department of Treasury	●	●	●	●	●	●	●
Department of Veterans Affairs	●	●	●	●	●	●	●
Environmental Protection Agency	●	●	●	●	●	●	●
General Services Administration	●	●	●	●	●	●	●
National Aeronautics and Space Administration	●	●	●	●	●	● ↑	●
National Archives and Records Administration	●	●	●	●	●	●	●
Smithsonian Institution	●	●	●	●	●	●	●
Social Security Administration	●	●	●	●	●	●	●
Tennessee Valley Authority	●	●	●	●	●	●	●
U.S. Postal Service	●	●	●	●	●	●	●

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 Technical Track

Facility Energy Program

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

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

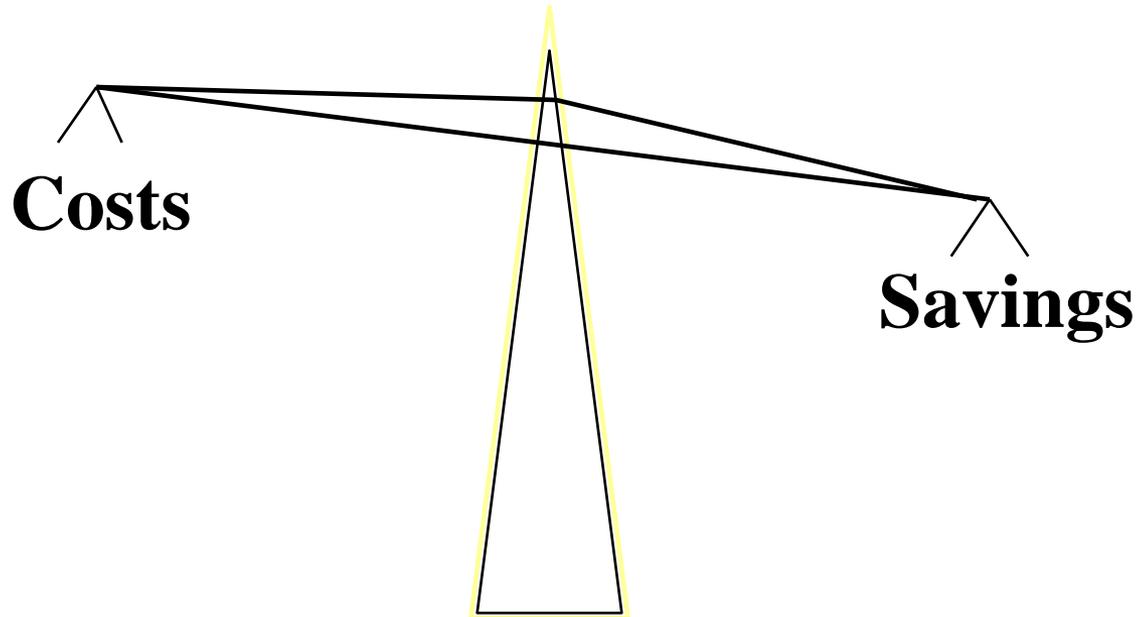
- Expands on the preliminary audit and is used in initial proposals for alternative financing
- Analyze 12-36 months of utility bills to evaluate rate structures and usage profiles
- Meter systems to supplement utility data
- Conduct in-depth interviews with site personnel
- Identify appropriate energy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

