2010

Architect of the Capitol

Preserving the Past, Anticipating the Future

Sustainability, Energy and Water Conservation Management Report

ARCHITECT OF THE CAPITOL

Contents

The Capitol landscape has evolved drastically since George Washington laid the cornerstone in 1793. Since that time, the Architect of the Capitol has served as builder and steward of these iconic national treasures.

All photography used in this report was provided by the AOC Office of the Curator – Photography Branch.

Message from the Architect

"We achieved our FY 2010 energy reduction goal of 15 percent."

On behalf of the Office of the Architect of the Capitol, I am pleased to present *Preserving the Past, Anticipating the Future*. This report highlights significant progress and successes in FY 2010 to reduce energy, encourage a sustainable Capitol and act as responsible stewards for the more than 17.4 million square feet and 450 acres of iconic buildings and grounds under our care.

Our challenge is unique — how to maintain aging buildings, implement state-of-the-art technology, and increase responsiveness to environmental, security and safety considerations in a rich historical setting. This report describes our achievements in addressing these concerns, while maintaining fiscal responsibility and helping enable the Legislative process.

The most important point of this report is that we achieved our FY 2010 energy reduction goal of 15 percent by reducing our energy consumption 17 percent under adverse weather conditions. We accomplished this while addressing the full range of facility maintenance and asset management issues attendant with our mission.

Successfully balancing these responsibilities is a high priority for our agency and could only be achieved through the dedication of talented professionals and crafts persons who consistently deliver innovative solutions to help preserve our buildings and our environment. In this way, we demonstrate our commitment to federal leadership in serving Congress.

Sincerely,

Stephen T. Ayers, AIA, LEED AP
Architect of the Capitol
May 15, 2011

Introduction

Since 1793, the Architect of the Capitol has served as builder, caretaker and guardian of the nation's most significant and iconic buildings. As stewards serving Congress, the Supreme Court and the American public, the Architect of the Capitol is dedicated to preserving and enhancing the U.S. Capitol and accomplishing our important historic mission in an environmentally sustainable manner.

The Agency maintains, rehabilitates, renovates and modernizes existing structures to the greatest extent possible.

In the early years, a future-oriented vision ensured designing and building for permanence through the use of durable, local materials capable of lasting 100 years or more. Projects designed and completed today continue to embody this philosophy of "building for the ages," while maintaining the expectations of modern comfort practicality and utilizing smart technologies. The Agency maintains, rehabilitates, renovates and modernizes existing structures to the greatest extent possible, always working to maintain the delicate balance between preservation and modernization.

As a national leader in sustainable and responsible practices, the Agency understands that historic preservation, the greenest of the building arts, and stewardship are powerful tools to drive the accomplishment of sustainability goals, overall energy and water savings and a high return on investment. This holistic stewardship approach distinguishes our work and ensures that we create value through transparent, results-oriented initiatives.

From project planning and maintenance projects to the act of decorative painting, a dedicated team of professionals supports this effort and is joined by highly skilled crafts persons who are committed to continuing the "lost" preservation arts, in addition to providing a training ground for traditional trades to ensure a next generation of skilled labor. Nowhere are these arts better displayed than in the Capitol which houses the working seat of

For over 200 years, Capitol Hill has played host to throngs of visitors viewing our nation's most inspiring and majestic sites. The Agency is committed to providing a welcoming, educational and safe environment for all visitors.

the U.S. government and is a much frequented tourist destination.

Serving the dual functions of sustainability and historic preservation can pose some limitations on what can be achieved in energy and water conservation. However, progressive strategies and measures have been successfully implemented to achieve energy reduction objectives. Benchmarking and engineering evaluations have led us to informed restoration and rehabilitation of facilities and plans that are harmonious with preservation.

The program to make the Capitol more energy and water efficient stresses environmental significance, cost-savings and delivery of improved services for constituencies. Guided by the four strategic goals of its five-year strategy (facilities management, project management, human capital and organizational excellence), the Agency prioritizes projects through a standardized process that assesses a project's urgency, type and importance for preservation of historic resources, regulatory compliance, mission accommodation, economics, physical security, energy and water efficiency and environmental quality. Before submitting budget requests for projects, the Agency classifies and prioritizes projects and annually evaluates funding requirements for developing its portfolio of projects and meeting project-specific needs.

