AIA

THE AMERICAN INSTITUTE OF ARCHITECTS

STATEMENT OF
MARSHALL E. PURNELL, FAIA
FIRST VICE-PRESIDENT

"ENERGY EFFICIENT FEDERAL BUILDINGS"

United States House of Representatives
Committee on Oversight and Government Reform

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Rayburn House Office Building

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Introduction

Mr. Chairman, Members of the Committee — good afternoon. I am Marshall Purnell, the First Vice President of the American Institute of Architects.

On behalf of our more than 80,000 members and the 281,000 Americans who work for architecture firms nationwide, I would like to thank you for the opportunity to appear today. I would like to share some of our nation's architects' thoughts on energy consumption and energy efficiency, and how these important topics relate to the most overlooked sector in the climate change debate, buildings: the buildings in which our people live, work, and play.

I commend you for holding this hearing to examine strategies that would reduce the amount of fossil-fuel generated energy consumed by the federal government. Furthermore, I would like to convey the AIA's strong support for the legislation being discussed here today. "The Carbon-Neutral Federal Government Act of 2007" makes major strides towards reducing the amount of fossil-fuel generated energy our government consumes. This bill will improve the federal government's energy efficiency as well as decrease the amount of greenhouse gas we produce. In particular, the AIA strongly supports Section 204 which establishes energy performance standards for new federal buildings and buildings undergoing major renovations. This section builds upon an AIA policy position which calls for carbon neutral buildings by 2030. We are extremely pleased to see that the Committee has included our 2030 goals in this bill.

It is vital that any serious discussions intended to reduce the carbon footprint of the federal government—and thus mitigating the effects of climate change--must include a dynamic conversation about our nation's buildings. It is critical for this Committee to understand the role of the built environment as it relates to climate change and energy usage, particularly as this committee has jurisdiction over the operations of the federal government. I feel it would be both useful and interesting for the Committee to learn how buildings designed in an energy-efficient manner can significantly reduce energy consumption and greenhouse gas emissions. These buildings can slow the effects of climate change and make the federal government less reliant on fossil fuel generated energy.

According to the Department of Energy's Energy Information Administration, buildings and their construction are responsible for nearly half of all greenhouse gas emissions produced in the U.S. every year. DOE's recently released Building Energy Data Book reveals that the building sector accounts for 39 percent of total U.S. energy consumption, more than both the transportation and industry sectors.[1] The same study found that buildings are responsible for 71 percent of U.S. electricity consumption and that *buildings in the United States alone account for 9.8 percent of carbon dioxide emissions worldwide.*[2]

In fact, according to the Department of Energy, U.S. *buildings account for nearly the same amount of carbon emissions as all sectors of the economies of Japan, France, and the United Kingdom combined.*[3]

3.1.1 Carbon Dioxide Emissions for U.S. Buildings, by Year (10^6 metric tons of carbon) (1)

	Buildings				U.S.			
	Site Fossil	Electricity	Total	Growth Rate 2004-Year	Total	Growth Rate 2004-Year	Buildings % of Total U.S.	Buildings % of Total Global
1980	172.0	255.2	427.1	-	1281.7	-	33%	8.5%
1990	153.7	317.2	470.9	-	1359.7	-	35%	8.1%
2000	167.4	426.2	593.5	-	1581.3	-	38%	9.1%
2004	**164.7** (2)	**443.4**	(2) **608.1**	-	**1610.2**	-	**38%**	**9.8%** (3)
2010	168.0	502.5	670.5	1.6%	1737.1	1.3%	39%	8.6%
2015	174.8	535.3	710.1	1.4%	1833.4	1.2%	39%	7.7%
2020	179.6	577.2	756.8	1.4%	1942.9	1.2%	39%	7.5%
2025	182.5	627.0	809.5	1.4%	2070.6	1.2%	39%	7.4%
2030	186.0	686.2	872.2	1.4%	2214.6	1.2%	39%	7.3%

Note(s): 1) Excludes emissions of buildings-related energy consumption in the industrial sector. Emissions assume complete combustion from energy consumption and exclude energy production activities such as gas flaring, coal mining, and cement production. 2) Emissions differ from EIA, AEO 2006, Feb. 2006 by less than 0.1%. 3) U.S. buildings emissions approximately equal the combined carbon emissions of Japan, France, and the United Kingdom.

