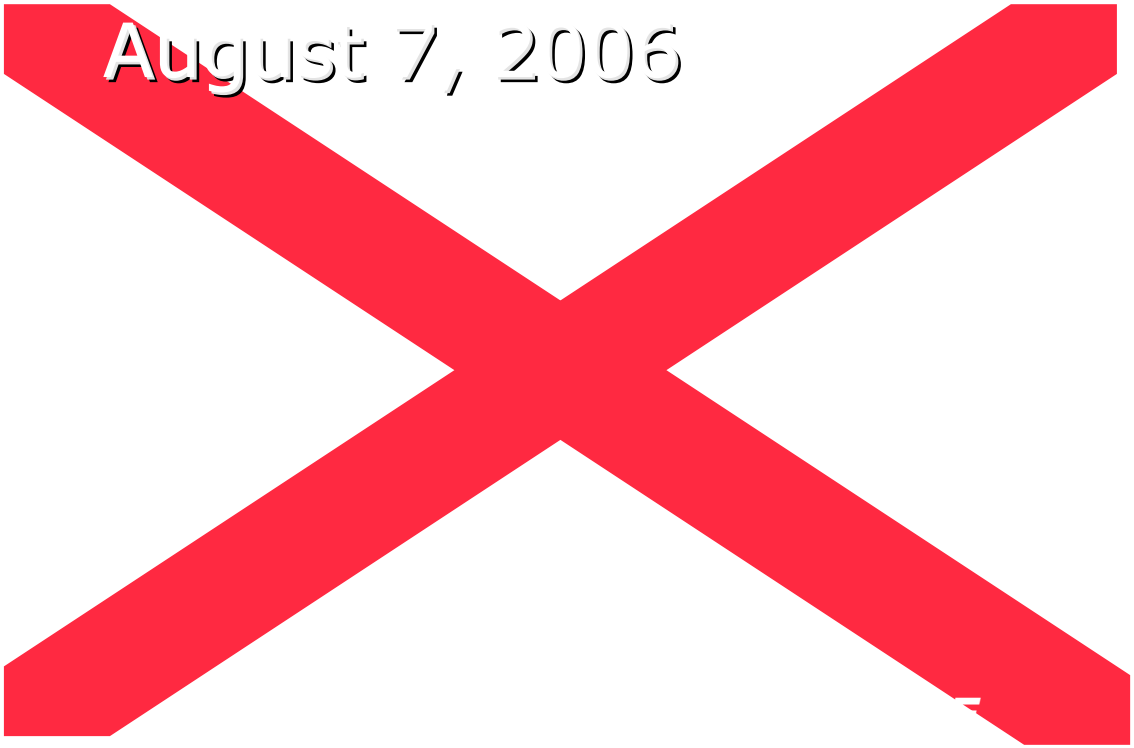
Energy Saving Expert Teams

DOE FEMP ESET Program

August 7, 2006



Background

- On September 26, 2005, …, to lead by example and contribute to the hurricane Katrina relief effort, the President directed the federal government to "…, conserve energy and fuel use ..."

www.eere.energy.gov/femp/newsevents/detail.cfm/news_id=9417

- In response, DOE's Federal Energy Management Program (FEMP), sent energy savings expert teams (ESET) to 28 federal sites.

Monthly average spot prices for natural gas supplied during 2005-2006 fluctuated around $12-13/mmBtu—about twice the average for the same months in 2004-2005

Why focus on natural gas?

