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

FEMP Federal Energy Management Program

Deep Energy Retrofit's Contribution to Meeting U.S. Energy Efficiency Goals

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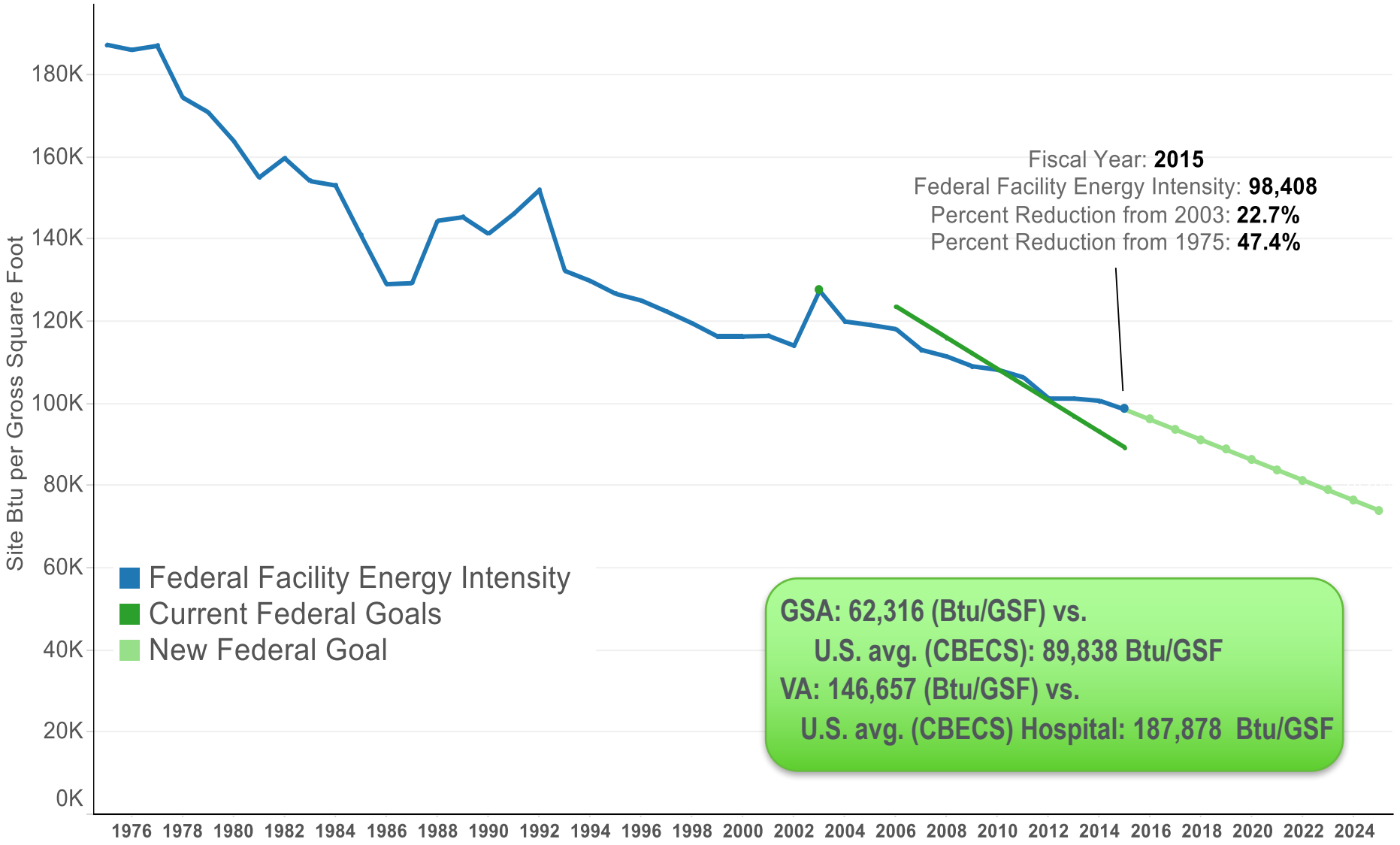
The Long Road of Progress



Continuous Improvements in U.S. Energy Efficiency

- The federal government has aggressively pursued energy and water efficiency in federal facilities.
- Energy intensity in federal buildings has been cut almost in half over the last 40 years.
- Energy performance contracting using energy savings performance contracts (ESPC) implemented by energy service companies (ESCOs) and utility energy services contracts (UESC) implemented by the utility industry have been the major means to finance efficiency projects cost-effectively without relying on appropriations.
- The U.S. has aggressive targets for continued efficiency improvements, but to meet them, future projects must outperform the typical 15 – 25% improvements of past projects. Deep Energy Retrofit (DER) projects offering 50% or greater energy reduction will be required.