Source(s): EIA, Emissions of Greenhouse Gases in the U.S. 1985-1990, Sept. 1993, Appendix B, Tables B1-B5, p. 73-74 for 1990; EIA, Emissions of Greenhouse Gases in the U.S. 2003, Dec. 2004, Tables 7-11, p. 29-31 for 1990 and 2000; EIA, Assumptions to the AEO 2006, Mar. 2006, Table 2, p. 9 for carbon coefficients; EIA, AEO 2006, Feb. 2006, Table A2, p. 134-138 for 2004-2030 energy consumption and Table A18, p. 160 for 2004-2030 emissions; EIA, International Energy Outlook 2006, June 2006, Table A10, p. 93 for 2003-2030 global emissions; and EIA, International Energy Annual 2004, July 2006, Table H1, www.eia.doe.gov for 1980-2000 global emission.

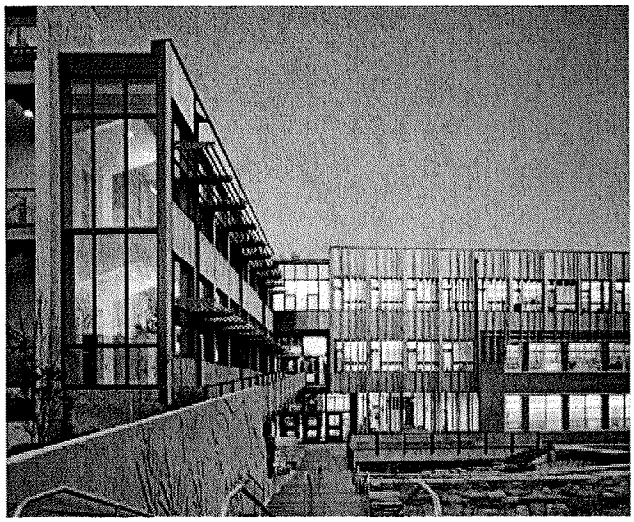
Therefore, if we in the United States want to be serious about energy efficiency and energy reductions, buildings *must* become a significant part of the discussion.

Annual U.S. energy consumption is projected to increase by 32 percent over the next twenty five years[4]. The AIA believes strongly that now is the time to act to reverse this course and start making significant reductions in the amount of fossil-fuel generated energy our nation consumes through its buildings.

The data shows that the building sector is only going to become more critical to the discussion. Over the next 30 years, the character of the built environment will change dramatically. Currently, U.S. building stock sits at 300 billion square feet. Experts predict that between now and 2035, 52 billion square feet will be demolished, 150 billion square feet will be remodeled, and another 150 billion square feet will be newly

constructed.[5] Because buildings are such a major producer of greenhouse gases, the AIA believes that if Congress and our nation want to address climate change, confronting energy consumption in the next generation of buildings is a vital endeavor. We believe that the federal government can and must take the lead to change the way our buildings use energy.

SHOWING THE PROMISE OF GREEN BUILDING
Sidwell Friends School
Washington, DC



The renovation and addition to the middle school transforms a 55-year-old facility into a school that teaches environmental responsibility by example. The 39,000 ft2 addition more than doubled the size of the existing building, while retaining and enhancing the value of the existing structure. The building was sited to take advantage of passive solar design. Together with high-efficiency lighting, photo sensors, and occupancy sensors, daylighting minimizes energy use. Solar-ventilation chimneys, operable windows, and ceiling fans minimize the need for mechanical cooling. A photovoltaic array generates about 5 % of the building's electricity needs. A green roof and constructed wetland reduce stormwater runoff, improve the quality of infiltrated runoff, and reduce municipal water use. The wetland treats wastewater for reuse in cooling tower.

To reduce energy consumption in the building sector, the AIA believes that architects must advocate for the sustainable use of our earth's resources through their work for clients. To support this principle, in December 2005, the AIA Board of Directors approved an official Institute position stating that all new buildings and major renovations to existing buildings be designed to meet an immediate 50 percent reduction in fossil fuel-generated energy (compared to a 2003 baseline) and that at five year intervals, that reduction target be increased by at least 10 percent until new and renovated

buildings achieve carbon neutrality in 2030. Architects across the country have embraced this principle and are currently utilizing design practices that integrate built and natural systems that enhance both the design quality and environmental performance of the built environment. But in order to truly revolutionize the way our nation designs buildings, the public sector, especially the federal government, must also play a role. This committee alone has jurisdiction over a sizable portion of all buildings in the U.S.[6] Through a combination of both regulation and incentives, we can achieve the goals of greatly reducing fossil fuel generated energy and improving energy efficiency nationwide.