- Hurricanes Katrina and Rita heightened the focus on natural gas supply and price volatility
- Peak loads remain a factor in areas with transmission constraints
- Containment of energy consumption and costs continues to be a high priority

ESET Objectives

- Identify low-cost, short-term measures that reduce natural gas consumption and costs
- Provide recommendations for O&M improvements that reduce natural gas demand
- Identify comprehensive projects for site to consider

www.eere.energy.gov/femp/services/assessments.cfm

Site Selection

- Based on natural gas consumption, agency support, and availability of an on-site energy champion
- Participating agencies included:
  - Federal Bureau of Prisons
  - U.S. Coast Guard
  - Department of Defense
    - Air Force, Army, & Navy
  - Department of Energy
  - Department of the Interior
  - National Park Service
  - Food & Drug Adm.
  - General Services Admin.
  - Health & Human Services
  - National Aeronautics & Space Admin.
  - Veterans Admin.

ESET Teams

- Assignments matched expertise & experience with site needs
- Existing FEMP support activities allowed ESET site visits to support multiple FEMP activities
- FEMP provided protocol and report training for all team members

ESET Teams

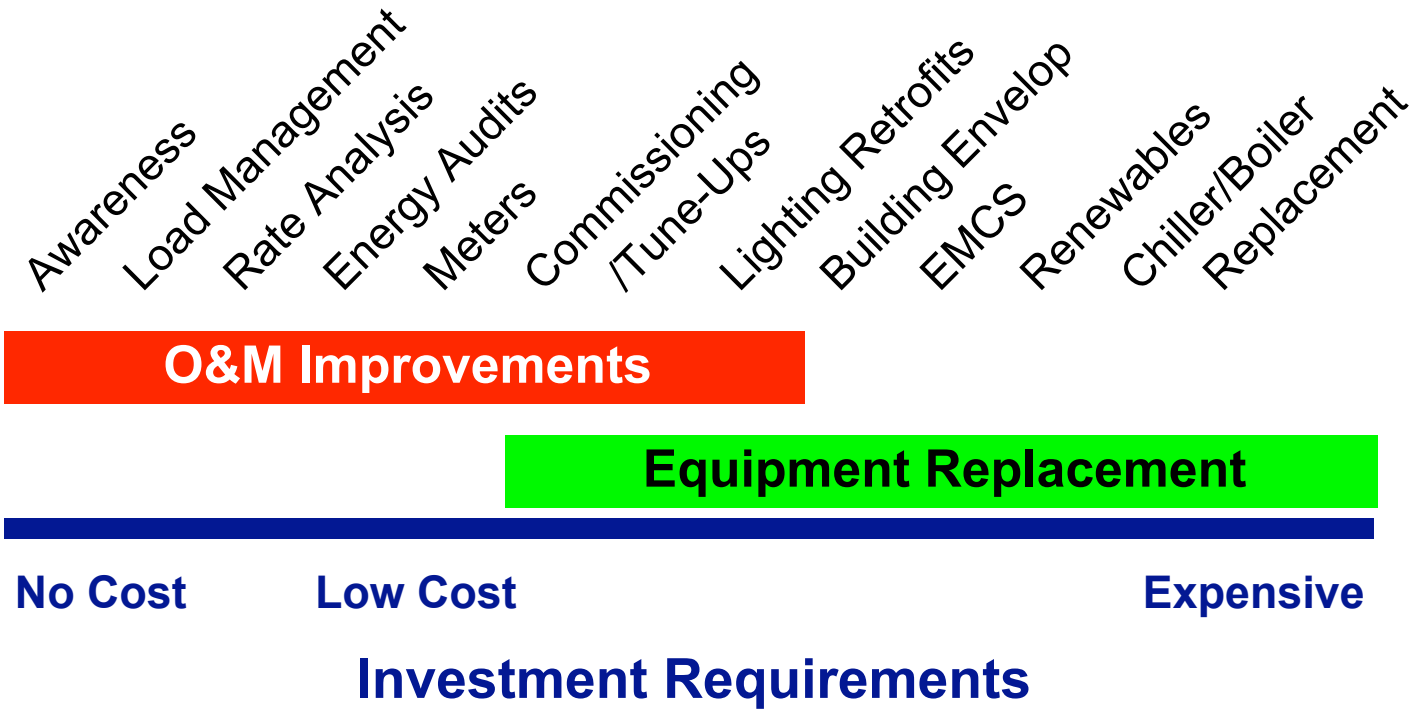
- Department of Energy, FEMP
  - Ab Ream, FEMP ESET Project Manager; Brad Gustafson; Tatiana Strajnic; Shawn Herrera; Bev Dyer; Anne Crawley; Randy Jones; David McAndrew
- Department of Energy Laboratories
  - Pacific Northwest National Laboratory
  - Lawrence Berkeley National Laboratory
  - National Renewable Energy Laboratory
  - Oak Ridge National Laboratory
- Private sector
  - Enviro Management & Research (EMR)
  - Washington Gas – PAX River Naval Base utility partner
  - DTE Energy – VAMC Detroit utility partner
  - Omaha Public Power District – VAMC Omaha utility partner
- Industrial Assessment Center (IAC)
  - University of Chicago
- SAVEnergy Contractor (SEC)
  - Celtic Energy
  - Simon & Associates
  - EMC Engineers

