PRELIMINARY REPORT

Green the Capitol Initiative

SUBMITTED TO

SPEAKER NANCY PELOSI

MAJORITY LEADER STENY H. HOYER

CHAIRWOMAN JUANITA MILLENDER-MCDONALD

BY

DANIEL P. BEARD, CHIEF ADMINISTRATIVE OFFICER

APRIL 19, 2007

Preliminary Report
Green the Capitol Initiative

Submitted to

Speaker Nancy Pelosi
Majority Leader Steny H. Hoyer
Chairwoman Juanita Millender-McDonald

by

Daniel P. Beard, Chief Administrative Officer
April 19, 2007

Executive Summary

Background

On March 1, 2007, you directed me to develop of a series of preliminary recommendations for your review to reduce the environmental impacts associated with operation of the House building complex. As noted in your letter, the House of Representatives should demonstrate leadership to the nation by providing an environmentally responsible and healthy working environment for our employees. In addition, the House complex should be a showcase for sustainability. "We cannot ask the American people to address global warming and climate change issues," you noted, "without first carefully examining ways to reduce our own energy consumption and develop sustainable workplace practices."

Environmental responsibility is our duty to future generations. Now is the appropriate time to act to reduce our energy consumption as well as our energy dependence. Congress should set the highest standards for environmental stewardship and sustainable energy use. To accomplish this, we will need to change the way we do business. A sustainable House Capitol complex should recognize the full environmental impact of our decisions on energy and water consumption, materials use and the quality of our workplace. By taking these steps, we not only reduce the impact of House operations on the environment, but also provide leadership by example.

As a result of your directive, I have undertaken a review of the House operating procedures with respect to energy conservation, sustainability and related matters, and I offer the following preliminary recommendations to "Green the Capitol." A more complete set of recommendations will be forthcoming in my final report on June 30, 2007.

Carbon Footprint of the House Complex

Using figures developed by the Government Accountability Office, Lawrence Berkeley National Laboratory estimated that the operation of the House complex is responsible for approximately 91,000 tons of greenhouse gas emissions (expressed in carbon dioxide equivalents) in fiscal year 2006. This is equivalent to the annual carbon dioxide emissions of 17,200 cars. Electricity use was the largest source of emissions, accounting for 63 percent of total carbon emissions. The electricity purchased by the House (and other Legislative Branch agencies) is generated from several sources: coal (53 percent), nuclear (37 percent), natural gas (7 percent), renewables (2 percent) and fuel oil (1 percent). The Capitol Power Plant accounts for another 33 percent of House greenhouse gas emissions, primarily from the combustion of fossil fuels at the boilers to generate steam to heat the buildings. The power plant's boilers are fired using coal (for 49 percent of the output), natural gas (47 percent) and other sources. All other business-related activities (travel in owned and leased vehicles, operation of heavy machinery, release of volatile organic compounds from paint, furniture refinishing, etc.) accounted for the remainder of the House's carbon dioxide emissions (4 percent).

Recommendations

Recommendation 1: Operate the House in a Carbon Neutral Manner. Climate change and global warming are serious problems caused primarily by the introduction of carbon into the atmosphere. One way the House can begin to address this problem is to work toward undertaking our operations in a carbon neutral manner. This will mean taking steps to reduce the greenhouse gas emissions our complex creates through its operations. Global warming is an international problem, but there are steps we can take to provide leadership for solving these issues locally. The most important step is to adopt a policy of making the operations of the House carbon neutral.

Accordingly, it is recommended the House operate in a carbon neutral manner at the earliest possible date, but no later than the end of the 110th Congress. By implementing this recommendation, we will be eliminating the impact of 91,000 tons of carbon dioxide emissions annually, which is the equivalent of taking 17,200 cars off the road each year.

Recommendation 2: Shift to 100 Percent Renewable Electric Power. The purchase of electricity is the largest source of carbon dioxide emissions from the operations of the House. In order to achieve our goal of making our operations carbon neutral, my office, working with the Architect of the Capitol, should negotiate to purchase 100 percent of our electricity needs (approximately 103,000 megawatt-hours per year) from renewable sources at the earliest possible date. The cost of electric power generated from renewable sources can be up to 20 percent more than power generated from traditional sources. This increase in cost will be offset over the long run by the energy conservation actions I am recommending. By implementing this recommendation, we will eliminate 57,000 tons of the total greenhouse gas emissions annually, or the equivalent of removing 11,000 cars from the roads.

Recommendation 3: Aggressively Improve Energy Efficiency. There are a series of immediate steps House offices can take to reduce energy use. I recommend we take the following actions:

a. Immediately convert 2,000 desk lamps in the House office buildings to compact fluorescent lamps (CFL). In addition, within six months take the steps necessary to convert the remaining 10,000 desk lamps to CFLs. Replacing 12,000 CFLs is the equivalent to removing 255 cars from the road, and it will yield a $245,000 savings in electric power costs to the House per year.
b. Direct the CAO and Architect of the Capitol to no longer purchase standard incandescent replacement bulbs with funds made available by the House. Standard incandescent bulbs consume four times the energy of compact fluorescents and it is time for the House to eliminate their use.
c. Instruct the Architect to convert the overhead House ceiling lights to high efficiency lighting and controls at the earliest possible date. Such action has the potential to reduce lighting energy from these sources by as much as 50 percent. This action will eliminate 7,130 tons of greenhouse gas emissions, which is equivalent to 1,340 cars.
d. Promote energy efficiency among the 7,000 staff of the House by making CFLs available at cost in the House office supply store. If all staff members installed just one CFL bulb for their own use, it would have a cumulative effect of removing 150 cars from the road.
e. Direct the Architect to expand their fluorescent lamp disposal program to include the proper collection of used CFLs.

Recommendation 4: Adopt Sustainable Business Practices. Our office is a major purchaser of products and services, and we should demonstrate leadership by making purchases that promote sustainability. Therefore, I recommend the following actions:

a. Purchase only Energy Star or Federal Energy Management Program-designated products where such designations are available. These products have been determined by the appropriate Federal agencies to be life-cycle cost effective in normal operations and will contribute significantly to reduced consumption of energy.
b. Purchase office equipment that is certified using the Electronic Product Environmental Assessment Tool (EPEAT) system. This system helps evaluate, compare and select electronic equipment based on its environmental attributes. EPEAT certified electronic devices are low in heavy metals and high in recycled plastic content.
c. Give priority to the purchase of climate neutral products that offset the life cycle contribution of greenhouse gas emissions. Specifically, purchase only adhesive, sealants, paints, coating, and carpets that emit very low quantities of volatile organic compounds. Volatile organic compounds are major components affecting indoor air quality and they contribute to climate change.
d. Purchase only furnishings that contain recycled products or wood certified as sustainable by the Sustainable Forests Initiative, the Forest Stewardship Council or similar programs. Implementing this recommendation will make a small contribution toward insuring bio-diverse forests for future generations.
e. Direct the Architect to finalize the installation of an Ethanol-85 tank, pump, and related infrastructure for the use of official vehicles within the next six months.

Recommendation 5: Continued Leadership on Sustainability Issues. It is important for Members and staff to continue to provide leadership on climate change and sustainability issues. To assist in maintaining this continuing commitment, I recommend the following actions:

a. Hold a "Green Expo" for House offices to demonstrate the latest in green products or services available to offices from commercial vendors.
b. Establish a sustainability education program for House employees providing guidance on how employees can make a contribution to impacting climate change and sustainability at home and in the work place.
c. Establish a "Green Revolving Fund" where revenues received from various sources will be placed in a revolving fund to be used to undertake energy and water conservation initiatives that offset greenhouse gas emissions.