Economics of Energy Management

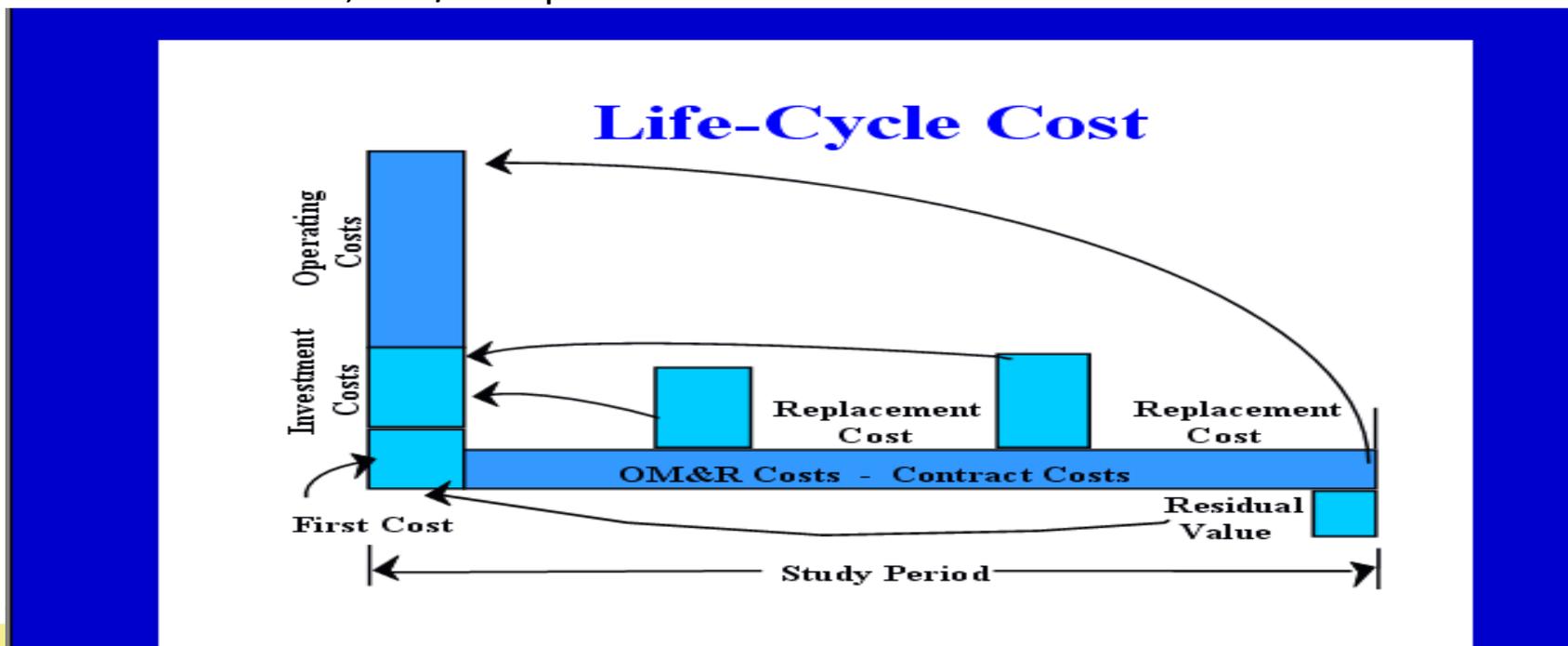
Savings must be greater than costs - over the life of the project!



Life Cycle Costing takes into account 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

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

Google

Federal Energy Management Progra...

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

Federal Energy Management Program

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

Information Resources

Printable Version

Search

Search Help | More Search Options

Site Map
EERE Information Center
Programs and Offices

Publications

Software

Handling Self-Extracting Archives

Conferences

Glossary

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).

It only looks scary



Federal and State Incentives

www.dsireusa.org/

[NC Solar Center](#)

[IREC](#)

[Contacts](#)

[About Us](#)

[NCSU](#)



DSIRE

Database of State Incentives for Renewables & Efficiency

[FAQs](#)

[Summary Maps](#)

[Summary Tables](#)

[Search By](#)

[Glossary](#)

[Links](#)

[Library](#)