ESET Protocol

- The assessment protocols included
  - boiler operations
  - steam & hot water distribution systems
  - automated controls
  - heating, ventilating, and air-conditioning (HVAC) systems
  - lighting systems

Energy Management Continuum

Low-cost measures were defined as less than $20,000 and/or less than 2 year simple payback



ESET findings were consistent across sites with recommendations for controls, boiler efficiency, steam trap maintenance, insulation, and distribution line improvements

Results & Implications

- 19 ESET teams assessed 28 sites
  - October 27th - December 21st
  - Exceeded initial goal of 25

Total square footage of 28 facilities assessed = 172,748,959

- Teams focused primarily on natural gas use and secondarily on electrical use

The percent of the federal natural gas load represented by the 28 assessments is approximately 9%

- based on 105,418,800 MMBtu standard buildings natural gas consumption

Results & Implications

- Estimated potential savings averaged for the 28 sites
  - Natural gas savings – 9.4%
    - total consumption of all sites assessed
  - Natural gas cost savings - $6,659,441
  - Electrical savings – 1.8%
    - total consumption of all sites assessed
  - Electricity cost savings - $3,577,580

Results & Implications

- The cost to implement measures for the 28 sites combined
  - $8,002,447
  - $8.10/MMBtu saved

Implementation of these measures could yield a return of $1,082,619 in annual cost savings

Annual Consumption & Estimated Potential Savings (MMBTU)

ESET 2006 Phase I - Annual Consumption & Estimated Potential Savings (MMBtu)						
	Agency	Site	Natural Gas Consumption	Natural Gas Savings	Electricity Consumption	Electricity Savings
1	BOP	Allenwood FCC	177,385	20,708	108,810	10,211
2	DHS	USCG Cape May	112,000	1,477	41,120	691
3	DOD	Eglin AFB	451,215	13,666	887,372	0
4	DOD	Hill AFB	1,283,121	99,290	914,089	4,101
5	DOD	Robins AFB	1,016,397	91,180	1,121,909	12,400
6	DOD	Wright-Patterson AFB	512,661	26,593	1,398,000	99
7	DOD	Fort Bragg	1,597,610	16,002	1,873,834	0
8	DOD	Fort Gordon	371,958	35,200	152,186	1,702
9	DOD	Fort Sill	658,240	29,473	592,247	14,890
10	DOD	Redstone Arsenal	300,017	18,844	751,130	7,511
11	DOD	Bangor Naval Base	404,929	12,556	564,556	0
12	DOD	Bremerton Naval Shipyard	939,000	58690	97,928	0
13	DOD	Crane NSA	487,140	106,723	486,883	35
14	DOD	Keyport NAS	113,054	4032	85,918	0
15	DOD	NAWC Patuxent	367,418	44,080	608,692	5,448

