

**Reducing Greenhouse Gas Emissions  
In Federal Buildings, Facilities and Vehicles**

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**For the Presidential Climate Action Project**

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## **Acknowledgements**

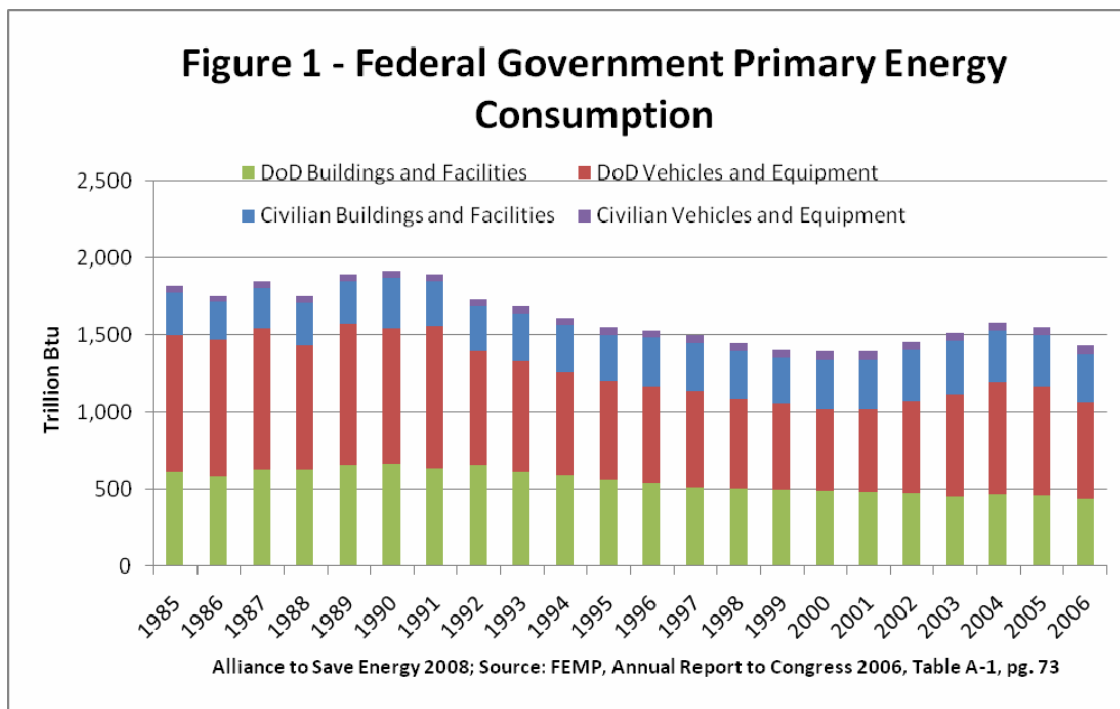
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## Introduction

The United States government is the single largest consumer of energy in the world. In 2006 the federal government used 1.5 quadrillion Btu (quads) of “primary” energy (including the fuel used to generate electricity at the power plant),<sup>1</sup> or 1.5 percent of total energy use in the United States.<sup>2</sup> Taxpayers in the U.S. paid \$17.7 billion for that energy,<sup>3</sup> which was responsible for some 96 million metric tons of carbon dioxide (CO<sub>2</sub>) emissions<sup>4</sup> – 1.6 percent of U.S. emissions.<sup>5</sup>

About 55 percent of the energy used by the federal government and 37 percent of its energy costs (about .85 quadrillion Btu and \$6.5 billion) is for heating, cooling and powering more than 500,000 federal buildings around the country.<sup>6</sup> The rest is for vehicles and equipment, primarily military planes, ships and land vehicles.



Efforts over the last two decades to reduce energy use in federal buildings and facilities have resulted in significant energy and cost savings. Overall federal primary energy use decreased by

<sup>1</sup> Federal Energy Management Program, *Annual Report to Congress on Federal Government Energy Management and Conservation Programs Fiscal Year 2006 (Draft)*, Assistant Secretary, Energy Efficiency and Renewable Energy, Department of Energy, November 28, 2007, pg. 1.

<sup>2</sup> Energy Information Administration, *Annual Energy Outlook 2008 with Projections for 2030 (Revised Early Release)*, Office of Integrated Analysis and Forecasting, U.S. Department of Energy, December 2007, Table A2, pg. 3.

<sup>3</sup> FEMP, *Annual Report to Congress*, 2005, pg. 1.

<sup>4</sup> Goal building and facility carbon emissions from FEMP, *Annual Report to Congress 2006*, Table 2, pg. 15; Exempt building, vehicles and operations carbon emissions data calculated from supporting data to the report.

<sup>5</sup> EIA, *Annual Energy Outlook 2008*, Table A18.

<sup>6</sup> Calculated from the supporting data for FEMP, *Annual Report to Congress 2006*, and from its Table A-9, pg. 80.

18 percent from 1985 to 2006,<sup>7</sup> and in buildings, primary energy consumption decreased by 8 percent.<sup>8</sup> Federal building and facility energy bills decreased by 22 percent in real terms in that time period, considerably more than the 15 percent decrease in the cost of primary energy supplied to those facilities.<sup>9</sup>

Federal building carbon emissions were 18 percent lower in 2005 than 1990,<sup>10</sup> mostly because of energy-saving efforts.<sup>11</sup> If the federal government's energy intensity in standard and energy-intensive buildings and facilities was the same in 2005 as it was in 1990, annual carbon dioxide emissions would be 2.3 million metric tons greater.<sup>12</sup> These savings are the result of energy-efficiency measures, increased use of renewable energy and a less carbon-intensive fuel mix overall.

The impacts of the federal government efforts to improve building and facility energy efficiency are not limited to the direct impacts on energy and CO<sub>2</sub>, but have broader market transforming benefits – the broader impacts of federal procurement activities could by some estimates be three times as great as the direct impacts.<sup>13</sup>

Large cost-effective savings opportunities remain. Recognizing this, Congress and the president have set aggressive requirements for future energy reductions in federal buildings and facilities that by 2015 could yield annual savings of an additional 0.1 quadrillion Btu of site energy, reduce the federal energy bill by more than \$1.6 billion, and reduce CO<sub>2</sub> emissions by almost 12 million metric tons.<sup>14</sup> Cumulative emissions reductions associated with these energy savings could total 55 million metric tons of CO<sub>2</sub> through 2015. At the same time, taxpayers would save \$8 billion cumulatively through 2015.<sup>15</sup>

The existing energy intensity reduction requirements are not applicable to mobile sources of carbon emissions. If the requirements were extended to include all federal energy consumption and carbon emission sources, and were fully achieved, they could go a long way to pushing the federal government towards reducing its emissions by 80 percent by 2050 compared to 1990.

The Energy Policy Acts of 1992 and 2005, Executive Order 13423, “Strengthening Federal Environmental, Energy, and Transportation Management,” and the Energy Independence and

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<sup>7</sup> FEMP, *Annual Report to Congress 2006*, Table 7, pg. 23.

<sup>8</sup> Alliance to Save Energy calculations from supporting data to FEMP, *Annual Report to Congress 2006*,

<sup>9</sup> Alliance to Save Energy calculations from supporting data to FEMP, *Annual Report to Congress 2006*,

<sup>10</sup> Supporting carbon data to FEMP, *Annual Report to Congress 2006* and FEMP, *Annual Report to Congress 2005*, Table 4, pg. 19.

<sup>11</sup> As discussed below, some of the reductions in energy (and carbon) intensity are the product of privatization of buildings, most notable DOD housing, which are not subject to government intensity reduction requirements.

<sup>12</sup> Alliance calculations from supporting data to FEMP *Annual Report to Congress 2006*

<sup>13</sup> Jeffrey Harris and Francis Johnson, “Potential Energy, Cost and CO<sub>2</sub> Savings from Energy-Efficient Government Purchasing,” *Commercial Buildings: Program Design, Implementation and Evaluation*, 2000, pg.1-2.

<sup>14</sup> *The Energy Independence and Security Act of 2007*, 110<sup>th</sup> Congress, Public Law 110-140, December 19, 2007, Section 431. Calculations based on supporting data to FEMP, *Annual Report to Congress 2006*.

<sup>15</sup> Based on cost per Btu of energy supplied to government buildings in 2006 and assume that federal government square footage stays constant through 2015. Primary energy reductions would not necessarily be representative of as large a percentage of baseline energy consumption, since some of the energy intensity reductions could stem from a shift from use of primary fuels to electricity. Similarly, the CO<sub>2</sub> emissions estimates could overstate the actual avoided emissions, since added electric utility emissions are ignored.

Security Act of 2007 (EISA) have given agencies many of the tools they need to justify requests for money, take advantage of alternative financing mechanisms, specify cost-effective energy-efficient equipment and buildings, measure energy use and improve their operations and management practices. First and foremost, agencies need to employ these existing tools in facilities to their full advantage – in some cases, that may require some refinements to existing policies.

Perhaps the most important factor in successful realization of the energy intensity requirements will be the sustained and visible interest of the president. Few things motivate people more than when their boss sets goals, provides resources, asks questions, holds them accountable and acknowledges a job well done. If fully implemented, the existing laws offer significant potential energy, budget and carbon savings. Full implementation will require vigilance and commitment on the part of the president.

In this report, we:

1. Discuss the potential for federal government reductions in energy and CO<sub>2</sub> emissions;
2. Summarize the major barriers to reducing federal energy use and carbon emissions – why we need policies in the first place; and
3. Summarize existing policies and provide recommendations for full implementation and extension of those policies.

## Potential to Reduce Federal Energy and Carbon Emissions

Agencies are required to reduce energy use per square foot in buildings and facilities by 30 percent in 2015 compared to 2003.<sup>16</sup> The cumulative carbon dioxide reductions associated with this requirement could exceed 55 million metric tons through 2015,<sup>17</sup> more than 15 states' annual energy-related CO<sub>2</sub> emissions as of 2004.<sup>18</sup> Creating parallel energy reduction goals for vehicles and equipment, which represent more than half of federal CO<sub>2</sub> emissions, could more than double the carbon and energy savings.<sup>19</sup>

### Buildings and Facilities

Reducing federal building and facility energy intensity by 3 percent annually is achievable, but aggressive. The Energy Information Administration (EIA) projects private sector commercial building energy intensity will *increase* by 3.2 percent in 2015 compared to 2003,<sup>20</sup> while residential building energy intensity is projected to decrease by 12 percent by 2015.<sup>21</sup> Clearly, the energy intensity reduction requirements push agencies to achieve improvements that are far beyond the business-as-usual projections of EIA.

No rigorous assessment of energy-efficiency potential in federal buildings and facilities has been conducted for at least the last decade. The most indicative public data are from audits of natural gas energy-saving opportunities in federal facilities by FEMP in the winter of 2005-2006 (see Figure 2). FEMP found natural gas savings potential of 2 to 60 percent from low and no-cost energy-saving measures in different facilities, with an average estimated energy savings potential of 9 percent.<sup>22</sup>

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<sup>16</sup> *The Energy Independence and Security Act of 2007*, 110<sup>th</sup> Congress, Public Law 110-140, December 19, 2007, Section 431,

<sup>17</sup> Calculated by assuming constant square footage in standard and energy-intensive facilities and constant carbon intensity of energy consumption, and by assuming agencies meet their goals from 2008-2015.

<sup>18</sup> [EIA, State Energy-related Carbon Dioxide Emissions Estimates](http://www.eia.doe.gov/environment.html), January 2008, Table 1, <http://www.eia.doe.gov/environment.html>.

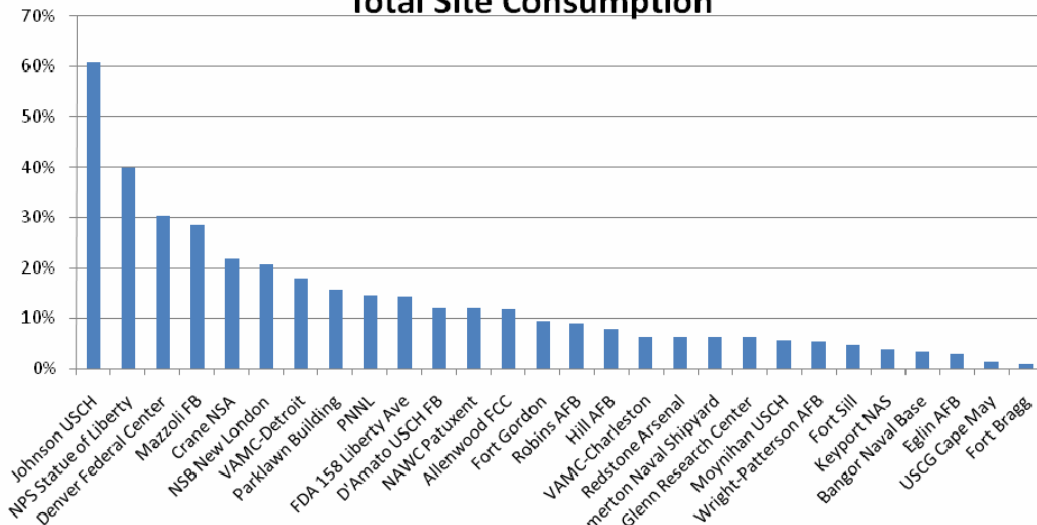
<sup>19</sup> Alliance to Save Energy calculations using background carbon emissions estimates to the FEMP *Annual Report to Congress 2006*, as provided to us by Chris Tremper, McNeil Technologies.

<sup>20</sup> EIA, *Annual Energy Outlook 2008, with Projections to 2030*, Table A5; *Annual Energy Outlook 2006, with Projections to 2030*, February, 2006, Table A5.

<sup>21</sup> EIA, *Annual Energy Outlook 2008, with Projections to 2030*, Table A4; EIA, *Annual Energy Outlook 2006, with Projections to 2030* Table A4.

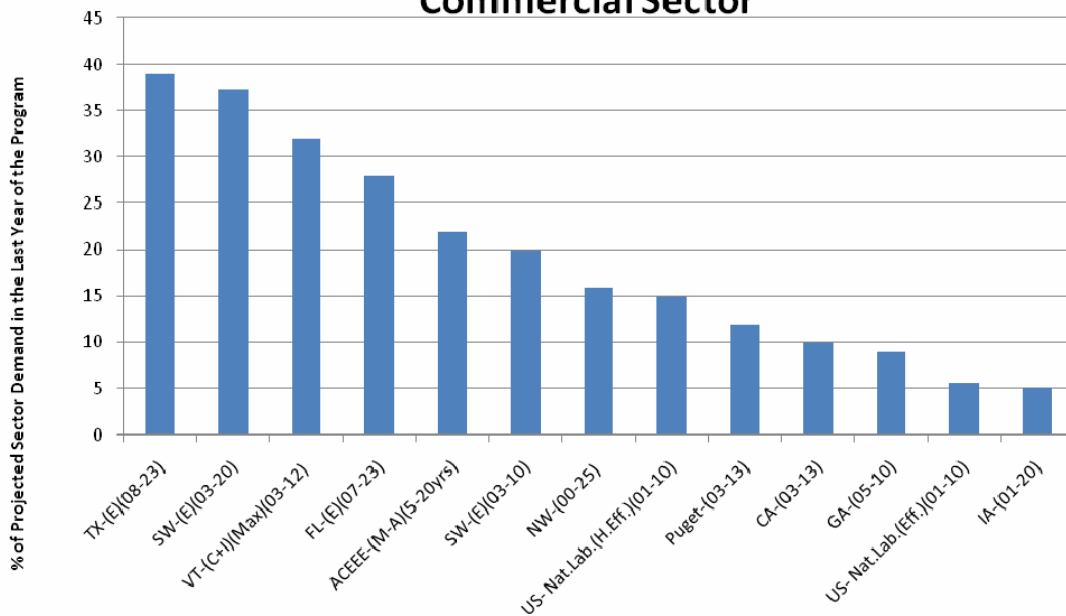
<sup>22</sup> Federal Energy Management Program, *Energy Saving Expert Teams: FY 2006 Summary Report*, U.S. Department of Energy, February 28, 2006, Figure 2, pg. 5.

**Figure 2 - Natural Gas Potential Savings as a Percent of Total Site Consumption**

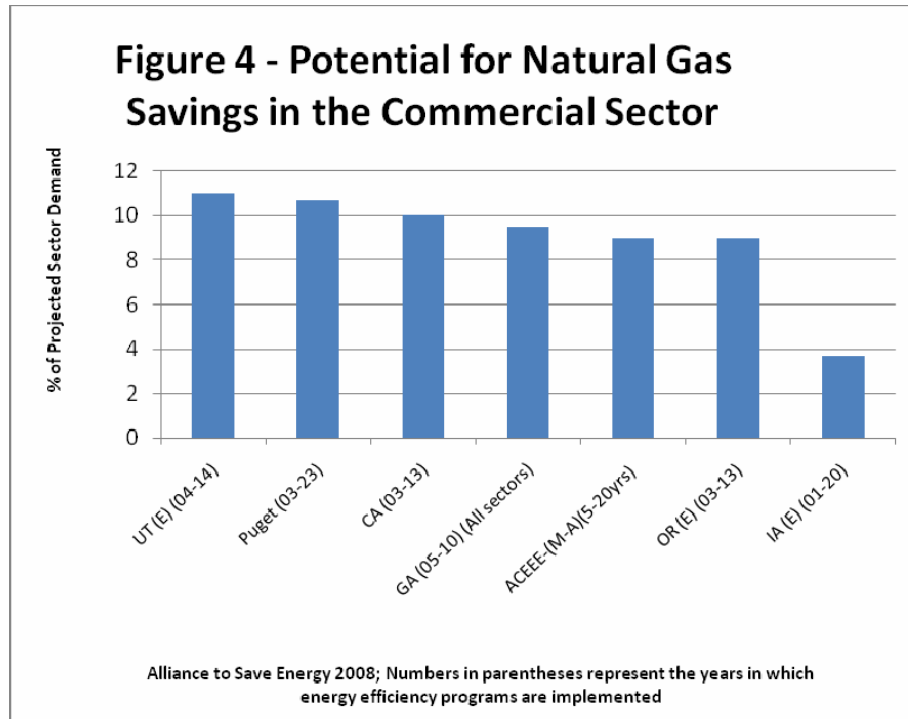


Alliance to Save Energy, 2008; Source: Federal Energy Management Program, Energy Saving Expert Teams: FY 2006 Summary Report, U.S. Department of Energy, February 28, 2006, Table 1, pg. 3

**Figure 3 - Potential for Electricity Savings in the Commercial Sector**



Alliance to Save Energy 2008; Numbers in parentheses represent the years in which energy efficiency programs are implemented.



The FEMP natural gas audits appear in line with the estimates of natural gas savings potential in studies of private sector commercial buildings. Recent estimates (post-2000) of energy reduction potential in commercial buildings also vary widely, from 4 to 11 percent beyond business-as-usual for natural gas and 5 percent to nearly 40 percent beyond business-as-usual for electricity (see Figures 3 and 4).<sup>23</sup> Collectively the studies suggest potential savings averages in buildings (using a variety of assumptions) of somewhere around 15-20 percent. Thirty-percent reductions over a 10 year period are at the higher end of those ranges, but well within them.

### Beyond Buildings and Facilities

Federal energy intensity reduction requirements and other policies are limited to buildings and other stationary facilities. That means that about 45 percent of federal energy use, 55 percent of DOD energy use, and half of federal CO<sub>2</sub> emissions are exempted.<sup>24</sup> This is also an important omission in terms of costs to taxpayers. According to a 2001 report by the Defense Science Board (DSB), the Air Force spends an average of \$17.50 per gallon for “tanker-delivered” fuel and the delivered cost of fuel to Army forces on the forward edge of the battlefield can be hundreds of dollars per gallon.<sup>25</sup> A more recent DSB report estimated that these estimates were low and failed to account for a good deal of the necessary force structure needed to transport the

<sup>23</sup> Joe Loper, Selin Devranoglu, Steve Capanna, & Mark Gilbert, *Energy Efficiency Potential in American Buildings*, Alliance to Save Energy and American Electric Power, Prepared for the National Petroleum Council Future of Oil and Natural Gas report, 2007, pg. 9. For a complete list of studies examined and referenced, see the Appendix.

<sup>24</sup> Alliance to Save Energy calculations based on supporting data to FEMP, *Annual Report to Congress 2006*, and Tables A-1 and A-7, pgs. 73 and 78.

<sup>25</sup> Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platforms, *More Capable Warfighting Through Reduced Fuel Burden*, January 2001, pg. ES-3.

fuel.<sup>26</sup> And military machinery consumes a lot of energy – fuel is 70 percent of Army tonnage shipped.<sup>27</sup> Furthermore, delivery of fuel to “battle space” results in casualties, as fuel is delivered over hostile terrain.

There are no reliable estimates of the overall potential for reducing energy use of weapons and other military systems, and estimating the potential is beyond the scope of this report. But even small percentage savings could mean big energy, cost and CO<sub>2</sub> savings. If all federal energy use was subject to energy intensity reduction requirements roughly comparable to buildings and facilities, annual CO<sub>2</sub> emissions would be reduced by nearly 19 million metric tons of additional savings below the baseline estimates in 2015. Energy use would be reduced by an additional 0.26 quads annually in 2015. Cumulative CO<sub>2</sub> emissions reductions from vehicle and equipment efficiency improvements through 2015 could equal up to 86 million metric tons, and cumulative energy savings could reach 1.2 quads.<sup>28</sup>

While these reductions will not be easily achieved, they are less stringent than the modifications to private sector fuel economy standards passed in EISA, which requires vehicle manufacturers to achieve fleet average fuel economy of at least 35 miles per gallon in 2020, a 40 percent increase over current requirements.<sup>29</sup>

### Matching Federal Energy Targets with Greenhouse Gas Stabilization Paths

To reflect the uncertainties related to federal government energy use and carbon emissions, we developed three scenarios that encompass the likely range of future federal government emissions given current policies. From those baselines, we calculated emissions that would result from the implementation of achievable cost-effective energy-efficiency improvements. We then show what additional carbon emissions reductions would be needed to attain emissions levels 80 percent below 1990 in 2050.