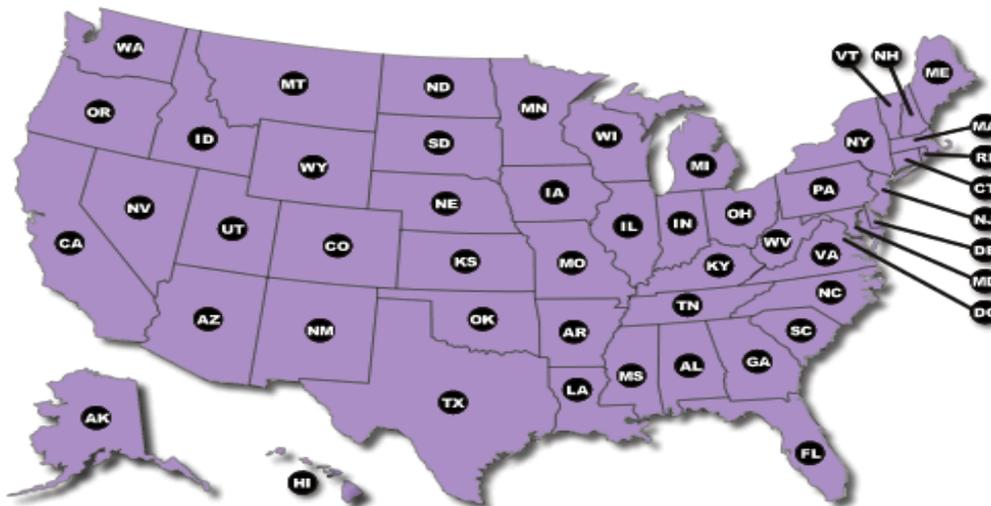
[New / Updated Incentives](#)

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

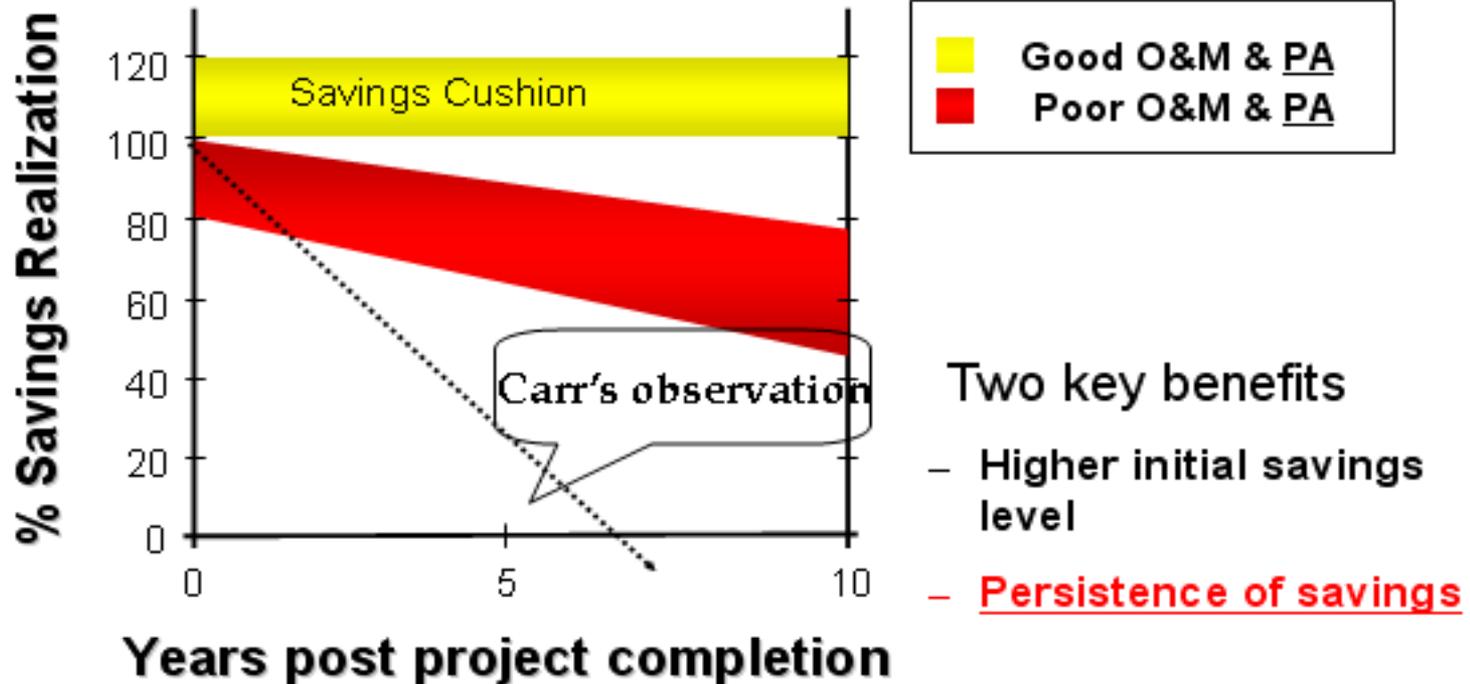
The Guidance on Life-Cycle Analysis Required by EO 13123 is at

