



**Testimony of Jennifer Amann  
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**Before the United States Senate Committee on  
Energy & Natural Resources**

**Hearing To**

***Provide recommendations for reducing energy consumption in buildings  
through improved implementation of authorized DOE programs and  
through other innovative federal energy efficiency policies and programs***

**February 26, 2009**

## Summary

Buildings in the U.S. account for approximately 40% of our national energy consumption. Improving the efficiency of our buildings can free up energy resources to reduce the need for additional power generation and free up money for productive use and investment in our families, communities and enterprises. Energy efficiency is the fastest, cheapest, cleanest energy source we have; tapping this resource in our buildings is a critical step toward economic recovery and climate protection.

In collaboration with a range of stakeholders in the energy efficiency, environmental, and business community, ACEEE is developing recommendations for enhancing our existing efficiency programs and policies and creating new initiatives that will accelerate an overhaul of our existing buildings stock. Our recommendations focus on: 1) increasing the availability and adoption of high efficiency appliances, equipment, and building components in new and existing buildings; 2) training the highly-skilled workforce needed to design, operate and maintain buildings and building systems to optimize energy efficiency; 3) improving information on building energy performance available to building owners, operators, purchasers, and renters; and 4) improving the efficiency of existing residential and commercial buildings through comprehensive building retrofits.

Specific recommendations include improvements to existing policies including advanced building codes, appliance and equipment standards, and energy efficiency tax incentives and adoption of new programs to retrofit residential and commercial buildings with additional attention directed to multifamily and manufactured housing, train a skilled workforce to design and operate buildings for optimal energy performance, and provide for disclosure of building energy consumption.

If implemented, these recommended policies and programs would reduce peak demand by about 41,000 megawatts with carbon emissions reductions totaling approximately 53 million metric tons in 2030.<sup>1</sup> The peak demand impacts are equivalent to 136 power plants of 300 MW each. The carbon emissions reductions are equivalent to taking 9 million cars off the road for a year. In 2030, annual savings would total 3.19 quads of primary energy<sup>2</sup>, including 153 billion kilowatt-hours (kWh) of electricity and 1,500 billion cubic feet of natural gas. These policies would also yield significant economic benefits including consumer energy bill savings of \$12 billion in 2030. In 2020, impacts would be about 50% of the 2030 impacts. Substantial additional energy will be saved by the Energy Efficiency Resource Standard.

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<sup>1</sup> Note: These are carbon emissions, not carbon dioxide emissions. Carbon dioxide emissions will be 3.67x the carbon emissions.

<sup>2</sup> A "quad" is a quadrillion Btu's. The U.S. uses about 100 quads annually.

## Introduction

My name is Jennifer Amann and I am the Director of the Buildings Program for the American Council for an Energy-Efficient Economy. ACEEE is a nonprofit organization dedicated to increasing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. For more than 25 years, ACEEE has contributed in key ways to energy legislation including the Energy Independence and Security Act of 2007, the Energy Policy Acts of 2005 and 1992, and the National Appliance Energy Conservation Act of 1987. ACEEE's niche is to conduct research on successful and promising technologies and programs and base our policy recommendations on the results of this research. I am here today to provide recommendations for reducing energy consumption in buildings through improved implementation of authorized DOE programs and through other innovative federal energy efficiency policies and programs. I thank you for the opportunity to testify here today.

Buildings in the U.S. account for approximately 40% of our national energy consumption.<sup>3</sup> This doesn't have to be the case. Within our homes, businesses, schools, and gathering places there exists a tremendous resource of wasted energy that can be captured and put to productive use elsewhere. Improving the efficiency of our buildings can free up energy resources to reduce the need for additional power generation and free up money for productive use and investment in our families, communities and enterprises. Energy efficiency is the fastest, cheapest, cleanest energy source we have; tapping this resource in our buildings is a critical step toward economic recovery and climate protection.

Over the past forty years, energy efficiency has been an important factor contributing to U.S. economic growth—while income per capita doubled over the period, energy resources to meet the needs of our growing economy increased by only 50%.<sup>4</sup> Moving forward, efficiency has an even more critical role to play in addressing our current economic downturn, aggressively reducing carbon emissions, and shoring up our energy infrastructure. ACEEE studies demonstrate the large potential for energy savings in new and existing buildings using existing technologies and practices. A recent analysis, focusing on the state of Maryland, found that electricity use reductions of 29% by 2025 are not only achievable, but cost-effective.<sup>5</sup> Emerging technologies offer the promise of even greater savings well into the future.