All three baseline scenarios assume that total building and facility square footage will remain the same through 2050 and that after 2015 (when existing energy reduction requirements end), building energy consumption will be stable. This is consistent with historical trends – from 1996 to 2006, building and facility space actually decreased slightly.<sup>30</sup>

In contrast to buildings and facilities, vehicle and equipment energy consumption are assumed to be linked to federal government spending in the baseline scenarios. Historically, however, vehicle and equipment energy consumption per dollar of the federal budget has gone down. So although we assume government spending will follow current projections and grow by about 2.5

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<sup>26</sup> Defense Science Board Task Force on DoD Energy Strategy, *More Fight – Less Fuel*, February 2008, pg.

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<sup>27</sup> Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platforms, *More Capable Warfighting Through Reduced Fuel Burden*, pg. 13.

<sup>28</sup> Alliance to Save Energy calculations based on data from FEMP, *Annual Report to Congress 2006*, and Office of Management and Budget, *Budget of the United States Government: Fiscal Year 2009*, Historical Tables, 2008, Table 1.3, pg. 27.

<sup>29</sup> EISA, Sections 102 and 103.

<sup>30</sup> Supporting documents for FEMP, *Annual Report to Congress 2006*, and FEMP, *Annual Report to Congress 2007*.

percent per year, vehicle and equipment energy consumption is assumed to increase by half that rate – an average of 1.25 percent annually in our Base Case (see Figure 5a).<sup>31</sup>

Unfortunately, vehicle and equipment emissions – especially military – are volatile and hard to predict. For example, from 1991 to 2000, government vehicle and equipment energy consumption dropped 40 percent. But from 2001 to 2006, following American involvement in the wars in Afghanistan and Iraq, vehicle and equipment energy consumption jumped 15 percent, or about 3 percent annually.<sup>32</sup>

In order to reflect this level of uncertainty, we also provide high and low baseline emissions cases. The High Emissions Case (see Figure 5b) assumes vehicle and equipment energy use increase at the same rate as GDP and the federal budgets (2.5 percent annually). The Low Emissions Case (see Figure 5c) assumes that vehicle and equipment energy use stays the same as today.

The difference between the three baseline scenarios is huge – federal government emissions in 2050 under the High Emissions Case are more than twice what they are in the Low Emissions Case.

We then estimate 2050 carbon emissions levels assuming all cost-effective achievable energy-efficiency potential in buildings is realized and that similar improvements are realized in vehicles and industrial operations. In our Base Case scenario (see Figure 5a), cost-effective and achievable efficiency improvements could save roughly more than 14 million metric tons of carbon annually in 2050 – a reduction of more than 45 percent below baseline and eight million metric tons less than today.

In order to achieve 80 percent reductions compared to 1990 emissions levels, federal buildings would need to reduce their emissions by considerably more than even very aggressive efficiency measures could lower them. Implementing all cost-effective and achievable efficiency improvements only achieves about 60 percent of the goal – an additional 10 million metric ton reduction would be required by 2050. To achieve this through energy efficiency would require reductions in federal energy use of nearly 2 percent of 2007 emissions annually through 2050.

Achieving these levels of reductions through efficiency alone would be an enormous feat. More realistically, aggressive energy-efficiency reductions will need to be supplemented by increased use of renewable and other low-carbon energy resources.<sup>33</sup> Once efficiency reductions are realized, low-carbon energy would need to supply about 65 percent of 2050 energy consumption to achieve overall emissions of 80 percent below 1990 levels.<sup>34</sup>

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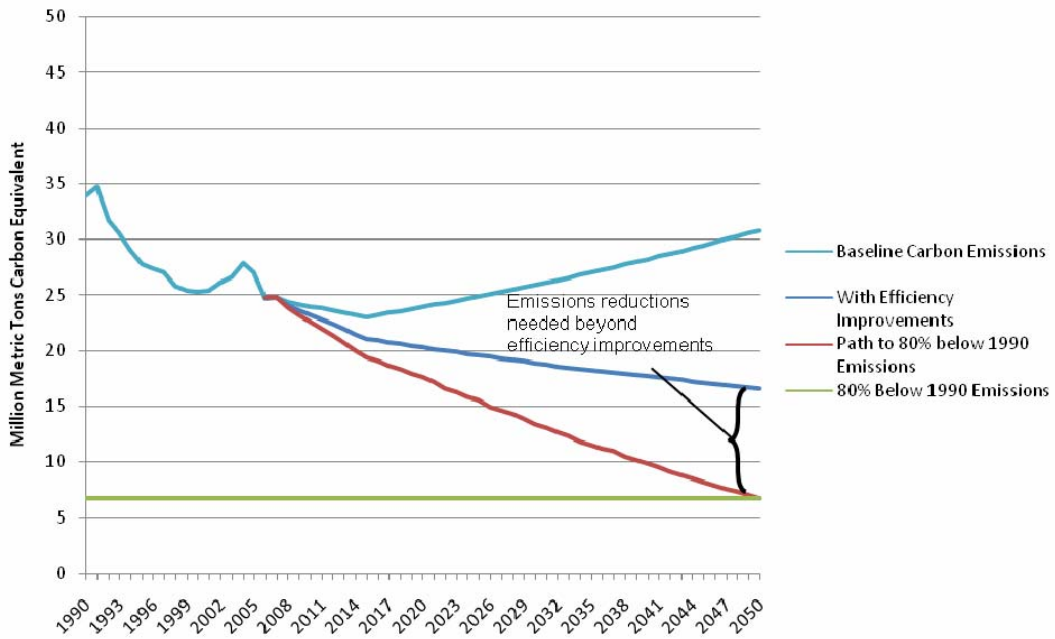
<sup>31</sup> Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2009*, Historical Tables, 2008, Table 1.3, pg. 27.

<sup>32</sup> FEMP, *Annual Report to Congress 2006*, Table A-7, pg. 77..

<sup>33</sup> Alliance to Save Energy, 2007; Source: FEMP, Annual Report 2005, Supporting Emissions Data.

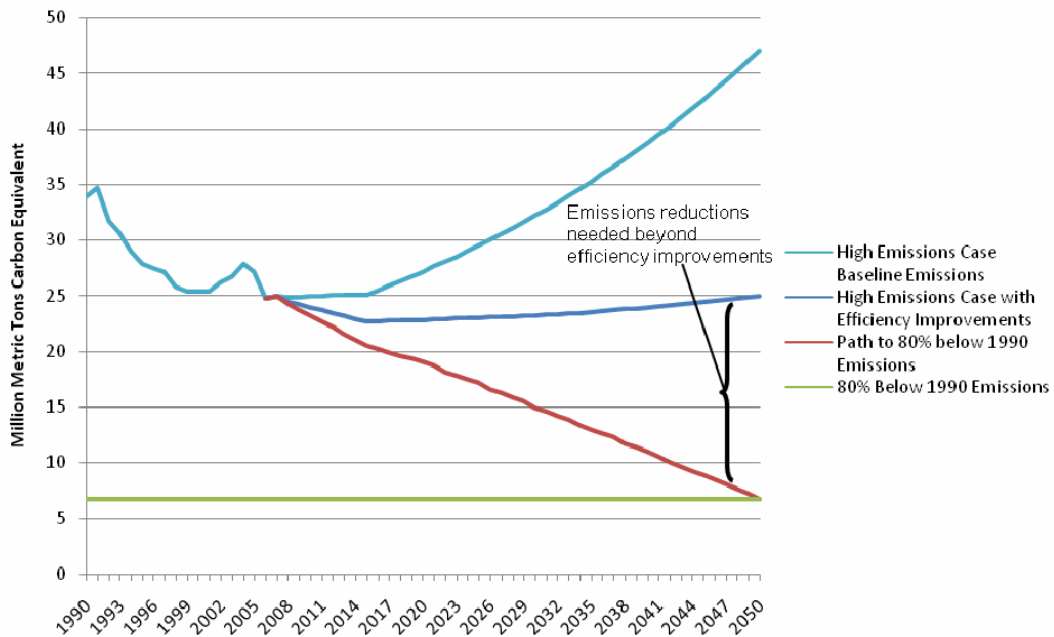
<sup>34</sup> Calculated assuming federal facilities would meet their renewable energy and energy intensity reduction requirements.

**Figure 5a - Projected Federal Government Carbon Emissions: Base Case**

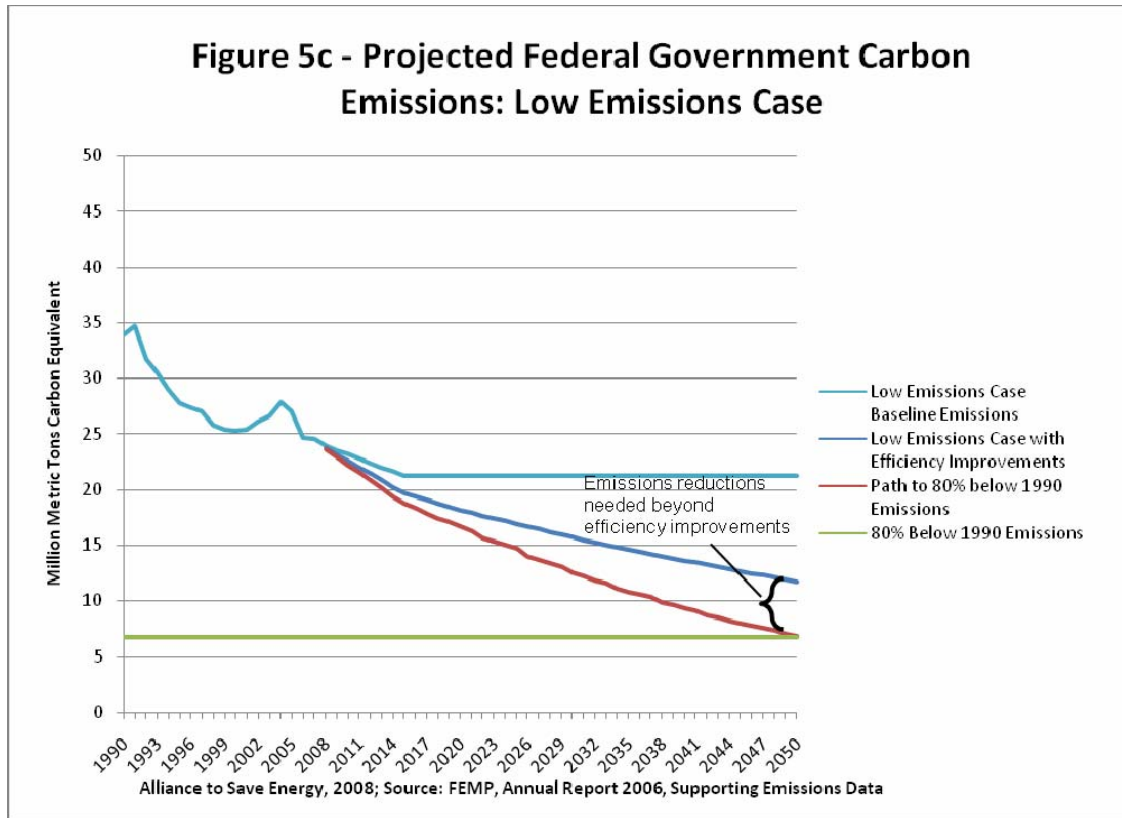


Alliance to Save Energy, 2008; Source: FEMP, Annual Report 2006, Supporting Emissions Data

**Figure 5b - Projected Federal Government Carbon Emissions: High Emissions Case**



Alliance to Save Energy, 2008; Source: FEMP, Annual Report 2006, Supporting Emissions Data



In the end, the carbon-reduction potential of the federal government is as much a function of the urgency with which the reductions are pursued as anything else. While the outer bound of carbon-reduction potential may be proscribed by technical capabilities, the most relevant boundary is the willingness to pay for carbon-reducing measures.

In sum, reducing federal carbon emissions 80 percent below 1990 levels by 2050 can be done. But it will take all of the policies in this report, and more. Nevertheless, the stakes are large: If achieved, the federal government could avoid about 24 million metric tons of carbon annually in 2050 – equal to the annual carbon emissions from more than 16 million passenger vehicles<sup>35</sup> – and more than 500 million metric tons cumulatively.<sup>36</sup>

<sup>35</sup> United States Environmental Protection Agency, “Greenhouse Gas Equivalencies Calculator,” February 11, 2008, <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

<sup>36</sup> Alliance to Save Energy calculations based on data from FEMP, *Annual Report to Congress 2006*; OMB, *Budget of the United States Government: Fiscal Year 2009*, Table 1.6, pg. 27; EIA, *Annual Energy Outlook 2008*, Table 19.

## Barriers to Increased Efficiency in the Federal Government

More than three decades of federal energy management have achieved significant energy savings, but have also served to highlight the barriers to energy efficiency in the federal sector. Though the federal government is frequently referred to as a single entity, in reality it is comprised of three branches, with 15 departments, more than 50 independent agencies (including the Environmental Protection Agency) and government corporations, and various other offices and positions. The federal government provides such diverse functions as national defense, mail delivery, social security, law enforcement, prison operation, food safety, and pollution control, to name but a few.

Not surprisingly, the federal government often does not move or react quickly or effortlessly to new directives or changes in policy. Decision-making is dispersed among many people and many organizational entities, all with varied mission-related responsibilities, experience, training, manpower, and budgets. Further complicating the matter, each agency has its own unique legal requirements, stakeholder demands, and impending crises that compete for its attention.

Major Barriers include:

- Energy efficiency is not core-mission of agency
- Lack of skilled personnel
- Capital budgeting process
- Budget shortfalls
- Many decision makers
- Lack of carrots and sticks

### Energy efficiency outside most agencies' core mission

Energy efficiency is usually not at the top of federal agency priorities. Many other demands draw the attention of agency leaders and their staffs. Responsibility for decisions that affect the federal government's energy-consuming behavior is dispersed among many people at dozens of federal agencies. But unless management at the highest level of each individual agency (and the government as a whole) is both convinced of energy efficiency's value and dedicated to furthering its implementation, energy management will continue to be a low priority, particularly in times of constrained budgets and reduced personnel resources. Maintaining and increasing management's dedication to energy-efficiency must somehow be tied to primary agency mission success.

### Lack of staff training and experience

In federal agencies, high-impact decisions about energy policies and operations are frequently made by individuals with little or no training, experience, or expertise in energy matters – and frequent turnover of personnel also works against developing institutional memory within upper management. Some of the mechanisms developed to help overcome barriers to greater energy efficiency, such as alternative financing, have added to the extensive knowledge base that energy

managers need to have. For example, alternative financing mechanisms, such as energy-savings performance contracts (ESPCs) or utility energy services contracts (UESCs) require a great deal of review and support, which must be performed by overworked management, council, budget or contract officers who were not trained to supervise these unique (to federal career personnel) and complicated contracts.

The down-sizing of in-house facility and energy managers in agencies and the privatization of operations and maintenance (O&M) functions in federal facilities has led to a dramatic loss of experience and expertise that is critically needed on a daily basis to assure continued implementation and monitoring of cost-effective energy-efficiency improvements. The short-term savings from personnel reduction has spawned a much greater long-term loss in unachieved energy savings potential and a backlog in facility maintenance which leads to increased energy, repair and replacement costs, and mission support degradation

In the past, DOE has offered comprehensive energy training to agency energy managers. However, in recent years, this program has been deemphasized as the regional offices and national laboratories, which supervised and performed the vast bulk of this training, have been seriously cut back. The subtle implication that the government has de-prioritized energy management has not been lost on the other agencies.

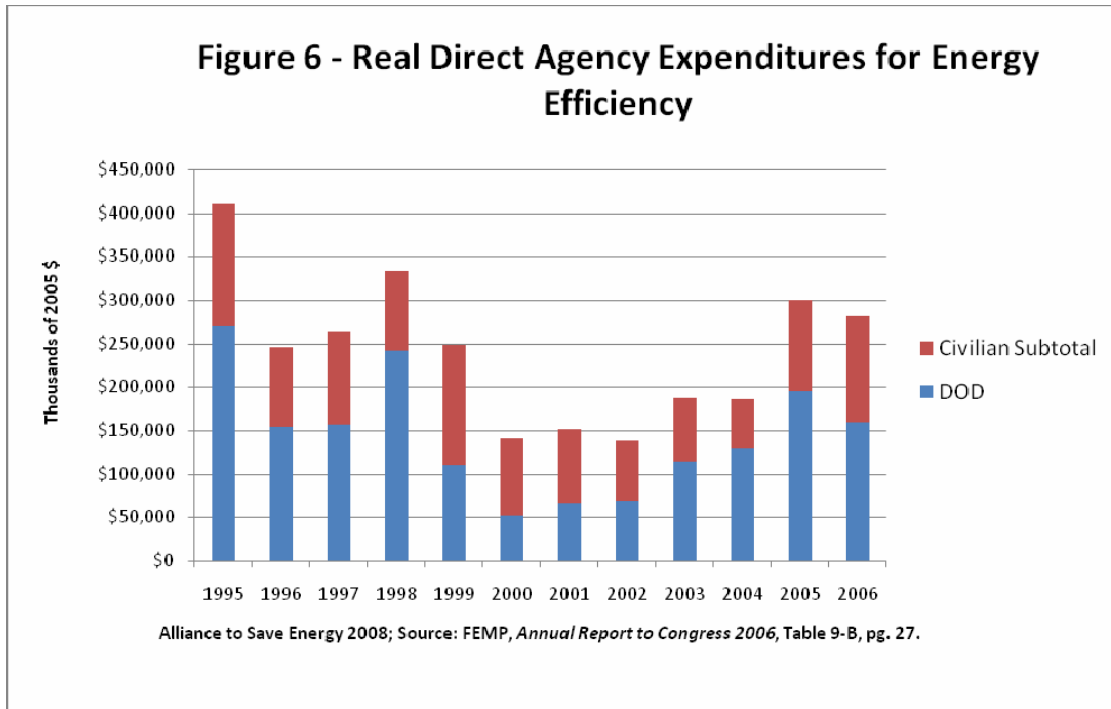
#### Capital budgeting

In many agencies, the capital budget and the operations and maintenance budgets are prepared in different organizations or parts of the organization. And in the competition for a part of the overall agency's annual budget request, often the O&M budget amount is short-changed in an effort to get a larger capital budget. This lack of O&M budget leads to degradation of facilities.

Furthermore, in some cases there is a disconnect between congressional committees that provide agency budgets. For example, DOD's capital budget is reviewed by the House and Senate Appropriations Military Construction, Veterans Affairs and Related Agencies Subcommittees, while the O&M budget is reviewed by the House and Senate Defense Appropriations Subcommittees. Consequently, there is no comprehensive oversight as to the real impact of inadequate construction quality and inadequate operations and maintenance resources. While Congress attempted to address the quality of new construction in the Energy Policy Act of 2005, there was no focus on the value of comprehensive building maintenance and continuous commissioning and the resources to accomplish them in EPAct 2005 or in EISA.

#### Budget Shortfalls

Appropriated budgets for energy efficiency have varied dramatically over the years (see Figure 6). In some cases, agencies requested larger budgets for energy-efficiency projects, and Congress appropriated the funds. In other cases, either agencies did not request as much money for efficiency projects or Congress did not comply with agencies' requests. Regardless of the cause, the waxing and waning of agency energy-efficiency budgets makes sustained attention to energy management difficult. Facility managers do not want to develop plans to implement energy-efficiency projects if they think the projects will run out of money a year or two later.



Historically, appropriated funding for energy-efficiency improvements has fallen far short of what is necessary to meet energy reduction targets even in years like 1995 or 2005 when appropriations for these projects were relatively high. ESPCS and UESCs – discussed in more detail below – will be called on to fill the gap.

### Many decision makers

Improving federal government energy efficiency involves many different types of federal employees. The most obvious are facility managers, building designers, and procurement staff. But many purchasing decisions are made by people who have little connection to facilities management and energy use. For example, in 2004, over 300,000 government employees had been issued purchase cards, allowing them to make purchases of up to \$2,500 with very little oversight.<sup>37</sup> Communicating policies and regulations to 2.7 million civilian workers (and another 1.4 million military personnel) is no simple task.<sup>38</sup> But to the extent that government employees are unaware of energy-efficiency policies and requirements and there are no checks in the purchasing system, compliance will be limited.

### Lack of carrots and sticks

Many legislative requirements have not been translated into agency implementation action plans, and administrative carrots and sticks have not been created to offer rewards for achieving or

<sup>37</sup> Department of Energy, “Affirmative and Environmentally Preferable Procurement: Training for Purchase Card Users and Approving Officials,” Federal Recycled and Biobased Procurement Preference Program.

<sup>38</sup> US Census Bureau, “Federal Government Civilian Employment by Function,” December 2006, <http://ftp2.census.gov/govs/apes/06fedfun.pdf>, Department of Defense, *Active Duty Military Personnel by Rank/Grade*, February 29, 2008, <http://siadapp.dmdc.osd.mil/personnel/MILITARY/rg0802.pdf>.

punishments for failing to achieve the requirements. While incentives and accountability are a vital part of implementing policies, the challenge is to reward and penalize people for things they have control over. It is difficult to hold people accountable for failure to implement efficiency projects if funding is not available, procurement rules impede actions, or supervisors give conflicting direction, for example.