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

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

Operations and Maintenance

Continuous High Quality O&M is Critical to Energy Efficiency



Constantly Battle Management Short Term Attention Span

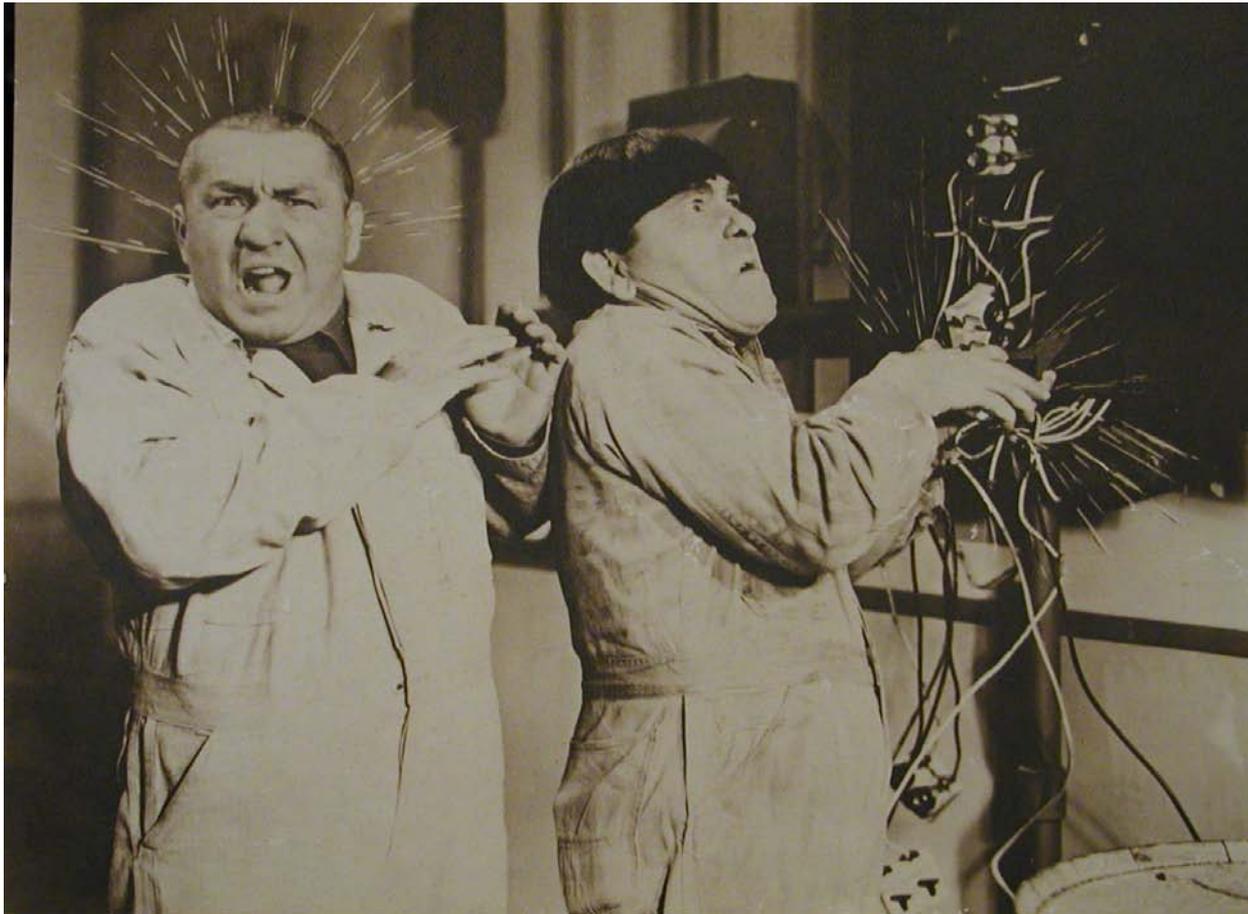
Operation and Maintenance is an easy annual budget target because the damage isn't seen for a while.