Pre-Existing Federal Goals Versus New E.O. 13693 Targets

Goals	Prior Goals	E.O. 13693 Targets
Building Energy Intensity (Btu/Sqft) Reduction	**30% (by 2015)** Baseline 2003	**25% (by 2025)** Baseline 2015
Clean Energy as a Percentage of Building Electric and Thermal Energy	**None**	**25% (by 2025)**
Renewable Electricity Use	**20% (by 2020)**	**30% (by 2025)**
Potable Water Use Intensity (Gal/Sqft) Reduction	**26% (by 2020)** Baseline 2007	**36% (by 2025)** Baseline 2007
Gov't-wide Scope 1&2 GHG Reduction	**28% (by 2020)** Baseline 2008	**40% (by 2025)** Baseline 2008
Percentage of Buildings Complying with Sustainability Guiding Principles	**15% (by 2015)**	**15% (by 2025)**
Efficiency Investment Implemented Through Performance Contracting	**$4B (by 2016)**	**$4B (by 2016)**
Vehicle Petroleum Reduction	**30% (by 2020)** Baseline 2005	**None**
Increase in Vehicle Alternative Fuel Use	**159% (by 2015)** Baseline 2005	**None**
Fleet-wide Per-Mile GHG Emissions Reduction	**None**	**30% (by 2025)** Baseline 2014

Deep Retrofits – Dramatically Increasing Energy Efficiency

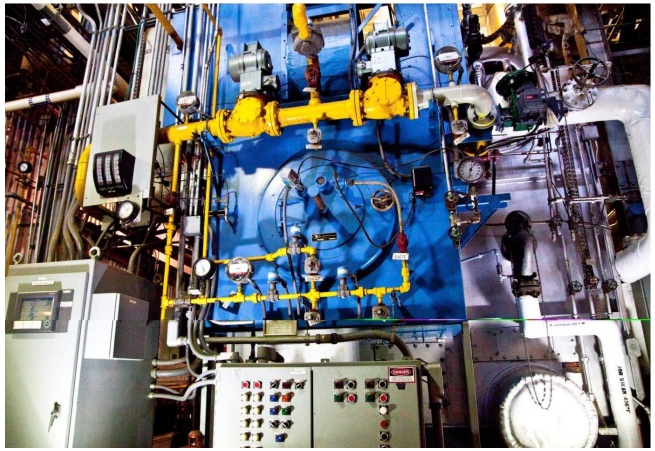
- **Bundling** – finding synergies among ECMs
- **Blending ROI** – use high return ("low hanging fruit") ECMs to pay for longer term payback ECMs, Renewable energy
- **Requiring** competing ESCOs to achieve deep retrofits (e.g., GSA design charrette)
- **Risk management** for advanced/innovative ECMs
  - savings stipulation (after rigorous commissioning)
  - "buy down" investment cost of initial installations in order to obtain performance data
- **Combining ECMs with capital and maintenance projects**
  - NNSA RAMP (Roof Asset Maintenance Program) required major roof maintenance projects to incorporate cool roof technology when technically feasible and cost-effective.
  - DoD SRM (sustainment, restoration, maintenance) projects incorporated ECMs into major construction and renovation projects. (e.g., when building façade is being renovated, adding external insulation is less expensive)

