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## US DOE Perspective on Deep Energy Retrofits

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**FEMP**  
Federal Energy Management Program

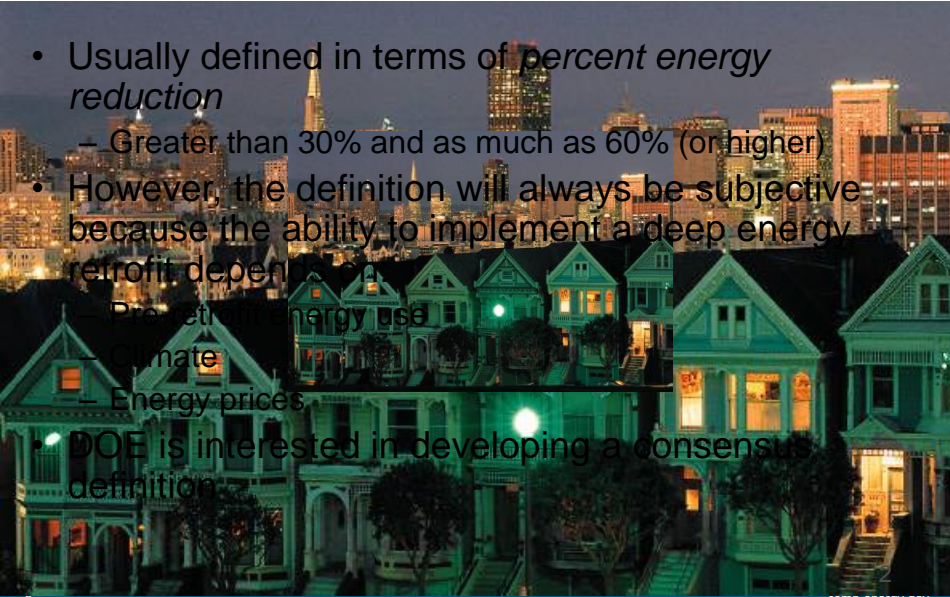
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## Definition of deep energy retrofit

- Usually defined in terms of *percent energy reduction*
  - Greater than 30% and as much as 60% (or higher)
- However, the definition will always be subjective because the ability to implement a deep energy retrofit depends on
  - Pre-retrofit energy use
  - Climate
  - Energy prices
- DOE is interested in developing a consensus definition



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## US government's interest in deep retrofits

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- Legislation requires a 30% reduction in energy use in federal buildings by 2015 relative to the 2003 baseline
  - Energy performance contracts – the main vehicle for comprehensive energy retrofits in the US federal government – are able to achieve 20% reductions in energy use, on average
  - Meeting the 30% goal will require the government to go beyond the typical retrofit projects that have been implemented so far
  - Government has goals for greenhouse gas reductions as well
- EPCA 433 – currently up in the air, but could be an important driver for deep retrofits as well

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## There are other Federal goals related to renewable energy use

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- EO 13423: Agencies are to ensure that at least half of the statutorily required renewable energy consumed by the agency in a fiscal year comes from new renewable sources and, to the extent feasible, the agency implements renewable energy generation projects on agency property for agency use
- EPCA 2005: Of the total amount of electric energy the Federal government consumes during any fiscal year (FY), the following amounts shall be renewable energy: not less than 7.5% in FY 2013 and each FY thereafter.

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## Deep retrofits and renewables

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- Renewable energy sources tend to be costly
- Key is to reduce energy use *first*, then install renewables to meet reduced loads
- Minimizing cost of renewables makes them more affordable
- Thus deep retrofits may make it easier for US federal government to meet renewable goals

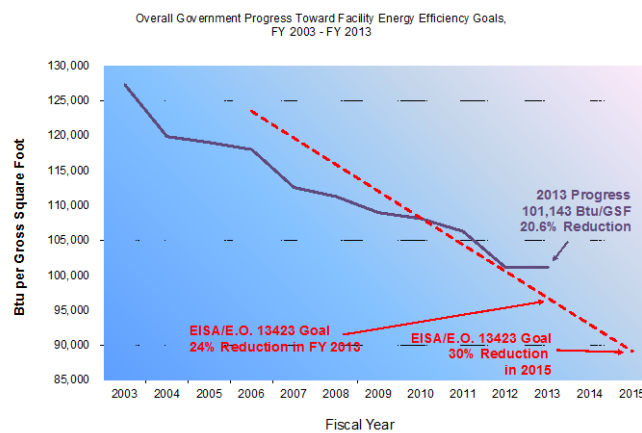
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## Progress toward goals

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### Federal Facilities: Energy Intensity (Btu/GSF) Reduction Goal



4 PRELIMINARY DATA

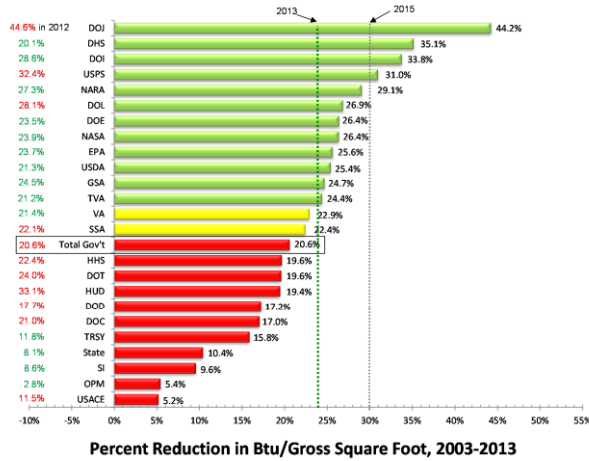
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**Progress by Agency** U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