Existing efficiency policies save American citizens and businesses money every day while reducing pollution and easing demand on our energy infrastructure. Appliance and equipment standards already in place will save more than 5 quadrillion Btu, over 4% of U.S. energy consumption in 2020.<sup>6</sup> Building energy codes have contributed to reductions in new home and commercial building energy use, savings consumers an estimated \$1 billion or more per year in energy costs. These policies have an ongoing

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<sup>3</sup>Energy Information Administration. 2008. *Annual Energy Outlook 2009 Early Release*. <http://www.eia.doe.gov/oiaf/aeo/index.html>. December. Washington, D.C.: U.S. Department of Energy.

<sup>4</sup>Ehrhardt-Martinez, K. and J.Laitner. 2008. *The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture*. May. Washington, D.C.: ACEEE.

<sup>5</sup>Eldridge, M. et al. 2008. *Energy Efficiency: The First Fuel for a Clean Energy Future Resources for Meeting Maryland's Electricity Needs*. February. Washington, D.C.: ACEEE.

<sup>6</sup>Nadel, S., de Laski, A., Eldridge, M., and Kliesch, J. 2006. *Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards*. Washington, D.C.: ACEEE

role to play in a comprehensive suite of buildings energy efficiency policies and programs.

New programs and policies can build on the success of these programs to yield deeper levels of energy savings and to broaden the reach of programs to improve energy efficiency throughout our diverse building stock. These policies will build on our growing understanding of building science; promote the latest best practices in construction, retrofits, and building operations and maintenance; and enable a new generation of highly-skilled building professionals to keep our building operating productively, efficiently, and with minimal environmental impact.

The American Recovery and Reinvestment Act of 2009 demonstrates Congress' recognition that building energy efficiency improvements can play an important role in saving consumers and businesses money and creating new jobs here in the U.S. The legislation provides a mix of grants, rebates, loan guarantees, and tax incentives for retrofitting federal buildings and low-income housing, expanding state-based efficiency programs, and increasing adoption of high-efficiency appliances and equipment. These investments in a more efficient buildings stock are a good start, but more needs to be done. We have a great opportunity to build on this momentum by strengthening existing buildings efficiency policies and creating new programs to address certain critical gaps.

In collaboration with a range of stakeholders in the energy efficiency, environmental, and business community, ACEEE is developing recommendations for enhancing our existing efficiency programs and policies and creating new initiatives that will accelerate an overhaul of our existing buildings stock. Our recommendations focus on: 1) increasing the availability and adoption of high efficiency appliances, equipment, and building components in new and existing buildings; 2) training the highly-skilled workforce needed to design, operate and maintain buildings and building systems to optimize energy efficiency; 3) improving information on building energy performance available to building owners, operators, purchasers, and renters; and 4) improving the efficiency of existing residential and commercial buildings through comprehensive building retrofits.

### **Specific Recommendations**

Below we provide a number of specific policy recommendations; some are relatively minor tweaks of existing programs while others are new programs that will require significant funding to succeed. Following the recommendations, we discuss potential mechanisms for funding any new programs.

#### Improving Existing Policies

*Advanced Building Codes:* In order to meet long-term energy goals, it is important that new buildings be as energy-efficient as is economically justified, since it will be much more expensive to retrofit these buildings after they are completed. Model code organizations are in the process of updating building codes to achieve aggressive levels of savings. The International Energy Codes Council recently adopted changes to residential building codes and will consider additional changes in the coming months. The American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) has set a 30% savings target for the pending 2010 update of their model commercial building code. To support these efforts, the 2007 House energy bill contained a provision calling for DOE and states to update energy codes for new

buildings. This provision directed DOE to support efforts by model code organizations to update building codes to reduce energy use of new buildings by at least 30% by 2010, and 50% by 2020.<sup>7</sup> As new codes are finalized, states were directed to either adopt these model codes or their own state-specific equivalents. Funding and technical assistance to states was authorized. This provision should be adopted in 2009, with the date for the second new code accelerated to 2016. Six years between code upgrades is reasonable, particularly since the 50% savings level is already being promoted by federal tax incentives enacted by Congress in 2005.

In addition, Congress should consider provisions to allow higher minimum equipment efficiency requirements in building codes (i.e., levels exceeding federal equipment efficiency standards) provided the code offers an explicit pathway for meeting code levels with equipment just meeting federal minimums (e.g., by including other efficiency measures to make up for the lower efficiency equipment).