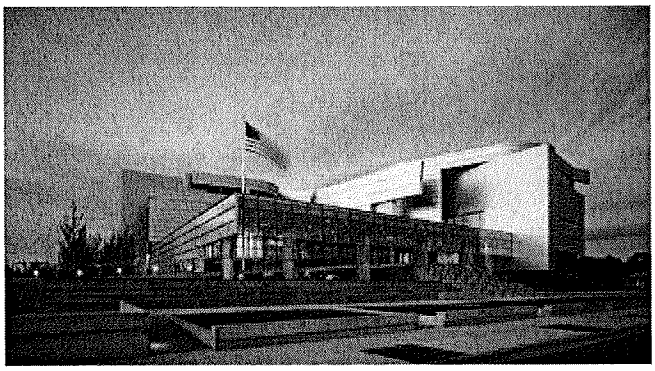
It is important for the federal government to show that energy efficient buildings are both realistic and cost-efficient. Requiring significant energy reduction targets in new and renovated federal buildings will demonstrate to the private sector that the federal government is leading by example. It would help spur the development of new materials, construction techniques, and technologies to make buildings more energy efficient. And it will help show that significant energy reductions are both practical and cost-effective.

The AIA strongly urges Congress to take the lead in the fight against climate change by establishing new energy consumption standards for federal buildings. As Congress has jurisdiction over all federal buildings, Congress can literally show the way for the private sector to attain energy consumption reductions by the built environment.

Federal Building Energy Efficiency

The AIA proposes that federal agencies be required to ensure that new buildings and buildings undergoing major renovations today consume no more than half the fossil fuel generated energy that a similar federal building consumed in 2003.

SHOWING THE PROMISE OF GREEN BUILDING
Wayne L. Morse United States Courthouse
Eugene, OR



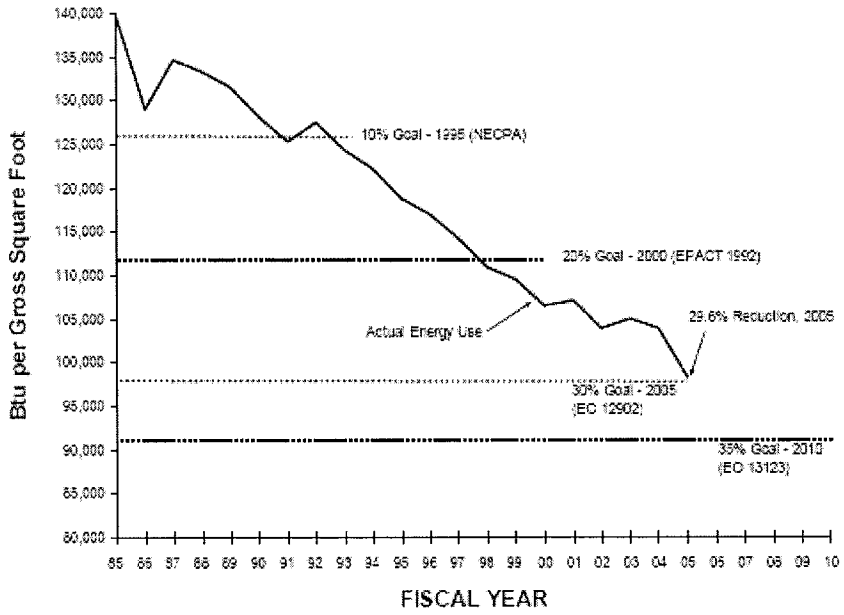
Because the courthouse works with high-risk law enforcement and intelligence agencies, courts, judicial offices and highly sensitive government records, the facility has stringent and complex security requirements to protect against bombings as well as ballistic, biological, and chemical attacks. Despite these design challenges, the building provides an architectural expression of judicial presence at a healthy, human scale. The project's energy use was also reduced by approximately 40% through the use of extensive daylighting, shading, high-performance glazing, efficient electric lighting, displacement ventilation, and radiant-floor heating and cooling. At night, air from the building is replaced with ambient air, reducing the cooling load. The building is certified as LEED Gold.