### Breaking down barriers

Many policies have been instituted that attempt to make energy efficiency a priority for agencies and employees, to provide the financial and technical resources necessary to successfully implement efficiency improvements, and to streamline bureaucratic processes to reduce burdens on employees trying to invest in energy efficiency. Requirements to reduce energy intensity and greenhouse gas emissions requirements and invest in more efficient buildings and energy using products provide agencies and their staffs with justification for related budget requests as well as useful measures of performance. Alternative financing mechanisms provide the means to pay for energy-saving projects when appropriations are not available. Meanwhile, DOE-FEMP and others provide technical assistance to help federal employees identify and implement cost-effective energy efficiency improvements in their facilities.

A process of continuous improvement is required to maintain the various policies' relevancy. In the next section we identify improvements that we believe would be most helpful at this point in time.

## Policy Recommendations in Context

The existing policy framework has been developed over the course of decades. Unless the existing framework is to be thrown out (we do not recommend this), additional policies will need to fit within it. And any new policies will lack credibility to the extent that existing policies are not fully and consistently being implemented or enforced. Thus the first and most effective step in reducing federal energy use would be to ensure existing policies and procedures are being carried out. This will require greater oversight by the executive branch and Congress as well as strengthening and refining many of the existing policies, a theme that runs throughout the discussion, which is broken into the following sections:

1. Ensure energy intensity reduction requirements are relevant and being met
2. Reinstate greenhouse gas emissions goals
3. Enforce energy-efficient purchasing requirements
4. Identify energy-saving opportunities in buildings and facilities
5. Create binding and understandable requirements for facility managers
6. Achieve carbon-neutral (zero net energy) new federal construction by 2030
7. Strengthen renewable energy targets
8. Use all available means to fund energy projects, including appropriations, ESPCs and UESCs
9. Expand policies to include federal transportation and military energy use
10. Leverage Federal Buying-Power to Lead and Transform the Market

## 1. Ensure energy intensity reduction requirements are met and relevant

Energy intensity reduction requirements have been the foundation of efforts to promote energy efficiency in the federal government for over three decades. Amendments to the National Energy Conservation Policy Act (NECPA) in 1988 required agencies to reduce site energy intensity in federal buildings by 10 percent below 1985 levels by 1995, and 20 percent by 2000.<sup>39</sup>

Executive Order 13123, “Greening the Government Through Efficient Energy Management,” issued in 1999, extended required reductions to 30 percent below 1985 levels by 2005 and 35 percent by 2010. In addition, EO 13123 established separate energy reduction requirements for industrial, laboratory and other energy-intensive facilities, which previously had been exempted from the building reduction requirements. Agencies were directed to reduce site energy intensity in energy-intensive operations by 20 percent by 2005 and 25 percent by 2010, compared to 1990 levels.<sup>40</sup>

The Energy Policy Act of 2005 (EPAct 2005) set new site energy intensity reduction goals for all federal buildings (including those previously designated as energy-intensive) of 2 percent a year, or 20 percent cumulatively, by 2015 compared to 2003 levels.<sup>41</sup> Executive Order 13423, released in January 2007, increased that goal to 3 percent annually or 30 percent by 2015.<sup>42</sup> The Energy Independence and Security Act of 2007 (EISA) codified these targets by increasing the energy intensity reduction requirement for 2009 to 9 percent below the 2003 baseline, and requiring agencies to further reduce energy intensity by an additional 3 percent annually through 2015.<sup>43</sup>

### Past record is generally good

The federal government as a whole has compiled a good track record in meeting its energy reduction requirements for buildings. It met its 1995 and 2000 goals earlier than required, and fell just short of meeting the 2005 goal (see Figure 7).<sup>44</sup>

Although the federal government as a whole has for the most part met the energy intensity reduction requirements, individual agencies’ success has varied (see Figure 8). DOD narrowly missed the 2005 requirement – Given that DOD represents nearly three-fourths of government primary energy consumption, it is not surprising that the federal government also fell short of its target.<sup>45</sup> Of the other cabinet level agencies, DOE showed the most improvement over the 1985 to 2005 period. Meanwhile, at least nine agencies did not meet the 2005 requirements. Three of

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<sup>39</sup> *Federal Energy Management Improvement Act of 1988*, 100<sup>th</sup> Congress, November 5, 1988. The first specific federal energy reduction requirements were set in 1977, under *Executive Order 12003: Relating to Energy Policy and Conservation*, July 20, 1977.

<sup>40</sup> President William J. Clinton, *Executive Order 13123 – Greening the Government Through Efficient Energy Management*, June 3, 1999, Sec. 202.

<sup>41</sup> *Energy Policy Act of 2005 Conference Report*, 109<sup>th</sup> Congress, July 27, 2005, Section 102.

<sup>42</sup> President George W. Bush, *Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management, Part II*, January 26, 2007, Sec. 2.

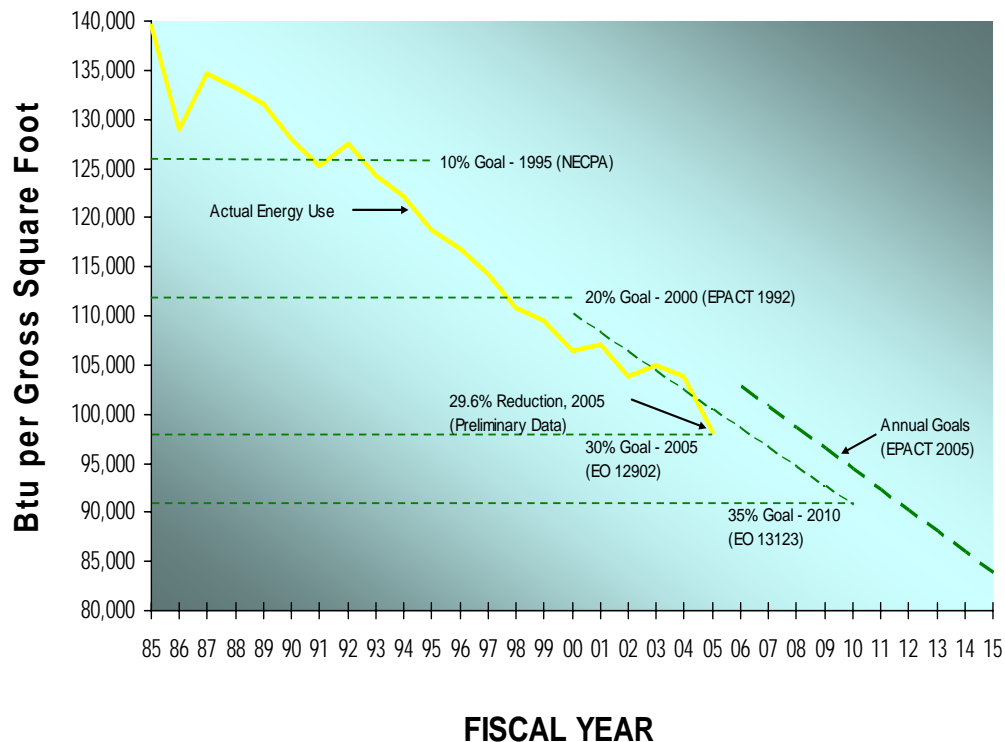
<sup>43</sup> *EISA*, Section 431,

<sup>44</sup> US Department of Energy, *Executive Order 13123: Efficient Energy Management*, Energy Efficiency and Renewable Energy, Power Point Presentation.

<sup>45</sup> FEMP, *Annual Report to Congress 2005*, Table A-1, pg. 148.

them – State Department, Department of the Interior, and Housing and Urban Development – had not even achieved their 1995 requirements by 2005.<sup>46</sup> The State Department’s energy intensity actually increased.

**Figure 7 – Federal Government Progress towards Energy Intensity Reduction Requirements**



Source: US Department of Energy, *Executive Order 13123: Efficient Energy Management*, Energy Efficiency and Renewable Energy, Power Point Presentation.

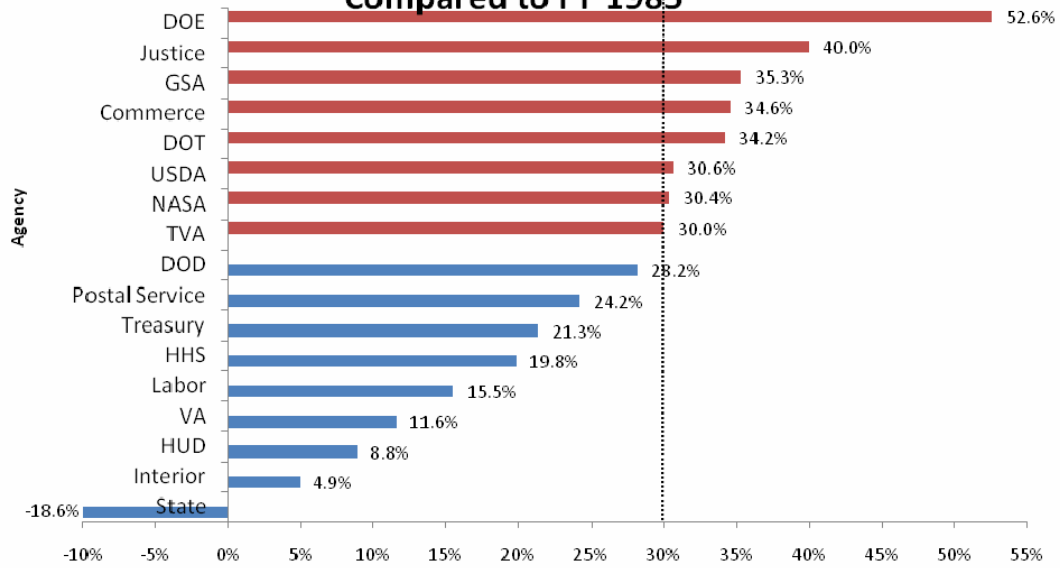
Overall, the federal government did not achieve the required 20 percent intensity reductions for energy-intensive facilities in 2005 compared to 1990 (see Figure 9) – combined agencies reduced intensity in these facilities by only 18 percent. Most of the major agencies, however, did meet the requirements.<sup>47</sup> Of the 13 agencies reporting energy-intensive facilities in both 1990 and 2005, only four agencies failed – namely Health and Human Services, NASA, Treasury, and the Social Security Administration.<sup>48</sup>

<sup>46</sup> FEMP, *Annual Report to Congress 2005*, Figure 4, pg. 11-12.

<sup>47</sup> Although it may seem anomalous for DOD and civilian agencies to both have reduced their energy intensity by more than 20 percent, but for overall intensity not to have reached the 20 percent threshold, this is due to an increased percentage of the energy-intensive buildings being represented by civilian buildings, which, on average, consume 52 percent more energy per square foot than their DOD counterparts.

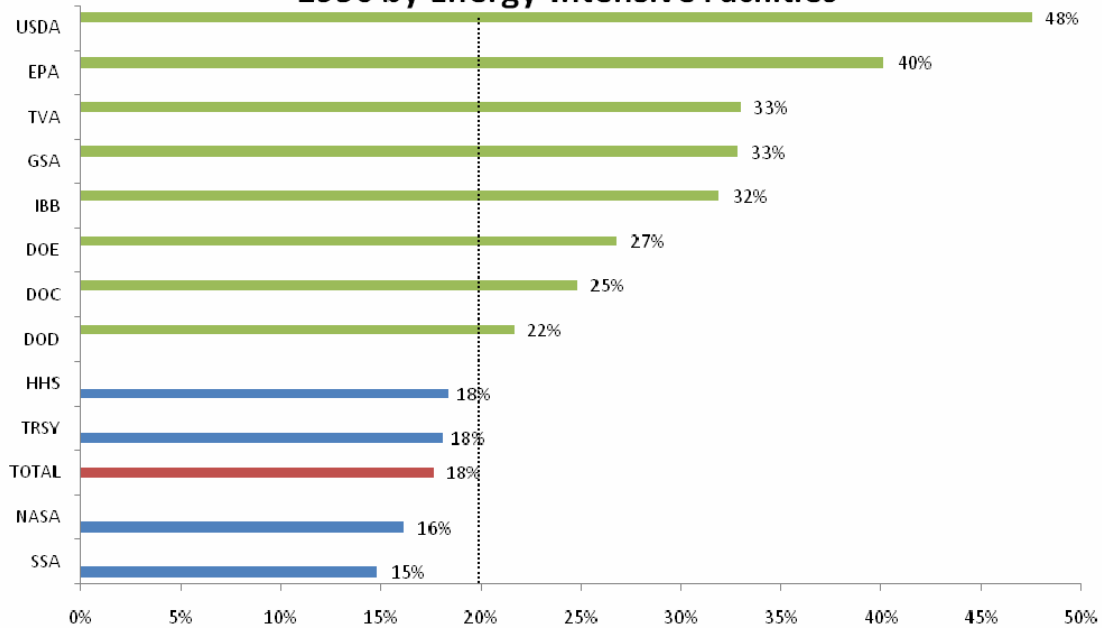
<sup>48</sup> FEMP, *Annual Report to Congress 2005*, Table 3, pg. 15.

**Figure 8 - Individual Agency Reductions in Btu per Square Foot of Standard Building Space in FY 2005 Compared to FY 1985**



Source: FEMP, Annual Report to Congress 2005, Figure 4, pg. 12

**Figure 9 - FY 2005 Btu/Square Foot Reduction from FY 1990 by Energy-Intensive Facilities**



Alliance to Save Energy, 2008; Source: FEMP, Annual Report to Congress 2005, Table 3, pg. 15.

## Holes in the System Reduce Real Savings

At least part of agencies' success meeting earlier reduction targets came from excluding certain facilities. Agencies were allowed to remove energy intensive operations, special use facilities and other types of facilities from their building mix. By doing so, at least one large agency was able to reduce energy consumption by more than the reduction in square footage, thus making it appear that energy intensity had been reduced when in fact some energy intensive buildings had merely been reclassified and excluded.<sup>49</sup>

This problem, which has been an issue since the first energy-intensity goals were implemented, finally may have been addressed by EPLA 2005, which directed DOE to clarify rules regarding exclusion of certain buildings and facilities from energy intensity targets.<sup>50</sup> DOE's guidance, issued in 2006, provided specific rules and definitions for different types of buildings and facilities along with conditions that must be met for agencies to exclude facilities from the energy intensity targets or classify them as energy-intensive facilities. Most importantly, agencies are required to implement all cost-effective energy-efficiency measures in excluded facilities and measure and report all energy use from those facilities.

Agencies wishing to shield certain facilities from the energy intensity reduction requirements will still have some wiggle room. For one, DOE guidance allows agencies to establish alternative energy intensity measures for different types of facilities – thus allowing a manufacturing operation, for example, to measure intensity based on energy per unit of output rather than energy per square foot.<sup>51</sup> This is a reasonable approach as long as agencies are required to establish and comply with alternative intensity measures. Alternative measures of energy intensity are not always clear – for example, opinions differ on the appropriate measure of energy intensity for data center operations.<sup>52</sup>

If agencies actually implement all cost-effective measures in buildings excluded from energy-intensity requirements, as DOE's guidance requires, then there is less reason for concern, since that is ultimately the objective of the intensity reduction requirements in the first place. But determining cost-effectiveness frequently hinges on what assumptions agencies make in their calculations. For instance, as discussed earlier, achieving the energy intensity reduction requirements in EO 13423 could require agencies to make improvements that are not cost-effective given energy prices, but that would be cost-effective if prices increase and/or externality costs are considered in investment decisions. If future costs of energy are underestimated, agencies may fail to implement many measures that become cost-effective once the higher prices take effect.

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<sup>49</sup> Joe Loper, Katie Miller and Mark Hopkins, *Leading by Example: Improving Energy Productivity in Federal Government Facilities*, Alliance to Save Energy, 1998, pg. 16.

<sup>50</sup> *Energy Policy Act of 2005*, Sec. 102(c).

<sup>51</sup> Federal Energy Management Program, *Guidelines Establishing Criteria for Excluding Buildings from the Energy Performance Requirements of Section 543 of the National Energy Conservation Policy Act as amended by the Energy Policy Act of 2005*, U.S. Department of Energy, Energy Efficiency and Renewable Energy, January 27, 2006.

<sup>52</sup> Data center energy use per square foot can be 40-times more intensive than regular buildings. For discussion of the growing energy use in data centers and energy efficiency opportunities, see Joe Loper and Sarah Parr, *Energy Use in Data Centers: A New Policy Frontier*, Alliance to Save Energy, 2006.

Recommendation: Ensure agencies are following the DOE protocol when they exclude buildings from energy-intensity targets. It is especially important to enforce implementation of all available cost-effective measures in facilities that are excluded from the intensity reduction requirements. Compliance with the DOE protocol should be tracked in the Federal Energy Management Annual Report to Congress.

Another problem with the energy intensity reduction requirements is that they are based on site instead of source energy consumption. Site energy includes only the energy consumed at a building or facility and ignores energy consumed by electric power plants to provide electricity to the site, as well as coal and other fuels used to deliver purchased steam. Source energy consumption accounts for both site energy and the energy used in generating and transmitting that energy. The use of site energy for determining reductions in energy intensity can be misleading, since roughly two-thirds of the energy used at a power plant to generate electricity is lost in the conversion and transmission of that electricity to the building where it is used. Site energy in effect counts only one out of every three Btus used in electricity consumption.

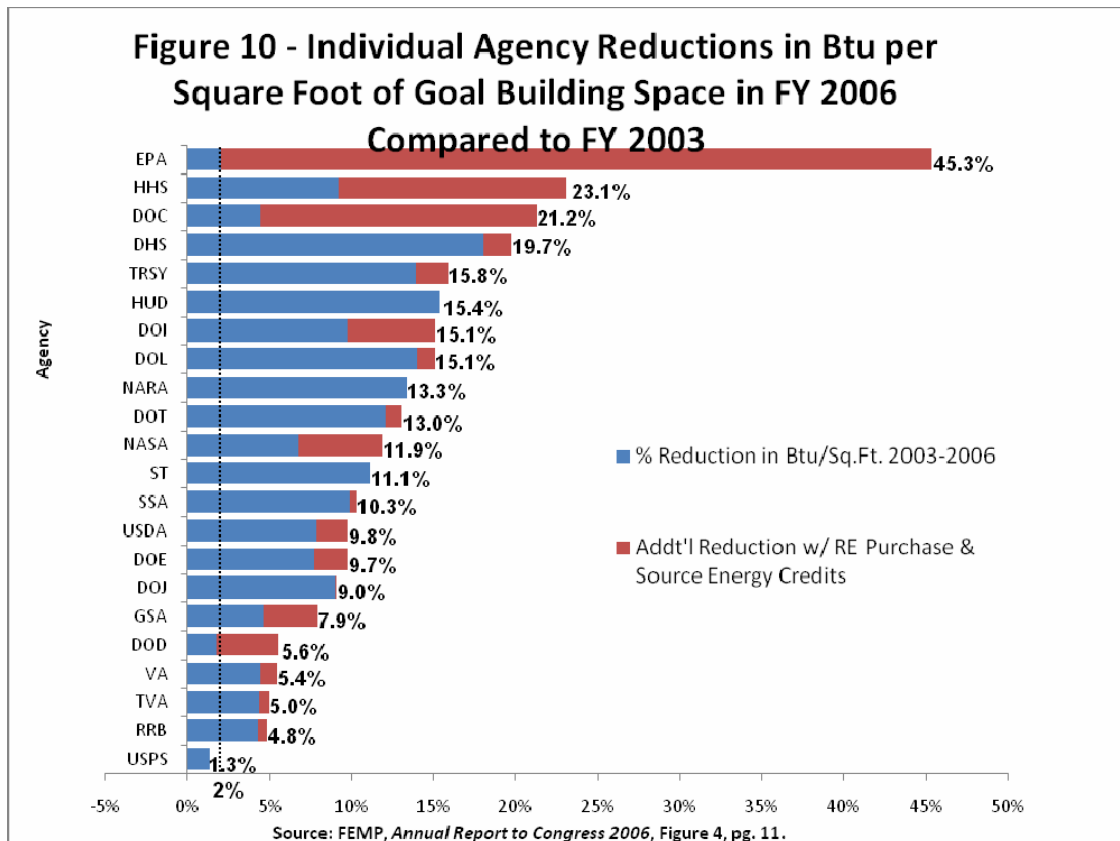
Using site energy as the measure of energy consumption has made compliance with the energy intensity reduction requirements far easier than it would have been using total energy. The site energy metric has masked the massive growth in electric plug loads from computers and other office equipment that occurred in the 1990s, along with growth in air-conditioned federal floor space (especially in warmer climates) and the retiring or outsourcing of electricity and steam generation capacity.

In sum, source energy intensity of federal goal buildings fell a paltry 0.1 percent between 1985 and 2005, nowhere near the site energy intensity reduction of 30 percent.<sup>53</sup> The use of source energy has been opposed by agencies and other stakeholders (like electric utilities), arguing that agencies have no control over energy and emissions associated with offsite generation, transmission, and distribution of electricity or steam. While to a large extent this is true, the objective for energy-saving efforts in the federal government is primarily two-fold: reduce energy costs and reduce energy-related emissions. Using site energy intensity requirements could affect agencies energy management and investment decisions – by shifting from onsite to offsite production of electricity or steam, agencies can reduce site energy use, even though total “source” energy consumption (and costs and emissions) increase. Source energy corresponds more closely to energy costs and emissions.<sup>54</sup>

Recommendation: Source energy should continue to be tracked and reported alongside site energy.

<sup>53</sup> Supporting data to FEMP, *Annual Report to Congress 2006 and Annual Report to Congress 2005*.