ACEEE estimates that by 2030, this building code provision would save 1.4 quads of energy (including 75.7 billion kWh of electricity and 567 billion cubic feet of direct natural gas), with carbon emissions reductions totaling approximately 23.4 million metric tons in 2030. The policy would also yield significant economic benefits including net energy bill savings for customers of \$5.13 billion in 2030.

*Appliance and Equipment Standards:* Federal minimum efficiency standards have been set by Congress on more than 40 products. New legislation should add a few additional products, based on negotiations now underway with industry to develop consensus recommendations on several products. New legislation should also clarify aspects of the process by which DOE periodically revises these standards including: clarifying DOE's authority to set multiple performance standards for a product (this was in the House and Senate 2007 energy bills, but dropped from the final bill); directing DOE to consider the impact of carbon emissions and the impact of the energy savings on energy prices when setting standards; strengthening the "rebuttable presumption test" for setting standards when efficiency savings are highly cost-effective, and setting standards on "BR" reflector lamps, a major loophole in current DOE standards. We understand the Committee is likely to have another hearing on appliance and equipment efficiency standards and we will provide further comments for that hearing, including energy savings estimates.

*Energy Efficiency Tax Incentives:* In addition to the recent changes to the tax incentives available for energy efficient equipment and building upgrades, Congress should adopt long-term extensions of the tax credit for high efficiency new homes. The new homes credit has been particularly effective, spurring the construction of more than 20,000 highly-efficient homes in 2007 (2008 data not yet available). Also, the amount of the efficient commercial buildings tax deduction should be increased from \$1.80 to \$3 per square foot, as participation at \$1.80 per square foot is very small. To increase the effectiveness of the tax incentives, Congress should also make certain policy changes such as simplifying and clarifying the commercial building tax incentive paperwork requirements and including labor costs in any extension of residential retrofit credits (for labor-intensive measures such as insulation and duct sealing, a credit limited to a small percentage of material cost has very little value or impact). We also recommend adoption of a tax credit to cover the costs of approved certifications for contractors. We have not yet analyzed the energy savings from such a provision.

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<sup>7</sup> The 50% goal is a qualification level for energy efficiency tax credits adopted by Congress in 2005.

## New Policies and Programs

*Building Training and Assessment Center Program:* Higher performance buildings that save energy by operating with greater energy efficiency are readily attainable today. These buildings are dependent on well-trained technicians, designers, and contractors to perform optimally. The effort and resources to properly train, recognize, and reward these individuals can yield enormous benefits given high and unpredictable energy costs. By carefully designing and engineering commercial and institutional buildings to be more energy-efficient, up to 50% of energy costs can be eliminated for owners of new buildings and potential savings in existing buildings of 20% to 30% or more. However, even well-designed commercial buildings may run 10-15% below expected energy performance levels because of poor installation, poor commissioning, and operational errors. Improving building energy efficiency is a cost-effective way to make buildings more affordable, improve comfort, and reduce costs for building owners.

We recommend that Congress establish a Building Training and Assessment Center (BTAC) program, based on the Industrial Assessment Center (IAC) program that has operated since 1976. This program has been one of DOE's most effective programs, training industrial engineers and providing them with practical hands-on experience by providing free energy audits to industrial firms. While there are existing building engineer and building and equipment technician training programs in some parts of the country, there is a fundamental need for more students trained in these skills and for increased levels of hands-on training addressing the real-world problems encountered in the field. The BTAC program will focus on leveraging existing programs at universities, community colleges, vocational-tech schools (secondary level), and apprenticeship programs, and developing new programs to expand and accelerate the numbers of qualified individuals with these skills and capabilities. BTACs would serve as an important source of new workforce for the field, and its graduates would likely be in high demand for their experience and expertise, as have the graduates from the IAC program. Graduates from the programs will be prime candidates for high-paying, high-skilled jobs.

In the BTAC program, engineering students in universities across the country will work closely with professors to provide free building energy assessments. The audits performed for commercial and institutional buildings will emphasize easy-to-execute, inexpensive energy saving measures for the buildings. The BTAC program will improve the operational efficiency and performance of thousands of buildings across the country, creating energy and dollar savings for owners and tenants. In addition, the technicians and building operators trained in the program will have the skills needed to maintain these energy savings and will be guaranteed practical experience in real buildings. By providing continuing education for building technicians, BTACs can work with local firms and technicians to improve capacities already in the market. A more detailed description of the program is attached to this testimony

*Building Energy Disclosure:* Building owners and potential purchasers and renters rarely have access to the information they need to understand the energy efficiency of a given building and opportunities for improvement. This information can motivate owners to upgrade their buildings, and help prospective buyers and tenants select more efficient buildings. Through the Energy Star buildings and new homes programs, EPA has a good track record in this area. Moving forward, a more comprehensive and effective building energy use disclosure program can have a much greater impact.