Recommendation 6: Offset to Insure Carbon Neutral Operations. It is likely that even by implementing all the recommendations outlined above, the House will not be operating in a carbon neutral manner. As a result, we will have to develop a strategy for offsetting as much as 34,000 tons of greenhouse gas emissions by either: (1) Purchasing offset credits in the domestic market, or (2) Contributing a per ton payment, based on the current domestic market, of carbon dioxide equivalents emitted by the Capitol Power Plant boilers and placing these funds in the Green Revolving Fund to be used to directly mitigate the emissions. Since the domestic offset market is in its infancy and lacks uniform standards, it is important the House carefully screen any offset purchases. Between now and June 30, I will undertake a review of possible investments and determine their acceptability. If an acceptable offset cannot be secured, depositing the offset monies in the Green Revolving Fund would provide us with an acceptable alternative.

Conclusion

The recommendations in this report are only the first step in the process of creating a Green Capitol and more sustainable House operations. The final report scheduled for release on June 30 will introduce additional recommendations and provide a framework for guiding future decisions. That framework will set benchmarks for existing energy use; establish meaningful and measurable goals for reducing energy and carbon; create timetables for implementing various changes in operating conditions; and define measures for reporting progress on a regular basis.

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Key Terms

Carbon dioxide. Carbon dioxide is a chemical compound composed of one carbon and two oxygen atoms. It is often referred to by its formula CO_2. It is present in the Earth's atmosphere at a low concentration of approximately 0.04 percent and is an important greenhouse gas. The unit we use in this report is tons of carbon dioxide.

Carbon neutral. Carbon neutral buildings are buildings that produce no net contribution to carbon emissions. See Zero Energy Building below.

Carbon offset. A carbon offset is part of the process of reducing the net carbon emissions of an individual or organization, either by their own actions, or through arrangements with a carbon-offset provider.

Cogeneration. Cogeneration**,** also called combined heat and power (CHP), is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

Energy security. Energy security, or the security of the energy supply, is a key component of energy policy in many countries. Since all economic activity requires the use of energy resources, the continuing availability of energy at a price that protects economic growth is a major concern of policy makers.

Global warming. Global warming is the observed increase in the average temperature of the Earth's near-surface air and oceans in recent decades, and its projected continuation. The cause is due to an increase in carbon dioxide emissions, primarily from the combustion of carbon fuels, and other "greenhouse gases."

Renewable energy. Renewable energies derived from resources that are regenerative or for all practical purposes cannot be depleted. For this reason, renewable energy sources are fundamentally different from fossil fuels, and do not produce as many greenhouse gases and other pollutants as fossil fuel combustion.

Sustainability. Sustainability refers to activities that provide the best outcomes for the human and natural environments, both now and into the indefinite future. One of the most cited definitions has been given by the former Norwegian Prime Minister, Gro Harlem Brundtland, who defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainability relates to the continuity of economic, social, institutional and environmental aspects of human society, as well as the non-human environment.

Zero Energy Building. A zero energy building (ZEB) or "net zero energy building" is a general term applied to a building with a net energy consumption of zero over a typical year. This consumption can be measured in different ways, relating to cost, energy or carbon emissions.

1. Background

On March 1, 2007, Speaker Nancy Pelosi, Majority Leader Steny H. Hoyer, and Chairwoman Juanita Millender-McDonald directed the Chief Administrative Officer to develop a series of preliminary recommendations in order to reduce the environmental impacts associated with the operation of the House office building complex. As they noted, "the House of Representatives should demonstrate leadership to the nation by providing an environmentally responsible and healthy working environment for our employees. In addition, the House complex should be a showcase for sustainability. The House cannot ask the American people to address global warming and climate change issues without first carefully examining ways to reduce our energy consumption and practice sustainable workplace practices."

As a result of this directive, the Chief Administrative Officer has undertaken a review of the House operating procedures with respect to energy conservation, sustainability and related matters, and offers the following preliminary recommendations to "Green the Capitol."

Several studies have recently been completed, or are currently under way, that characterize the energy and carbon use of the Capitol area complex. The Architect of the Capitol is preparing an overall Sustainability Plan, and is completing an assessment of the energy retrofits that can be undertaken as part of its overall facilities planning process. The Government Accountability Office (GAO) is documenting detailed analysis of the energy and carbon use for the Capitol complex to determine its "carbon footprint." The House Science Committee is proposing demonstration offices to showcase energy efficient and sustainable practices. Recommendations have been made by Carnegie Mellon University and others on specific measures that can be taken, both as short-term actions and through improved specifications for future retrofits. The Vermont Energy Investment Corporation, a non-profit entity, has offered recommendations to Congressman Peter Welch on the best way to insure carbon neutral operations for his office in the Longworth Building.

This report draws on these draft studies and recommendations, and other sources. It presents a framework in which all of these recommendations, and others, can be reviewed and implemented. A more complete set of recommendations will be forthcoming in the final report on June 30, 2007.

2. Carbon Footprint of the House Complex

Summary

Using figures developed by the Government Accountability Office, Lawrence Berkeley National Laboratory estimated that the operation of the House complex is responsible for approximately 91,000 tons of greenhouse gas emissions (expressed in carbon dioxide equivalents) in fiscal year 2006. This is equivalent to the annual carbon dioxide emissions of 17,200 cars. Electricity use was the largest source of emissions, accounting for 63 percent of total carbon dioxide emissions.

The electricity purchased by the House (and other Legislative Branch agencies) is generated from several sources: coal (53 percent), nuclear (37 percent), natural gas (7 percent), renewables (2 percent) and fuel oil (1 percent). The Capitol Power Plant, which no longer generates electricity, accounts for another 33 percent of the House greenhouse gas emissions, primarily from the combustion of fossil fuels at the boilers to generate steam to heat the buildings. The power plant's boilers are fired using coal (for 49 percent of the output), natural gas (47 percent), and other sources. All other business-related activities (travel in owned and leased vehicles, operation of heavy machinery and release of volatile organic compounds from paint, furniture refinishing, etc.) accounted for the remainder of the House's carbon emissions (4 percent).

Characteristics of the House Building Complex

The House building complex described in this report consists of seven buildings in the Capitol complex, accounting for 6.1 million square feet, roughly 40 percent of the 15.4 million square feet of the total Capitol complex area (see Table 1).

Table 1. Name, Year Built and Floor Area of the House Buildings, not including the Capitol Power Plant

Building Name	Year Built	2006 Floor Area [square feet]
Cannon House Office Building	1908	888,536
Longworth House Office Building	1933	682,791
Rayburn House Office Building (inc. E & W Underground Garages)	1965	2,971,469
Ford House Office Building	1939	594,730
House Page Dorm	1940	44,986
U.S. Capitol [A]	1793	421,800
Capitol Visitors Center	(under construction)	518,000
TOTAL		**6,122,312**

[A]Only one-half of the Capitol floor area is under House jurisdiction

These buildings represent a diverse mix of office and support spaces, and include historical buildings as well as buildings currently under construction. The House complex can be viewed as a small campus within the larger Capitol complex.

Energy Consumption for the House Buildings

Energy is supplied to the House buildings from several sources. Electricity is purchased from the local utility and provided directly to the buildings. Buildings are on a district steam and chilled water loop produced by the Capitol Power Plant (CPP), located on site. The CPP does not produce electricity, but purchases electricity to operate the chillers. The boilers of the plant primarily use coal or natural gas to produce steam that is distributed to many of the buildings. Some of the buildings, for example, the Ford House Office Building, have other suppliers of energy.

Total energy consumption in House buildings is shown in Table 2. The table combines three types of energy consumption: energy consumption (primarily electricity) metered at each House building, electricity used by the CPP to provide chilled water to House buildings, and fuel used by the CPP boilers to provide steam heat to House buildings.