<sup>54</sup> Alliance to Save Energy and the Federal Energy Productivity Task Force, *Leading by Example: Improving Energy Productivity in Federal Government Facilities*, 1998, pg. 1-2.



Finally, subtle changes in energy intensity reduction requirements can determine whether agencies meet them. The EPAct 2005 energy intensity reduction requirements were less stringent over the near term than those created under EO 13123. As discussed above, about half of the major agencies would have failed to meet the EO 13123 requirements. However, nearly all agencies met their 2006 requirement under EPAct 2005 of 2 percent below 2003 levels (see Figure 10).<sup>55</sup>

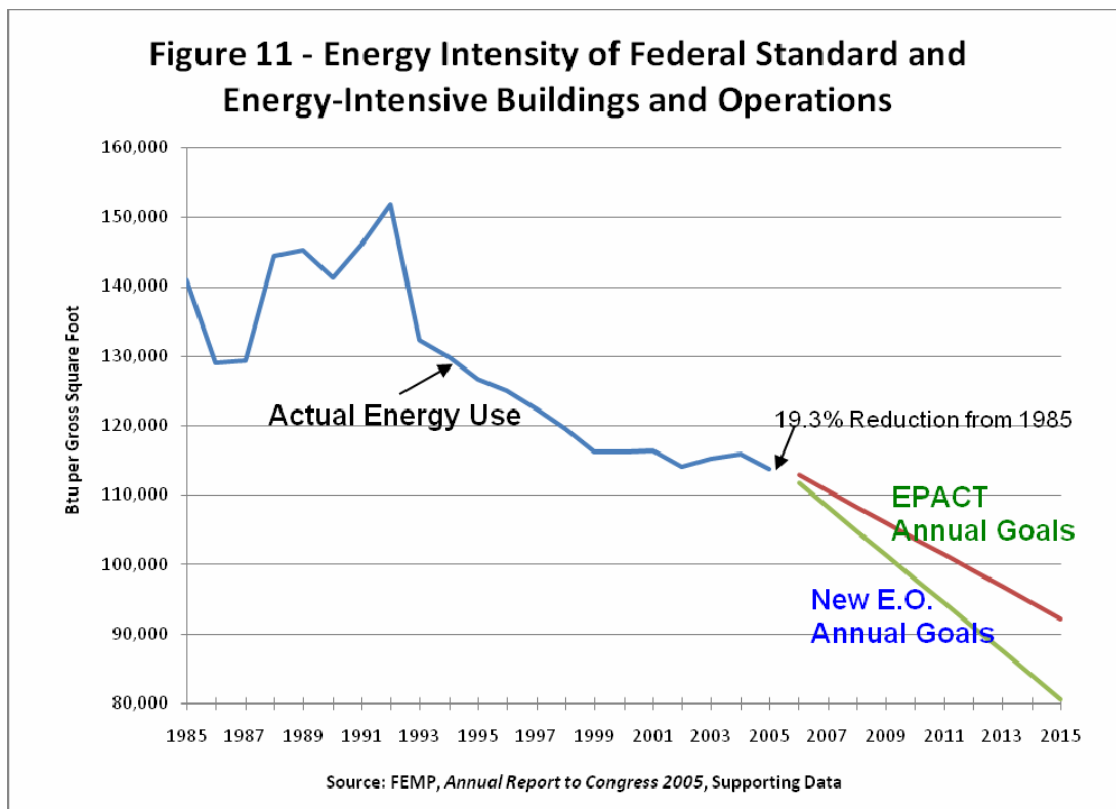
Meeting new intensity requirements will be challenging

As previously noted, the energy intensity reduction requirements in EO 13423 and EISA will be far more challenging than previous reduction requirements, as shown in the figure below. Over the period 1985-2005, agencies reduced overall energy intensity for buildings and energy intensive operations combined by an average of 1 percent per year (see Figure 11). EPAct 2005 would have required twice that rate of improvement for the next decade. EO 13423 and EISA require annual intensity reductions that are three times the historical rate. And the requirements apply to both standard and energy-intensive buildings.<sup>56</sup>

<sup>55</sup> U.S. Department of Energy, Energy Efficiency and Renewable Energy, as used in Beth Shearer, "Leadership in Federal Energy Management," Power Point Presentation.

<sup>56</sup> FEMP, *Annual Report to Congress 2005*, Supporting Data.

Meeting the new requirements will require the use of all available resources and more. In addition, it will require some means for enforcement – as noted above, some agencies have not even met 1995 requirements. There is some precedent for penalties being imposed on agencies for non-compliance with federal environmental laws. According to EPA’s Compliance Report, a million dollars worth of penalties against federal agencies induced \$100 million worth of compliance action in 2003.<sup>57</sup> These enforcement actions appear to be negotiated between EPA and agencies – it is not clear that EPA can actually impose penalties. However, if EPA and an agency can’t come to agreement, EPA can at least draw attention to the agency’s actions (or inactions).<sup>58</sup>



**Recommendation:** Hold periodic Congressional oversight hearings to underscore the importance of meeting targets, understand challenges agencies face in meeting the targets and let agencies know that non-compliance is illegal. Furthermore, OMB should continue and enhance oversight of federal energy management requirements. If an agency is found to be consistently in non-compliance without an acceptable justification (e.g., sudden shift in mission requirements), Congress and/or OMB should impose meaningful penalties, for example restrictions on bonuses of upper management or refusal of capital budget request for new construction until they have shown they are effectively managing the energy performance of their existing facilities.

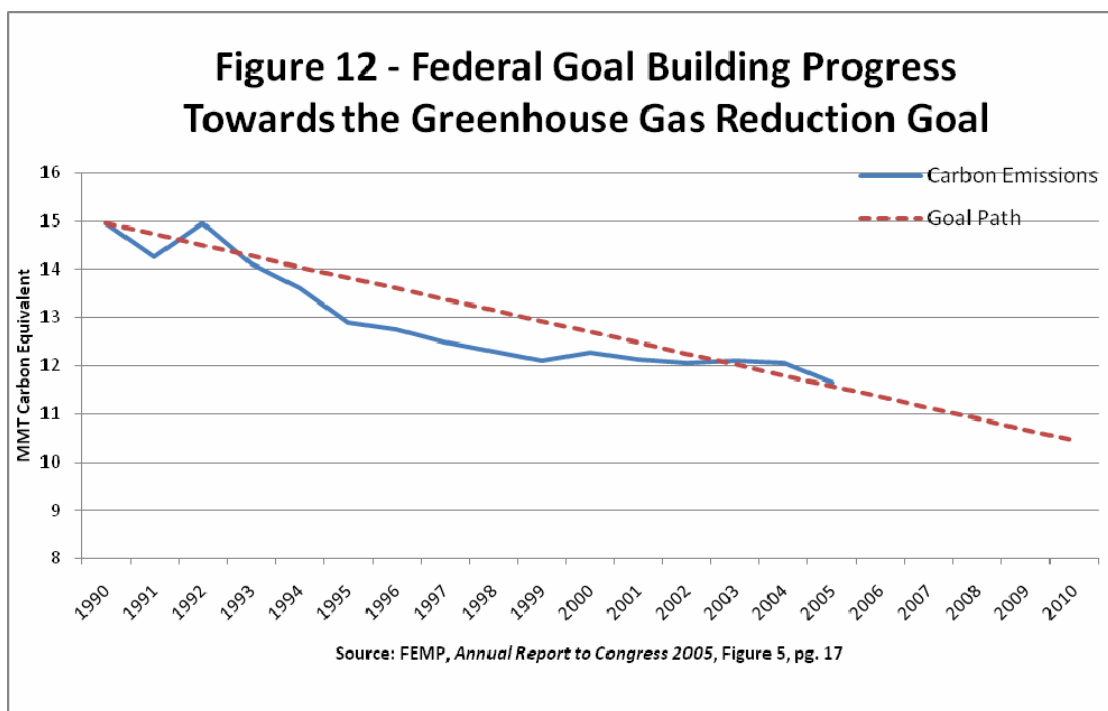
<sup>57</sup> 70 percent of the compliance actions stemmed from one case, however, and 85 percent was from two cases.

<sup>58</sup> Environmental Protection Agency, *The State of Federal Facilities: An Overview of Environmental Compliance at Federal Facilities, FY 2003-2004*, Federal Facilities Enforcement Office, November 2005, Section VI, Exhibit 20, pg. 19.

## 2. Reinstate greenhouse gas emissions goals

Until January 2007, agencies were also subject to greenhouse gas emission reduction goals for their buildings and other fixed facilities. EO 13123 required agencies to reduce their facilities' greenhouse gas emissions by 30 percent by 2010 compared to 1990 levels.<sup>59</sup> Significantly, this was not an energy intensity reduction goal, but rather called for a reduction in absolute emissions. In addition, it included carbon emissions from power plants and other offsite facilities associated with federal energy use.

EO 13423 rescinded the greenhouse gas emissions goal, stating merely that the energy intensity reduction requirements were instituted to “improve energy efficiency and reduce greenhouse gas emissions.”<sup>60</sup> As noted above, since the energy intensity reduction requirements are based on site energy, the intensity reduction requirements may have little correspondence with carbon emissions.

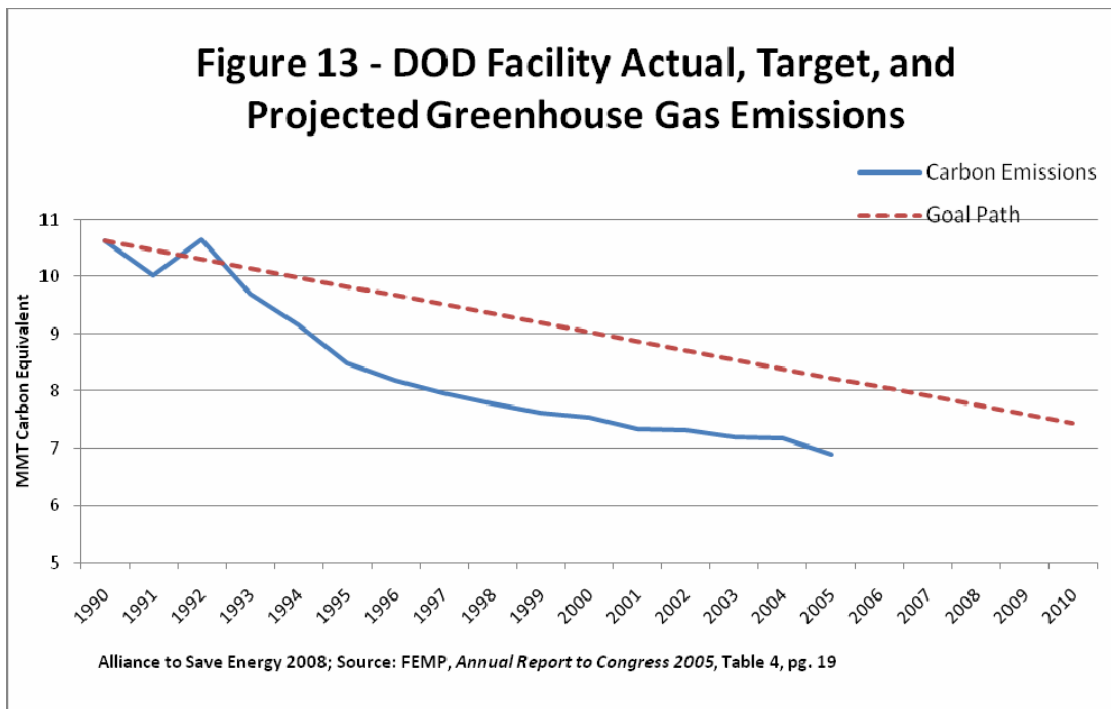


It is unclear whether the government was on track to meet the previous goal for buildings (see Figure 12). While federal agencies on the whole were beating their target emissions targets for much of the 1990s, from 1999 to 2004, emissions levels were unchanged. So although the federal government was still more or less on pace to meet its buildings emission reduction goals in 2005, its emission rates over the previous six years create significant doubt as to whether it could have maintained that pace and achieved the 30 percent reduction target in 2010 without the extensive use of renewable energy credits (discussed below).<sup>61</sup>

<sup>59</sup> FEMP, *Annual Report to Congress*, pg. 17.

<sup>60</sup> President George W. Bush, *Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management, Part II*, Section 2(a).

<sup>61</sup> FEMP, *Annual Report to Congress 2005*, Figure 5, pg. 17.



Civilian agencies were definitely not on pace to meet the greenhouse gas emissions goals. In aggregate, their buildings were responsible for almost 10 percent more greenhouse gas emissions in 2005 than in 1990. Individual agencies not on pace to meet their goals included the second and third largest agency carbon emitters (the Postal Service and Veterans’ Affairs) whose emissions grew by 35 percent and 20 percent, respectively.<sup>62</sup>

DOD at least appeared primed to meet its greenhouse gas emission goals from buildings and facilities; by 2005, DOD emissions were already lower than the 2010 goal mandated (see Figure 13).<sup>63</sup> But these numbers were in large part driven by a 22-percent reduction in floor space in the 1990- 2005 period. While DOD does not explain this decrease in its reports to FEMP, military base closures following the fall of the Soviet Union and privatization of military housing, combined with the purchase of RECs may have driven much of their reductions in square footage, and thus greenhouse gas “reductions.”<sup>64</sup> Of course, any emissions associated with privatized military housing were not eliminated – they simply became part of someone else’s carbon footprint. And emissions avoided through the closure of military bases, if not accompanied by efficiency improvements, will be (and have been) reversed in periods of heightened military activity.

At any rate, the federal government no longer has a greenhouse gas target to achieve or fail to achieve. This is a big omission going forward, doubly so as long as energy intensity targets continue to be based on site rather than source energy. A new greenhouse gas reduction target

<sup>62</sup> FEMP, *Annual Report to Congress 2005*, Table 4, pg. 19.

<sup>63</sup> FEMP, *Annual Report to Congress 2005*, Table 4, pg. 19.

<sup>64</sup> Private Correspondence with Chris Tremper, McNeil Technologies, May 14, 2007.

should also incorporate vehicles and equipment, not just buildings and facilities; vehicles and equipment represent about half of total government CO<sub>2</sub> emissions.<sup>65</sup>

Recommendation: Enact legislation that reinstates greenhouse gas emission reduction targets (better yet, requirements) for all federal agency energy use, including vehicles and equipment.

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<sup>65</sup> FEMP, *Annual Report to Congress 2006*, Table 2, pg. 14 and Alliance calculations from supporting data

### 3. Enforce energy-efficient purchasing requirements

The federal government is the single largest purchaser of energy-consuming products in the world,<sup>66</sup> purchasing about \$10 billion-worth annually,<sup>67</sup> representing 10 percent of total energy-consuming product sales.<sup>68</sup> The efficiency of the computers, exit signs, air conditioners, motors and other equipment purchased today will be a factor in determining the overall efficiency of the federal government for years to come. Furthermore, the federal government's enormous presence in the marketplace allows it to transform markets for efficient products. Through its purchasing choices, the federal government helps manufacturers realize economies of scale for their emerging technologies, thus bringing down their costs.<sup>69</sup>

EPA 2005 required federal agencies to purchase Energy Star or FEMP-designated products, when such products existed and were cost-effective.<sup>70</sup> These requirements were not new, but rather a codification into law of existing Executive Orders.<sup>71</sup> EPA 2005 additionally required written justification from agency heads for any purchases of non-efficient equipment. Energy Star has energy-efficiency designations for more than 50 residential and commercial product categories. For most energy-using product categories that do not have an Energy Star label, FEMP has provided guidance on performance criteria that meet the procurement requirements – although not the actual lists of complying products by make and model numbers, as Energy Star provides.

A recent study by the Alliance to Save Energy suggests that compliance with this requirement remains extremely low. When agencies need to make a large-scale purchase of equipment or appliances, they must post a solicitation for whatever equipment is needed, and accept bids on the sale from vendors. These solicitations go into great detail as to the product specifications. However, despite the legislation requiring it to do so, agencies generally omit energy-efficiency requirements in their specifications. Of the 164 examined government solicitations that included requests for products covered by the energy-efficiency purchasing requirements, only 7 percent appeared to be fully compliant.

The Alliance also talked to 25 government procurement officials, many of whom were listed as contacts on solicitations for products covered by the EPA 2005 regulation. Only two of those 25

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<sup>66</sup> Federal Energy Management Program, "Energy-Efficient Products: Criteria for Developing FEMP's Efficiency Recommendations," January 31, 2007, <http://www1.eere.energy.gov/femp/procurement/>.

<sup>67</sup> Federal Energy Management Program, "Equipment Procurement," February 8, 2007, [http://www1.eere.energy.gov/femp/program/equip\\_procurement.html](http://www1.eere.energy.gov/femp/program/equip_procurement.html).

<sup>68</sup> Jeffrey Harris & Francis Johnson, *Potential Energy, Cost, and CO2 Savings from Energy-Efficient Government Purchasing*, Lawrence Berkeley National Laboratory and Stockholm Environmental Institute, Proceedings of the 2000 ACEEE Summer Study on Energy-Efficient Buildings, August 2002, [http://www1.eere.energy.gov/femp/procurement/eep\\_related\\_pubs.html](http://www1.eere.energy.gov/femp/procurement/eep_related_pubs.html).

<sup>69</sup> For more discussion of federal, state, and local government purchasing opportunities, see Harris and Johnson, pg. 4.147-4.165.

<sup>70</sup> EPA 2005, Section 104.

<sup>71</sup> See, for example, President Bill Clinton, *Executive Order 12902 – Energy Efficiency and Water Conservation at Federal Facilities*, March 8, 1994, Sec. 507.

government employees knew about the energy-efficient procurement requirement in detail and believed they were at least partly responsible for ensuring that the requirement was followed.<sup>72</sup>

Recommendation: Train procurement staff about the energy-efficient procurement requirements. Without further guidance and knowledge about the requirement, the procurement staff will not be able to correctly determine when the energy-efficiency requirements apply. It would also be useful to train staff that regularly request equipment or draw up specifications for procurement requests (engineers/program managers, etc) about these requirements so they can modify their requests accordingly, but training procurement staff should be a higher priority. An oversight agency should ensure that facilities are carrying out environmental management training programs as directed in EO 13423. Top-level support for and focus on these programs will embolden procurement staff to reject non-compliant requests

EPAct Section 104 also required the federal supply agencies, the General Services Administration (GSA) and the Defense Logistics Agency (DLA), to supply only those products complying with the energy-efficient procurement requirements unless they receive a written exception. To date, GSA and DLA have shown similar levels of non-compliance as the rest of the government, failing to list any compliant models on their purchasing websites in 65 percent and 80 percent of the covered product categories, respectively.

While GSA and DLA have made some efforts to identify efficient products that meet the Energy Star and FEMP criteria, it is a major undertaking to keep such designations current. In addition, the accuracy and completeness of product coding for efficiency is far from perfect, especially since vendors are currently responsible for classifying their own products as meeting Energy Star and FEMP designations or not.<sup>73</sup> To date, neither supply agency has been willing to de-list inefficient and outdated equipment, including inefficient air conditioners, refrigerators, lighting and other products that do not comply with energy-efficient procurement mandates, arguing that the buyers should be free to choose a cheaper, less efficient product if they wish, despite the law's direction to the contrary.<sup>74</sup> EISA Section 525 requires GSA and DLA to delist non-compliant products by August 19, 2008 and to label compliant products on their websites.<sup>75</sup>

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<sup>72</sup> Steve Capanna, Selin Devranoglu and Joe Loper, *Outlaw Agencies: Continued Non-Compliance with Energy-Efficient Procurement Requirements*, Alliance to Save Energy, to be finalized in April 2008.

<sup>73</sup> GSA and Energy Star are currently testing a new vendor package that would automatically make these designations for the vendors. To our knowledge, DLA has not participated in an equivalent project. It is considerably more difficult to create a similar project with FEMP, since it provides specifications necessary to comply, not specific model numbers.

<sup>74</sup> For example, GSA Advantage still lists incandescent exit signs. We surveyed lighting experts to see if there was any reason why someone would want to purchase an incandescent exit sign and none could suggest a single reason. Not cost, not architectural design, nothing. There are no up-front cost savings, the energy and maintenance costs are far higher and exit signs using LEDs or CFLs look the same from the outside as the incandescent signs.

<sup>75</sup> The deadline in the law is actually nine months from when the bill was signed into law, which was on December 19, 2007

Recommendation: DLA and GSA may need to continue to list inefficient products along with the compliant products on their online shopping sites, so that agencies with written exceptions can purchase the products they need and so that combat-related purchases can still be made on those sites. These purchases should be the exception, not the rule, however, so the online shopping sites should be redesigned so that queries into their main search engines return only compliant products. If an agency needs a non-compliant product, there should be a separate search engine, much as GSA has a separate Environmental Aisle currently. This change (and others recommended below) should be made by August 19, 2008, to meet the deadline given in Section 525 of EISA.

The Alliance only spoke to a few representatives of companies that sell to government agencies during our research, but they unanimously said that their companies supplied whatever the government asked (compliant or not). Given its enormous purchasing power, vendors have a vested incentive to keep the government satisfied, so there is little reason to doubt vendors who claim they would meet whatever requirements the government makes in a solicitation.

But vendors are also not going to supply a more expensive product than necessary to meet government specifications. So if a solicitation doesn't specify that any products supplied must be Energy Star or FEMP-designated, vendors will bid with their cheapest product that meets the specifications, irrespective of the product's energy efficiency

Recommendation: Make more detailed data on procurement performance of agencies public: Currently, an agency's compliance with the energy-efficient procurement regulations is considered in the Office of Management and Budget's (OMB) energy scorecard. But these scorecards are not available in detail to the public. Publicizing agency performance would give agencies more of an incentive to comply and would allow oversight agencies and advocacy organizations to better gauge agency-level compliance.<sup>76</sup>

In sum, even though federal energy-efficiency procurement requirements have existed since Executive Order 13123 was issued by President Clinton in 1999, compliance with the requirements still remains very low, by all measureable data. Agencies, individual staffers and government shopping websites continue either to not know or not care about this law.