We recommend that EPA and/or DOE develop a rating system designed primarily to help home buyers and renters compare the energy efficiency of homes, and rating systems to help buyers and tenants compare the energy efficiency of commercial buildings of the same type. The rating systems should include an operational component based on estimated or actual source energy use (adjusted for weather and operating conditions) and an asset component based on the construction, envelope and major energy systems. The rating methods may be different for new and existing buildings but should attempt to yield comparable ratings. Existing ratings such as the Home Energy Rating System and the Energy Star benchmarking system for commercial buildings may be the basis for these ratings. To ease comparisons, the rating systems should include the efficiency of a similar building that meets the model building energy code as of the date of the rating and of a similar building that meets Energy Star criteria.

These rating systems should form the basis for building energy disclosure requirements. Rating and public disclosure of building energy consumption should be required for all public buildings. For privately-owned buildings, disclosure should be encouraged for the parties to a purchase, finance or lease transaction along with annual disclosure of operational ratings to tenants of large buildings. The program should include provisions for DOE and EPA to work with states, counties and local governments to implement programs that encourage building owners to have publicly accessible certificates showing the individual building's performance relative to similar buildings, the building's energy efficiency potential, and the location and type of transit services within walking distance of the building.

If implemented, building disclosure will directly save approximately 8.2 billion kWh of electricity and 68 billion cubic feet of direct natural gas, with carbon emissions reductions totaling approximately 2.7 million metric tons in 2030. The policy would also yield significant direct economic benefits including energy bill savings for customers of \$580 million in 2030. These are only direct benefits from assessments conducted under the program. In addition, the increased number and quality of building engineers and technicians will enable substantial additional energy savings which we have not attempted to quantify.

*Residential Retrofits:* The untapped potential of our homes to operate efficiently is a drag on consumer spending, as dollars are wasted on energy. Tapping in to this potential puts money in pockets and creates durable, domestic jobs in home efficiency that can never be sent overseas. Congress should act immediately to implement a national home efficiency retrofit program to save Americans money and stimulate the economy. This program would expand the EPA Home Performance with Energy Star comprehensive retrofit program that now operates in 22 states and should encourage much greater participation in the program by establishing rebates for homes that undertake comprehensive energy efficiency retrofits. The rebate would be performance based, rewarding higher levels of energy efficiency improvement with higher rebates. Funding for the state-administered rebates could initially come out of stimulus funds being given to states and cities, with longer-term funding provided under climate legislation. The expanded program should include support for the training of contractors and home energy raters who would help implement the program. A more detailed description of the program is attached to this testimony.

Significant environmental and economic benefits would result. For homeowners, the benefits are meaningful and immediate. The average homeowner will spend around \$2,300 on energy bills this year, and a performance retrofit will likely reduce these costs by about 25%, corresponding to nearly \$6,000 in energy savings through the 10<sup>th</sup> year. This money represents extra cash for necessities or disposable income that will be injected back into the larger economy. At a national scale, the benefits of home retrofits are enormous. If the program reaches a million homes per year the 10 year energy savings would be enough to fully power about 15 million homes for a year. Scaling up the home efficiency industry would provide about 50,000 net jobs. This program has the support of more than 160 organizations and businesses including energy and environmental advocates, contractors, and related trade associations.

If implemented, residential retrofits will save approximately 26 billion kWh of electricity and 560 billion cubic feet of direct natural gas, with carbon emissions reductions totaling approximately 13.3 million metric tons in 2030. Energy savings in 2030 total 0.84 quads with energy bill savings for homeowners of \$3.1 billion in that year.

*Commercial Retrofits:* Improving the efficiency of commercial buildings can yield higher returns for owners, increase tenant retention, and improve the productivity of workers, students, and others using the facilities. Congress should establish a program that would encourage the near term launch of large scale, deep retrofitting of private and publicly owned commercial buildings or portfolios of buildings. The program would provide an incentive to building owners for efficiency improvements based on demonstrated energy savings of no less than 20% with incentives calibrated to encourage 30% savings or greater. The Energy Star Building benchmarking program would be used to document and verify performance and the incentive would take the form of a rebate per square foot. A loan guarantee, proportional to the targeted energy savings level, would be established to enable upfront investment in energy efficiency projects. Partial payment of the incentive would be granted upon completion of the efficiency project and with the remainder of the incentive conditioned on verification of actual performance over a three year period. This proposal was initially developed by the Real Estate Roundtable and NRDC. This would be another program for which initial incentives might come out of stimulus funds, with long-term funding incorporated into climate legislation.