**Federal Facilities: Agency Progress Toward Energy Reduction Goal**



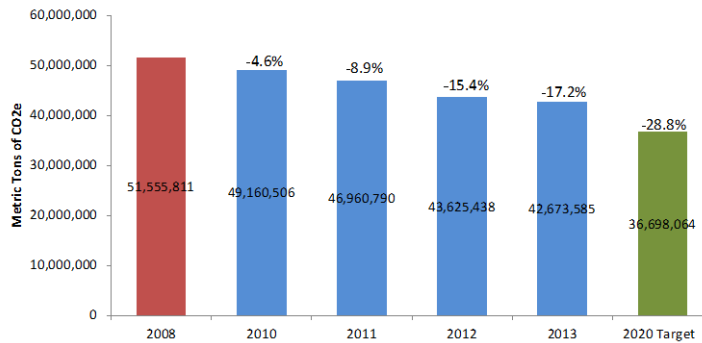
6 PRELIMINARY DATA

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**Greenhouse gas emissions** U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

**Targeted Scope 1&2 GHG Emissions, FY 2008 - FY 2013**

**Federal Agency Progress toward Scope 1 & 2 Greenhouse Gas Goals**

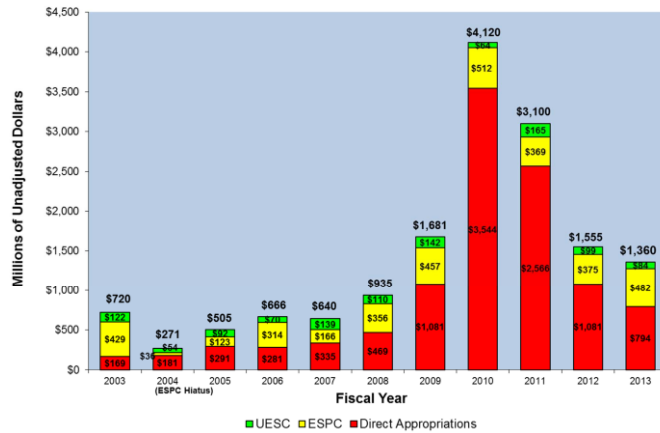


13 PRELIMINARY DATA

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**Funding sources** U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

Federal Facilities: Investment in Resource Efficiency Projects



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**How deep energy savings are achieved** U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

- Improve envelope to reduce heating and cooling loads
  - Increase wall and roof insulation
  - Seal envelope to reduce outdoor air infiltration
  - Heat recovery ventilation
  - Efficient windows
  - Insulated doors
- Reduce lighting and appliance loads
- Install efficient HVAC, occupancy controls
- Install renewable generation

## Paying for deep retrofits is more problematic

- Performance contracting is the main vehicle for comprehensive energy retrofits in the US federal government
  - However, 20% energy savings seems to be the economic limit for pay-from-savings projects
  - Large “buydowns” required to achieve higher level of savings
- The government also spends a great deal of money on building renovations
  - Objective is to modernize and extend the useful life of the building
  - Energy savings is not the primary goal, though modest (~10%) energy savings are often achieved
- If performed simultaneously, building renovation and comprehensive energy retrofit can achieve deeper savings than either type of project can on its own

## Challenges to the concept

- Contractors under federal Energy Savings Performance Contracts (ESPC) can install energy-related measures *only*
- Building renovations involve numerous non-energy-related tasks such as installation of carpeting, fire protection systems, etc.
- For this reason, two separate contractors are required
  - Renovation contractor, funded by the building renovation funds
  - Energy Services Company (ESCO) funded by ESPC (and that portion of the renovation funds that involve energy)

## Issues to consider

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- Simultaneous award of the renovation and ESPC contracts to the different contractors
- Coordinating the design of the two projects
- Coordinating construction
- Dispute resolution
- Army perceives this approach to have higher risk than conventional approaches where a single firm manages construction

## Current status

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- FEMP and Army formed a joint task force to implement a deep retrofit project at an Army facility
- Several potential candidate sites have been identified
- The process has been slow: represents a change from the way Army has done business in the past
- Our best candidate, Bldg 1117 at Fort Carson, CO will now be done exclusively with appropriated funds

## Fort Carson Building 1117

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- Old barracks and mess hall which has been converted to a combination of office and classroom space
- The 50,000 sq. ft. building is three stories in height and is “H” shaped with east and west wings
- Current source energy use about 210 kBtu/sq.ft./yr
- Provides an opportunity to pilot technical solutions, if not the contracting approach



Year	Annual Electrical Usage kWh	Annual Gas usage (Therm)
2011	526,483	
2012	561,243	2,443

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## Conclusions

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- Deep energy retrofits further several goals of the US federal government
  - Energy reduction
  - Greenhouse gas reduction
  - Increased use of renewables
  - Leverages limited appropriated funding
- Deep energy retrofits are technically feasible
  - Technology exists to reduce energy use by more than 50% in the average US federal building
- US General Services Administration has shown that ESPC alone can be used to achieve these levels of savings

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## Conclusions (continued)

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- DOE believes there are additional savings opportunities available by combining building renovation with comprehensive energy retrofits
- The barriers to this approach are strictly procedural
  - No legal impediments to using two contractors to achieve a common goal
  - Funding is available – Army has a large SRM budget, and no shortage of private funding for ESPC
  - New ways of doing business often meet with resistance

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## Questions?

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