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<sup>76</sup> These and many other recommendations can be found in Capanna, Devranoglu & Loper, *Outlaw Agencies: Continued Non-Compliance with Energy-Efficient Procurement Requirements*.

#### 4. Identify energy-saving opportunities in buildings and facilities

Energy intensity reduction requirements provide measures of performance and accountability for agencies. But it is not always clear how these agency requirements translate into savings and improvements at individual buildings and facilities. It does not make sense to require each facility to reduce its energy use in accordance with its share of the agency's total energy, since facilities will vary in their baseline energy use, in the efficiency improvements they have implemented, and the cost and availability of additional efficiency opportunities.

<b>Table 1 - Percentage of Audited Facility Space as Reported by Agencies on Energy Scorecards</b>		
Agency	percent Audited in 2005	percent Audited since 1992
NARA	45.0 percent	136.0 percent
Treasury	26.0 percent	87.0 percent
CIA	20.0 percent	100.0 percent
Labor	14.0 percent	63.0 percent
NASA	12.7 percent	113.6 percent
DOD	10.7 percent	128.2 percent
GSA	10.0 percent	95.0 percent
HHS	10.0 percent	95.0 percent
DHS	10.0 percent	TBD
State	10.0 percent	100.0 percent
SSA	10.0 percent	100.0 percent
Commerce	8.2 percent	87.1 percent
TVA	8.0 percent	131.0 percent
Interior	4.0 percent	74.2 percent
Justice	3.0 percent	85.0 percent
DOT	2.7 percent	85.0 percent
Energy	2.0 percent	94.0 percent
USDA	1.0 percent	unknown
VA	1.0 percent	36.0 percent
HUD	0.0 percent	100.0 percent
NRC	0.0 percent	100.0 percent
RRB	0.0 percent	200.0 percent
EPA	No reply	72.0 percent
USPS	No reply	70.0 percent
Source: Personal Correspondence, Chris Tremper, McNeil Technologies, May 17, 2007		

Effectively managing building and facility energy use requires knowing where energy is being consumed and identifying opportunities for cost-effective efficiency improvements. This requires a great deal of background knowledge, including current and projected energy use and costs, building and equipment characteristics, potential and/or typical building performance and the cost of installing further improvements. Generally, compiling this information requires both internal and external resources. Facility managers can provide information about the existing state of the facility. Outside consultation is often required to benchmark performance relative to other similar facilities and estimate costs of possible energy-efficiency measures. Metering and submetering major energy uses is often the first step.

Executive Order 12902 directed agencies to audit 10 percent of their building space each year.<sup>77</sup> Overall, agencies report fairly aggressive auditing of their buildings and facilities (see Table 1). Of agencies reporting, VA reported the lowest percentage of space audited at 36 percent; most agencies reported much higher percentages of space having been audited. Of course, the rigor and thoroughness of the audits vary widely. And audits do not necessarily result in energy savings, since the audit recommendations may never be acted upon, despite a legal requirement to implement all measures with simple payback of less than 10 years.

EISA Section 432 requires agencies to audit 25 percent of qualifying building and facility building space each year. The Secretary of Energy is charged with developing the criteria for qualifying buildings and facilities, which at a minimum must comprise 75 percent of facility energy use at each agency. Full implementation of this EISA provision is by no means guaranteed as agencies, and even DOE, have to date shown little enthusiasm for meeting it.

Recommendation: The president should declare the administration's commitment to fully implement this policy, ensure that financial and technical resources are available to agencies to help in compliance, and impose penalties on agencies that fail to demonstrate meaningful progress towards compliance.

Recommendation: DOE should develop a certification and tracking system to ensure the audits meet minimum quality standards and that cost-effective measures identified in the audits are implemented.

FEMP has conducted energy approximately 700 energy audits covering more than 300 million square feet since 1994. They generally have targeted measures with paybacks of five years or less.<sup>78</sup> The FEMP audits have identified \$70 million worth of project opportunities that, if fully implemented, would reduce federal energy costs by \$20 million annually.<sup>79</sup>

FEMP's SavEnergy audits cost about 5 cents per square foot.<sup>80</sup> At that rate, auditing 80 percent of the federal government's approximately 3 billion square feet of facility space<sup>81</sup> would cost about \$120 million – about \$30 million a year if 25 percent of the space was audited each year, as EISA requires.<sup>82</sup> Applying to smaller facilities (thus sacrificing economies of scale) and extending in scope to include longer-term capital investment opportunities could easily double the cost per square foot, but even then the costs would be a small portion of the more than \$1.3 billion annual investment (see Section 8 below) needed to achieve the energy intensity reduction requirements.

<sup>77</sup> *Executive Order 12902*, Sec. 302.

<sup>78</sup> This payback threshold is a curious one since agencies are required in EPACT 1992 to install measures with paybacks of ten years or less.

<sup>79</sup> Personal correspondence, Ab Ream, Federal Energy Management Program, May 17, 2007.

<sup>80</sup> Personal correspondence, Ab Ream, Federal Energy Management Program, May 17, 2007.

<sup>81</sup> FEMP, *Annual Report to Congress 2006*, Table 1, pg. 13.

<sup>82</sup> EISA, Section 432.

Funding for FEMP's SavEnergy audit program was eliminated in 2006, and alternative funding allows FEMP to perform only a few dozen a year. Conducting audits on a large scale as proposed will require technical and other support, especially for smaller agencies. In the past, FEMP went through a time-consuming bid process for each audit and selected the low bid, but not always the best value – a less expensive audit may just be a less thorough audit. Agencies were not given choices, which may have lessened their trust in the audit results.

Recommendation: FEMP's audit program should be reinvigorated. FEMP should set up an Indefinite Deliver Indefinite Quantity (IDIQ) multiple award contract for SavEnergy auditors and let agencies choose who will do the audit.

Advanced metering provides energy managers with the information they need to save energy and money as part of an effective operations and management practice. Beyond simply measuring electricity, gas, steam and water consumption, metering also facilitates bill allocation and energy management. Advanced metering also helps agencies identify energy savings opportunities, comply with energy reduction mandates, verify savings and participate in utility demand reduction programs.

The lack of widespread metering in federal buildings and facilities impedes efforts to identify energy-saving opportunities. EAct 2005 directed agencies to install advanced meters on all federal facilities, to the maximum extent practicable, by 2012, so as to monitor electricity consumption and to identify electricity-saving opportunities.<sup>83</sup> Subsequent guidance from DOE highlighted the need for data management systems in order to use the data collected from the meters to its maximum potential. Basically, the guidance stressed that simply installing a meter on a building would not in and of itself save energy. The DOE guidelines limited the metering requirements to electricity use, thus excluding natural gas, steam and hot or chilled water.<sup>84</sup> EISA, however, expanded the requirement by directing federal agencies to include meters tracking natural gas and steam consumption on all federal facilities by October 1, 2016.<sup>85</sup>

If fully implemented, the metering requirements would encourage and facilitate better energy management of facilities. It is unknown if agencies are on pace to meet these requirements. Agencies were required to submit their electric meter implementation plans to DOE in August of 2006, and most have reportedly done so, but no agency plans have been made available for the general public, and their quality is reportedly mixed.

Recommendation: Agencies and FEMP should provide annual progress reports to Congress, along with specific metering program budget line items. Agencies should demonstrate they are on track to meet the EAct 2005 and EISA metering requirements within the prescribed timeline, that all types of energy consumption is being measured, and that the metered data is being effectively used.

<sup>83</sup> *Energy Policy Act of 2005*, Section 103.

<sup>84</sup> Federal Energy Management Program, *Guidance for Electric Metering in Federal Buildings*, U.S. Department of Energy, Energy Efficiency and Renewable Energy, February 3, 2006.

<sup>85</sup> *EISA*, Section 434.

Resource Efficiency Managers (REMs) are another resource available to help agencies identify and implement energy savings opportunities. REMs are full-time contractors that must generate sufficient savings to pay their salaries. Typically, REMs operate under one-year contracts with agencies having the option to renew. One-year contract cycles encourage REMs to target low and no-cost operations and management opportunities for energy savings, although they provide recommendations for capital improvement projects as well. REMs can be contracted easily using the GSA federal schedule, which has pre-qualified REM contractors. Another advantage REMs have is that they are unlikely to be called on by senior facility managers for unrelated tasks, but rather are left alone to focus on efficiency improvements.<sup>86</sup>

As of September 2006, more than 60 REMs were in place at facilities – mostly DOD – throughout the world.<sup>87</sup> The vast majority of REMs are renewed for multiple years, with some in place for six years or more. One contractor reports average overall savings of four times the REM compensation, in some cases as high as eight to one.<sup>88</sup> The various branches of DOD are increasing the use of REMs at their facilities. By contrast, other agencies appear less aware and tend to rely on employees to identify and implement energy-saving projects and improvements. Two hundred to 400 REMs could be usefully deployed throughout the federal government, six to seven times the current deployment level.<sup>89</sup>

Among the barriers to increased number of REMs are problems securing first-year funding, difficulties with measuring and verifying performance, and the challenge of finding qualified people willing to take temporary assignments. They are not insurmountable, however. First-year funding for REMs has come from a variety of sources, including agency budgets, ESPCs, UESCs and state government grants.<sup>90</sup> Many methods have been developed and used to measure performance – there is no lack of experience on which to draw when developing REM performance metrics. Ultimately, obtaining qualified people may be the greatest obstacle.

Having a dedicated energy efficiency champion is a critical element for a successful energy efficiency program at a federal facility. Few agencies have qualified personnel solely dedicated to identifying and implementing efficiency projects – most energy managers wear several hats and many do not have an energy engineering background. REMs serve as a dedicated champion with the added incentive to maximize energy efficiency improvements and cost savings to keep their jobs.

EISA Section 432 requires that energy managers be designated for federal buildings. REMs could be used to help meet this requirement.

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<sup>86</sup> Energy 2006 Conference, August 2006.

<sup>87</sup> Rick Kunkle, *Federal Resource Efficiency Manager Assessment: Final Report*, Prepared by Washington State University Extension Energy Program for U.S. Department of Energy, September 2006.

<sup>88</sup> Millard Carr, Sain Engineering Associates, personal correspondence, May 18, 2007.

<sup>89</sup> Kunkle, pg. 27.

<sup>90</sup> Kunkle; Malcolm Verdict, personal correspondence, May 18, 2007.

Recommendations: Agencies should be required to specify that experienced personnel are in place at agency headquarters and facilities working to achieve their energy intensity reduction requirements. If staffing is under-qualified or otherwise insufficient, agencies should budget funds to hire qualified REMs at headquarters or major facilities where the potential for accelerated savings justifies the effort. DOE-FEMP should help identify government, utility, ESPC and other resources that can be used to underwrite the first-year budget for the REMs.

## 5. Create binding and understandable requirements for facility managers

The effort and cost associated with performing energy audits and installing advanced electrical metering will be wasted if savings opportunities are not identified and implemented. EPAct 1992 directed all buildings and facilities to implement energy-efficiency measures with simple paybacks of 10 years or less by 2005.<sup>91</sup> However, there was never any measure of accountability or enforcement attached to the requirement, and 10-year paybacks may now be too short.

**Table 2 – Comparison of Service Lives Estimates**

Equipment Item	Median Service Life, Years		Equipment Item	Median Service Life, Years		Equipment Item	Median Service Life, Years	
	Abramson et al. (2005)	Akalin (1978)		Abramson et al. (2005)	Akalin (1978)		Abramson et al. (2005)	Akalin (1978)
<b>Air Conditioners</b>			<b>Air Terminals</b>			<b>Condensers</b>		
Window unit	N/A*	10	Diffusers, grilles, and registers	N/A*	27	Air-cooled	N/A	20
Residential single or split package	N/A*	15	Induction and fan-coil units	N/A*	20	Evaporative	N/A*	20
Commercial through-the-wall	N/A*	15	VAV and double-duct boxes	N/A*	20	<b>Insulation</b>		
Water-cooled package	>24	15	Air washers	N/A*	17	Molded	N/A*	20
<b>Heat pumps</b>			<b>Ductwork</b>	N/A*	30	Blanket	N/A*	24
Residential air-to-air	N/A*	15 <sup>b</sup>	<b>Dampers</b>	N/A*	20	<b>Pumps</b>		
Commercial air-to-air	N/A*	15	Fans	N/A*	20	Base-mounted	N/A*	20
Commercial water-to-air	>24	19	Centrifugal	N/A*	25	Pipe-mounted	N/A*	10
<b>Roof-top air conditioners</b>			Axial	N/A*	20	Sump and well	N/A*	10
Single-zone	N/A*	15	Propeller	N/A*	15	Condensate	N/A*	15
Multizone	N/A*	15	Ventilating roof-mounted	N/A*	20	<b>Reciprocating engines</b>	N/A*	20
<b>Boilers, Hot-Water (Steam)</b>			<b>Coils</b>			Steam turbines	N/A*	30
Steel water-tube	>22	24 (30)	DX, water, or steam	N/A*	20	Electric motors	N/A*	18
Steel fire-tube		25 (25)	Electric	N/A*	15	Motor starters	N/A*	17
Cast iron	N/A*	35 (30)	<b>Heat Exchangers</b>			Electric transformers	N/A*	30
Electric	N/A*	15	Shell-and-tube	N/A*	24	<b>Controls</b>		
<b>Burners</b>	N/A*	21	<b>Reciprocating compressors</b>	N/A*	20	Pneumatic	N/A*	20
<b>Furnaces</b>			<b>Packaged Chillers</b>			Electric	N/A*	16
Gas- or oil-fired	N/A*	18	Reciprocating	N/A*	20	Electronic	N/A*	15
<b>Unit heaters</b>			Centrifugal	>25	23	<b>Valve actuators</b>		
Gas or electric	N/A*	13	Absorption	N/A*	23	Hydraulic	N/A*	15
Hot-water or steam	N/A*	20	<b>Cooling Towers</b>			Pneumatic	N/A*	20
<b>Radiant heaters</b>			Galvanized metal	>22	20	Self-contained		10
Electric	N/A*	10	Wood	N/A*	20			
Hot-water or steam	N/A*	25	Ceramic	N/A*	34			

\*N/A: Not enough data yet in Abramson et al. (2005). Note that data from Akalin (1978) for these categories may be outdated and not statistically relevant. Use these data with caution until enough updated data are accumulated in Abramson et al.

Source: ASHRAE, *HVAC Applications Handbook, SI Edition*, 2007, Table 4, pg. 36.3, using B. Abramson, D. Herman & L. Wong, *Interactive Web-based owning and operating cost database*, TRP-1237, 2005 & M.T. Alkalin, "Equipment life and maintenance cost survey," *ASHRAE Transactions*, 1978, 84(2), pgs. 94-106.

Given the more aggressive energy intensity reduction targets and growing concerns about climate change, agencies will need to pursue all cost-effective project opportunities. Combining individual measures with simple paybacks of 12 to 15 years and less would generally create projects with simple paybacks of seven to 10 years. Ten-year simple payback projects with 4.5 percent financing (roughly the cost of federal borrowing) would pay off in 14 or 15 years, which is within the life of most energy-using equipment in buildings and thus makes it likely that project costs would be recouped within the equipment life (see Table 2).<sup>92</sup> Of course, the life

<sup>91</sup> *Energy Policy Act of 1992*, Section 152.

<sup>92</sup> ASHRAE, *HVAC Applications Handbook, SI Edition*, 2007, Table 4, pg. 36.3, using B. Abramson, D. Herman & L. Wong, *Interactive Web-based owning and operating cost database*, TRP-1237, 2005 & M.T. Alkalin, "Equipment life and maintenance cost survey," *ASHRAE Transactions*, 1978, 84(2), pgs. 94-106.

expectancy of most energy-using equipment or energy-saving measures (e.g., controls) will depend on how well the equipment is operated and maintained.

EISA does not require implementation of measures identified in the audits. Section 432 authorizes implementation of all life-cycle cost effective measures, but does not require it.

Recommendation: Agencies should implement all measures identified in the audits that have a simple payback of less than 12 years. The calculation of net savings should consider not only energy and water costs but also operations, maintenance, repair and replacement costs. Congress should enact legislation requiring agencies to implement all cost-effective measures.

As the basis for an inventory of energy-saving opportunities and to certify that audits have been completed, audit results need to be tracked centrally and the raw data needs to be converted into a form that is informative for agencies in managing their facility energy use. EISA Section 432 instructs DOE to develop this audit-tracking and certification system.

Energy Star's Portfolio Manager is a national building energy performance rating system that facilitates comparisons of individual buildings over time (to help track the effects of efficiency improvements, or to ease the transition between facility managers) and allows buildings to be benchmarked against other buildings.

The Portfolio Manager database contains private sector buildings, federal buildings and non-federal public buildings, including offices, courthouses, financial buildings, hospitals, schools and more. Almost 6,000 buildings have been rated to date.<sup>93</sup> Buildings in the top 25 percent of each category are eligible for the Energy Star label. As of March 31, 2008, 179 federal buildings and nearly 4,400 buildings overall had received the Energy Star label.<sup>94</sup>

Portfolio Manager can be used to convert data from the central tracking system into information that agencies can use to manage their facilities.

Recommendation: The President should provide DOE with resources to ensure the tracking system is created and fully implemented. DOE should consider using the Portfolio Manager as a core strategy for converting raw data into useful information.

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<sup>93</sup> Energy Star, "Service Providers Offer Automated Benchmarking," data as of January 23, 2007, [http://www.energystar.gov/index.cfm?c=spp\\_res.pt\\_spps\\_automated\\_benchmarking](http://www.energystar.gov/index.cfm?c=spp_res.pt_spps_automated_benchmarking), retrieved May 21, 2007.

<sup>94</sup> Energy Star, "Energy Star Labeled Buildings and Plants," [http://www.energystar.gov/index.cfm?fuseaction=labeled\\_buildings.showBuildingSearch](http://www.energystar.gov/index.cfm?fuseaction=labeled_buildings.showBuildingSearch), retrieved March 31, 2008.

## 6. Achieve carbon-neutral (zero net energy) new federal construction by 2030

### New Federal Buildings

EPAct 2005 mandated a significant advance in building energy efficiency by requiring that new federal buildings – if life-cycle cost-effective – be 30 percent more energy-efficient than the model energy codes (ASHRAE Standard 90.1 for non-residential buildings and the International Energy Conservation Code (IECC) for residential buildings).<sup>95</sup> The final rule on Section 109 of EPAct, issued by DOE in December 2007, generally met the intended goal of the EPACT-2005 provision.<sup>96</sup> However, there are a few aspects of the rule which could be altered slightly to strengthen the energy savings resulting from the provision.<sup>97</sup>

While the new federal standard represents a major step forward for federal construction practices, other leading professional and industry organizations, private firms and individuals are beginning to commit to even more aggressive long-term goals, as evidenced by the recent announcements of the American Institute of Architects (AIA), ASHRAE, the U.S. Green Building Council and the U.S. Council of Mayors, based on the “Architecture2030 Challenge,” to pursue policies targeting 30 to 50 percent energy and carbon reductions for new buildings by 2010, and 100 percent (“net-zero” annual energy use or carbon-neutrality) by 2030.<sup>98</sup> A number of mayors of U.S. cities have adopted similar policy commitments to significantly reduce energy use in their own civic buildings and in private commercial buildings. In this light, a more aggressive set of long-term federal goals for new construction is needed not only to maintain a federal leadership role, but merely to keep up with other initiatives by states, local governments and the private sector.

With passage of the EISA legislation in December 2007, federal agencies were given a new set of performance requirements for their new buildings, which must be designed to reduce fossil fuel-generated energy use by 55 percent as of 2010, increasing to 100 percent (or a “zero-fossil-fuel” building) by 2030. The baseline for such reductions is energy consumption by a similar building in 2003, as reported by the DOE Energy Information Administration’s Commercial (or Residential) Energy Consumption surveys (CBECS and RECS).<sup>99</sup>

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<sup>95</sup> *The Energy Policy Act of 2005*, Section 109.

<sup>96</sup> Department of Energy, *Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings*, Office of Energy Efficiency and Renewable Energy, Federal Register, Vol. 72, No. 245 December 21, 2007, pg. 72565-72571.

<sup>97</sup> Many of our suggested changes are included in the recommendations in this section. Our full list of suggested changes, which we submitted to DOE in comments to the interim final rule, are discussed in the final rule, and reproduced in their entirety at Rulemaking Title: Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings, Docket Number: EE-RM/STD-02-112, Closing Date: February 2, 2007, pgs. 20-31, [http://www2.eere.energy.gov/femp/pdfs/ee\\_rm\\_std\\_02\\_112.pdf](http://www2.eere.energy.gov/femp/pdfs/ee_rm_std_02_112.pdf).

<sup>98</sup> [www.architecture2030.org](http://www.architecture2030.org).

<sup>99</sup> Energy Information Administration, *2003 Commercial Buildings Energy Consumption Survey*, <http://www.eia.doe.gov/emeu/cbecs/contents.html> and Energy Information Administration, *Residential Energy Consumption Survey*, <http://www.eia.doe.gov/emeu/>.