ACEEE estimates that commercial retrofits would save approximately 40 billion kWh of electricity and 266 billion cubic feet of direct natural gas, with carbon emissions reductions totaling approximately 11.9 million metric tons in 2030. Energy savings in 2030 total 0.67 quads with energy bill savings for businesses of \$2.6 billion in that year.

*Multi-Family and Manufactured Housing:* Multifamily buildings and manufactured (mobile) homes offer a vital opportunity to save significant amounts of money through energy efficiency program implementation. These housing types represent more than a quarter of U.S. housing units and comprise 20% of residential energy consumption. Multifamily and manufactured homes demand special attention because it has proven difficult to implement efficiency programs targeting these homes and the disproportionate numbers of low to moderate income families have the greatest difficulty making efficiency



investments without assistance.<sup>8</sup> Given the limited experience with such programs to date, we recommend a process that will encourage a variety of innovative approaches for trial and evaluation. The most successful approaches could be developed into broader programs.

Past experience has shown that multifamily buildings have the potential to realize energy efficiency savings up to, and even exceeding, 20%. To tap the potential savings, we propose that Congress establish a competitive grant program to seek creative solutions to multifamily and manufactured housing efficiency. These programs would be administered by DOE, with grants provided to state and local government agencies as well as non-profit organizations to create effective, replicable projects. Priority should be given to projects that provide substantial energy savings while targeting recipients with the greatest financial need. Prioritizing highly cost effective programs with significant matching funds will help maximize the return on investment of federal grant funds. A more detailed description of the program is attached to this testimony ACEEE's preliminary estimates indicate that this program would yield 0.15 quads of energy savings in 2030, with consumer energy bill savings of \$570 million and carbon emissions reductions of 2.4 million metric tons.

*Energy Efficiency Resource Standard:* Though not specifically a buildings energy efficiency policy, the substantial majority of savings from an energy efficiency resource standard would come from energy efficiency improvements in residential and commercial buildings. Providing each major electricity and natural gas distributor with a simple and equitable target for achieving energy savings will serve to drive investment in cost-effective energy efficiency as an energy resource for large-scale acquisition. Eighteen states have enacted successful energy efficiency resource standards; a national policy would expand the savings and benefits throughout the country and yield national emissions reduction and price reduction effects that would benefit all states, including those that have already enacted the standard. ACEEE estimates that by 2020, a well-designed federal energy efficiency resource standard would reduce peak demand by about 90,000 megawatts with carbon emissions reductions totaling approximately 260 million metric tons in 2020. The policy would also yield significant economic benefits including net energy bill savings for utility customers of \$144 billion and the creation of 260,000 net jobs. Our analysis only looks at energy savings targets through 2020, and thus energy savings drop off somewhat in 2030 as measures installed in earlier years wear out. If targets are increased over the 2020-2030 period, much higher 2030 savings would result.

### **Funding the Recommended Programs**

In order to succeed, the new programs we recommend must receive adequate funding. We see several potential mechanisms for allocating the necessary program funds. State and local stimulus funds may be a source of funding for programs with significant administration or coordination by state and local governments, such as the Residential Retrofit and Multifamily and Manufactured Housing program. Similarly, any new stimulus funds could be directed toward the recommended programs. Other potential

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<sup>8</sup> According to the 2005 Residential Energy Consumption Survey (EIA 2007), 71% of households in multi-family buildings and 80% of households in manufactured housing are low-income (earning less than \$40,000), while 28% in each housing type are living below the poverty line (\$20,000).<sup>8</sup>

sources include emissions allowances resulting from climate legislation or appropriations made as part of the normal budget process to allow for start up of climate-related programs prior to final passage of climate legislation. Even if funds are not available immediately, we recommend that these programs be authorized so they are ready when and if funds become available. Several new programs were authorized in the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007 and first funded under the American Recovery and Reinvestment Act. We anticipate a similar process with emerging 2009 energy legislation authorizing programs that could be funded under future climate legislation.

### **Overall Savings**

ACEEE has developed estimates of energy savings and carbon emissions reductions associated with each of the recommended policies and program. The table below summarizes our preliminary estimates of savings for each provision we discuss. Together, the recommended improvements to existing policies and adoption of new policies and programs will save 3.19 quads of primary energy in 2030, avoiding 41,000 mega-watts of peak demand and creating annual consumer energy bill savings of \$12 billion. The peak demand reductions are equivalent to the output of 136 300-MW power plants. Carbon emissions reductions from the buildings programs will total approximately 53 million metric tons in 2030, the equivalent of taking 9 million cars off the road<sup>9</sup>. Substantial additional energy will be saved by the Energy Efficiency Resource Standard.