Of course, the CPP provides chilled water and steam throughout the Capitol complex, not just to House buildings. Because metered consumption of chilled water and steam is not available for each House building, we had to calculate an estimate of the percentage of total CPP output that was attributable to the House buildings. Based on square footage data for buildings served by the CPP, we estimate that 31 percent of the CPP output is attributable to House buildings. By applying that 31 percent factor to total CPP electricity and fuel consumption, we attributed chilled water and steam energy consumption to the House buildings.

Table 2. 2006 House Building Energy Consumption

Building Name	Metered Electricity (kWh)	Electricity (Million Btu)	Total Fuel (Million Btu)	Total Energy (Million Btu)
Cannon HOB	9,126,128	31,138		31,138
Longworth HOB	8,761,167	29,893		29,893
Rayburn HOB plus East & West Underground Garages	28,046,168	95,694		95,694
Ford HOB	11,744,970	40,074	22,992	63,066
House Page Dorm	393,300	1,342		1,342
U.S. Capitol	12,709,015	43,363		43,363
Capitol Visitors Center	431,400	1,472		1,472
Capitol Power Plant @ 31%	32,198,738	109,862	433,259	543,121
TOTAL	**103,410,886**	**352,838**	**456,251**	**809,089**

Source: Architect of the Capitol 2007

In 2006, the total annual energy use for the House buildings, using the 31 percent factor for the energy from the Capitol Power Plant, is 809,089 Million Btu (with electricity converted as site energy, not source energy).

Carbon Footprint for the House Buildings

The estimated total carbon footprint for the House buildings is 91,000 tons of carbon dioxide, of which 63 percent (57,000 tons of carbon dioxide) is from electricity used by both the Capitol Power Plant and directly at the buildings, with the remainder from the fossil fuels, primarily at the CPP. The fuel mix for generating the electricity purchased from the local electricity provider was coal (53 percent), nuclear (37 percent), natural gas (7 percent), renewables (2 percent) and fuel oil (1 percent).

Change in Electricity Consumption for the House Buildings

The total 2006 annual electricity consumption for the House buildings, including the 31 percent factor at the Capitol Power Plant, is 103,411,000 kWh (Table 3). This is roughly the same electricity consumption as 8,600 U.S. homes.

Table 3 also shows a two percent increase in electricity consumption by 2006 from the FY03 baseline established by the Energy Policy Act of 2005, with the even greater increase in electricity use in the House buildings. The power consumption at the Capitol Power Plant has been decreasing over the same period.

Table 3. Trend in Electricity Consumption for the House Buildings, including the estimated fraction for the Capitol Power Plant, 2003-2006

House Buildings Electricity [kWh/yr]					2006 Change from 2003 Baseline	
	FY 03	FY 04	FY 05	FY 06	kWh	%
Cannon HOB	9,057,321	9,204,855	8,889,950	9,126,128	68,807	0.8%
Longworth HOB	9,173,153	9,867,332	9,560,481	8,761,167	-411,986	-4.5%
Rayburn HOB	27,485,346	27,398,807	27,773,721	28,046,168	560,822	2.0%
Ford HOB	11,835,756	12,749,496	12,747,986	11,744,970	-90,786	-0.8%
House Page Dorm	409,500	439,200	408,600	393,300	-16,200	-4.0%
U.S. Capitol (House only)	9,402,524	9,663,404	9,682,487	12,709,015	3,306,491	35.2%
House Total (kWh)	67,471,200	70,894,294	71,664,825	71,212,148	3,740,948	5.5%
Capitol Power Plant @ 31%	34,214,225			32,198,738	14,916,964	-5.9%
TOTAL HOUSE & CAPITOL POWER PLANT	**101,685,425**			**103,410,886**	**29,850,128**	**1.7%**

Source: Architect of the Capitol 2007

Trends in Energy and Carbon Emissions

Figure 1 shows that for the past ten years there has been no clear trend in total energy consumption for the House buildings. Central steam predominates, followed by central chilled water from the Capitol Power Plant.

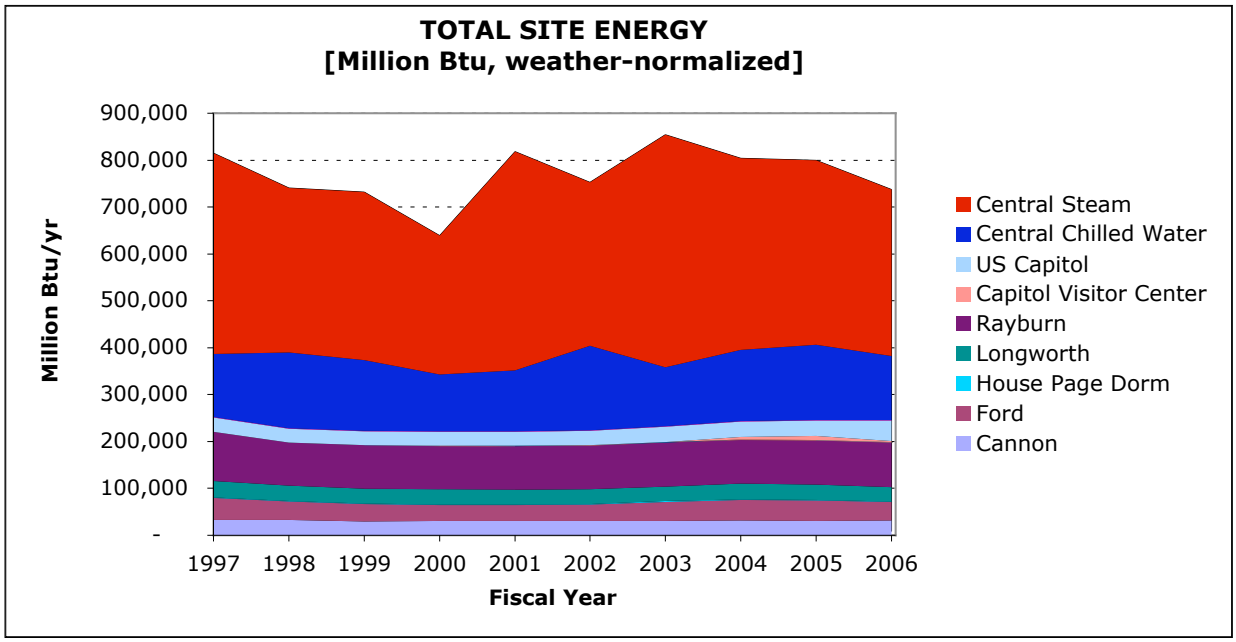

Figure 1. Total Energy Consumption for the House Buildings 1997-2006.