These new requirements are generally consistent with the goals of the Architecture2030 Challenge mentioned above, and at least in later years are more stringent than the “30 percent below model energy code” requirements of EPAct 2005. However, the EISA statutory wording raises a number of conceptual and practical issues that need to be resolved by DOE rulemaking or by guidelines issued in consultation with the newly created GSA Office of Federal High-Performance Green Buildings:

- Baseline – Does the phrase “similar building in 2003” refer to the average building (of that type) in the 2003 stock or the average newly constructed building?
- Building type – CBECS and RECS do not include all of the specialized building types in the federal stock and, while some data are reported separately for federal versus non-federal buildings, energy use information is not available for all building types in the federal stock, or for federal buildings by type and by region. In some cases where RECS or CBECS data are not available in sufficient detail, additional benchmarks will need to be established using computer simulations or additional data gathering.
- End uses – As interpreted by the DOE Final Rule, the 30 percent savings target in EPAct 2005 (compared with the IECC residential model code or the ASHRAE-90.1 commercial standard) applies only to “covered” end-uses, typically space conditioning, lighting and hot water. However, the EISA targets evidently apply to ALL energy used in the building (and reported in CBECS and RECS).
- Fuel source – EISA refers to “fossil fuel-generated energy consumption,” which presumably includes fossil fuel used indirectly at the power plant to meet a building’s electricity needs. But is the fuel content of electricity determined based on a national average? A regional average? On a marginal basis rather than an average (i.e., based on the last-added or next-needed generating source)? Or on a time-of-use basis? Last, how will the baseline level be set, for fossil-based electricity of a “similar building in 2003”? (By region, time-of-use, average or marginal fuel mix, etc. – or should that baseline use the 2003 level of electricity but the current-year fuel mix of electricity?)
- Green power – Similarly, how will green power be treated in calculating the reduction in fossil-fuel based energy? Could a building qualify without reducing its primary energy use below the baseline – or even increasing it – but simply by shifting to an all-electric building that purchases green power from the local utility (or Renewable Energy Certificates)? If green power purchases are allowed to meet part or all of the required reductions in fossil fuel electricity, how would this relate to agencies’ existing purchases of green power? Can a new building simply claim some of the green power already being purchased by that agency, or does it have to make incremental purchases in order to count this green power toward meeting its goal of reducing “fossil fuel-generated energy?”<sup>100</sup>
- Net-zero energy – Does the requirement by 2030 of a “100 percent reduction” in fossil fuel-generated energy mean that a building cannot qualify if it is net-zero on an annual basis – and uses some fossil fuel-generated electricity from the utility grid but makes up for this by producing excess renewable power at other times (from on-site wind or PV for example) and supplying this excess energy back to the grid?

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<sup>100</sup> Note that federal purchases of green power in 2005 already substantially exceeded the goal of 2.5% of total power purchases: actual green power was 2375 GWh compared with a requirement for 1395 GWh – see [http://www1.eere.energy.gov/femp/renewable\\_energy/renewable\\_fedrequire.html](http://www1.eere.energy.gov/femp/renewable_energy/renewable_fedrequire.html).

For all these reasons, it is not yet clear whether the EISA requirements as of the early years, beginning in 2010, are more stringent or less stringent than the existing EAct 2005 requirement. This is the most time-urgent need for additional analysis and guidance from DOE (and now GSA), since many planning and budgeting decisions are underway for buildings that will begin construction (or renovation) in 2010.

Achieving net-zero consumption in new federal buildings may not be cost-effective in the near-term, but significant steps in this direction are feasible with today’s commercial or near-commercial technologies, combined with thoughtful integration of energy efficiency and sustainability principles early in the design process, effective quality control during construction, post-construction commissioning, and proper operation and maintenance practices.

**Recommendation:** Federal policy should be to achieve net-zero energy use and carbon neutrality in new federal buildings by 2030. DOE/FEMP should be directed to develop milestones and a strategic plan to achieve these long-term goals. The specific provisions of the recent DOE efficiency standards for new federal buildings also should be strengthened in specific ways, as listed below.

DOE’s final rule on Section 109 of EAct specifies that federal agencies need not design buildings that are more stringent than 30 percent beyond the applicable code. However, EAct Section 109 mandates that agencies construct buildings “at least 30 percent below” code (emphasis added). The spirit of the law directs agencies to achieve the greatest energy savings possible, subject to life-cycle cost-effectiveness.<sup>101</sup>

**Recommendation:** DOE should clarify to agencies that the 30 percent savings goal (beyond current codes) represents a floor, not a ceiling, and that new federal facilities should be designed and built to maximize cost-effective energy savings, even beyond 30 percent. The initial performance levels in the DOE rulemaking should be reviewed and updated at least every five years – sooner if there has been a change in the ASHRAE Standard 90.1 or IECC model codes.

As with virtually all federal energy management requirements, a major roadblock to achieving the potential energy savings will be ensuring agency awareness and compliance.

**Recommendation:** DOE, in cooperation with OMB and other agencies, should take steps to assure that these new energy standards are widely disseminated and incorporated into standard practice by federal agencies and their design firms. OMB should assure that new project proposals are carefully reviewed for compliance prior to funding approval.

A separate section of EAct 2005 requires that all equipment specified and installed in federal construction or renovation projects must meet Energy Star® or FEMP-designated energy efficiency criteria.<sup>102</sup> Many of these federal specifications for energy-efficient equipment are more stringent than the minimum prescriptive requirements in ASHRAE Standard 90.1 and

<sup>101</sup> Department of Energy, *Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings*.

<sup>102</sup> *The Energy Policy Act of 2005*, Section 104.

IECC that are included by reference in the federal building standards. These requirements are not explicitly referred to in DOE's final rule on Section 109, however, which may confuse or mislead federal agencies.<sup>103</sup>

Recommendation: The requirements that new federal buildings must include efficient Energy Star or FEMP-designated equipment should be included directly in the text of the federal building energy conservation standards.

### Major Renovations, Leased Federal Buildings and Privatized Military Family Housing

While previous legislation and the DOE Final Rule implementing the EPCA 2005 provisions for new federal buildings did not state whether these energy standards applied to major building renovations as well as to new construction, the language in EISA specifically includes "major renovations" and directs DOE to establish criteria for which renovation projects are covered. Similarly, EISA goes beyond previous legislation (and the DOE Final Rule) by extending the regulations to built-to-lease federal buildings, including privatized military housing.

In addition to government-owned buildings, GSA and federal agencies also lease a large number of buildings, many of which are built specifically for federal use based on long-term lease commitments. Other buildings, such as privatized military housing,<sup>104</sup> are built for the government and often with government assistance. One way or another, taxpayer funds pay for the energy used in these buildings – whether through direct payment of utility bills or by paying for these costs indirectly as part of the rent. Either way, the government has a vested interest in the energy performance of its leased space.

Many federal agencies occupy existing buildings as tenants, with the leases often arranged by GSA. EO 13123 required that agencies:

"...incorporate lease provisions that encourage energy and water efficiency wherever life-cycle cost-effective. Build-to-suit lease solicitations shall contain criteria encouraging sustainable design and development, energy efficiency and verification of building performance. Agencies shall include a preference for buildings having the Energy Star<sup>®</sup> building label in their selection criteria for acquiring leased buildings. In addition, all agencies shall encourage lessors to apply for the Energy Star<sup>®</sup> building label and to explore and implement projects that would reduce costs to the Federal Government, including projects carried out through the lessors' Energy-Savings Performance Contracts or utility energy-efficiency service contracts."<sup>105</sup>

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<sup>103</sup> Department of Energy, *Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings*.

<sup>104</sup> The Department of Defense was authorized in 1996 to enter into long-term agreements with private developers to replace or renovate about 180,000 family housing units over a multiyear period, with long-term leases to the military and monthly rental costs to be paid by each serviceperson's federally funded Base Housing Allowance. See <http://www.acq.osd.mil/housing/mhpi.htm>.

<sup>105</sup> Executive Order 13123, *Greening the Government through Efficient Energy Management*, June 3, 1999, Section 403.

While this earlier Executive Order was rescinded by EO 13423 (which has no similar provision governing energy efficiency in leased federal buildings), provisions in EISA call for federal agencies to lease space only in Energy Star rated buildings (those in the lowest quartile of energy use per square foot of floor space) or if no such leased space is available, to include in the lease agreement provisions to install lighting, equipment and building envelope efficiency upgrades that are cost-effective within the term of the lease.

Even once construction is completed for a privatized housing complex, these units will continue to be occupied for years, perhaps decades. Regular renovation and equipment replacement cycles offer important opportunities for efficiency upgrades with the added costs rolled into monthly payments but more than offset by what military families save on monthly utility bills. Energy and water audits can identify energy-saving opportunities in existing privatized military housing units.

Recommendations: 1) DOE should work with GSA and DOD to provide additional guidance and training to federal procurement officials to assure that they understand how to apply the new building performance standards to major building renovations and built-to-lease facilities, including privatized military housing. 2) For privatized housing projects under contract but with some units not yet in construction, DOD should modify the contracts to include these efficiency requirements. 4) For all privatized military family housing already completed and occupied (or well along in design and construction), DOD should identify and implement all energy-saving retrofit measures for the building envelope and equipment that are cost-effective for the remaining term of the DOD lease.<sup>106</sup> 5) DOD should modify existing privatized housing lease agreements to require installation of Energy Star and FEMP-designated products when replacing appliances, building mechanical equipment, or other building components (such as windows or roofs).

Many years of experience by federal agencies have demonstrated that start-up commissioning of building energy systems is essential to assure that the intended energy performance is actually achieved. Periodic re-commissioning is also needed to identify and recalibrate faulty equipment, and to take advantage of performance monitoring and verification. Re-commission (or retro-commissioning) has shown whole-building savings of 10 to 15 percent.<sup>107</sup> Re-commissioning by Texas A&M University of over 40 million square feet in federal, state, commercial and institutional buildings, show an average payback of 25 to 30 percent.<sup>108</sup>

Recommendation: The DOE building standards should be revised to require that federal agencies employ building start-up commissioning practices tailored to the size and complexity of the building and its systems in order to verify performance and ensure that design requirements are met. Federal agencies should be required to re-commission buildings over 50,000 square feet every five years or more frequently as indicated by performance tracking. Finally, Congress

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<sup>106</sup> An Energy Star Homes rating (or equivalent) would be suitable evidence of incorporating energy efficiency in the initial design and construction.

<sup>107</sup> Mills, E. et al. 2004. *The Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States*. LBNL Report LBNL-56637. <http://eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html>

<sup>108</sup> M. Verdict, Texas A&M University, personal communication, May 2007.

should include funding for start-up commissioning in agencies' construction and renovation budgets.

Energy metering is much easier and cheaper to install at time of construction than to retrofit. At a minimum, electrical circuits and thermal distribution systems can be designed to make future permanent metering or spot-measurements feasible.

Recommendation: DOE should update the federal building standards to add a requirement that every new, renovated or built-to-lease building be metered at the whole-building level for all forms of energy, and that buildings over a specified size (or peak kW demand) must include advanced (interval) electricity meters as well as submetering of major equipment and end-uses. (Also see the recommendations in the previous section on metering federal facilities.)

Design intent does not always lead to verified performance in actual buildings as constructed, occupied and operated. The availability of metered data is only a first step; these data are of little use unless they are tracked over time and compared with meaningful benchmarks of each building's performance, the energy use of similar buildings and design targets or other goals tailored to that facility.

Section 432 of EISA requires that energy data collected at all federal buildings where energy audits are performed (which must combine to represent at least 75 percent of each agency's facility energy consumption) must be entered into a benchmarking system, such as Energy Star's Portfolio Manager. The benchmarked data must be made public.

Recommendation: Ensure agencies submit metered data to Portfolio Manager or another benchmarking system, and update the public data regularly.

As the federal building energy standards are updated, they should include provisions to make building systems more adaptable to new and emerging technologies. Examples of technology readiness that can be designed into a new building at much lower cost than a later retrofit include demand-responsive HVAC controls, circuitry designed for solar PV or plug-in hybrids, plumbing and roof structures prepared for retrofitting solar water heating, and space or access for ground-source heat pump systems.

Recommendation: Update the federal building energy standards periodically to ensure that buildings are technology ready to incorporate new and emerging technologies, as applicable.

Recommendation: Congress could direct GSA and other agencies to dedicate a specified portion of their capital acquisition (and operating) budgets to investments in promising new emerging technologies that will save energy. A starting point could be 0.1 percent, growing to 0.5 percent with experience and success in the early stages.<sup>109</sup>

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<sup>109</sup> Note that the intention to use federal buying power to create or expand entry markets for new energy-saving technologies is not a new idea; similar provisions were included in the Energy Policy Act of 1992, Sec. 152.

## Government and Institutional Use of Tax Incentives

EPAct 2005 included a special provision to allow government agencies at all levels to take advantage of the tax deduction for new commercial property (whole buildings or energy-efficient building components or equipment) even though they do not pay federal taxes, by assigning the tax benefit to the “person primarily responsible” for design of the building or energy-efficient equipment.<sup>110</sup> Unfortunately, this provision has yet to receive much attention or use from government agencies or non-profit organizations, partly because it is a relatively new concept, partly due to the long delays in issuance of IRS guidelines (which were just released in March 2008),<sup>111</sup> and partly due, perhaps, to the uncertainty whether the 2005 tax provisions will be extended beyond 2008.<sup>112</sup>

Recommendation: Federal agencies should lead the way in using this special tax provision for public buildings, to help defray the costs of incorporating energy efficiency and sustainability principles early in the design process as well as to pay for start-up commissioning and perhaps other energy-related activities to improve the energy efficiency features of new federal buildings.

## Smart Growth Criteria in Siting New Federal Facilities

Just as building design impacts the energy use in federal buildings, the location of federal buildings can have a dramatic impact on the travel energy use of employees and members of the public who need to access federal buildings as clients or as citizens. This impact is often multiplied as federal buildings attract additional residential and commercial development and infrastructure.

There are about 2.7 million federal employees.<sup>113</sup> The average automobile commute trip is about 15 miles/day,<sup>114</sup> so gasoline use by federal civilian employees is about 440 million gallons/year<sup>115</sup> – more than direct annual consumption of gasoline use by federal agencies.<sup>116</sup>

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<sup>110</sup> *The Energy Policy Act of 2005*, Section 1331.

<sup>111</sup> A link to the IRS guidance can be found at the Tax Incentives Awareness Project, “IRS Regulations,” 2005-2008, [http://www.energytaxincentives.org/general/irs\\_regs.php](http://www.energytaxincentives.org/general/irs_regs.php).

<sup>112</sup> The tax credit as written in EPAct was set to expire at the end of 2007. Congress extended the credit through 2008, and several bills to further extend its life have been introduced in the US Congress but none have been voted on thus far. Still, it is widely assumed that the credit will eventually be extended, as it enjoys the support of advocates, industry, and many members of Congress.

<sup>113</sup> US Census Bureau, “Federal Government Civilian Employment by Function,” December 2006, <http://ftp2.census.gov/govs/apes/06fedfun.pdf>.

<sup>114</sup> DOE reports average commute length of 12.1 miles, or 24.2 miles round trip, but our number, while possibly low, also allows for current ridesharing and transit use. Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book, Edition 26*, Oak Ridge National Laboratory, U.S. Department of Energy, Energy Efficiency and Renewable Energy, 2006, Table 8.8, pg. 8-10.

<sup>115</sup> Assuming the average fuel economy of the vehicles of federal employees mirrors that of the population at large – 21.5 mpg in 2006, according to the *Transportation Energy Data Book*, Table 4.8, pg. 4-8 – then each employee uses 0.7 gallons per day. Assuming the federal government is open 260 days a week, but that each employee gets an average of 3 weeks’ vacation and 2 weeks’ sick leave, then each employee works 235 days per year:  $0.7 * 2.7 * 235 = 443$  million gallons of gasoline.

<sup>116</sup> Total federal gasoline consumption in 2005 was about 380 million gallons. FEMP, supporting data to *Annual Report to Congress 2006*.

And added to this is the gasoline used by millions of Americans who come to federal offices and other facilities for Social Security, employment and health care services, just to name a few.

Recommendation: Require a transportation energy impact assessment for each new or expanded federal facility over 50,000 square feet or employing more than 100 people. The impact assessment should include direct (employee, client and public) travel as well as induced travel (for local service/support contractors, support services for employees, freight deliveries, etc.).

### Congressional Leadership

Congress must demonstrate its commitment to energy efficiency. Speaker of the House Nancy Pelosi's Greening of the Capitol initiative is a good start, but to capture and sustain all potential energy savings will require a long-term commitment of resources and congressional attention. While Section 503 of EISA required the architect of the capitol to include energy efficiency and conservation, greenhouse gas emission reduction and other environmental measures to the maximum extent practicable in the Capitol Complex Master Plan, this requirement is vague enough that it does not ensure efficiency or greenhouse gas emission reductions in the Capitol Complex.

Recommendation: Congress should commit to energy-efficiency provisions in its buildings, vehicle use and procurement practices that are at least as stringent as the energy savings targets and requirements that other federal agencies have to meet – thus making the capitol complex a model for energy efficiency within the federal government.

## 7. Strengthen renewable energy targets

Executive Order 13123 established the first renewable energy goal for federal agencies, requiring that, by 2005, 2.5 percent of federal facility electricity consumption should come from projects or purchases of renewable energy acquired after 1990. EPAct 2005 extended the renewable electricity requirement, requiring agencies to use renewable energy sources for 3 percent of their electricity use in 2007-2009, 5 percent in 2010-2012 and 7.5 percent in 2013 and thereafter.<sup>117</sup> Executive Order 13423 specified that at least half of the renewable energy used to meet this requirement must come from renewable energy sources acquired after January 1, 1999.

In 2006, agencies were required to use renewable energy to meet 2.5 percent of their electricity consumption. Although the goal is based on federal electricity consumption, non-electric renewable energy use – steam or heat from biomass – can be counted toward the requirement.<sup>118</sup> In 2006, 2.5 percent of site-delivered Btu federal electricity consumption was equal to about 4,700 billion Btu, equal to about 1,380 GWh.<sup>119</sup>

In aggregate, federal agencies were exceeding the 2006 goal by 2004, and in both 2005 and 2006 were generating or purchasing renewable energy equivalent to nearly 7 percent of their electricity consumption, up from almost 3 percent in 2004.

The rate of growth in renewable energy use was not nearly as great as it appears – much of the 2004-2005 increase was due to DOD recognition of waste to energy and geothermal facilities that it had not counted previously. And in 2006, about 70 percent of the renewable electricity was purchased using renewable energy credits. Renewable energy generated onsite still represented only a little more than 2 percent of total electricity consumption.<sup>120</sup>

About 65 percent of agencies exceeded the 2.5 percent requirement (see Figure 14)<sup>121</sup>, but they represented nearly 85 percent of federal electricity consumption. And notably, in 2006 EPA had sufficient RECs to cover all its electricity purchases – including leased space where it doesn't pay for electricity.<sup>122</sup>

DOE allowed agencies to count purchases of RECs towards their 2006 energy intensity requirements. This, in effect made the 2006 intensity requirement far less stringent. For example, EPA's site energy intensity in 2006 would have been 1.99 percent below 2003 (the EPAct baseline) – it would have just barely failed to achieve the required 2 percent per year reduction. But EPA's aggressive purchasing of RECs allowed them to show energy intensity reductions of 45 percent – in effect meeting 15 years worth of the 3 percent annual intensity reduction requirements.<sup>123</sup>

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<sup>117</sup> EPAct 2005, Section 203.

<sup>118</sup> FEMP, *Annual Report to Congress 2005*, pg. 20.

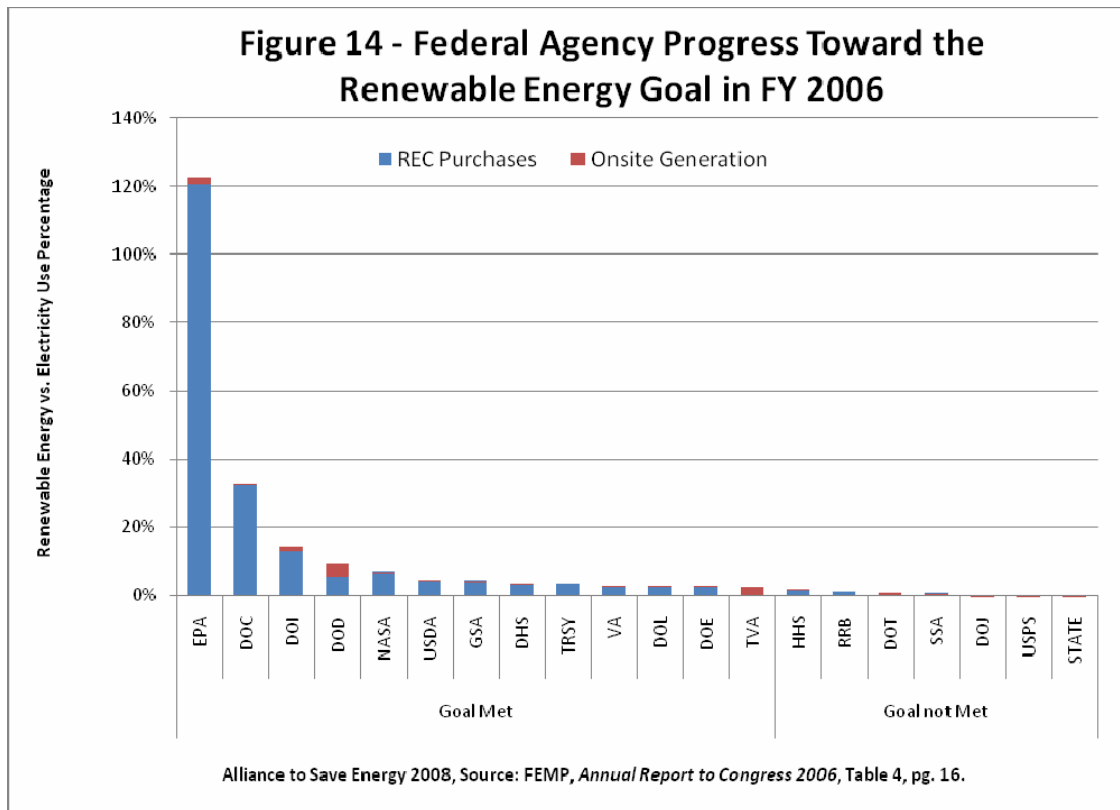
<sup>119</sup> FEMP, supporting data to *Annual Report to Congress 2006*.