Conservation and Consumption Focus — Energy and Water

Conserving energy and water conserves resources. Research on the water-energy nexus has shown that even independent reductions in either water or energy lead to indirect reductions in the other. The added promotion of water reduction goals not only affects water conservation, but also energy conservation and the associated financial savings as well.

Energy and water are significant elements that are part of our broader conservation focus. From building standards to maintenance procedures, the Architect of the Capitol strives to improve energy and water efficiency and reduce consumption of natural resources, while respecting the environment. Actions to leverage the retention of embodied energy in buildings and grounds through careful preservation-oriented maintenance, as opposed to disposable architecture, ensure that iconic facilities survive in perpetuity. The result is that future generations can continue to be inspired by, learn from, and work in, the same environment that inspired our forefathers.

Our Mission

The mission of the Architect of the Capitol is to provide Congress and the public a wide range of professional expertise and services to preserve and enhance the Capitol complex and related facilities.

Our Vision

The Architect of the Capitol will be an innovative and efficient team dedicated to service excellence and to preserving, maintaining and enhancing the national treasures entrusted to our care.

The Architect of the Capitol is focusing on improving its capacity to manage and wisely use its water resources and considers water conservation a key environmental priority. The Agency places water consumption reduction high on its agenda and is exploring mitigation measures and identifying, promoting, and implementing water reuse strategies that reduce potable water consumption.

Plans are in place to assess water usage, potential water conservation actions, water consumption and runoff patterns. The data will inform design practices that will maximize water and energy cost savings, and facilitate the application of best management practices. Specific action items and recommendations include developing a binding water reduction goal and target for the

House Office Buildings in the range of 25 percent to 30 percent, and supporting funding for water savings initiatives.

Multi-Faceted and Efficient Business Processes

The Architect of the Capitol is committed to responsible use of tax dollars in the construction, operation and maintenance of Capitol facilities. Its multi-faceted and efficient business and operational practices address sustainable costs and benefits and ensure a refined project delivery process that focuses on the highest impact at the lowest possible cost.

Standard business models for all construction and renovation projects include a five-part, continuous-cycle, close-looped process — assessment, planning, implementation, outcome evaluation and reassessment.

The approach pinpoints deviations; and identifies, analyzes and corrects a problem with a system, product or process.

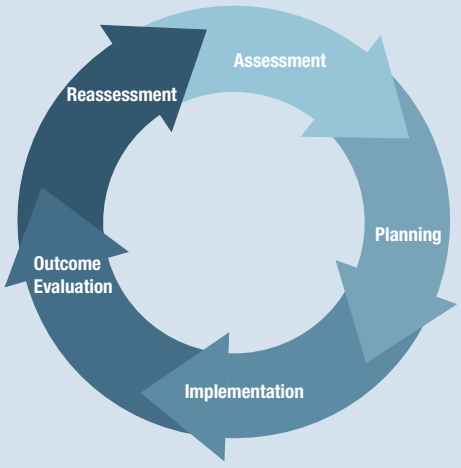
This includes the use of decision making tools to analyze the cost of systems over their life span. It also includes an evaluation of environmental impacts, non-economic and societal impacts, and energy and water efficiency across multiple, broad perspective stakeholder groups.

Assessment: This phase includes an evaluation and review of the myriad of energy and water options, taking into account present and future needs, available technology, and fiscal responsibility. The Agency's comprehensive assessments:

Architect of the Capitol employees consult a blueprint while planning a restoration project.

- Evaluate the benefits of reusing historic buildings versus constructing new buildings
- Prepare inventories and document historic elements in historic structures reports
- Ensure awareness of the condition of its buildings and properties
- Identify energy and water savings opportunities and prioritize which building systems and assets need to be replaced or renewed

Planning: The Architect of the Capitol incorporates best-practice strategies and tools in its planning processes and works to ensure that intent and goals are consistent with the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007.



The Architect of the Capitol's five-part continuous cycle ensures we focus on the highest outcomes at the lowest possible cost.

1793

1793 — The cornerstone of the U.S. Capitol was laid by President George Washington in the building's southeast corner on September 18, 1793, with Masonic ceremonies.

The Sustainability Framework Plan, one of six in the Capitol Complex Master Plan, guides the Agency's long-range planning, and the determination of facility and infrastructure opportunities.