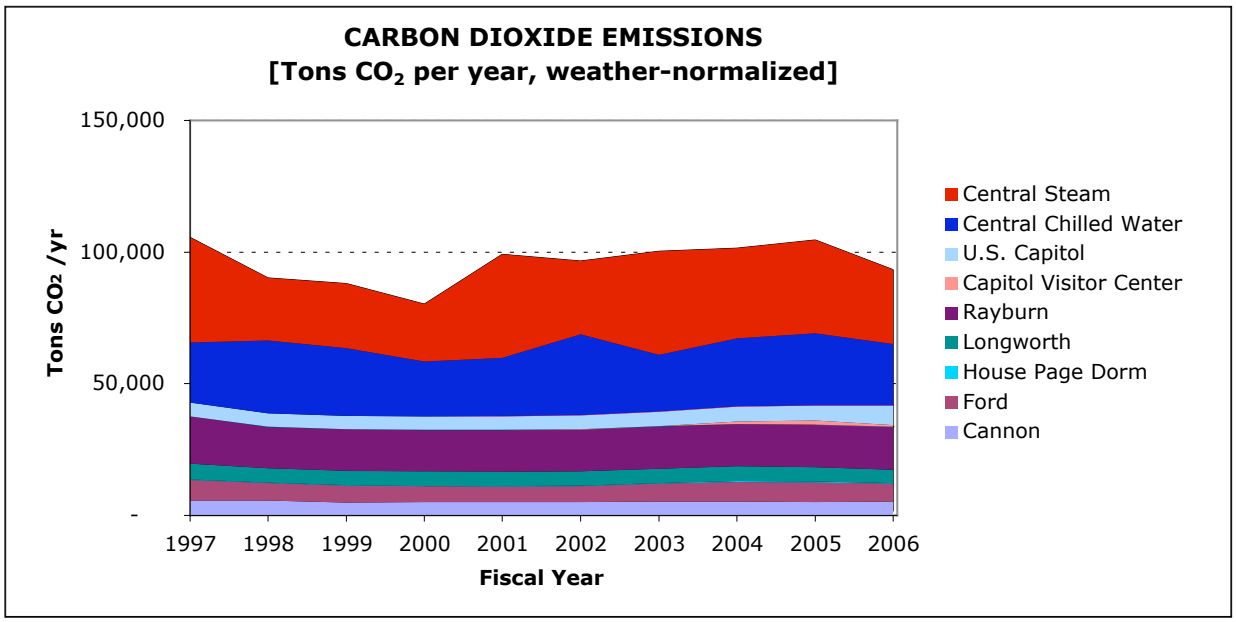

Figure 2. Total Carbon Dioxide Emissions for the House Buildings 1997-2006.

Similar to the energy consumption shown in Figure 1, Figure 2 illustrates that there has been no clear trend in carbon dioxide emissions for the past 10 years, with the drop in 1998-2001 for central steam probably due to price-based fuel switching for the boilers in the CPP. The data in Figure 2 uses 2004 carbon emission factors from Pepco.

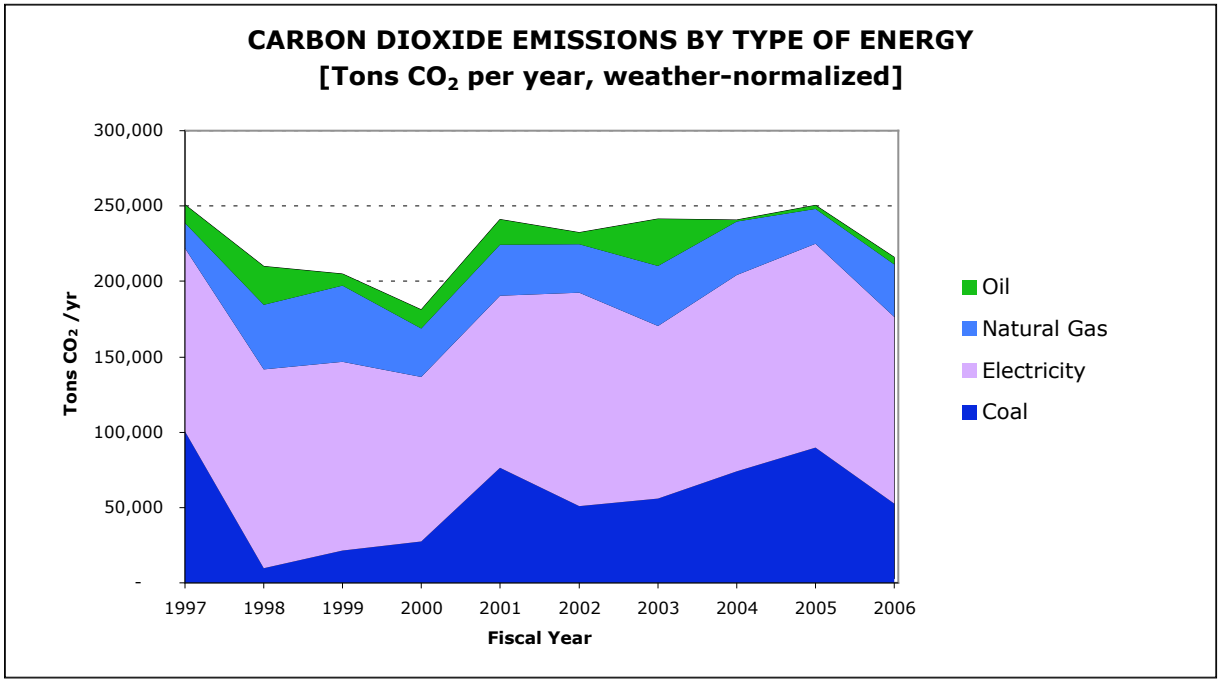

Figure 3. Carbon Dioxide Emissions by Type of Energy.

The impact of fuel substitution at the plant (natural gas for coal) from 1998-2000 is clearly seen in Figure 3. Note that the carbon dioxide emissions from purchased electricity for the Capitol complex come largely from the combustion of coal.

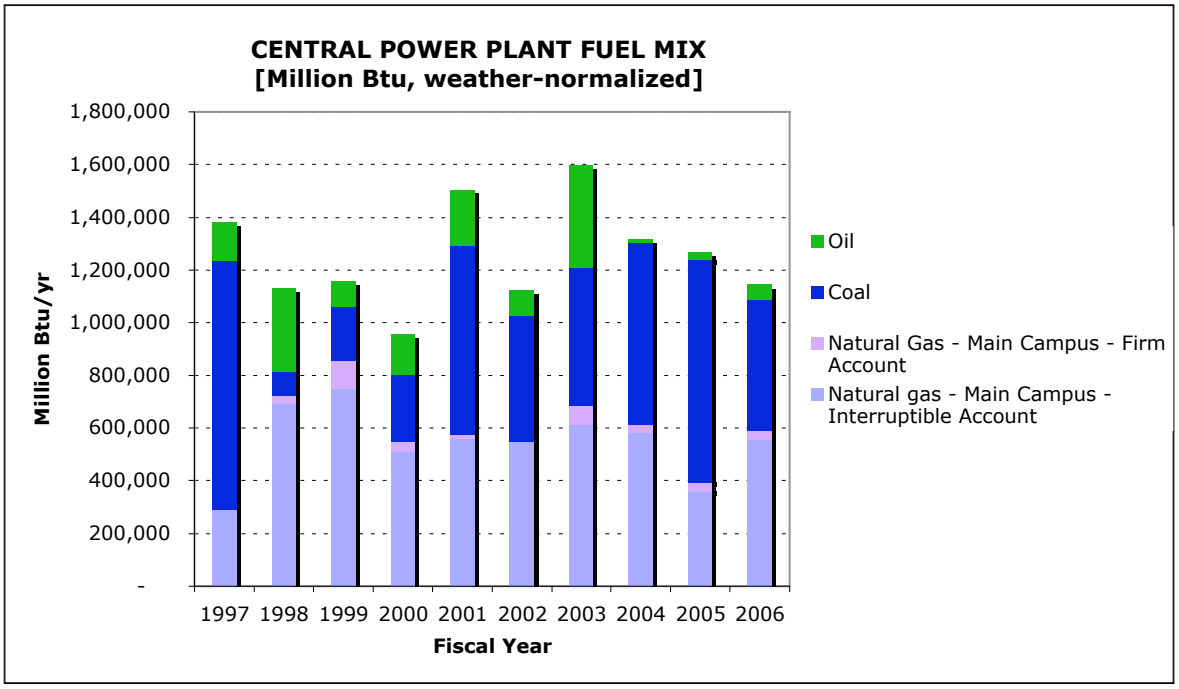

Figure 4. Capitol Power Plant Fuel Mix (Million Btu).

The Capitol Power Plant has shifted its mix of fuels from year to year, as shown in Figure 4.