### **Conclusion**

Buildings represent the largest energy using sector of the U.S. economy. Improving the energy efficiency of our new and existing building stock should be a core component of our energy and climate policies. The policies and programs recommended above will impact all Americans by reducing energy expenditures, creating jobs, and cutting carbon emissions. We urge you to give serious consideration to these policies and to include them in upcoming energy legislation.

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<sup>9</sup> Note: Based on 6 metric tons of CO2 per vehicle per year.

**Savings Estimates for Potential Buildings Provisions**  
 ACEEE's assessment of the potential energy, carbon, and economic savings

Annual Energy Savings Estimates			2020						
Title	Subtitle	Section	Electricity (TWh)	Avoided Peak Demand (MW)	Direct Natural Gas (BCF)	Indirect Natural Gas (BCF)	Oil Savings (Million barrels per day)	Primary Energy Savings (Quads)	Carbon (MMT)
<b>EERS</b>	<i>Energy Efficiency Resource Standard</i>		282.2	90,763	1,366	1429	195	2.94	70.8
<b>Buildings</b>	<i>Advanced Building Energy Codes</i>	Residential	10.9	2,946	93	55	8	0.21	3.5
		Commercial	21.6	5,842	143	110	15	0.37	6.4
	<i>Building Labeling/Disclosure</i>	Residential	1.7	470	18	9	1	0.02	0.6
		Commercial	2.5	682	16	13	2	0.04	0.8
	<i>Energy-Saving Home Retrofits</i>		14.2	3,830	247	72	10	0.09	6.5
	<i>Multifamily and Manufactured Housing</i>		6.8	1,842	59	35	5	0.13	2.3
	<i>Commercial Building Efficiency Retrofits</i>		34.5	9,315	16	175	24	0.39	7.1
<i>Building Training &amp; Assessment Centers( BTACs)</i>		0.122	33	0.8	0.62	0.08	0.0021	0.036	
<b>Subtotal</b>			92.4	24959.5	593.2	468.2	63.9	1.2	27.3
<b>Total</b>			374.5	115722.4	1958.5	1897.1	259.0	4.2	98.1

**Savings Estimates for Potential Buildings Provisions**  
 ACEEE's assessment of the potential energy, carbon, and economic savings

Annual Energy Savings Estimates			2030								
Title	Subtitle	Section	Electricity (TWh)	Avoided Peak Demand (MW)	Direct Natural Gas (BCF)	Indirect Natural Gas (BCF)	Oil Savings (Million barrels per day)	Primary Energy Savings (Quads)	Carbon (MMT)	Carbon Dioxide (MMT)	Gross Consumer Savings (Billion 2005\$)
<b>EERS</b>	<i>Energy Efficiency Resource Standard</i>		188.6	60,646	549	921	126	2.58	41.7	153.0	\$ 144.10
<b>Buildings</b>	<i>Advanced Building Energy Codes</i>	Residential	20.2	5,458	223	99	13	0.44	7.3	26.8	\$ 1.64
		Commercial	55.5	14,985	344	271	37	0.94	16.1	59.1	\$ 3.49
	<i>Building Labeling/Disclosure</i>	Residential	2.8	759	35	14	2	0.07	1.1	3.9	\$ 0.24
		Commercial	5.4	1,458	33	27	4	0.09	1.6	5.7	\$ 0.34
	<i>Energy-Saving Home Retrofits</i>		25.6	6,921	560	130	18	0.84	13.3	49.0	\$ 3.12
	<i>Multifamily and Manufactured Housing</i>		3.3	900	116	17	2	0.15	2.4	8.7	\$ 0.57
	<i>Commercial Building Efficiency Retrofits</i>		40.0	10,800	266	203	28	0.67	11.9	43.6	\$ 2.58
<i>Building Training &amp; Assessment Centers( BTACs)</i>		0.2	42	0.9	0.8	0.11	0.0025	0.044	0.16	\$ 0.010	
<b>Subtotal</b>			153.0	41322.7	1576.8	761.2	103.9	3.2	53.7	197.0	12.0
<b>Total</b>			341.5	101927.5	2124.5	1681.8	229.6	5.8	95.3	281.0	156.1

## The Home Efficiency Retrofit Program

*Creating Jobs and Saving Energy*  
February, 2009

Congress should act immediately to implement a national home efficiency retrofit program to save Americans money and stimulate the economy. This program would expand the EPA Home Performance with Energy Star comprehensive retrofit program that now operates in 22 states. The untapped potential of our homes to operate efficiently is a drag on consumer spending, as dollars are wasted on energy. Tapping in to this potential puts money in pockets and creates durable, domestic jobs in home efficiency that can never be sent overseas.