Implementation: As both a builder and steward, the Architect of the Capitol undertakes projects that are fiscally responsible, communicated clearly, and implemented safely in a manner that respects the historic and iconic fabric of the Capitol. The Agency is implementing a broad set of sustainability and energy and water management activities that protects the environment and natural resources, reduces greenhouse gas emissions and saves taxpayer dollars.

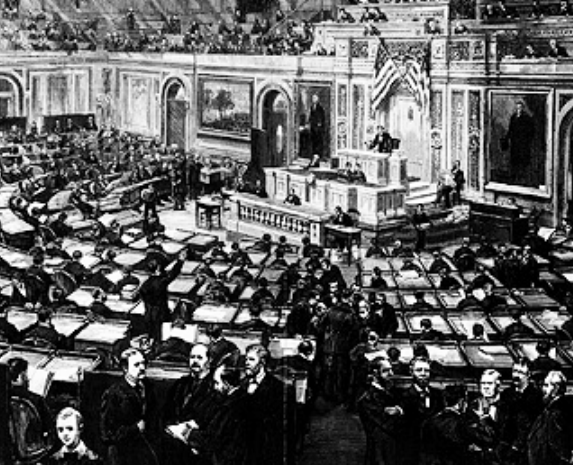
Outcome evaluation: The Architect of the Capitol uses industry benchmarks to set goals, measure the results of its actions and determine the effectiveness and efficiency of its work. Outcomes achieved thus far illustrate the Agency's commitment to constant evaluation of its work and the benefits provided by a comprehensive approach to energy and water management. Knowing the impact of capital and human resources investments leads to better decision making on the energy and water conservation measures.

Reassessment: The ongoing analysis of the Architect of the Capitol's processes and projects and the desire for continued improvement strengthens strategy, execution and innovation. This ensures greater awareness of the short- and long-term effects of energy, water and preservation efforts, and documents with certainty that the Agency is obtaining its desired outcomes. Assessing the implementation of projects creates efficiencies in work processes and enhances understanding of the impacts mid-course decisions may have had on a project's success.

As both a builder and steward, the Architect of the Capitol undertakes projects that are fiscally responsible.

These business processes and energy and water conservation initiatives position historic preservation and stewardship as powerful tools to accomplish sustainability goals across the Architect of the Capitol's operations (e.g., procurement, planning, design, construction, operations and maintenance). Purchasing sustainable materials, recycling and innovative energy and water conservation techniques contribute to a common goal of saving resources and respecting the environment, while providing exceptional facilities management and services. The Architect of the Capitol operates this way because it makes good business sense, is good for the environment, and supports the objective of ensuring that Capitol facilities fully support the mission of Congress and the Supreme Court for decades to come.

A view of the Capitol Dome from the U.S. Botanic Garden Conservatory.



Executive Summary

From the beginning, the Architect of the Capitol has applied ingenuity and craftsmanship to its work, providing safe, comfortable, efficient and modern building environments, and preserving history for the American public. From building standards to maintenance procedures, the Architect of the Capitol, operating under the Capitol Complex Master Plan, has improved energy and water efficiency, reduced consumption of natural resources, improved service, and saved taxpayer dollars — all while respecting the environment.

From the beginning, the Architect of the Capitol has applied ingenuity and craftsmanship to its work.

This report highlights FY 2010 significant progress and achievements in the Architect of the Capitol's effort to:

- Position energy, water and effective resource utilization as key business imperatives
- Develop planning tools and business processes to ensure that historic preservation and stewardship opportunities are identified and accomplished sustainably
- Evaluate and implement sustainable and manageable solutions with high return on investment
- Rely on fact-based prioritization of requirements, use comprehensive long-range plans and operate under a clear vision to improve performance

Section I defines the management approach and context of achievements. This section provides the criteria and standards used to report and compare results of energy and water conservation measures and performance. Section I also delineates the management structure responsible for maintaining and operating the facilities, executing programs, and interacting with stakeholders regarding energy, water and sustainability practices.