Beginning in 2010, the agencies should then follow a declining cap on energy consumption such that they meet a minimum energy performance reduction when compared to the 2003 baseline. We propose that by 2010, new and significantly renovated federal buildings be required to reduce fossil fuel generated energy by 60 percent. By 2015, the cap would lower to a 70 percent reduction, continuing until 2030 when we would achieve a 100 percent reduction in fossil fuel generated energy in all new federal buildings.

Setting declining caps on energy usage is not a new idea. In 1999, President Clinton issued an executive order requiring energy consumption reductions in all federal buildings; The Energy Policy Act of 2005 extended and deepened these reduction goals, and last year, Governor Bill Richardson of New Mexico signed an executive order calling for a 50 percent reduction in energy consumption for new and renovated public buildings in the state. And just last month, President Bush issued an executive order requiring federal agencies to reduce energy use by almost a third over a 2003 baseline by 2015. These are important first steps, but we need an aggressive commitment to long term energy reductions for new buildings and major renovations, well into the future.

Energy reduction requirements like these have shown a record of success, as demonstrated by DOE's recently submitted annual report to Congress on Energy Management and Conservation programs. DOE's report found that in 2005, federal agencies responding to President Clinton's 1999 Executive Order had reduced their consumption levels by 29.6 percent, narrowly missing the goal established by President Clinton's Executive Order by only .4 (point 4) percent [see graph below]. This makes it clear that when they are required to do so, federal agencies have the ability to meet reduced energy consumption targets.

Overall Government Progress Toward the Energy Efficiency Goals for Standard Buildings, FY 1985 through FY 2005
(Certain types of renewable energy purchases are treated as energy reductions)



We encourage Congress to build upon these sound policy steps by taking an even more aggressive stance. Congress should also focus energy reduction goals on new construction and buildings undergoing significant renovations. It is far easier and more cost-effective to address energy usage issues beginning with the design stage of the building process.

Requiring all new and significantly renovated federal buildings to consume significantly less fossil-fuel generated energy is a bold idea, but one whose time has come. It would show the world and the private sector that the United States government believes that climate change is real and that aggressive action is needed in order to reverse its course. It demonstrates that the AIA-recommended energy reduction targets are achievable in

new and significantly renovated buildings, often through little or no additional life cycle costs.

SHOWING THE PROMISE OF GREEN BUILDING
Heifer International Headquarters
Little Rock, Arkansas

This building is designed to use up to 55% less energy than a conventional office building. The narrow, semicircular floor plan provides daylight and views to the adjacent riverfront park and wetland for all 474 employees. A stated goal that zero water leave the site led to the restoration of a wetland on an abandoned railroad switching yard; the wetland collects and cleans stormwater for reuse.

Architects across the country are designing high performance "Green Buildings" that are environmentally responsible, healthy, and productive places to work. Today, architects can design carbon neutral office buildings using available technologies and design strategies. Clearly, the building site - including its climatic zone, its orientation toward the sun, its roof area, its proximity to other structures and numerous other variables- will impact how such a design is developed. But certain features will be common to all new carbon neutral buildings. The objective is to minimize energy usage to the maximum extent possible, and then supply what energy is required through renewable sources.

Designing an efficient building envelope (walls, windows, roofs, etc.) can significantly reduce loss of heat in the winter and absorption of heat in the summer, contributing to reduced energy consumption. Architects will place small windows on the north sides of

structures and large windows on the south side. Glazing can incorporate coatings that transmit visible light, but block infrared radiation in order to minimize air conditioning load. Overhangs or sun shades can be used to admit winter sun but block heat in the summer. Use of vegetation on-site, especially deciduous trees, provide summer shade but are leafless and therefore allow sunlight to pass in the winter. Light scoops and skylights maximize natural light and diminish the need for artificial light. Windows should be operable so that during temperate weather fresh air can obviate the need for artificially heated or cooled air.

Recent developments in the insulation of the building shell can significantly reduce the thermal transmissivity of walls. Incandescent lighting should be avoided; fluorescent or LED lighting is much more efficient and cost effective. Modern HVAC systems can be scaled to the heat load generated by people and equipment in the building and operated using sensors that monitor heat load and curtail heating and cooling system use when appropriate. Building design should incorporate energy efficient appliances to minimize the "plug loads" within the structure.