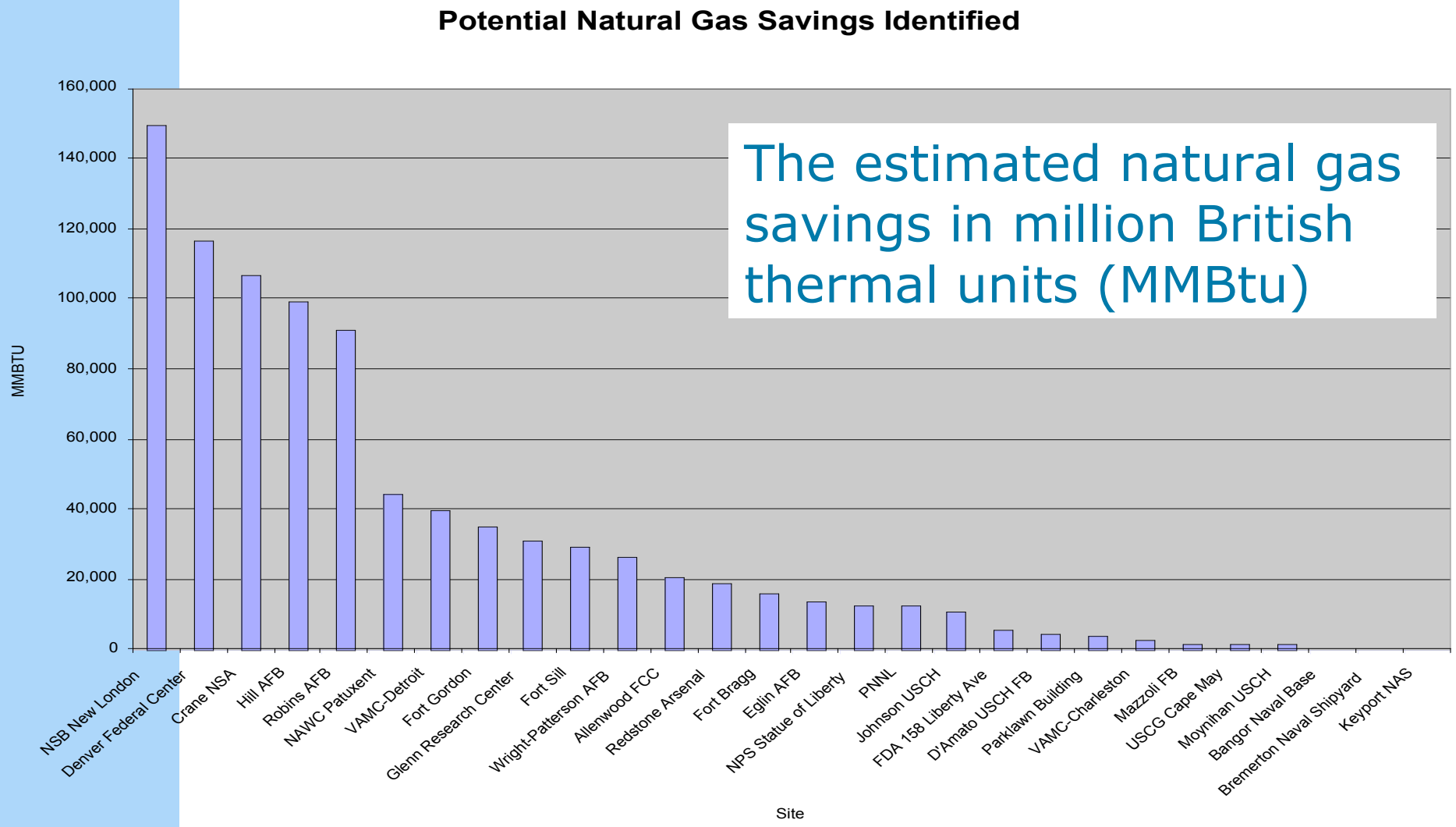
Annual Consumption & Estimated Potential Savings (MMBTU)