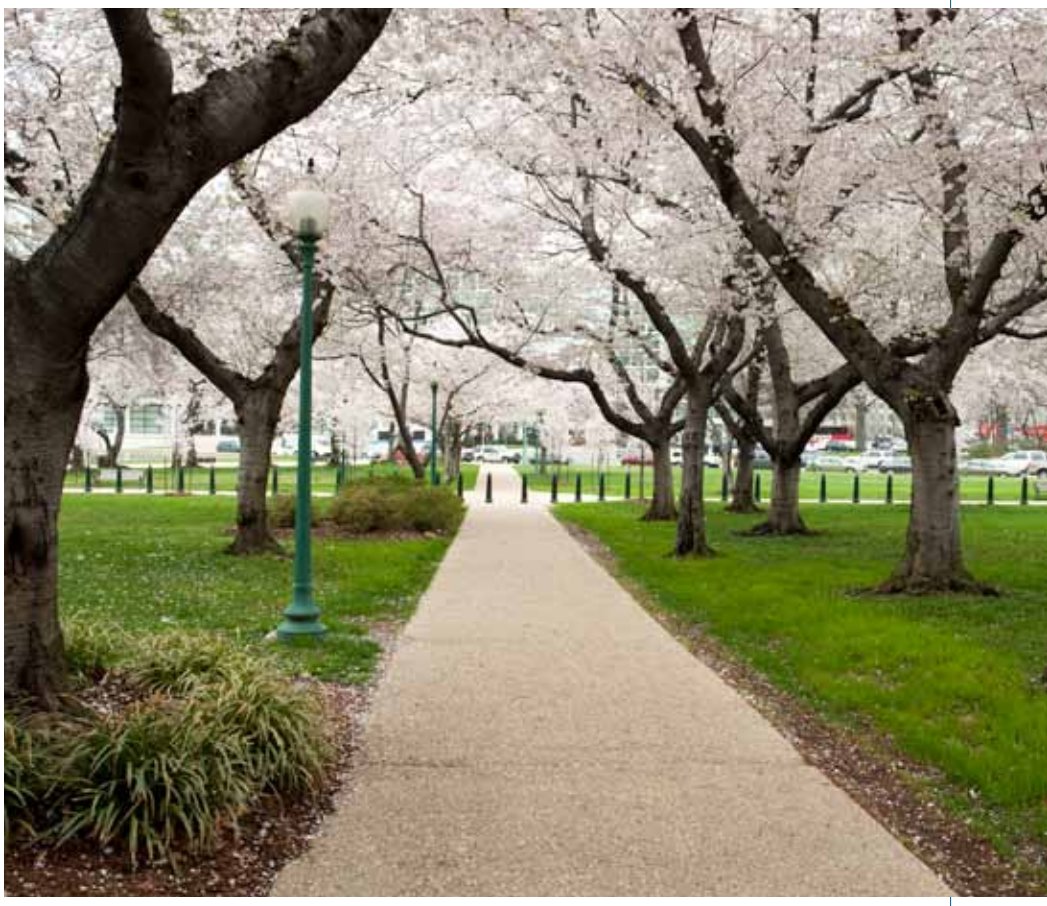
During its 200-year history, the Agency has worked tirelessly to ensure that Capitol facilities support the mission of Congress by providing a safe, comfortable, efficient and modern working environment.

Work continues to be informed and guided by the Capitol Complex Master Plan.

In addition, Section I shows transformed business practices, improved project management policies and increased awareness of energy and water consumption. It also features the key management tools and initiatives and a progressive approach to historic preservation and stewardship (e.g., energy audits and studies, Energy Savings Performance Contracts, metering and sub-metering program, facility condition assessments, Sustainability Framework Plan, utility tracking and management program, life cycle costing software, design standards, recycling programs, clean fuels program, refrigerant conversions and efficiencies, energy management program, renewable energy, and biobased procurement).

In **Section II**, the report highlights the Architect of the Capitol's energy and water efficiency performance and accomplishments, in addition to providing a detailed account of specific accomplishments that directly support the energy conservation goal of 30 percent by FY 2015, set forth by Congress in the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007.

The Architect of the Capitol supports the needs of nearly 30,000 building occupants and millions of tourists who visit the Capitol annually, ensuring the buildings and grounds meet modern standards and preserving the historic legacy of the landmarks entrusted to its care.



The Capitol Grounds, designed by Frederick Law Olmsted, are as important to American history as the U.S. Capitol itself.