<sup>120</sup> FEMP, *Annual Report to Congress 2006*, Figure 5, pg. 17.

<sup>121</sup> FEMP, *Annual Report to Congress 2006*, Figure 5, pg. 17.

<sup>122</sup> U.S. Environmental Protection Agency, *Energy Management and Conservation Program: Fiscal Year 2006 Annual Report*, December 18, 2006, pg. 50.

<sup>123</sup> FEMP, supporting data to *Annual Report to Congress 2006*.



DOE’s guidance on renewable energy credits, released in January 2008, phases out the use of RECs for meeting energy intensity requirements, allowing agencies to meet 60 percent of their 2008 goal through RECs, 40 percent of the 2009 goal, 20 percent of the 2010 goal, and 10 percent of the 2011 goal. RECs are not allowed to be counted towards agency energy intensity goals for any subsequent years. Long-term renewable energy purchases of 10 years or more that contribute to developing new renewable energy generation are allowed to meet a slightly higher percentage of the energy intensity requirements through 2011, but their eligibility also expires in 2012. The use of on-site renewable generation to meet the energy intensity requirements is not restricted.<sup>124</sup>

Counting RECs toward energy intensity targets (and even renewable energy requirements) is somewhat controversial. For one, there is a question whether the RECs stimulate additional renewable energy generation or if they simply take credit for renewable generation that already is occurring. If the latter is the case, then the RECs may represent little or no real value in terms of emissions reductions. However, once the demand for RECs exceeds the amount of existing renewable energy then they could induce additional investments in renewable generation.

**Recommendation:** On-site generation of renewable energy – but not renewable energy credits – should be allowed to count towards the energy intensity requirement.

<sup>124</sup> Federal Energy Management Program, *2007 Federal Energy Management Program (FEMP) Renewable Energy Requirement Guidance for EPACT 2005 and Executive Order 13423 Final*, U.S. Department of Energy, January 28<sup>th</sup>, 2008, pgs. 14-15, [http://www1.eere.energy.gov/femp/pdfs/epact05\\_fedrenewenergyguid.pdf](http://www1.eere.energy.gov/femp/pdfs/epact05_fedrenewenergyguid.pdf).

Acquiring 7.5 percent of electricity through renewable energy does not appear too difficult for agencies to meet. In fact, government-wide the goal has almost been met. If EPA is at all representative of the federal government's ability to increase its use of renewable energy, far more aggressive requirements would probably be achievable.

Recommendation: DOE should conduct an assessment of the feasibility and cost of more aggressive renewable energy goals and a reasonable schedule for achieving them. The renewable energy requirements should be adjusted based on that study.

As more agencies increase RECs purchases, verifying that they really represent renewable energy production will become increasingly important. EPA uses the Green-e Renewable Electricity Certification System wherever available to endorse its purchases of renewable energy credits.<sup>125</sup> In order to achieve Green-E certification, at least 50 percent of the electricity in green power products must come from renewable energy and that the remaining sources minimize adverse environmental impacts.<sup>126</sup>

Generation attribute systems are already in place in most of the country. These systems track RECs and other environmental attributes, including related air emissions, generation fuel and location. They ensure that each REC is only used once, and that it has been certified by a credible organization.<sup>127</sup>

Recommendation: All renewable energy credits used to meet agency renewable energy requirements should be endorsed by Green-e or a similar organization, and should be tracked through a central trading platform.

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<sup>125</sup> Environmental Protection Agency, *Green Power*, December 2001.

<sup>126</sup> Environmental Protection Agency, *EPA Region 9 Purchases Renewable Power*, Environmentally Preferable Purchasing, November 7, 2007, <http://www.epa.gov/epp/pubs/case/grnpwr.htm>.

<sup>127</sup> APX, "Environmental Registries & Banking," 2008, <http://www.apx.com/environmental/environmental-registries.asp>.

## 8. Use all available means to fund energy projects, including appropriations, ESPCs and UESCs

An investment of almost \$11 billion through 2015, or about \$1.3 billion per year over the next eight years, likely will be needed to meet current energy targets and reap the associated energy and carbon savings.<sup>128</sup> This investment is far greater than recent annual appropriations for energy efficiency, water conservation and renewable energy projects in existing federal buildings, which have ranged from only about \$100 million to \$300 million. Through 2015, at existing appropriations, the federal government would therefore be facing a cumulative budget shortfall of up to \$8 billion.<sup>129</sup> While agencies are required to include appropriations requests for energy efficiency investments in their annual budgets, they often fail to do so.

Recommendation: The President should encourage agencies to request and the Office of Management and Budget to include appropriations requests for energy-efficiency investments in annual budgets.

Appropriations for energy-efficiency improvements historically have been insufficient to exploit more than a small fraction of the energy-saving opportunities in federal facilities.<sup>130</sup> In response, EPAct 1992 authorized agencies to upgrade buildings using energy services performance contracts (ESPCs) and utility energy services contracts (UESCs). Under an ESPC, energy service companies (ESCOs) finance and implement energy-saving projects in federal facilities. The ESCO guarantees the savings will be realized. By law, the savings must be at least as great as the contractor payments – if the savings are not realized, the contractor does not get paid. The contract periods may be up to 25 years, and there is no limit on the amount of investment that can be provided.

UESCs allow electric and gas utilities to provide financing for energy-efficiency projects, as well as offer rebates and technical assistance to federal agencies through their demand-side management programs. Similar to ESPCs, utility investments under UESCs are repaid from the utility bill savings due to the projects.

Agencies have relied heavily on these alternative financing sources, which have provided funding for nearly half of the federal efficiency investments made since 1985. Of the \$6.3 billion invested in energy-efficiency improvements by the federal government since 1985, \$3.19 billion has come from appropriations, \$1.95 billion has come from ESPCs and \$1.16 billion has come from UESCs.<sup>131</sup> At their peak a few years ago, ESPCs and UESCs were providing more than \$500 million per year for energy-efficiency investments in federal buildings and facilities

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<sup>128</sup> Site energy savings in 2015 from the energy intensity reduction requirements would equal about .098 quads. Investment costs in energy efficiency projects are roughly \$1 per almost 9,000 Btus saved. This works out to almost \$11 billion cumulatively and about \$1.3 billion per year over the next 7 years. “Super ESPC Awarded Delivery Orders Summary,” provided by Chris Tremper, McNeil Technologies, 4/12/2007; Supporting data to FEMP, *Annual Report to Congress 2006*.

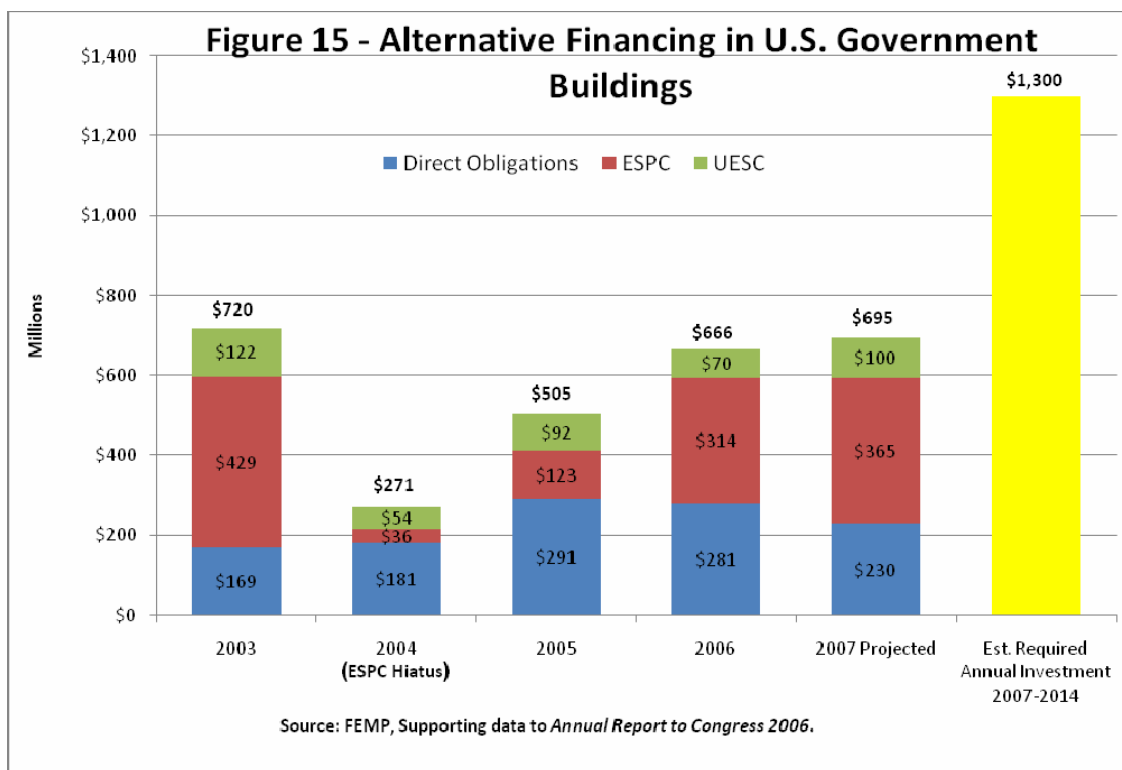
<sup>129</sup> See Figure 6. Cumulative shortfall is calculated by assuming appropriated funds for energy efficiency will remain around \$300 million annually, about \$1 billion short of the needed investment. \$1 billion for eight years is about \$8 billion.

<sup>130</sup> Loper, et al, *Leading by Example*, Figure S2, pg. 4.

<sup>131</sup> Private Correspondence with Alicia Collier, Honeywell, May 14, 2007.

(Figure 15).<sup>132</sup> Cumulative net savings from ESPCs alone are estimated at \$1.4 billion, with annual savings of 17.6 trillion Btu,<sup>133</sup> equal to about \$290 million per year.<sup>134</sup>

In September 2003, authority to enter into new ESPCs lapsed. This authority was reinstated by Congress in 2004, extended through 2016 in EPAct 2005,<sup>135</sup> and made permanent in EISA.<sup>136</sup> The use of these financing tools has nearly bounced back to previous levels. While investments in ESPCs and UESCs remained considerably lower in Fiscal Year 2005 than they had been before the authority expired, by Fiscal Year 2006, investments through ESPCs totaled \$314 million, while UESCS totaled \$70 million. Projections for Fiscal Year 2007 are even higher (Figure 15). The drop off in alternative financing of government efficiency projects in Fiscal Years 2004 and 2005 most likely led to fewer implemented efficiency improvements during those years. The dramatically reduced level of ESPCs corresponds with the authority lapse. The drop-off in UESCs is less clear.



**Recommendation:** Encourage agencies to aggressively pursue ESPCs and UESCs. DOE should be directed and empowered to work with all agencies to identify barriers to greater use of alternative financing mechanisms and provide alternative action to overcome them.

<sup>132</sup> FEMP, supporting data to *Annual Report to Congress 2006*.

<sup>133</sup> Federal Energy Management Program Fact Sheet, "Super ESPC – Just the Facts," July 2007, [http://www1.eere.energy.gov/femp/pdfs/espc\\_fact\\_sheet.pdf](http://www1.eere.energy.gov/femp/pdfs/espc_fact_sheet.pdf).

<sup>134</sup> Average cost per million Btu of energy in federal facilities is \$16.62. Alliance to Save Energy calculation from FEMP, *Annual Report to Congress 2006*, Table A-9, pg. 79.

<sup>135</sup> *Energy Policy Act of 2005*, Section 105.

<sup>136</sup> *EISA*, Section 514.

UESCs allow electric and gas utilities to provide financing for energy-efficiency projects, as well as offer rebates and technical assistance to federal agencies through their demand-side management programs. Similar to ESPCs, utility investments under UESCs are repaid from the utility bill savings due to the projects.

Use of UESCs has been hampered by a couple of factors. For one, UESC contract periods are generally limited to 10 years. Despite a longstanding GSA legal opinion to the contrary, agencies are unwilling to extend UESC contract periods beyond 10 years, allowing for implementation of the most comprehensive energy projects that can include renewable energy technologies. A basic lack of awareness among agencies of the availability of the UESC vehicle also hampers its use. And state public utility commissions have seldom been willing to offer real incentive for utilities to participate in UESC programs. Consequently, agencies' use of UESCs is minimal and many utilities have shifted their focus to their core business and no longer see the value in providing UESCs to customers.<sup>137</sup>

FEMP is working to improve communication and education among partners and stakeholders. A greater level of technical assistance is being made available to help kick-start UESC projects. FEMP is also increasing awareness of the UESC vehicle, including support for the Federal Utility Partnership Working Group. The group has 400 members representing the federal government, the utility industry and other stakeholders and works to improve partnerships between the federal agencies and their local utility companies. The group provides federal agencies guidance on making wise utility management and acquisition decisions. The group has developed the Performance Assurance guidelines that are being used by federal agencies, which requires a performance guarantee in their UESC projects.<sup>138</sup>

Recommendation: Enact legislation to establish contracts terms up to 25 years based on life-cycle cost effectiveness criteria (as opposed to simple payback criteria for energy measure selection). Any project over 10 years should be subject to a performance guarantee in line with the FEMP's Performance Assurance Guidelines.

Investments in ESPCs and UESCs will need to be accelerated quickly to fill the projected funding shortfall of almost \$8 billion through 2015.<sup>139</sup> To meet the energy intensity requirements over the next seven years could require annual alternative financing equal to \$1 billion annually, almost twice the combined annual investments from ESPCs and UESCs at their peak.

Ultimately, the successful use of alternative financing requires a champion – a committed official who is able and willing to overcome bureaucratic bottlenecks and internal lack of support for projects, demonstrate project benefits and accept criticism if a project falls short of goals. There tends to be a shortage of agency personnel knowledgeable about alternative financing methods. ESPCs and UESCs can be complicated and are not the typical way that services and products are procured by the federal government. Successfully implementing an ESPC or UESC requires knowledge in many areas, including energy-efficiency technology, finance, federal contracting

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<sup>137</sup> Personal correspondence, Karen Thomas, National Renewable Energy Laboratory, May 31, 2007.

<sup>138</sup> Personal correspondence, Karen Thomas, National Renewable Energy Laboratory, May 31, 2007.

<sup>139</sup> See page 47 for details.

rules and baseline development. Some agencies, especially large ones, have staff with strong knowledge and experience with alternative financing, but most do not. And where that knowledge exists, it can be lost quickly as staff moves on to other positions.

**Recommendation:** All major agencies should have at least one person on staff or available under contract at each major facility who has knowledge of and experience with ESPCs and UESCs.

For nearly a decade, DOE-FEMP, along with DOE regional offices and the national laboratories, provided sustained support to help agencies and facilities trying to negotiate ESPC contracts. Over the last couple years, DOE's support capability has been allowed to erode as the regional offices have been closed and national lab resources for technical support of ESPCs and UESCs has declined dramatically.

**Recommendation:** Reaffirm as one of DOE's major responsibilities the assistance of other agencies to meet the energy program goals and rebuild FEMP's technical support capacity (regional offices and laboratory support capabilities) to help agencies develop and implement ESPCs and UESCs in a timely and efficient manner. The annual level of effort required to meet the current targets will be more than three times the level of effort required over the last 20 years. FEMP's budget should be increased in proportion to the overall level of effort required by the federal government at large to reflect the importance of FEMP's technical assistance role.

Some types of energy-efficiency measures may be less suitable for private financing. Appropriated funds may make more sense for some types of measures or projects. ESCOs and utilities may be reluctant to fund measures with lengthy payback periods, such as renewable energy systems and building shell improvements. Appropriated funds could be used to pay for maintenance, continuous commissioning and other measures related to the installation of capital equipment under an ESPC to ensure savings are sustained. Finally, appropriated funds could be used to pay for the monitoring and verification costs associated with ESPC and UESC projects; this would ensure these functions are performed while limiting the associated financing costs.

Various legislative funding authorities (provided in many cases by different congressional committees with different agendas) prohibit the mixing of fund sources in many instances. In some cases, it is unclear whether the prohibition exists and agencies have self-imposed restrictions to play it safe.<sup>140</sup> EISA gave explicit authority to agencies to combine various sources of funding (ESPCs and appropriations) for energy efficiency projects.<sup>141</sup>

**Recommendation:** Ensure agencies are aware that they are explicitly allowed to mix appropriations with ESPC funds.

The basis for 25-year, multi-million dollar ESPCs is guaranteed savings in excess of the cost to the federal government. Ensuring due diligence before and during ESPC projects is key to the credibility of these alternative financing mechanisms. Reasonable monitoring and verification requirements can reduce risks to both parties, identify non-functioning or sub-performing

<sup>140</sup> Personal correspondence with Millard Carr, May 14, 2007.  
<sup>141</sup> EISA, Section 512.

projects, and enhance the use of ESPCs. There are many opportunities to reduce costs associated with verification of energy savings since the cost of meters such as thermal insertion meters, third-party data collection devices that are web-accessible and emerging technologies such as wireless metering networks have dropped significantly.

On the other hand, continuing to waste energy as a result of *not* doing an energy efficiency project is probably the most costly course of action. Excessive monitoring and verification requirements can impede the use of ESPCs and thus discourage projects.

Recommendation: DOE should continue to work with ESCOs and utility companies to identify and reduce barriers to the use of ESPCs and other alternatively financed projects and enhance their value for the federal government.
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## 9. Expand policies to include federal transportation and military energy use

Almost all of the federal energy-efficiency targets, policy requirements and programs address energy use in federally owned buildings or other facilities. While this focus has contributed to significant improvements in energy efficiency in the past 20 years, it also neglects about 45 percent of the federal government's primary energy use and half its greenhouse gas emissions – those from fuel used in transportation vehicles and mobile equipment.<sup>142</sup> This mobility energy is consumed both by the military and by a range of other agencies with field deployment requirements for disaster relief and recovery, environmental protection, scientific research, federal lands management, border protection, mail delivery and so on.

### Goals for Mobility Energy Savings

For buildings, energy-efficiency goals call for 3 percent annual reductions in energy intensity, which (absent significant growth in total floor space) may translate into reduced greenhouse gas emissions.<sup>143</sup> Executive Order 13423 created a separate federal requirement for 2 percent/year savings through 2015 in petroleum used by federal fleet vehicles, which was codified in Section 142 of EISA.<sup>144</sup> However, fleet vehicle petroleum consumption accounts for less than 20 percent of total mobility energy use (and greenhouse gas emissions) by federal agencies.<sup>145</sup> EO 13423 and EISA also call for agencies to increase their consumption of non-petroleum-based fuel by 10 percent annually,<sup>146</sup> and EO 13423 directs federal agencies to purchase plug-in hybrid vehicles when they are commercially available and life-cycle cost-effective compared with conventional vehicles.

But even achieving these relatively modest energy reduction goals will mean that federal agencies must sharply reverse recent trends. After a significant decline in the early 1990s, total federal mobility energy consumption changed relatively little until it began to rise significantly from 2002 to 2005, corresponding to the military build-up. However, even excluding all fuel used for DOD vehicles, ships and planes, total vehicle operations consumption by civilian agencies also increased 6 percent from 1990 (45.7 trillion Btu) to 2006 (48.3 TBtu).<sup>147</sup> Although this represents only 7 percent of federal vehicle operations energy consumption, it seems to indicate that there are savings opportunities available throughout the federal government's transportation energy use. And while fuel requirements for military ships, planes and other transport and combat functions will continue to rise and fall with the level of defense mobilization, it is likely that military petroleum consumption could be reduced through efficiency and other measures regardless of the level of mobilization.

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<sup>142</sup> Vehicle operations account for 44 percent of federal primary energy consumption, and 50 percent of federal greenhouse gas emissions. FEMP, *Annual Report to Congress 2006*, Tables A-1 and A-8, pgs. 72 and 78, and supplemental data to the report.

<sup>143</sup> As explained above, because the energy intensity reduction requirements are for site energy consumption, they will not necessarily be accompanied by proportionate greenhouse gas reductions (if agencies switch from natural gas boilers to greater use of coal-generated electricity, for instance.)

<sup>144</sup> Section 142 actually requires federal fleets to reduce petroleum use by 20% annually, but this is an error which is likely to be corrected in a technical correction bill later in 2008.

<sup>145</sup> Based on the percentage of gasoline and diesel oil, out of total federal energy use for vehicles and equipment, as reported in FEMP, *Annual Report to Congress 2006*, Table A-8, pg. 78.

<sup>146</sup> EISA, Section 142.

<sup>147</sup> FEMP, *Annual Report to Congress 2006*, Table A-7, pg. 77.

Recommendation: The federal government should adopt an aggressive goal of reducing petroleum use for all mobility functions through a combination of energy-efficient hardware and operations, and an accelerated transition to alternative, low-carbon fuels. As a starting point, the same 3 percent/year reductions as apply to federal buildings should be implemented for all federal mobility energy use. FEMP should be directed to work with DOD and other federal agencies to conduct a detailed assessment of energy-saving opportunities for the federal mobility sector, both military and civilian, and to recommend to Congress and the President modified goals for 5-, 10-, and 20-year periods.