16	DOD	NSB New London	728,211	149,795	298,910	58,862
17	DOE	PNNL	85,191	12,225	230,043	0
18	DOI	NPS Statue of Liberty	30,724	12,272	38,990	9,343
19	HHS	FDA 158 Liberty Ave	38,000	5,368	35,238	9,105
20	GSA	D'Amato USCH FB	34,790	4175	47610	3875
21	GSA	Moynihan USCH	24,998	1,368	47,493	7,689
22	GSA	Denver Federal Center	385,892	117,037	129,464	863
23	GSA	Johnson USCH	18,023	10943	24,425	10,907
24	GSA	Mazzoli FB	6,186	1,755	27,984	2,555
25	HHS	Parklawn Building	23,639	3,709	67,257	8,100
26	NASA	Glenn Research Center	511,567	31,253	656,294	0
27	VA	VAMC-Detroit	222,427	39,940	111,236	14,172
28	VA	VAMC-Charleston	38,218	2,410	47,978	1,095
Total			**10,940,011**	**970,764**	**11,447,596**	**183,654**

Natural Gas Savings Total = 970,764 MMBTU

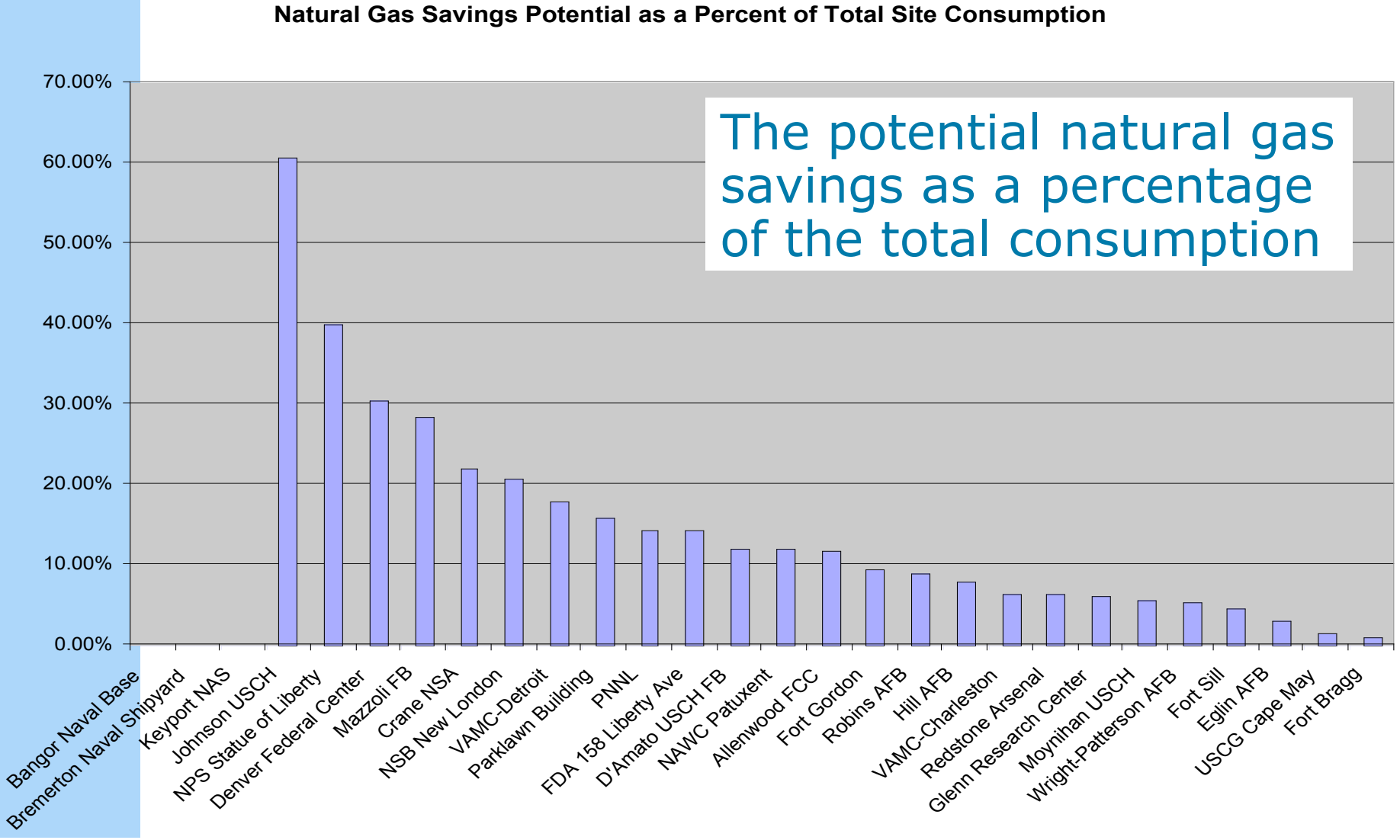
Electricity Savings Total = 183,654 MMBTU