Work continues to be informed and guided by the Capitol Complex Master Plan and the Sustainability, Energy and Water Management Plan, a definitive roadmap that positions sustainability within a Capitol security and historic preservation context. The Sustainability, Energy and Water Management Plan also provides an assessment framework for determining project return on investment, leveraging outcomes, and evaluating new opportunities.

During FY 2010, the Architect of the Capitol made a 30 percent increase in their alternative fuel vehicle fleet.

Key Initiatives and Accomplishments

During FY 2010, the Architect of the Capitol made significant progress on a number of energy, water and sustainability initiatives:

- A 30 percent increase in the AOC alternative fuel vehicle fleet (currently consists of 60 E-85 electric, and hybrid powered vehicles)
- Installed over 125 water filtration units in Member Offices, resulting in more space for staff and reduced operational costs and plastic bottle waste
- Expanded recycling efforts with 49 new recycling containers on the Capitol Grounds
- 932 (36 percent) of AOC employees use mass transit
- 127 out of 2600 AOC employees participate in the telework program
- Two employees obtained Corporate Social Responsibility Practitioner (CSR-P) certifications
- Completed the Historic Preservation Guide for the Longworth House Office Building and are on track for production of 19 more guides
- Completed a carbon footprint baseline

FY 2010 activities featured additional completion of energy audits, progression towards cogeneration, studies on new technologies, reduction in carbon emissions, initiation of a roadmap for storm water best practices, installation of storm water filtering smart sponges, installation of green roofs for the Hart Senate Office Building and Dirksen Senate Office Building, installation and purchase of low volatile organic compound (VOC) materials, promotion of bike sharing, improved management of construction waste and reductions in landfill waste.

Section III details jurisdictional accomplishments in improving the features of building architecture, energy efficient upgrades, improvements to workplace productivity, expanding metering and sub-metering capabilities, and a transition to cleaner fuels for heating.

Section IV, Looking Ahead, reconfirms Agency goals to continue its focus on historic preservation and stewardship, commitment to responsible use of tax dollars, and its holistic approach to project management. This section also provides details about future plans on the use of new technologies, expanding sub-metering capabilities, completing additional historic preservation guideline documents, establishing a new division that will oversee sustainability initiatives, and other forward-looking actions.

1794

1794 — Architect of the Capitol Dr. William Thornton was appointed commissioner of the federal city by President Washington and served until 1802. During his tenure, the north wing of the U.S. Capitol was constructed.

The Architect of the Capitol had a very productive FY 2010, exceptionally satisfied clients and significant Agency-wide energy and water savings. FY 2010 accomplishments included efficient and effectively delivered services that further ensure the Capitol facilities and grounds continue to serve as the seat of our nation's legislative process and a source of inspiration for Americans for generations to come.

In the final analysis, FY 2010 achievements showcase evidence of its dedication to delivering on its mission to serve Congress and the Supreme Court to meet their daily operational and facility needs, preserve the Capitol's historic fabric, and sustain the home of American democracy.

The Agency has achieved significant energy and water savings while maintaining exceptionally satisfied clients.

Room S-213 of the U.S. Capitol Building has been carefully preserved to maintain its historical integrity.

Section I:

Management Discussion and Analysis

Federal buildings account for approximately 30 percent of the government's energy use. In recent years, Congress passed legislation in response to rising energy costs and environmental concerns. The Energy Policy Act of 2005 established the goal of reducing energy consumption in federal buildings by two percent per year, on a square-foot basis, compared to a FY 2003 baseline. The ultimate goal of the Energy Policy Act is to reduce energy consumption by a total of 20 percent by FY 2015.

In 2007, Congress amended the Energy Policy Act of 2005 with the Energy Independence and Security Act of 2007. The Energy Independence and Security Act of 2007's aggressive standards require reduction of energy use by three percent annually from FY 2003 levels; yielding a 15 percent total decrease by FY 2010 and a 30 percent total reduction by FY 2015.

Concurrent with the adoption of Energy Policy Act of 2005 and Energy Independence and Security Act of 2007, the Architect of the Capitol has worked to transform its operations and project management policies and planning in order to meet and exceed these conservation goals, increase awareness of energy consumption in the 65 facilities, and make these historic facilities more energy efficient.