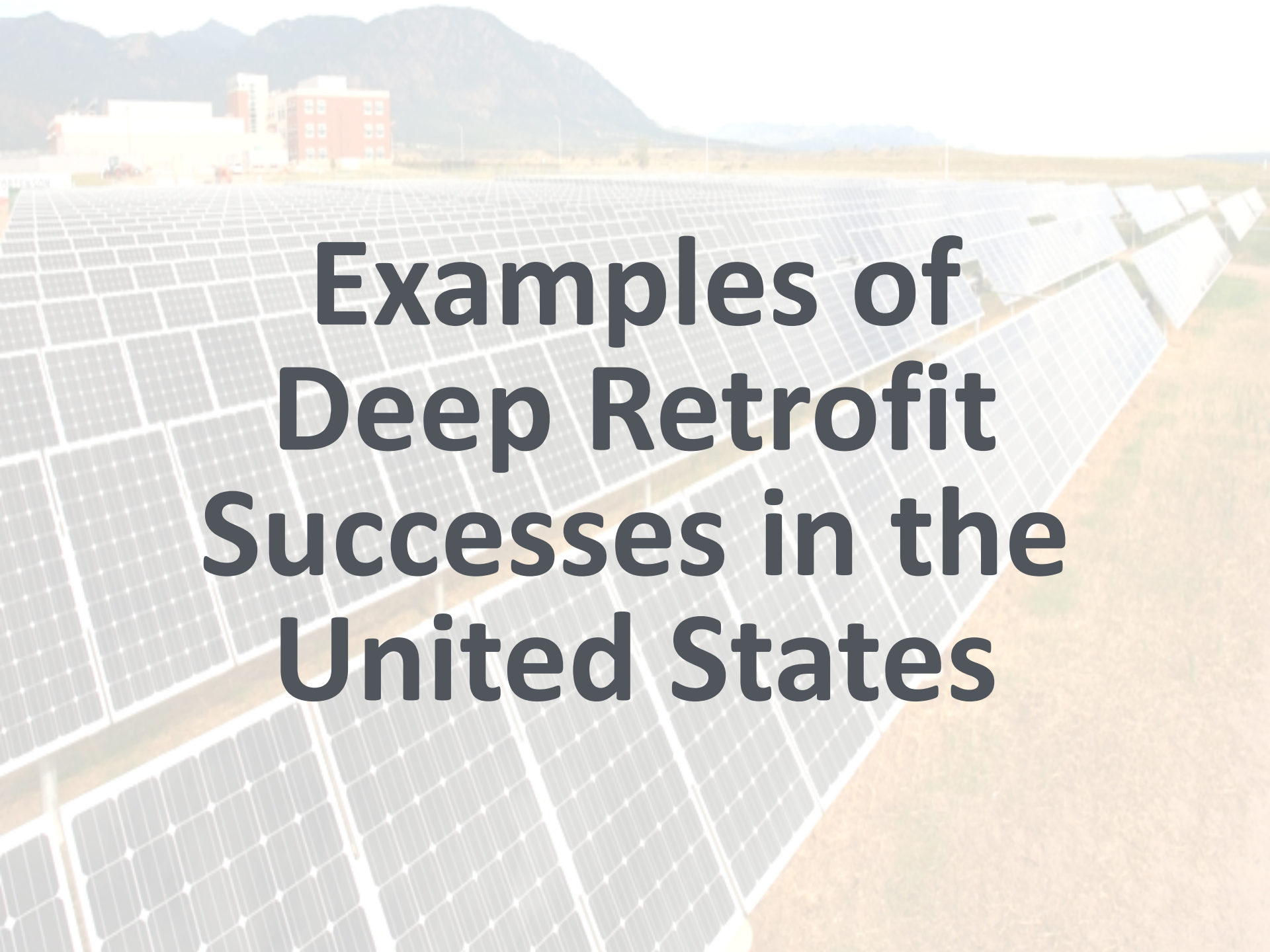
Combining ECMs with Construction and Maintenance Projects

Incorporating ECMs in construction and maintenance projects is the most effective means of achieving deep retrofits, but it isn't easy.

Challenges include:

- Legislative authority (combining operating and appropriated funds)
- Procurement (specification) and contract negotiation (1 or 2 procurement actions?)
- Multiple contractor involvement (general contractor and ESCO):
  - Responsibility and liability for cost, performance, schedule, maintenance, guaranteed savings
  - Project coordination and scheduling





Examples of Deep Retrofit Successes in the United States

GSA Example: Silver Spring Metro Center & New Carrollton Federal Building

Project Facts:

- **Square Footage**: 2,112,664
- **Investment Value**: $44,633,045
- **Payback Period :** 22 years with 2-year construction period
- **M/BTUs/year**: 94,588
- **Energy Reduction**: **60%**
- **Water Reduction**: 56%
- **Appropriated Funds included**: $586,172
- **ESCO:** Ameresco