### The Benefits

The benefits to homeowners are significant and immediate. The average homeowner will spend around \$2,300 on energy bills this year, and a performance retrofit will likely reduce these costs by about 25%, corresponding to nearly \$6,000 in energy savings through the 10<sup>th</sup> year. This money represents extra cash for necessities or disposable income that will be injected back into the larger economy.

At a national scale, the benefits of home retrofits are enormous. If the program reaches a million homes per year the 10 year energy savings would be enough to fully power about 15 million homes for a year. Scaling up the home efficiency industry would provide about 50,000 net jobs.

### The Program

Under the current program, private contractors receive certification in advanced home weatherization techniques and provide energy audits and installation services to homeowners. Marketing is done by both the private contractors and state and utility program sponsors. The current program involves no federal incentives, although some states and utilities do provide incentives. In order to “turbo charge” this program we recommend that substantial financial incentives be provided by the federal government. The whole home grant program would allow residents all over the country to begin to immediately save 10-50% on their energy bills in a matter of weeks. The program would grant approximately 20-50% of the costs for efficiency retrofits based on the energy savings achieved, with higher incentives for larger savings. The program consists of two paths, one prescriptive and one performance based.

In the prescriptive path the homeowner may elect to pursue a combination of measures from a list that has been designed to achieve 10 or 20% energy savings. The grant for 10% savings would be set at \$1000 and \$2000 for 20%. This option would be implemented quickly and would sunset after a year, or upon administrator discretion.

The performance path would provide a \$3,000 grant for a 20% improvement in energy performance of the home. The amount of the grant would increase with higher performance at a rate of \$150 for each 1% improvement. The documentation and verification of energy savings would be done utilizing and scaling up the home energy rater and home performance contractor industries, using accepted third party standards from RESNET and BPI. The grants would be available to homeowners or another party designated by the owner.

**Efficiency is an untapped resource in American homes.** Home efficiency combines short term, job- creating investment with long term cost reductions and environmental benefits. Homeowners simply cannot afford to continue to let up to half of their energy leak out of their homes without providing any service. Energy efficiency is the fastest, cheapest, cleanest energy source we have and tapping it in our homes is the first step we must make toward our economic recovery.

## Concept for Building Training and Assessment Center (BTAC) Program at DOE

Prepared by ACEEE  
February 2009

**Recommendation:** Authorize a new Building Training and Assessment Center (BTAC) program, based loosely on DOE's very successful Industrial Assessment Center program, to help train new building engineers and technicians who can provide energy-saving assistance to owners and operators of commercial and institutional buildings with energy-saving technical assistance.

Today's commercial and institutional buildings have increasingly sophisticated controls and need a well-trained workforce to help design and operate them with optimal energy efficiency. This required workforce is comprised of a number of disciplines: the architects and engineers who create the buildings and equipment; the builders and installers of equipment; and the technicians that service and maintain the buildings and equipment over time. An aging current workforce presaging large-scale retirement of technicians, combined with the rapidly growing need for professionals well-trained in building energy efficiency, has created the need for a comprehensive approach to improving the education and training of professionals in each of these fields:

- : Universities need to provide an avenue for training architects, building and equipment engineers, and building scientists in the skills to design and execute efficient buildings and equipment.
- : Community colleges, trade schools, and apprenticeship programs must train technicians conversant with modern building energy systems and equipment.
- : In addition, as a second step, it is important to provide training for building operators, including continuing education for those who currently hold these jobs.

The Building Training and Assessment Center (BTAC) program will utilize three groups of higher education institutions to develop the energy efficiency workforce:

1. University-level BTACs will educate building engineers and building scientists, creating opportunities to train these professionals in designing and operating buildings with optimal efficiency. Universities will support work with satellite BTACs at community colleges and trade schools.
2. Satellite BTACs designed to train building technicians will be based in community colleges and trade schools (including continuing education programs) in a program emphasizing troubleshooting building operations.
3. The last tier of universities will be "Centers of Excellence," BTAC universities that are already established leaders in the field of buildings energy efficiency. They will serve as resources to the other BTACs, with a budget to travel in order to provide mentoring and maintain the network of educators creating a better trained and qualified workforce.