On September 3, 2009, the Architect of the Capitol signed a resource conservation policy statement (see Appendix C). Demonstrating its commitment to resource conservation, this policy statement has three main goals: reduce consumption of resources, use environmentally preferable products and source reduction processes, and increase recycling.

This report highlights the innovative progress achieved to meet the energy and sustainability challenges inherent in the stewardship of the Capitol.

Energy Management Focus

Energy Management Organization

The Architect of the Capitol has a professional Energy Management Team dedicated to energy conservation. The Energy Management Team uses its skills and expertise, as well as the advice and guidance of interagency bodies and consultants, to coordinate deferred maintenance and capital improvement energy and water conservation projects throughout the Capitol.

The Energy Management Team performs several functions as part of a unified effort to meet strategic,

Commissioned by Congress in 1873, Frederick Law Olmsted designed the Capitol Grounds to provide stunning views of the Capitol to visitors and workers alike. Today, the Capitol Grounds are maintained using the most energy-efficient practices available.

The Energy Management Team and jurisdictions work as one to maintain and operate Capitol facilities.

Architect of the Capitol Stephen T. Ayers and Chief Operating Officer Christine Merdon surrounded by various members of the Sustainability and Energy Support team.

mission-oriented goals to serve Congress, the Supreme Court and the American people. The team provides technical support regarding sustainability and energy conservation to the entire population housed throughout nine Agency jurisdictions: The U.S. Capitol, Capitol Grounds, House and Senate Office Buildings, Library of Congress Building and Grounds, Capitol Power Plant, United States Botanic Garden, Office of Security Programs, and the Supreme Court Buildings and Grounds. The team and jurisdictions work as one to maintain and operate the facilities, execute programs, and inform and educate stakeholders regarding best practices.

Major Energy Management Functions

The Energy Management Team performs several core functions to support strategic goals. They assess energy consumption through energy audits and metering, plan for material and behavioral change to improve performance based on the assessments, implement specific energy saving projects and initiatives as planned, evaluate the outcomes of the initiatives, and complete the cycle by reassessing the results.

Organizational Structure

The Energy Management Working Group is a comprised of the central Energy Management Team and the jurisdictional Energy Managers. Monthly working group meetings serve as a forum for information exchange, a clearinghouse for energy conservation ideas and will often highlight new energy initiatives or recent accomplishments and successes.

At the management level, the Architect of the Capitol coordinates efforts with the jurisdiction superintendents and building staff to raise awareness of energy and water saving opportunities, and continues to assess and implement measures to improve energy efficient operations and maintenance within the Capitol facilities. In addition, management fosters awareness among and cooperation across the jurisdictions regarding the goals of the Energy Independence and Security Act of 2007. To strengthen staff expertise in facility management, the following actions were implemented:

Comprehensive energy audits help building owners better understand where energy is being consumed.

Employees inspect a window replacement in the Library of Congress Thomas Jefferson Building.

- Prepared the Strategic Long-Term Energy Plan for the Capitol Power Plant. A committee of industry experts, formed by the National Academies and comprised of representatives from the Department of Energy's Sandia National Lab and Lawrence Berkley National Lab and others, evaluated the plan. With this assessment, the Architect of the Capitol finalized the U.S. Capitol Power Plant Strategic Long-Term Energy Plan in summer 2009
- Used Energy Savings Performance Contracts to achieve a portion of the required energy reductions for the U.S. Capitol, House Office Buildings and Senate Office Buildings
- Used widespread distribution of the online utility tracking and management data, including the distribution of quarterly facility performance reports to each jurisdiction
- Increased the development of the environmental module within the Facility Condition Assessment software, Facility Management Assistant, so facility upgrades are evaluated systematically
- Trained personnel to use life cycle cost software to evaluate facility upgrades for their life cycle cost effectiveness
- Formulated energy projects and coordinated with jurisdictions on the line item construction program
- Continued implementation of the energy and sustainability communication plan and promotional materials
- Installation of meters continues throughout the Capitol, as building-level metering is the cornerstone of an effective energy management program

Energy Management Tools and Initiatives

Energy Audits and Studies

Comprehensive energy audits help building owners better understand where energy is being consumed and identify opportunities to reduce energy consumption and costs. Inspection teams conduct a walkthrough to determine an individual buildings' energy performance, then prepare a detailed model to simulate energy use. The energy models are calibrated to match metering data, if available. If meters are not yet installed, the energy models serve as estimated energy use for the building.