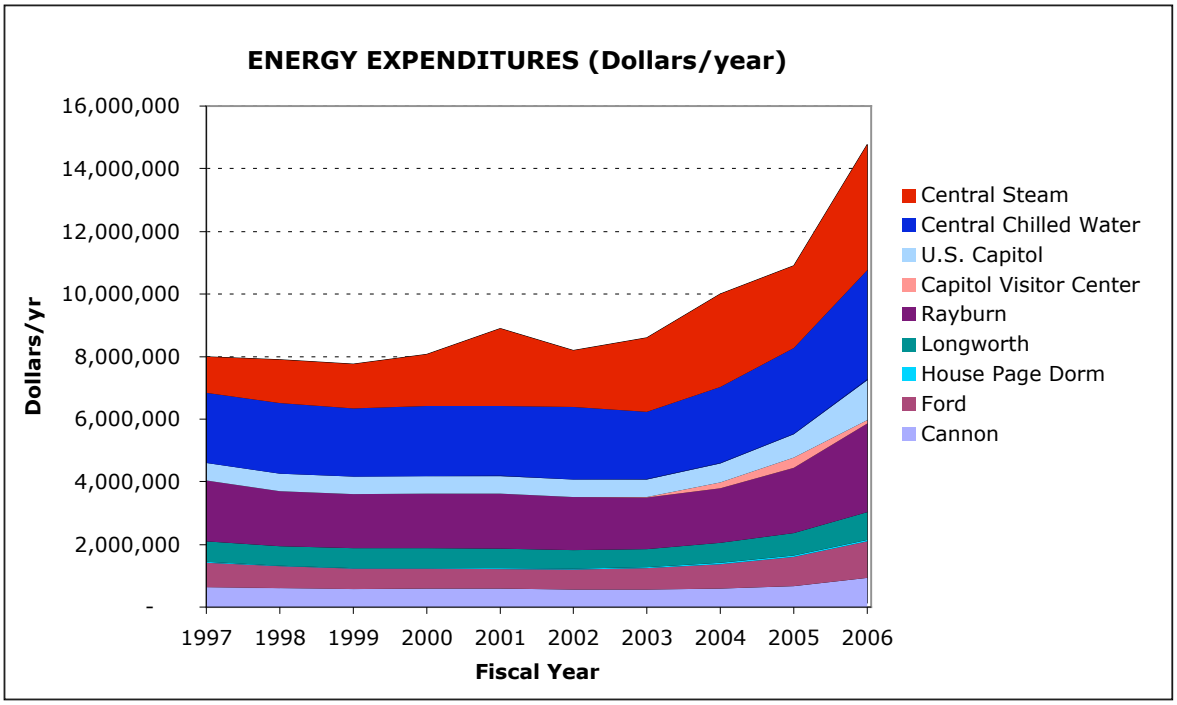

Figure 5. Annual Energy Expenditure for Key End Uses

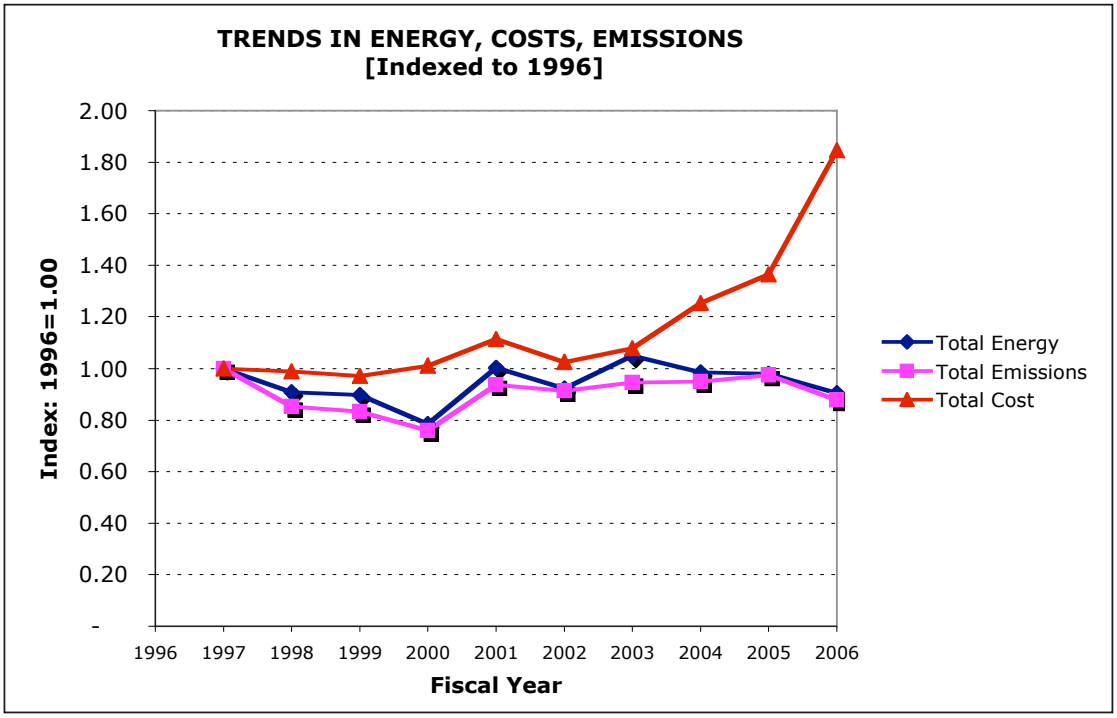

Figure 6. Trends in Energy, Costs and Emissions

Figures 5 and 6 shows that the costs of energy have risen dramatically in recent years, more than doubling in the past 10 years. Figure 5 shows the actual costs, and Figure 6 shows the normalized costs, along with the normalized emissions and energy consumption.

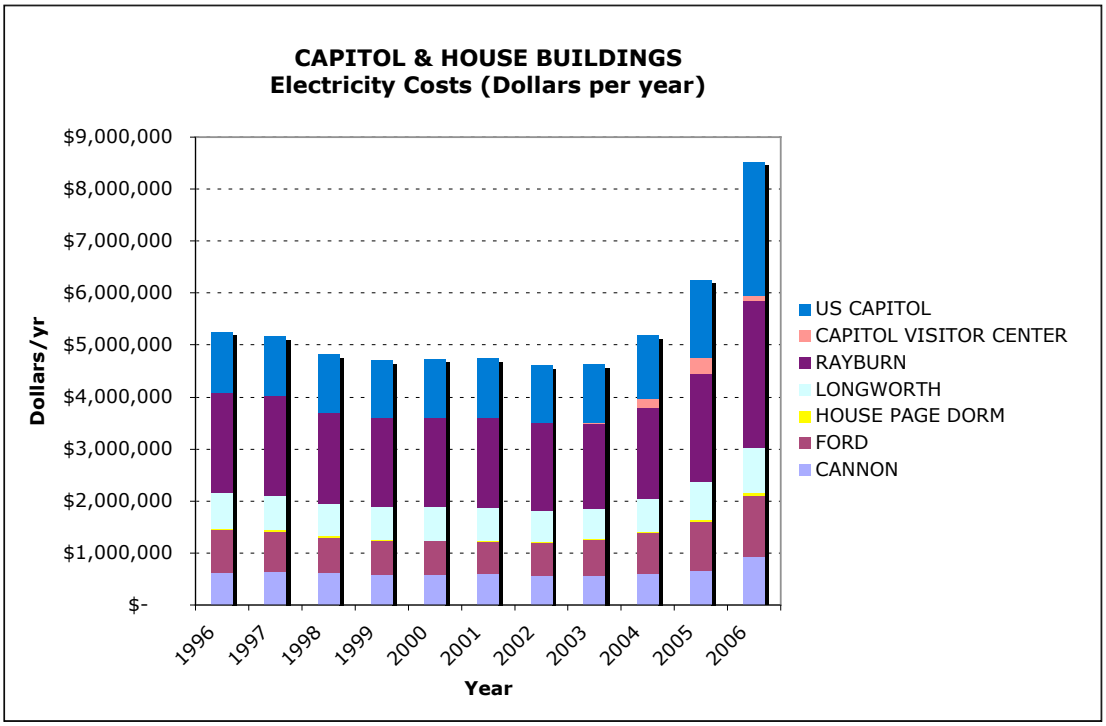

Figure 7. Purchased Electricity Costs for the House Buildings (dollars/year).