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

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
- Geoexchange technologies
- Energy services and project financing

Metering

- Advanced meters and analysis will allow
 - Base-lining 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



GovEnergy 2010

Renewable Energy

Renewable electricity requirements

- EPL Act 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
- 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



NREL HOME

ABOUT NREL ENERGY ANALYSIS SCIENCE & TECHNOLOGY TECHNOLOGY TRANSFER APPLYING TECHNOLOGIES

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.



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 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 image of the Edward R. Roybal Campus is shown with the caption "Edward R. Roybal Campus CENTER FOR DISEASE CONTROL - ATLANTA, GEORGIA". On the right side, there is a search bar and a "NEWS" section with several news items.

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

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

[More News](#)

[Subscribe to RSS News Feed](#)

[Subscribe to EERE News Updates](#)

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

DUS(DI&E) - Facilities Energy - Facilities Energy Directorate Energy Manager Program Support - Mozilla Firefox

File Edit View History Bookmarks Tools Help

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

DUS(DI&E) - Facilities Energy - Facilit...

Site Map | A-Z Index | Contact

OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE INSTALLATIONS AND ENVIRONMENT

I&E Home

About I&E

Leadership

Related Links

Reports

Testimonies

Tools

- DoD Goes Green
- DoD Open Government

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.

Search I&E

Search

Energy Home

Energy Programs

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

[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](#)



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.

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

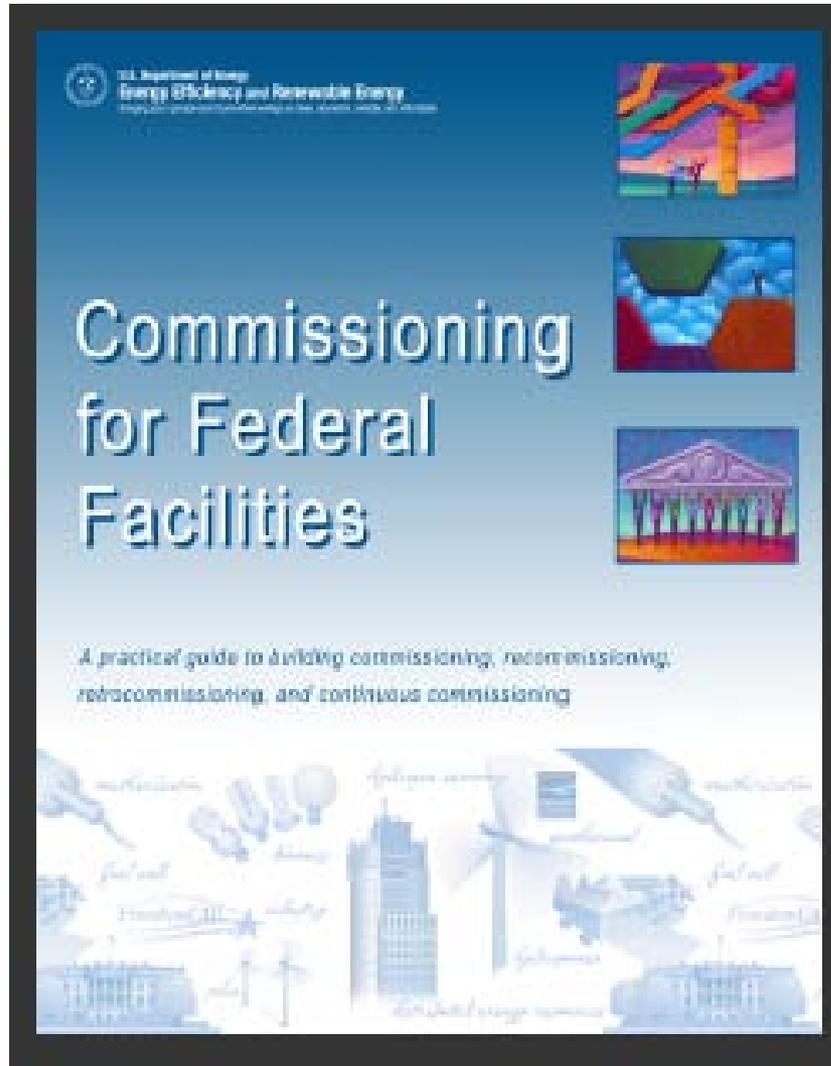
- HVAC
- Controls
- Duct work & pipe insulation
- Renewable technologies
- Lighting controls
- Day-lighting systems
- Waste heat recovery
- Advanced technologies