Energy audits of buildings are being performed on a four-year cycle. These energy audits are being used both to document existing usage to form a baseline, and to develop a

1803

1803 — Architect of the Capitol Benjamin Henry Latrobe was hired by President Thomas Jefferson. During his tenure, the south wing of the U.S. Capitol was constructed, and the interior of the north wing was rebuilt.

set of energy conservation measures to develop future projects. The resulting projects may be stand-alone energy-only projects, or they may be incorporated into other rehabilitation efforts. The smaller projects may be pursued directly by the jurisdictions, while the larger projects may require architect/engineering design firms and contractors.

Energy audits will be coordinated with the Capitol Complex Master Plan and the Facility Condition Assessments for each building, and integrated into the Capitol Improvement Plan. Additional audits are planned to further determine Capitol-wide energy consumption and to determine priority projects to be coordinated with ongoing maintenance and building rehabilitation projects (e.g., projects recommended in the Energy Savings Performance Contracts will be evaluated and better monitored).

A total of 36 buildings are scheduled to be included in this first cycle. Audits for the first 17 buildings were completed in FY 2009 and FY 2010. Energy audits for 19 more buildings will be completed during FY 2011. The second cycle starting in FY 2012 will be more focused and center on 17 major buildings in coordination with the Facility Condition Assessments and Building Retro-commissioning efforts.

In FY 2010, the Architect of the Capitol completed seven energy audits in the following Capitol facilities (approximately 34 percent of the Capitol space): U.S. Capitol, Cannon House Office Building, East and West Underground Garages, Library of Congress James Madison Memorial Building, Dirksen Senate Office Building and the Robert F. Taft Memorial.

Energy Savings Performance Contracts

Energy Savings Performance Contracts permit an energy service contractor to finance and install energy-saving projects in facilities. These types of contracts, which implement cost–effective, energy-efficient projects and guarantee performance delivery, play a significant role in helping reach required long-term targets. The resulting projects, which operate with minimal Agency investment, are funded through the savings generated by the installed improvements.

Energy Savings Performance Contracts are typically long-term performance contracting vehicles with savings guarantees. Such arrangements enable federal agencies to enter into contracts with an energy service contractor. Through its own facility energy audit, an energy service contractor identifies improvements that produce utility savings sufficient to pay for the improvements over the term of the contract. The energy service contractor establishes third party financing to fund the projects, and is then paid a negotiated portion of the realized savings over the term of the contract.

After the contract ends, all additional cost savings accrue to the Agency. Contract terms of up to 25 years are allowed. Such contracting vehicles allow agencies to accomplish energy and water conservation projects without up-front capital costs and without special appropriations to pay for the improvements.

The Energy Management Team plans to use Energy Savings Performance Contracts to achieve a portion of the required energy reductions. These contracts provide for the performance of services for the design, acquisition, installation, testing, operation, and where appropriate, maintenance and repair

Energy Savings Performance Contracts implement cost-effective, energy-efficient projects.

of an identified energy or water conservation measure or series of measures at one or more locations.

In FY 2010, Energy Savings Performance Contract task orders were awarded for the U.S. Capitol and Senate Office Buildings. Awarded in FY 2009, the Energy Savings Performance Contract for the House Office Building began construction in FY 2010.

Building Retro-commissioning

The Energy Independence and Security Act of 2007 defines retro-commissioning under Section 432, Management of Energy and Water Efficiency in Federal Buildings, as a process of commissioning a facility or system (not previously commissioned) beyond the project development and warranty phases of the facility or system with a primary goal of ensuring optimum performance of a facility, in accordance with design or current operating needs, over the useful life of the facility, while meeting building occupancy requirements.

Retro-commissioning focuses on tuning up building systems to optimize performance and is regarded as an operations and maintenance best practice. These activities usually result in low cost repairs with adjustments addressed and maintained by building personnel with simple payback periods ranging from less than half a year to two years. Examples of measures can include automating manual operations, improving chilled water temperature differentials and modifying or adding control strategies such as economizer cycle, night setback and temperature reset.