Figures 7 and 8 show the annual costs and use of the electricity for the House Buildings.

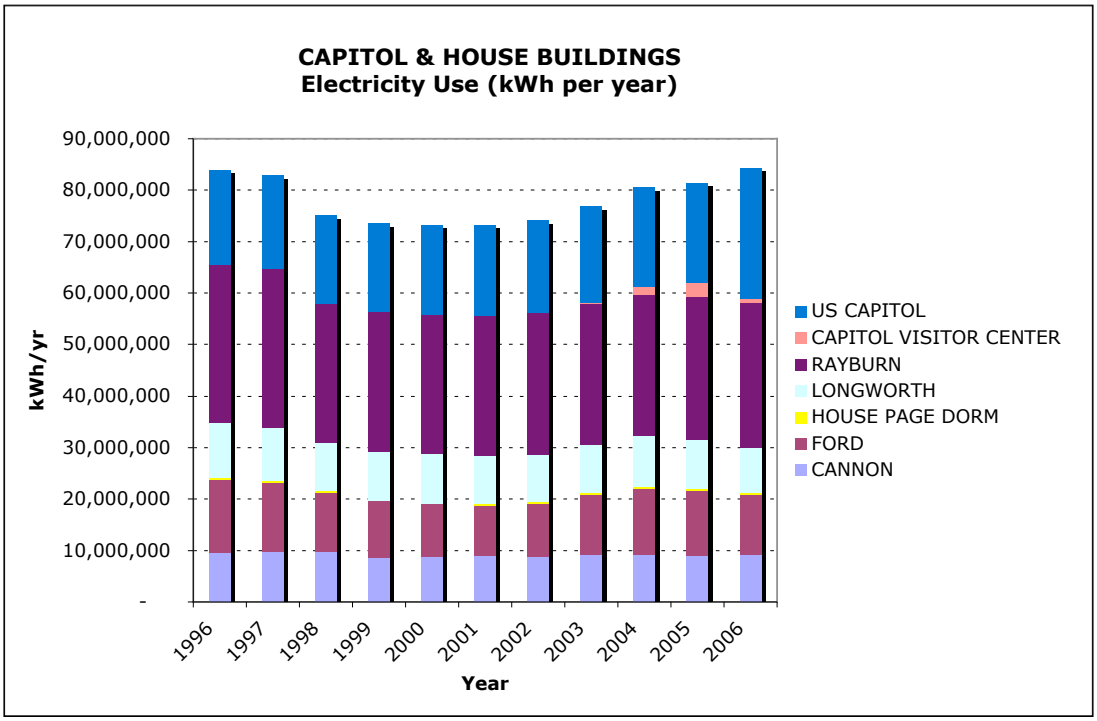

Figure 8. Purchased Electricity Use for the House Buildings (kWh/yr).

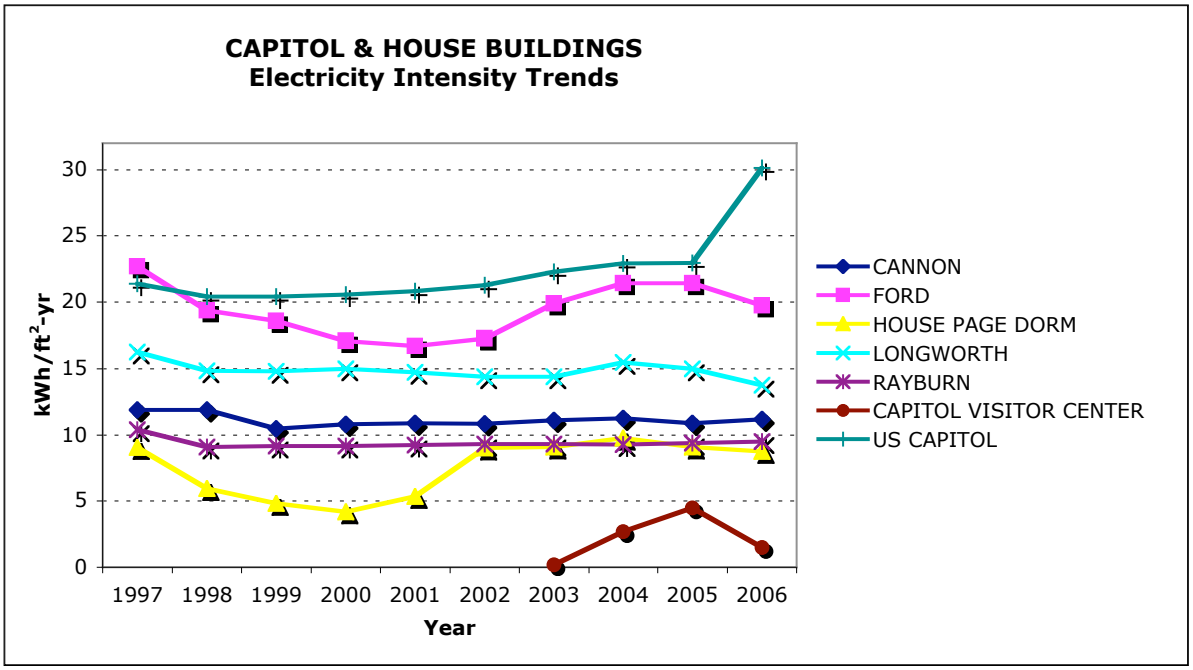

Figure 9. Electricity Intensity Trends for Capitol and House Buildings (kWh/ft2-yr).

Figure 9 provides a means for comparing the electric power use of the House office buildings. The Capitol itself was the most energy intensive, with the House Page Dorm being the least energy intensive.

3. Recommendations

3.1 Recommendation 1: Operate the House in a Carbon Neutral Manner.

Climate change and global warming are serious problems caused primarily by carbon. One way the House can begin to address this problem is to work towards operating our facilities in a carbon neutral manner. This will mean taking steps to reduce the greenhouse gas emissions our complex creates through its operation. Global warming is an international problem, but there are steps we can take to provide leadership for solving these issues locally. The most important step is to adopt a policy of making the operations of the House carbon neutral.

Accordingly, it is recommended the House operate in a carbon neutral manner at the earliest possible date, but no later than the end of the 110th Congress. By implementing this recommendation, we will be eliminating the impact of 91,000 tons of carbon dioxide emissions, which is the equivalent of taking 17,200 cars off the road.

3.2 Recommendation 2: Shift to 100 percent Renewable Electric Power.

The purchase of electricity is the largest source of carbon dioxide emissions from the operations of the House. In order to achieve our goal of making our operations carbon neutral, my office, working with the Architect of the Capitol, should negotiate to purchase 100 percent of our electricity needs (approximately 103,000 megawatt-hours per year) using Competitive Renewable Power at the earliest possible date. The quantities that would be required by the House to meet its annual expected electricity usage can be provided by one or more sources of power located within the boundaries of, or immediately adjacent to, the PJM Interconnection. The specific facility or facilities will be determined at a later date. These facilities already exist within the states of Maryland, Pennsylvania, New Jersey, West Virginia, and Michigan. The electricity cost premium to purchase power generated from renewable sources can be as much as 20 percent. This increase will be offset over the long run by energy conservation actions.