#### Accounting for the Full Delivered Cost of Fuel

Fuel use for federal mobility can be reduced by investments in upgrading the efficiency of aircraft, ships and field equipment powered by petroleum-fueled generators. DOD values fuel savings based on the wholesale refinery price, not taking into account the cost of delivering the fuel to where it will be consumed. The full delivered cost of fuel can be many times the market price of fuel.<sup>148</sup>

It is not enough for the government to begin using activity-based costing to determine the fully burdened cost of fuel to compare options internally; requests for proposals and source selection criteria for contracts also must use the same full-cost accounting methods. Otherwise, suppliers will fail to offer competitive products that reflect the higher value of efficiency, since the government purchases systems from the private sector and many of the decisions regarding design features and technologies used are made by suppliers.

Recommendation: Agencies should be required to implement all cost-effective energy-saving measures, using the full delivered cost of fuel to calculate energy saving measures that are cost-effective. All federal agency requests for proposal for fuel-consuming systems should instruct bidders to use the fully burdened cost of fuel in all cost/benefit analyses. Source selection criteria should use the fully burdened cost of fuel in life-cycle cost estimates, and best-value procurement decisions should also be based on the fully burdened cost of fuel.

#### Alternative Financing for Mobility Energy Efficiency

Third-party performance contracting, including ESPCs and UESCs, can only be implemented in federal buildings or facilities. There is no reason why these programs, described in detail above, could not be used to finance efficiency improvements in vehicles and mobile systems as well, with the initial investment repaid from carefully measured and verified energy cost savings (and in some cases, other operating cost savings such as reduced repair and maintenance). However, determining savings may be difficult as the use of vehicles and mobile equipment can vary over time, even more than for buildings. The fuel savings from the measures also may be used for other purposes, such as more training with weapons systems, rather than yielding monetary savings.

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<sup>148</sup> Defense Science Board (2001), *More Capable Warfighting Through Reduced Fuel Burden*, and Defense Science Board Task Force on DoD Energy Strategy, *More Fight – Less Fuel*, February 2008, pg. 28.

Recommendation: Congress should authorize a series of pilot projects to apply alternative finance mechanisms to energy-saving measures in DOD and other federal mobility systems. The results should be carefully monitored and evaluated, and reported annually to Congress. OMB, in consultation with DOD, DOE, and other affected agencies, should develop initial guidelines for these pilot projects, including measurement and verification of savings. OMB should also report progress to Congress annually and recommend within three years whether the authorization for mobility-sector ESPCs should be extended or made permanent.

### Low-Carbon Fuel Standard

Transportation represents about a third of national greenhouse gas emissions.<sup>149</sup> A transition to low-carbon alternative fuels would significantly reduce this percentage. The federal government can facilitate this transition by maintaining strong research, design, development and deployment activities, but it can further spur the transition economy-wide by increasing the percentage of its consumption represented by alternative fuels.

While the existing provision in EO 13423 and EISA, which requires federal agencies to consume increasing amounts of non-petroleum-based fuels, attempts to realize this goal, it is not ideal. While increased use of alternative fuels will be an important component of meeting the petroleum-based fuel reduction requirements, mandating an increase in net energy consumption from any energy source seems counter-intuitive and counter-productive.<sup>150</sup>

Recommendation: Create a low-carbon fuel standard requiring a steadily declining carbon content of fuel use by both DOD and civilian agencies. This would replace the provision in EO 13423 and EISA, which mandates an increased share of non-petroleum fuel and would also specify that these non-petroleum fuels be significantly lower in carbon emissions than the diesel and jet fuel they are replacing. Energy efficiency measures that reduce total fuel consumption should be counted as contributing to the carbon portfolio reduction goals.

### Vehicle Fleet Efficiency Requirements

California has adopted greenhouse gas emissions standards for light- and medium-duty passenger vehicles, vans and trucks. Although these standards are now in litigation, other states (representing about one-third of the U.S. car market) have agreed to adopt the same standards, as has Canada. The principle way of achieving these reduced emissions, at least in the near-term, would be through selection of more fuel-efficient vehicles in each size category. California's standards will reduce greenhouse gas emissions 22 percent by 2012 and 30 percent by 2016, compared to 2002; so presumably, a similar federal sector fleet standard would achieve similar proportional savings.<sup>151</sup> Typical federal fleet efficiency and greenhouse gas emissions gains from choosing California-compliant models would be on the order of 30 percent once the fleet has completely turned over.

<sup>149</sup> EIA, *Annual Energy Outlook 2008*, Table A18.

<sup>150</sup> EISA, Section 142.

<sup>151</sup> Pew Center on Global Climate Change, *State and Local Net Greenhouse Gas Emissions Reduction Programs*, "Greenhouse Gas Standards for Vehicles", , " <http://www.pewclimate.org/states.cfm?ID=51>.

Recommendation: Regardless of the outcome or timing of litigation, all federal agencies should be directed to begin purchasing or leasing only vehicles that meet the California carbon emissions standards.

### Local-use Vehicles

Many agencies operate campus-like installations and use fleet vehicles to conduct essential functions. Examples include hospital complexes, research campuses, military installations and others. Speed limits are usually low and distances are usually short, meaning most vehicular functions can be accomplished using electric rather than petroleum powered vehicles. Electric vehicles can be recharged overnight, thus lowering petroleum consumption, reducing operating costs and in most cases reducing net carbon emissions. For functions for which electric vehicles are not appropriate, hybrid vehicles or other small, fuel-efficient vehicles likely are. A widespread government shift to these more fuel-efficient vehicles would have the effect of stimulating the market for electric vehicles, hybrids and investments in technologies to improve the cost and performance of these vehicles.

Recommendation: For vehicles fleets used exclusively in a campus or military installation setting, agencies should be required to use electric vehicles where life-cycle cost-effective. If electric vehicles cannot meet the functions required, then hybrids or other high-mileage vehicles appropriate for the vehicle's purpose should be the next choice.

### Improved Fuel Measurement

“What gets measured gets managed” is a proven and well used business management phrase. Although federal agencies are required to reduce fuel consumption in vehicle fleets by 2 percent per year, not all agencies track fuel use at a sufficiently disaggregated level, making it more difficult to develop an effective strategy or program to achieve the goals.

In the case of vehicles and other mobile equipment intended for field mobilization under combat conditions, natural disasters or other difficult circumstances, it may be impractical to keep careful records using conventional methods. DOD and civilian agencies could cooperate to develop innovative, low-cost technologies such as radio-frequency identification tags to automatically associate individual vehicles or other mobile equipment with fueling station drawdown records.

Recommendation: Agencies should use data on fuel consumption at the vehicle level as a management tool for the purpose of identifying and prioritizing their efforts and investments to achieve the requirement of the executive order, and should jointly develop and deploy new sensing and information management technology to accomplish this in a cost-effective manner.

### Flexible Workplaces and Schedules

Besides siting new federal facilities and buildings in accessible locations (as discussed earlier) federal agencies can reduce commuter energy consumption by encouraging telecommuting or compressed scheduling (in which employees work more hours per day, but fewer days per

week). About 4 million to 6 million Americans telecommute at least once a week, reducing gasoline use,<sup>152</sup> but more than 97 million workers (76 percent) drive to work alone, and only 3.2 percent work at home.<sup>153</sup> If half of all federal employees telecommuted one additional day per week – or used compressed scheduling – commuting vehicle miles traveled could be reduced by 10 percent, saving more than 44 million gallons of gasoline annually.<sup>154</sup>

This probably overstates the potential savings somewhat, since most studies conclude that some of the travel-related energy reductions would be offset by teleworkers moving farther from their workplace or other types of travel increases. And the net building energy impacts (more energy at home, less energy at the workplace) associated with working at home would need to be considered, although the effects are likely negligible.<sup>155</sup>

Recommendation: Direct agencies to encourage federal employees to work from home or use compressed scheduling at least once every two weeks.

Finally, agencies can be directed to undertake specific actions and join government-wide initiatives to help achieve mobility savings. For example:

- A directive to buy hybrids<sup>156</sup> and other high-mileage vehicles could be tied to a requirement to steadily improve the average efficiency of the federal fleet.
- Efforts to create a national tire energy performance testing and rating program could be significantly accelerated; in the meantime federal agencies also could require their tire suppliers to provide replacement tires with the same or better rolling resistance as the OEM tires.
- Federal purchasing of motor oil could include a requirement for high-efficiency synthetic oil, provided this results in a net saving of petroleum compared with recycled oil.

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<sup>152</sup> TIAX LLC, *The Energy and Greenhouse Gas Emissions Impact of Telecommuting and e-Commerce*, Report to the Consumer Electronics Association, July 2007, slide 39, [http://www.ce.org/Energy\\_and\\_Greenhouse\\_Gas\\_Emissions\\_Impact\\_CEA\\_July\\_2007.pdf](http://www.ce.org/Energy_and_Greenhouse_Gas_Emissions_Impact_CEA_July_2007.pdf). Estimates of Americans working from home at least once a month are considerably higher; 30 million, according to the Japan Telework Association, [www.japan-telework.or.jp/english/pdf/english\\_010.pdf](http://www.japan-telework.or.jp/english/pdf/english_010.pdf) (last accessed February 13, 2006), as cited in Organisation for Economic Co-operation and Development, *OECD Information Technology Outlook 2006*, 2006, pg. 230.

<sup>153</sup> Davis & Diegel, *Transportation Energy Data Book*, Table 8.14 pg. 8-18.

<sup>154</sup> Based on the 443 million gallons annual consumption as calculated on page 42.

<sup>155</sup> This section taken largely from Joe Loper and Steve Capanna, *Energy Consumption in the Information Age – An Inconclusive Truth*, Alliance to Save Energy, prepared for the National Petroleum Council, 2007, pg. 2.

<sup>156</sup> Meaning conventional hybrids currently available, in contrast to the plug-in hybrids – an important emerging technology but not a currently available product – mentioned in EO 13423.

## 10. Leverage Federal Buying-Power to Lead and Transform the Market

As we have noted, the federal government is a powerful force in the market both because of its size and its symbolic importance. In addition to saving energy, saving money and reducing carbon emissions, federal policies can have a potentially even greater impact on greenhouse gas emissions by stimulating both the demand for and supply of energy-efficient products and services outside the federal sector. This requires broadening federal energy efficiency policies in several ways:

- Upstream strategies to “lean” (not just “green”) the federal supply chain by establishing goals and incentives for federal suppliers and contractors to improve energy efficiency in their own facilities, operations and purchasing.
- Downstream strategies that use federal program funds as a source of leverage on energy and carbon-saving decisions linked to government grants, loans and loan underwriting/guarantees.
- Technology seed-bed initiatives – making the federal government a leading technology innovator and market entry point for promising energy efficiency, renewable energy and low-carbon fuel technologies.
- An inter-governmental energy management challenge to public officials in state and local governments (including public schools, universities and health care facilities), asking that they match the federal goals for energy efficiency and carbon reductions – and then actively collaborating with and assisting them in this effort.

### Upstream Strategies – Leaning the Federal Supply Chain

All federal agencies, including GSA and DLA, could take better advantage of their market influence and the trend toward outsourcing service and support functions by adopting criteria to “lean” their supply chains. In simple terms, this is the energy efficiency equivalent of supply chain “greening,” but with energy efficiency provisions rather than requiring suppliers to practice recycling, sustainable forestry practices or other environmental activities.

Federal agencies could join private industry leaders such as Wal-Mart and Giant Eagle supermarkets in calling on major suppliers to demonstrate energy-efficient practices and results. Examples of specific contractor actions include achieving Energy Star or LEED ratings for a given fraction of their facilities, completion of energy audits at their facilities and a commitment to implement all measures with payback periods of up to five years, joining the EPA “Smartway” partnership<sup>157</sup> and undertaking actions to reduce freight transport energy, and adopting Energy Star and FEMP criteria for energy-efficient purchasing.

To start, these criteria could be implemented as a procurement preference for major federal procurement actions (\$10 million or more) by awarding extra credit in competitive solicitations. At some point they could become a firm procurement requirement for contractors who want to

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<sup>157</sup> See <http://www.epa.gov/smartway/>.

do business with the federal government. Another option is to limit the allowable cost reimbursement to contractors to levels that would have been incurred if the contractor's facilities were operating at the 25th percentile of best-practice for energy efficiency. Because this would require additional data and analysis, it may be suitable only for large contracts involving contractor operations in fixed facilities.

Recommendation: Direct OMB, in consultation with federal agencies and the Federal Acquisition Regulations Council, to develop guidelines and criteria for a pilot program on leaning the federal supply chain, and to evaluate the results in a report to Congress with any recommended legislative changes within three years.

### Downstream Strategies – Exert Leverage through Federal Programs

A large number of federal programs provide grant funding or other forms of financial assistance (loans, loan guarantees, etc.) for non-energy purposes, but these funds often have – or could have – a significant impact on energy-related investment decisions by the state or local jurisdictions receiving the funds. Thus, adding criteria for energy efficiency to the guidelines for awarding federal funds, and/or for the use of those funds once received, could provide significant leverage beyond the federal sector itself.

Examples include:

- Department of Agriculture (USDA) grants/loans for rural housing and community facilities, rural hospitals, wastewater treatment and rural electric utility systems. These multi-billion dollar loan programs could include specific provisions for energy-efficient projects, and in the case of rural utility loans, a requirement for integrated resource plans that implement demand-side management (DSM) first, then renewable or other clean energy supply projects, and last conventional power generation.
- Home mortgage loans with lower interest due to insurance by the Federal Housing Authority (FHA) or Veterans Administration (VA) guarantees, and secondary mortgage underwriting (FNMA and GNMA). These assisted mortgage programs are supposed to require new homes to meet national model building energy codes. They could better enforce the requirement (at the state or local level or for individual homes) or adopt more stringent efficiency criteria.
- Department of Transportation (DOT) funding for construction, maintenance, and improvement of highway, rail and other transportation infrastructure. Funding could include minimum allocations for energy-saving transportation measures, or/and funds could be conditioned on state and local adoption of transportation energy-efficiency measures.
- Housing and Urban Development (HUD) energy standards for manufactured housing. EISA directed DOE in consultation with HUD to set energy standards for manufactured housing based on the model code for site-built housing. DOE should quickly set a standard at least as stringent as that code.

Recommendation: OMB should issue guidance directing agencies to review their programs and to make changes in criteria or procedures that would encourage energy-related decisions by recipients of federal funds or other financial incentives. Agencies would propose statutory changes where needed to achieve this objective. Alternatively, Congress could request that the Government Accountability Office conduct an independent review of the full range of federal programs to identify opportunities for program leverage on energy-saving actions by grant and loan recipients.

The federal government can play a positive role in energy-efficiency policy implementation at the utility level by participating as a utility customer (where possible) in DSM rebates, UESC financing, and other utility programs as discussed above, and by encouraging new, continuing or expanded DSM programs. In the past, some representatives of federal agencies have opposed funding for DSM programs and public benefit programs, on the basis that the rate surcharges for these programs increase utility rates. While this may be true in a narrow sense, it neglects the fact that what matters to consumers and to the economy as a whole is not utility rates but utility bills (the total cost of providing the needed energy services). And utility bills can be much lower when energy efficiency is implemented cost-effectively as a result of well designed and well managed utility DSM programs.

Recommendation: The federal government should issue a clear policy stating that the government supports cost-effective utility DSM programs, as well as regulatory incentives or other provisions that create a level playing field for utility investments in demand-side as well as supply-side resources.

### Federal Technology Innovation

The federal government should invest fully in energy-saving technologies that are available and cost-effective, and should make energy efficiency best practices a part of its own standard practice. But the government also has an important role to play in helping to speed the next generation of energy-saving technologies into the market by identifying the most promising new technologies, testing and demonstrating them in federal facilities, widely sharing the results,<sup>158</sup> and serving as a point of market entry and market-aggregation for selected technologies, products and systems.

The policy of using federal buying power to create or expand entry markets for new energy-saving technologies is not a new idea. Similar provisions were included in Section 152 of the Energy Policy Act of 1992, which called for a report to Congress, but only limited follow-up action has occurred since then. FEMP's New Technology Demonstration Program has issued a number of "Technology Alerts" for use by federal agencies, but for many years has had little funding to expand this effort, let alone undertake active demonstration or technology-procurement efforts.<sup>159</sup> More recently, the FEMP program has been exploring other mechanisms

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<sup>158</sup> This includes the important but sometimes politically challenging role of clearly reporting which technologies are not ready for commercial deployment, and which new products fail to meet the energy efficiency claims made by suppliers.

<sup>159</sup> "Technology procurement" refers to a process of aggregating buyer demand, often by public or institutional buyers, to issue a solicitation for a product that does not yet exist – in general because there has been no perceived

to accelerate the introduction of new energy-saving technologies to the federal sector, such as requiring that at least some new technology be included in each ESPC-financed project, but the effort remains modest, and focused mainly on the small subset of technologies developed as a result of DOE-funded research and development.

**Recommendation:** FEMP's New Technologies Demonstration Program should be reinvigorated with adequate technical staff and resources. FEMP should cooperate with other DOE Efficiency and Renewable Energy programs and with other federal agencies to review and, where appropriate, field-test promising energy-saving technologies.

In addition to expanding these FEMP activities, as discussed in the section on new federal construction, federal building energy standards and facility leases could include technology-readiness requirements, and Congress could require that agencies dedicate a portion of their capital budgets to investments in promising new energy-saving technologies.

### Intergovernmental Energy Management and Market Leadership

Effective federal actions to save energy and reduce greenhouse gas emissions within government facilities and operations can have an influence well beyond the federal sector by providing an example for other governments and institutions, and challenging them to meet (or exceed) the federal sector commitments. Governments can work together to share ideas, lessons learned and critical information resources such as training curricula, policy guides, model contracts, lists of energy-efficient products and information on qualified energy management firms, building commissioning agents and sustainable design professionals.

The consumption expenditures of the public sector (including state, local and federal governments) totaled about \$2.7 trillion in 2007, almost 20 percent of economy-wide GDP.<sup>160</sup> Many federal programs, including ESPCs and procurement requirements, have been models for other levels of government. And a growing number of state and local government agencies have taken their own innovative steps to reduce their energy use, greenhouse gas emissions and reliance on fossil fuels – but these efforts have not become universal or coordinated to send the strongest possible signal to the supply side of the market.

**Recommendation:** To harness the full power of the public sector for market leadership toward energy efficiency and reduced greenhouse gas emissions, the President should challenge all U.S. mayors and city councils, all governors, state legislatures and the top officials of other public institutions – as well as corporate leaders – to commit to aggressive energy management and greenhouse gas reduction goals, policies and concrete actions at least comparable to those being pursued at the federal level.

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market for it. The buyer group generally commits to some minimum level of purchases if the new product(s) meet specified performance and cost criteria. Allison ten Cate, et al. 1998. *Technology Procurement as a Market Transformation Tool*, Proceedings of the 1998 ACEEE Summer Study on Energy-Efficient Buildings.

<sup>160</sup> U.S. Bureau of Economic Analysis, *Survey of Current Business*, National Data, Selected NIPA Tables, Volume 88, Number 3, March 2008, Table 1.1.5, pg. D-3, [http://www.bea.gov/scb/pdf/2008/03%20March/D-Pages/0308dpg\\_a.pdf](http://www.bea.gov/scb/pdf/2008/03%20March/D-Pages/0308dpg_a.pdf).

## Appendix 1: Studies included in Figures 3 and 4

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## **Appendix 2: Acronyms Used**

ACEEE – American Council for an Energy Efficient Economy  
AIA – American Institute of Architects  
ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers  
BTU – British Thermal Unit  
CBECS – Commercial Buildings Energy Consumption Survey  
CFL – Compact Fluorescent Lamp  
CIA – Central Intelligence Agency  
DHS – Department of Homeland Security  
DLA – Defense Logistics Agency  
DOC – Department of Commerce  
DOD – Department of Defense  
DOE – Department of Energy  
DOI – Department of Interior  
DOJ – Department of Justice  
DOT – Department of Transportation  
DSB – Department Science Board  
DSM – Demand Side Management  
EIA – Energy Information Administration  
EISA – Energy Independence and Security Act of 2007  
EO – Executive Order  
EPA – Environmental Protection Agency  
EPAct 1992 – Energy Policy Act of 1992  
EPAct 2005 – Energy Policy Act of 2005  
ESCO – Energy Service Company  
ESPC – Energy Saving Performance Contracts  
FEMP – Federal Energy Management Program  
FHA – Federal Housing Authority  
FNMA – Federal National Mortgage Association  
GDP – Gross Domestic Product  
GNMA – Government National Mortgage Administration  
GSA – General Services Administration  
HHS – Health and Human Services  
HUD – Housing and Urban Development  
HVAC – Heating, Ventilating, and Air Conditioning  
IBB – International Broadcasting Bureau  
IECC – International Energy Conservation Code  
IRS – Internal Revenue Service  
LED – Light Emitting Diode  
LEED – Leadership in Energy and Environmental Design  
NARA – National Archives and Records Administration  
NASA – National Aeronautics and Space Administration  
NECPA – National Energy Conservation Policy Act  
NRC – Nuclear Regulatory Commission

O&M – Operations and Maintenance  
OEM – Original Equipment Manufacturer  
OMB – Office of Management and Budget  
PV – Photovoltaic  
REC – Renewable Energy Certificate  
RECS – Residential Energy Consumption Survey  
REM – Resource Efficiency Manager  
RRB – Railroad Retirement Board  
SSA – Social Security Administration  
TVA – Tennessee Valley Authority  
UESC – Utility Energy Services Contracts  
USDA – United States Department of Agriculture  
USPS – United States Postal Service  
VA – Veterans Administration