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



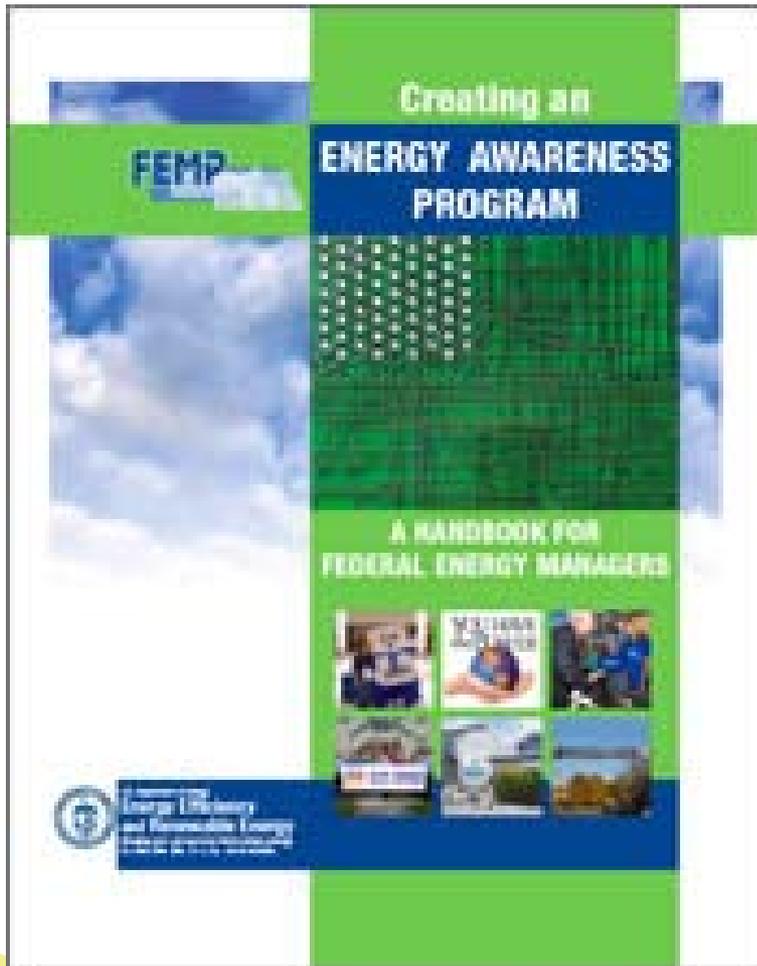
Awareness and Outreach

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
 - Presidential award

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

Search

Search Help More Search Options

Site Map
EERE Information Center
Programs and Offices

Printable Version

Services

Project Assistance

Training

Outreach

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

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

Sustainable Transportation



Sustainable Transportation



Questions?



INSPIRATION

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