By implementing this recommendation, the House buildings will eliminate 57,000 tons of greenhouse gas emissions, or the equivalent of removing 11,000 cars from the roads.

3.3 Recommendation 3: Aggressively Improve Energy Efficiency.

Energy efficiency offers the greatest contribution to reducing carbon emissions by reducing the fuels purchased for services. The Architect of the Capitol has identified over one hundred opportunities for improvements in the physical buildings and operations in analysis required by the Energy Policy Act of 2005 (Public Law 109-58).

We address five areas for improving energy efficiency:

A. Interior Lighting
B. Office Electronics
C. Data Center and Computer Servers
D. Heating, Ventilating and Air Conditioning (HVAC)
E. Capitol Power Plant

Other areas for improving energy efficiency, such as power infrastructure, operations and maintenance, and transportation, will be addressed in the implementation phase.

A. Lighting Retrofits

There are a series of immediate steps House offices can take to reduce energy use through improving the efficiency of lighting. The CAO recommends the following actions:

a. Immediately convert 2,000 desk lamps in the House office buildings to CFLs. In addition, within six months take the steps necessary to convert the remaining 10,000 desk lamps to CFLs. Replacing 12,000 CFLs is the equivalent to removing 255 cars from the road, and it will yield a $245,000 savings in electric power costs to the House per year.

b. Direct the CAO and Architect of the Capitol to no longer purchase standard incandescent replacement bulbs with funds made available by the House. Standard incandescent bulbs consume four times the energy of compact fluorescents and it is time for the House to eliminate their use.

c. Instruct the Architect to convert the overhead House ceiling lights to high efficiency lighting and controls at the earliest possible date. This action has the potential to reduce lighting energy from these sources by as much as 50 percent. It would also eliminate 7,130 tons of greenhouse gas emissions, which is equivalent to 1,340 cars.

d. Promote energy efficiency among the 7,000 staff of the House by making compact fluorescent lamps available at cost in the House office supply store. If all staff members installed just one CFL bulb in their home, it would have a cumulative effect of removing 150 cars from the road.

e. Direct the Architect to expand their fluorescent lamp disposal program to include the proper collection of used compact fluorescent lamps.

B. Office Electronics

Offices inside the Capitol buildings make heavy use of computers, displays, televisions, printers, faxes and many other kinds of electronic equipment. Together these devices probably consume as much electricity as the lights. A combination of new, efficient equipment and improved operating practices could easily reduce electricity use by half.

The "electronics" category covers office equipment, consumer electronics and other miscellaneous products. A partial list of target products is given below:

Office Equipment
Computers, displays, printers, fax machines, scanners, photocopy machines, routers, modems, computer speakers, uninterruptible power supplies, refrigerators, etc.

Consumer Electronics
Televisions, VCRs, DVD & CD players, audio equipment, set-top boxes, telephones and answering machines, battery chargers, etc.

Other Electronics
Video surveillance and security equipment

The exact mix of recommendations in this area will be addressed in detail in the June 30 report.

C. House Computer Data Center and Computer Servers

The House Data Center and computer servers are a significant target of opportunity for early energy and carbon savings. Table 4 gives the range of percent savings for IT equipment for different applications.

Table 4. Representative Percent Savings for IT equipment

Scenario	**Equipment Location**	
	Server Closet/Room	Data Center
Improved Management	10%	15% (10-20%)
Best Practice	30%	40% (30-60%)
State of the Art	50%	67% (50-80%)

Source: Brown et al., 2007

The types of opportunities for energy savings for server rooms and data centers are described below as three scenarios:

Improved Operational Management: This scenario includes efficiency improvements that require essentially no capital investment. Most of the improvements are operational in nature, i.e., operating the existing capital stock more efficiently.

Best Practice: This scenario represents the efficiency levels achieved by the most efficient existing facilities today. It builds on the operational improvements in scenario 1, and includes

improvements that require more capital investment, planning and engineering. The technologies in this scenario are all available today, but are not widely used in the Capitol.

State of the Art: This scenario represents the efficiency levels that are achievable through aggressive optimization of the data center system — what might be called "showcase" buildings. The scenario combines efficiency technologies that are available today in ways that are not currently practiced. These efficiency levels are generally only feasible in new data centers.

In the June 30 report we will include an action plan to reduce energy consumption by the House Data Center.

D. Heating, Ventilating and Air Conditioning (HVAC) and Distribution Systems

Together, the Capitol Power Plant (CPP) and Capitol Complex Buildings form a typical district heating and cooling system. This system consists of three main components: a "power"[1] plant, a distribution system and multiple buildings with various end uses. Figure 10 illustrates the connections between a generic plant and a generic space heating and cooling system in a building, along with some of the important energy and water flows.

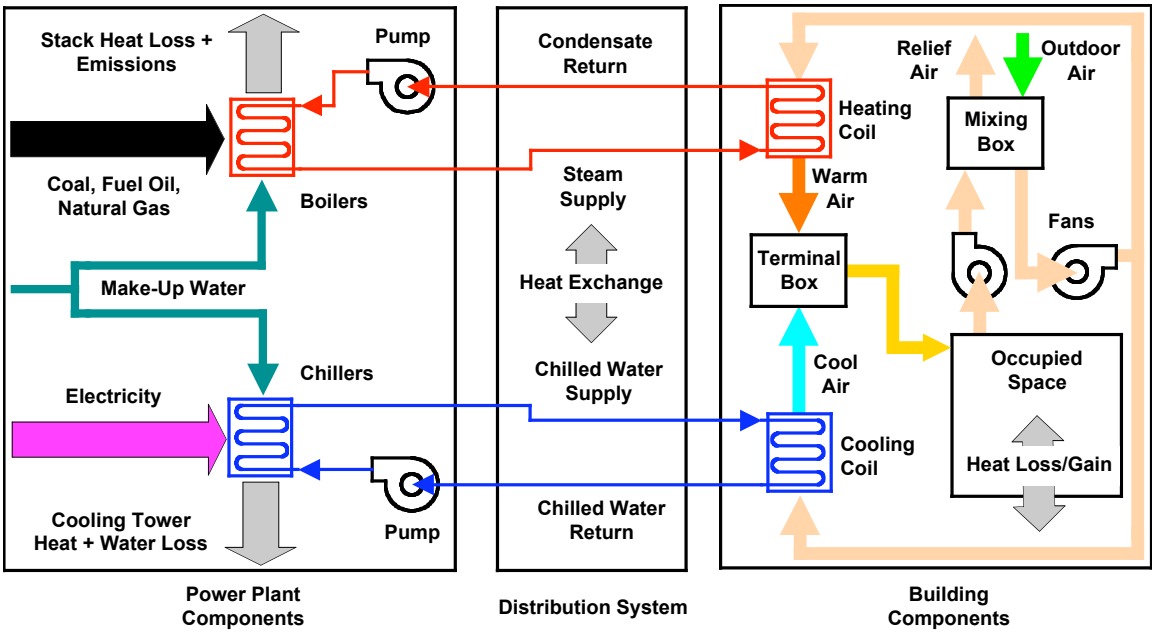

Figure 10: District Heating and Cooling System Schematic.

It is important to recognize that the effects of the power plant, distribution system and building inefficiencies are multiplicative. For example, to heat a conditioned space, if 40 percent of the steam and chilled water energy supplied to the buildings is wasted before it reaches the

[1] Although the CPP was originally equipped with steam turbines, it has not generated electricity since the early 1950s.

conditioned spaces, 15 percent of the energy supplied to the distribution system pipes is wasted before it reaches the buildings, and 25 percent of the energy supplied to the plant is wasted before it reaches the distribution system, then the net efficiency (fuel to end use) is only about 0.38. This means that about 62 percent of the energy supplied to the plant is ultimately wasted, or conversely, the plant must supply about 2.6 times more energy than the building end uses require. It also means that actions to reduce CPP energy use should include improvements to the distribution and HVAC systems.