Potential natural gas savings identified at each site



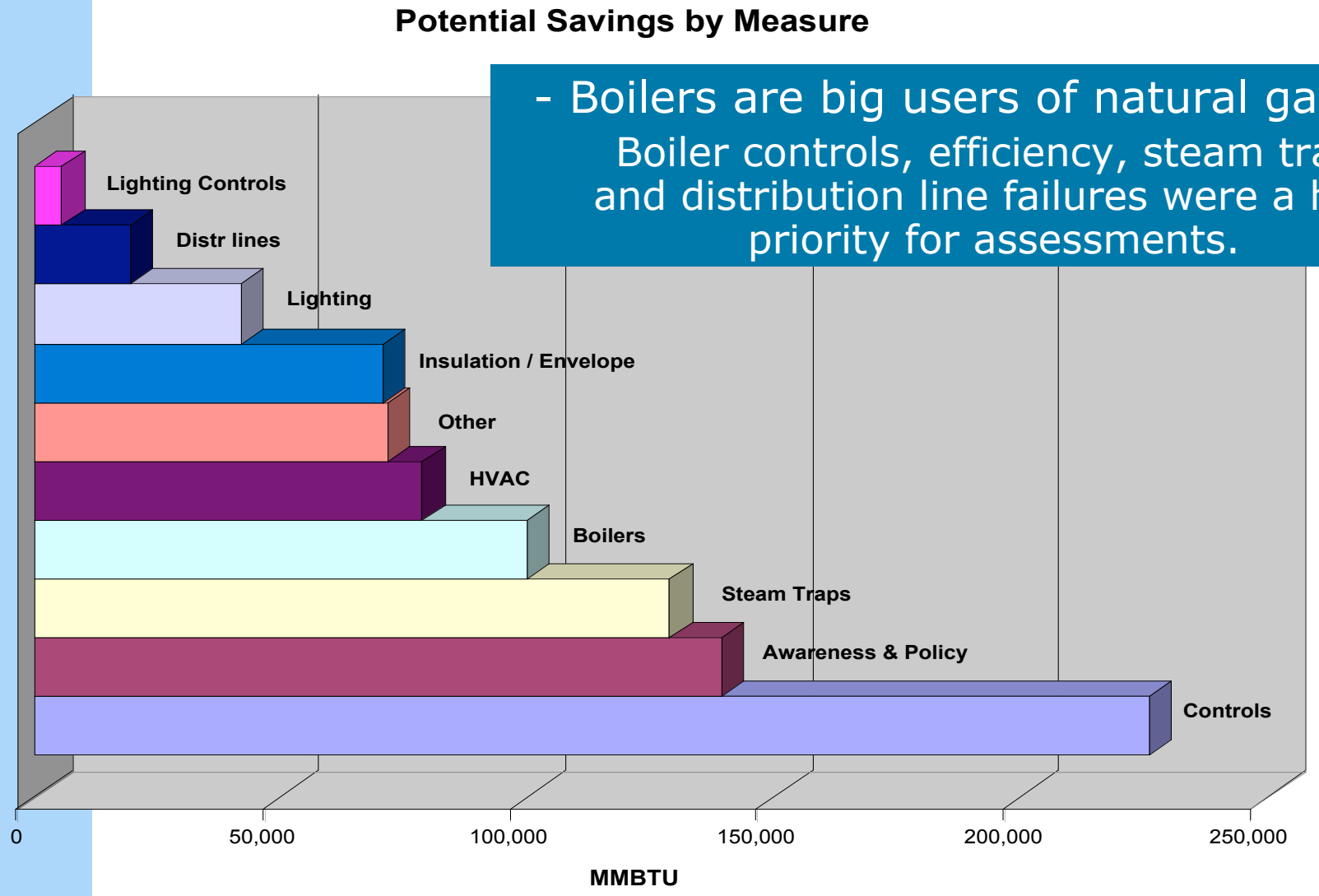
The estimated natural gas savings in million British thermal units (MMBtu)