A key component of each BTAC program will be free energy performance assessments of individual commercial and institutional buildings, providing energy-saving suggestions to building owners and operators while providing practical hands-on experience to trainees. This combination has been a key for success in the Industrial Assessment Center program.

### Impacts:

The BTAC program would support training of building scientists, engineers, and technicians in order to develop the buildings and equipment skilled workforce. The program will combine classroom instruction with hands-on field experience in building assessment through free audits and internship programs. The free building assessments each BTAC provides in their local communities will create the potential for significant energy savings. These energy savings result in direct jobs installing energy-efficiency measures and in manufacturing the energy-efficiency equipment installed at the buildings, while helping building owners keep a major operating cost in check, improving their economic viability and the number of people they employ.

### Funding:

We recommend funding levels of \$400,000-600,000/year to run each of the university BTACs, \$250,000/year to create and maintain each community college/trade school BTAC, and \$750,000/year to manage each of the Centers of Excellence BTACs. About 25 university centers should be established, with an effort to engage many of the existing academic centers with leading building programs. Each university center would eventually serve 2-3 satellite BTACs. Initially, the program would start with perhaps 10-12 university-based centers, each with a

satellite center. Ultimately, 75 more university or satellite centers would be established throughout the nation, each selected through a competitive solicitation. To serve these needs, legislation should authorize \$5 million in start-up funding in FY 2010, \$10 million in FY 2011, \$20 million in FY 2012, and \$40 million/year thereafter. Establishing long-term, sustained funding is necessary to convince schools to commit to developing or expanding a program and to ensure the program will continue to get renewed best practices information into the field.

**Background:**

Commercial buildings account for nearly 20% of U.S. energy use annually (AEO 2009), but ACEEE's studies show opportunities for cost-effective energy savings in existing buildings of up to 30%. Higher performance buildings that save energy by operating with greater energy efficiency are readily attainable today. These buildings are dependent on well-trained technicians, designers, and contractors to perform optimally. The effort and resources to properly train, recognize, and reward these individuals can yield enormous benefits given high and unpredictable energy costs. By carefully designing new commercial and institutional buildings to be more energy-efficient, up to 50% of the energy costs can be eliminated for owners. However, even well-designed commercial buildings may run 10-15% below expected energy performance levels because of poor installation, poor commissioning, and operational errors. Improving building energy efficiency is a cost-effective way to make buildings more affordable, improve comfort, and reduce costs for building owners.

Consequently, it is essential to create a vibrant workforce of engineers and technicians trained to reduce energy costs through efficiency. There is a staggering shortage of skilled energy engineers in the building industry and among energy efficiency programs and consultants. As energy efficiency becomes more of a priority for economic, security, and environmental reasons, there will be significant need for more building engineers and technicians with the knowledge and training to design, operate, install, and maintain building equipment.

The Building Training and Assessment Center (BTAC) program concept is based on the model of the Industrial Assessment Center (IAC) program that has operated since 1976. This program has been one of DOE's most effective programs, training industrial engineers and providing them with practical hands-on experience by providing free energy audits to industrial firms. The program has trained more than 2,500 engineers and reduced energy use at more than 14,000 factories. Trainees from the program are in high demand and receive multiple job offers with a majority of IAC graduates taking jobs in the energy efficiency field.

While there are existing building engineer and building and equipment technician training programs throughout the country, there is a fundamental need for more students trained in these skills. The BTAC program will focus on leveraging existing programs at universities, community colleges, vocational-tech schools (secondary level), and apprenticeship programs, and developing new programs to expand and accelerate the numbers of qualified individuals with these skills and capabilities. BTACs would serve as an important source of new workforce for the field, and its graduates would likely be in high demand for their experience and expertise, as have the graduates from the IAC program. Graduates from the programs will be prime candidates for high-paying, high-skilled jobs.

In the BTAC program, engineering students in universities across the country will work closely with professors to provide free building energy assessments, capturing the results of the recommendations in a database similar to the one established for the IAC program. The audits performed for commercial and institutional buildings will emphasize easy-to-execute, inexpensive energy saving measures for the buildings. The BTAC program will improve the operational efficiency and performance of thousands of buildings across the country, creating energy and dollar savings for owners and tenants. In addition, the technicians and building operators trained in the program will have the skills needed to maintain these energy savings and will be guaranteed practical experience in real buildings. By providing continuing education for building technicians, BTACs can work with local firms and technicians to improve capacities already in the market.

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