Consultants that have carried out energy audits of the Rayburn House Office Building and the Capitol Building have recommended several improvements to increase HVAC energy efficiency such as replacing faulty equipment and using motors and pumps that are more efficient. However, the recommendations do not include two major, low-cost opportunities: reducing duct leakage, and improving the operation of fans that circulate hot and cool air.

Electricity used by fans to circulate hot and cool air in large commercial buildings is typically 30 to 50 percent of the HVAC site energy use. Recent field data indicate that duct leakage can result in fan energy increases of 25 to 35 percent. It is possible to almost eliminate this energy waste by internally sealing the ducts using sealants or similar technology. New wireless-based control technology has also recently become available to help reduce fan energy, as well as reduce unnecessary heating and cooling (fan drives need to be upgraded, but there is no need to replace other air distribution components). Potential energy savings from duct leakage sealing and improving fan operation are about 30 to 50 percent of supply fan energy consumption, plus about 30 to 40 percent of the other heating, cooling and HVAC auxiliary equipment energy consumption.

The House might also want to consider recommending two longer term, more capital-intensive improvements:

a. Steam traps are used throughout the buildings to remove water from steam lines. Although the AOC has an excellent trap maintenance program in place, steam traps are often a critical source of energy inefficiency. The problem with steam traps could be reduced by changing steam distribution at the buildings to hot water, where feasible.

b. The steam and chilled water pipes that connect the CPP to the buildings that it serves are located in an extremely hot environment throughout the year due to heat losses from the steam pipes. Energy losses associated with steam line leakage and inadequate insulation can be in the range of 5 to 20 percent of the energy entering the steam line. An audit is needed to quantify the savings opportunities from lowering steam temperatures and pressures and improving the pipe insulation.

Any recommendations for specific actions in these areas will have to be developed in concert with the AOC. Effort will be made to develop specific recommendations for the June 30 report.

E. Capitol Power Plant (CPP)

The CPP produces steam using two coal-fired boilers and five oil- and/or natural gas-fired boilers. Well-tuned generic boilers have "fuel-to-steam" efficiencies in the range of 70 to 85 percent at full load, but the efficiency drops rapidly as less steam is needed (e.g., warmer weather results in lower steam demands from the buildings served). There can be further efficiency losses (10 to 15 percent) due to soot and scale contamination of the boiler heat transfer surfaces, and poor water quality control practices. In combination at full load, as much as 45 percent of the energy in the fuel could be wasted. The AOC is planning to address one of the larger opportunities for savings: adding controls so that one or more boilers are operated at or near full load as much as possible. Other opportunities they should consider include: using natural gas instead of coal in the two coal-fired boilers (or to simply not use the coal fired boilers because of excess capacity); recovering heat from the stacks to preheat water for the boilers or to supply hot water directly to nearby buildings; and improving maintenance to minimize boiler contamination.

Chilled water is produced by 10 electrically driven chillers located in the CPP with efficiencies that are likely about 0.05 to 0.075 W/Btu at rated conditions. Compared to boilers, chiller efficiency is less dependent on load. Retrofits are under way to address the largest opportunity for savings: replacing inefficient chillers with ones that are more efficient, and adding controls to operate one or more chillers at or near maximum efficiency as much as possible. Other opportunities that should be considered include: using "free" cooling technologies to reduce chiller power consumption, supplying warmer chilled water to the buildings and using waste heat from the cooling processes to preheat water for the boilers or to supply warm water directly to nearby buildings.

One major opportunity that the House might want to consider in the future is recommending the AOC reconfigure the CPP to be a combined heat and power (CHP) system, also known as a cogeneration system. Such a system would generate electrical power on site, and energy that would normally be wasted in offsite electricity generation (as much as 2/3 of the energy input) would be used to produce steam and chilled water onsite. A CHP system can save at least 50 percent of the combined energy that otherwise would be required to separately generate electricity off site, and steam and chilled water onsite. The conversion is capital intensive and requires further study.

Any changes in the CPP operations will require considerable consultation with the AOC and will have to be addressed in the June report.

3.4 Recommendation 4: Adopt Sustainable Business Practices.

The House is a major purchaser of products and services, and we should demonstrate leadership by making purchases that promote sustainability. Therefore, I recommend the following actions:

a. Purchase only Energy Star or Federal Energy Management Program-designated products where such designations are available. These products have been determined by the

appropriate Federal agencies to be life-cycle cost effective in normal operations and will contribute significantly to reduced consumption of energy.

b. Purchase office equipment that is certified using the Electronic Product Environmental Assessment Tool (EPEAT) system. This system helps evaluate, compare and select electronic equipment based on its environmental attributes. EPEAT certified electronic devices are low in heavy metals and high in recycled plastic content.

c. Give priority to the purchase of climate neutral products that offset the life cycle contribution of greenhouse gas emissions. Specifically, purchase only adhesive, sealants, paints, coating, and carpets that emit very low quantities of volatile organic compounds. Volatile organic compounds are major components affecting indoor air quality and they contribute to climate change.

d. Purchase only furnishings that contain recycled products or wood certified as sustainable by the Sustainable Forests Initiative, the Forest Stewardship Council or similar programs. Implementing this recommendation will make a small contribution toward insuring bio-diverse forests for future generations.

e. Direct the Architect to finalize the installation of an Ethanol-85 tank, pump and related infrastructure for the use of official vehicles within the next six months.

While some actions for improving the sustainable operations of the Capitol can take place immediately, others will take a few years to design and implement. Specific actions are needed to address water consumption and management, storm water runoff, material selection and use, recycling and operations and maintenance.

3.5 Recommendation 5: Continued Leadership on Sustainability Issues.

It is important for Members and staff to continue to provide leadership on climate change and sustainability issues. To assist in maintaining this continuing commitment, I recommend the following actions:

a. Hold a “Green Expo” for House offices to demonstrate the latest in green products or services available to offices from commercial vendors.

b. Establish a sustainability education program for House employees providing guidance on how employees can make a contribution to impacting climate change and sustainability at home and in the work place.

c. Establish a “Green Revolving Fund,” where revenues received from various sources will be placed in a revolving fund to be used to undertake energy and water conservation initiatives that offset greenhouse gas emissions.

3.6 Recommendation 6: Offset to Insure Carbon Neutral Operations.

It is likely that even by implementing all the recommendations outlined above, the House will not be operating in a carbon neutral manner.

As a result, we will have to develop a strategy for offsetting as much as 34,000 tons of greenhouse gas emissions by either:

(1) Purchasing offset credits in the domestic market.

(2) Contributing a per ton payment, based on the current domestic market, of carbon dioxide equivalents emitted by the Capitol Power Plant boilers. These funds should be deposited into the Green Revolving Fund and used to mitigate the emissions. Since the domestic offset market is in its infancy and lacks uniform standards, it is important the House carefully screen any offset purchases.

Between now and June 30, I will undertake a review of possible investments and determine their acceptability. If an acceptable offset cannot be secured, depositing the offset monies in the Green Revolving Fund would provide us with an acceptable alternative.

4. Conclusion

The recommendations in this report are only the first step in the process of creating a Green Capitol and more sustainable House operations. The final report scheduled for release on June 30 will introduce additional recommendations and provide a framework for guiding future decisions. That framework will set benchmarks for existing energy use; establish meaningful and measurable goals for reducing energy and carbon; create timetables for implementing various changes in operating conditions; and define measures for reporting progress on a regular basis.