Heating and cooling can be facilitated by the use of ground source heat pumps. By circulating water and coolant (glycol) in a closed loop between the building and the ground beneath the building, a uniform temperature can be achieved all year round. Energy to augment these heat pumps can be derived from on-site passive solar, solar photovoltaic or other renewable energy sources. Electrical resources needed beyond

these sources can be purchased from utility companies' portfolio of renewable energy generation.

The AIA's Committee on the Environment (COTE) annually recognizes such accomplishments in its Top 10 Awards for Sustainable Design. Federal buildings can and should be built in ways that reduce energy consumption and decrease the amount of greenhouse gases they produce, as demonstrated through COTE's Top 10 Awards.

Standards

The AIA strongly supports the transparent, consensus-based development of green building rating systems and standards as they often promote energy efficiency and conservation. The AIA supports standards that incorporate LCA (life-cycle assessments), acknowledge and address regional and bio-climactic differences as well as building type differences, and require measurable reductions in GHG emissions attributable to the built environment. Green rating systems or standards are the easiest and most cost effective way to achieve energy efficiency in buildings. The ratings serve as a checklist to ensure that a building or project actually meets energy reduction and environmental protection goals.

Rating systems encourage and promote green design. As many existing programs offer multiple levels of certification, the design/building community is encouraged to continually strive for more far-reaching sustainability goals. Governments need to institutionalize these standards to not only reap the benefits of high-performance

technology, but to incentivize building green. By offering a system with which to compare buildings, standards are developed and quality is assured.

The AIA believes that rating systems should be developed and renewed through a consensus-based process with the participation of all interested parties. Further, they should require documentation to demonstrate compliance, independent third party validation and the utilization of life cycle assessment data as the basis for design and construction decision making.

The Cost of Building Green

In my professional experience, the primary concern I hear from clients about building "green" is cost. It is true that some energy efficient building systems may cost slightly more than their traditional counterparts. However once the building is in operation, the savings in energy expenditures alone often far outweigh the initial costs of installing "green" systems. While there have been some studies to date that show this, the AIA is currently working with a team of economists to research the economic benefits of energy efficient federal buildings. This study will analyze the estimated energy and dollar savings that federal government would realize by implementing our energy reduction goals for federal buildings over the lifespan of the building. We expect to have the study complete by this summer and we would be happy to submit it for the record. Other sources, most importantly the noted cost consultant Davis Langdon, argue that the cost of sustainability is statistically insignificant to a project's total cost.[7]

The economic value of energy reductions from federal buildings can be seen by looking at previous energy reduction mandates in federal buildings. Because of federal legislation and President Clinton's 1999 Executive Order, federal agencies consumed nearly 30 percent less energy per square foot in 2005 compared to 1985. As a result of this improved energy efficiency, the federal government saved approximately $2.2 billion on energy costs in standard federal buildings in 2005 when compared to 1985. While there are clearly other factors aside from federal energy management activities that go into this reduced spending, improved energy efficiency and energy reduction clearly played a large role.

America is Ready

Finally, the American public believes the time is now to reduce energy usage and reduce the impacts of climate change. The Tarrance Group and Lake Research Partners recently conducted a nationwide poll of voters and found that 74 percent of those polled agreed that "the government should take the lead in promoting real estate development that conserves our natural resources." In addition, 71 percent of voters agreed that "the government should immediately put into effect new energy policies that drastically reduce greenhouse gas emissions." The American public supports conserving our precious resources, and believes that it is in the best interests of our nation and the world to reduce our reliance on fossil fuel produced energy and move towards a sustainable future. Reducing energy use in federal buildings would be a major step towards that goal.

We encourage Congress to consider our proposal, and I welcome any questions from the committee. Thank you Mr. Chairman and members of the committee.

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[1] http://buildingsdatabook.eere.energy.gov/docs/1.1.3.pdf
[2] http://buildingsdatabook.eere.energy.gov/docs/3.1.1.pdf
[3] http://buildingsdatabook.eere.energy.gov/docs/3.1.1.pdf
[4] http://www.eia.doe.gov/oiaf/ieo/pdf/ieoreftab_1.pdf
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[7] Matthissen, Lisa and Morris, Peter. "Costing Green: A Comprehensive Cost Database and Budgeting Methodology. June, 2004; Davis Langdon.