Potential natural gas savings as a percentage of total consumption

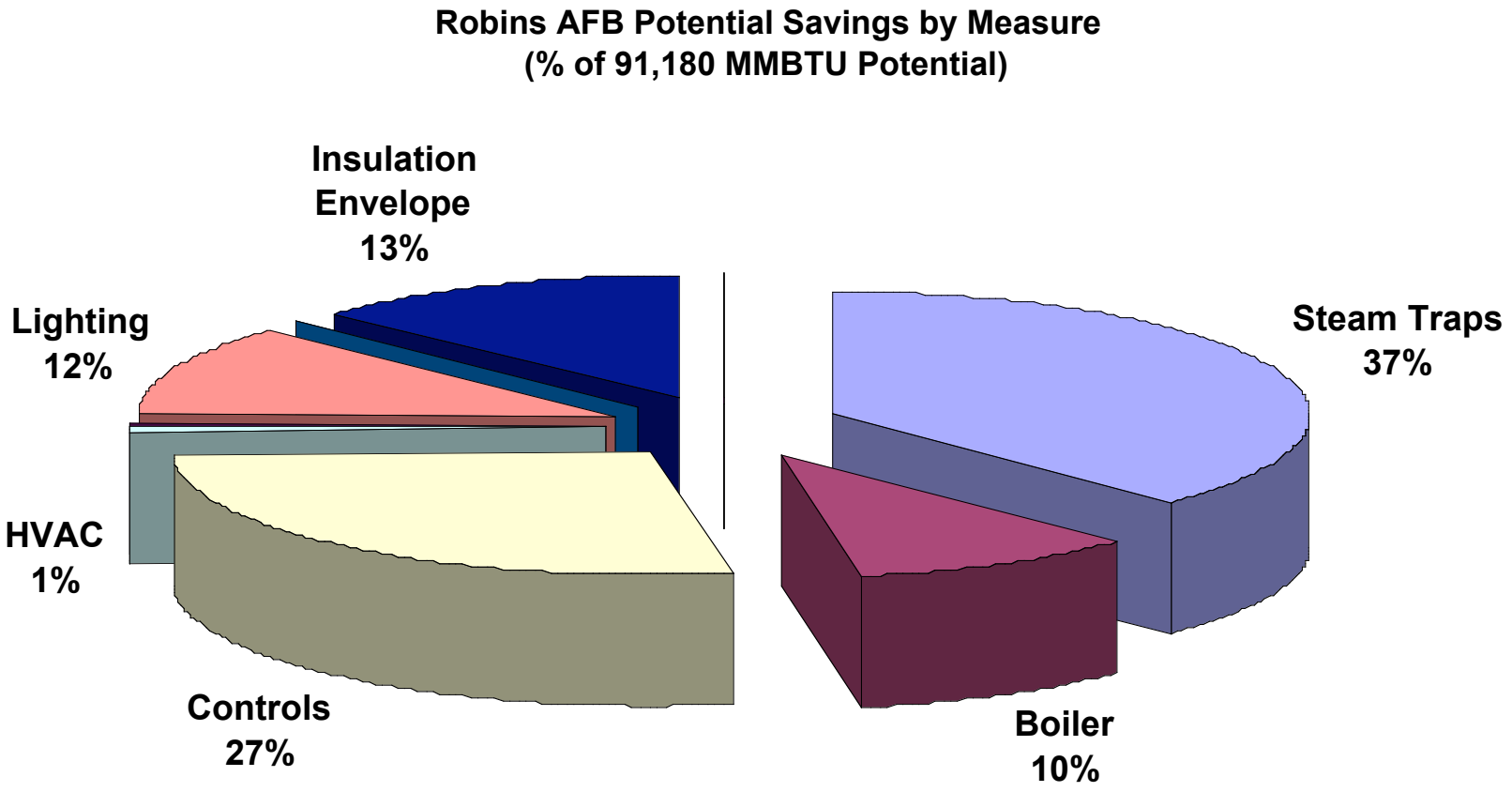


The potential natural gas savings as a percentage of the total consumption

ECM type and the resulting MMBtu savings identified



Robins Air Force Base potential natural gas savings by ECM type



Savings opportunities identified and potential impact of recommended improvements

Results & Implications

A careful assessment can almost always find improvements even in a well-run building. We were informed the day before we arrived in Charleston that the VAMC had been designated an Energy Star building a few years ago, and our experience was that the facilities staff were very knowledgeable and they had advanced equipment (e.g., ice storage) to help them run efficiently. We nonetheless were able to find 19 no/low cost measures that will save over 3,500 MMBtu—more than 5% of consumption—and identified 12 capital-intensive measures that will save them additional energy if implemented.

- Charles Williams
Lawrence Berkeley National Laboratory

Potential for Contributing to Federal Energy Goals

- The findings support
  - An estimated 10% potential savings through building tune-ups
  - >10% through the use of comprehensive retro-commissioning activities that focus on performance of existing equipment

Opportunities exist to improve operational efficiency at federal sites

Potential for Contributing to Federal Energy Goals

- Federal agencies reduced site energy consumption by 21.7% between 1985 and 2000, largely through investment in retrofits