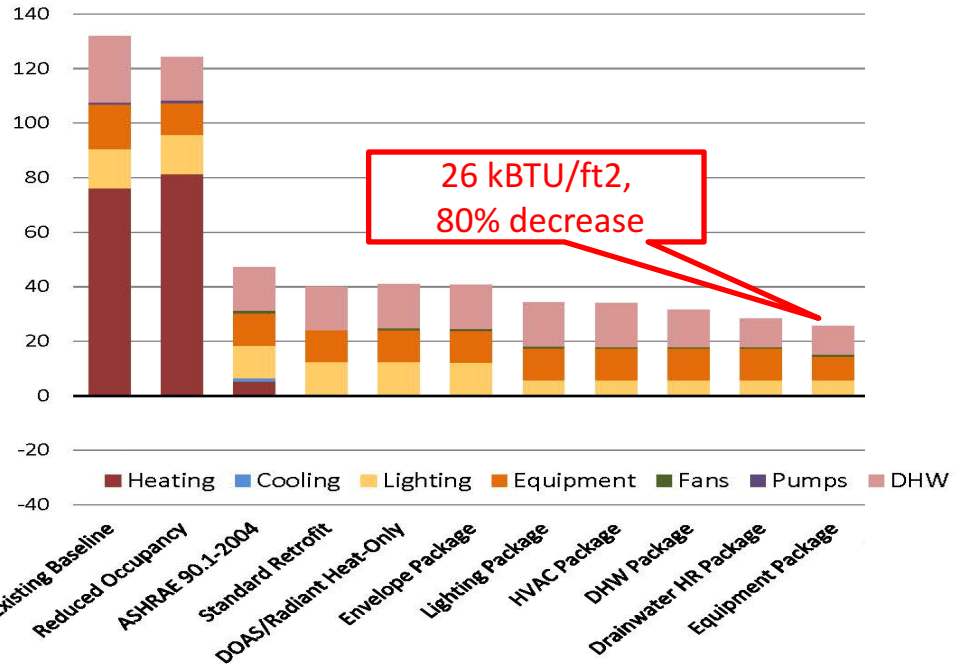
Energy Conservation Measures

- Lighting upgrades & controls
- Domestic water system upgrades
- HVAC upgrade with geothermal
- Building control system
- Solar PV and thermal
- High efficiency motors & VFDs
- High efficiency transformers
- Water conservation fixtures
- Building envelope insulation
- Improved air tightness
- Exhaust air heat recovery
- Kitchen exhaust controls
- Communications room cooling upgrades
- Chilled water system upgrade

DoD Example: Presidio of Monterey AG Barracks Building

Barracks building built in 1968
Total floor area 63,840ft2 (5746 m2)
Current energy use: Site 131.4 kBTU/ft²/yr (427 kWh/m²/yr)
Energy targets: Site 26 KBTU/ft²/yr (84kWh/m²/yr); Source 60 KBTYU/ft2 (220 kWh/m²/yr)
Planned site energy use reduction: **80%**
Project scope: Building renovation, solar thermal roof-top panels, on-site greywater treatment, insulate building envelope, lighting upgrade & controls, air tightness improvement, return air heat recovery
Project budget: $23,355,492

One wing has been gutted



Renovated barracks façade (rendering)

GSA DER Project Outlook for the U.S.

10 U.S. Phase I DER Projects

Investment	Total Guaranteed Savings	Total Contract Price	Average % Energy Savings	Average Contract Term (years)	Total Annual Energy Savings	Total Cumulative Energy Savings
$171,722,562	$307,922,800	$303,572,565	38%	19	299,545 MMBTU	6,300,103 MMBTU

GSA Phase II DER Projects

- 6 projects under development ($150 - $170 M total)
- All projects have completed Investment Grade Audit
- 2 projects have submitted final proposal to GSA
- 4 project proposal submissions expected within 60 days
- All 6 projects expected to be under contract by December 2016

Conclusions

- The U.S. Federal Government has been very successful in making its facilities energy- and water-efficient.
  - ESPCs, UESCs
  - Training, guidance and resources – technical, contractual, fiscal, management
- To continue our progress, we will need to aggressively reduce energy consumption for each new project – Deep Energy Retrofits
  - Combining sustainment, restoration, maintenance and construction with ESPCs
  - Employing advanced ECMs, technologies, renewable energy

QUESTIONS?

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