- Increased emphasis on operations and maintenance efficiency can further reduce consumption while improving performance

If all federal agencies implemented similar efficiency improvements across the board, we would see a significant contribution to our energy reduction goals

Follow On Plans

- FEMP is following up with the 28 ESET sites to maximize realized savings
  - identify resources
  - help sites with completion of low-/no-cost measures
  - help with project development for capital-intensive measures

Conclusions & Recommendations

- There is significant opportunity for improvements in the O&M of natural gas systems
  - Boiler re-tuning
  - Improved controls systems
  - Identification and repair of steam leaks
- There is significant need to develop better energy efficiency training and awareness programs for building operators and facilities managers

ESET Activities for FY 2007

- Focus on solutions
  - Commissioning Hybrid
  - O&M Improvements
  - Training
  - Highlight on Controls

ESET should evolve into comprehensive retro-commissioning activities to ensure energy and cost savings are sustainable

Closing Thoughts – Common Opportunities

- Simultaneous heating & cooling
- Control system overrides
- Temperature set-points & setbacks
- Missing insulation
- Leaking valves & steam traps
- Damper operations & economizers
- Match equipment schedules to building operating hours & plans
- "Bio-meters" – occupant behavior – open windows, over-/under-dressing, blocked air registers, etc.
- Conditioned vacant space
- Fuel switching

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

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