In FY 2010, a project was awarded to perform retro-commissioning in combination with an air handler study in two Library of Congress facilities, the John Adams and Thomas Jefferson Buildings and some limited work in the Dirksen Senate Office Building. Despite the limited control and monitoring capabilities of the older, original pneumatic systems, a total of 68 issues in the John Adams Building and 116 issues in the Thomas Jefferson Building were identified, which consisted mostly of sensor calibration and malfunctioning valves and dampers. The potential savings from correcting these issues is over $90,000. Also as part of this contract, several related energy conservation measures including variable frequency drive and outside air damper control were formulated.

System commissioning was included in the Energy Savings Performance Contracts to ensure proper sequences of operations are attained for the control strategies. These contracts also provide on-the-job training for jurisdictional staff in the commissioning process so they can become familiar with the new systems, their capabilities and energy savings strategies. The Energy Savings Performance Contracts will address the larger equipment requirements for these improvements, such as air handlers and pumps and will likely achieve savings within a two-year time frame.

Future re-commissioning and retro-commissioning are planned in coordination with the next five-year cycle of Facility Condition Assessments and Energy Audits for the major Capitol facilities.

During retro-commissioning, an employee inspects equipment for operational capacity.

Tank monitoring systems were installed under the Capitol Complex Metering Program.

The Agency began installing new primary utility meters in its facilities in FY 2008 to collect, store and analyze real-time data.

Capitol Complex Metering Program

Many of the buildings serviced by the Capitol Power Plant have electricity, steam, chilled water, natural gas and water consumption non-networked analog meters originally installed in the 1980s by the Architect of the Capitol or through the utility companies. These meters are not reliable for real-time utility metering and only provide monthly snapshots.

The Energy Independence and Security Act of 2007 and the Energy Policy Act of 2005 require that all utilities be metered and the meter data collected. Under the new Capitol Complex Metering Program, the Architect of the Capitol began installing new primary utility meters in its facilities in FY 2008 to collect, store and analyze real-time data, and identify building energy waste and target improvements to reduce energy consumption. This real-time metering system enables the Agency to effectively:

- Optimize and verify performance
- Diagnose and troubleshoot problem areas and identify retrofit and replacement projects
- Determine a building's energy profile and quantify distribution system losses
- Benchmark each utility and focus savings efforts on the buildings that are furthest out of tolerance
- Validate results of energy conservation measures
- Identifying energy savings opportunities and reduce building operating costs
- Target the highest energy consuming components

Installation of building-specific steam, chilled water and water meters continues throughout the Capitol to quantify accomplishments and promote more effective energy management and decision making in future years. Work continues on improving current metering conditions:

- Water is metered only by supply volume (not sewer volume), and meters account for all Capitol consumption, including landscape irrigation and Capitol Power Plant cooling tower use
- Currently, not all buildings are individually metered for steam and chilled water use; therefore, heating and cooling consumption is totaled based only on Capitol Power Plant energy inputs
- Electricity meters for individual buildings include some exterior, site and street lighting; therefore, some facility electricity consumption includes outside areas not accounted for by building square footage
- Some buildings, such as the East and West Underground Garages, are not metered separately;

Electricians inspect equipment to ensure that critical systems are functioning properly.

instead, their consumption is included in another building (e.g., the Rayburn House Office Building)

A beta version of a Utility Metering Enterprise System was developed under a contract with National Technical Information Service, a scientific and technical services provider that, among its other services, assists federal agencies with the collection and tracking of energy consumption data. The main project focus was to create a secure, web-based system that would function as an easy-to understand, informational website for the Congressional staff and other building occupants.

Although the National Technical Information Service system performs some utility analysis functions for energy managers and operational staff, an enhanced Utility Metering Enterprise System is currently being developed by the Capitol Power Plant through a follow-on competitive contract, incorporating advanced utilities analysis, historical data, jurisdictional feedback, and additional metering.

FY 2010 meter installations included: domestic water in all Senate buildings, steam main and sub-meters in the Hart Senate Office Building, one steam main and one sub-meter in the Russell Senate Office Building and a steam sub-meter in the Capitol Visitor Center. Additional meter installation in other facilities is scheduled to occur under FY 2011 and FY 2012 projects.

Utility Tracking and Management Program

The Architect of the Capitol uses Utility Guru, a utility tracking and management program that documents energy consumption and costs associated with the use of electrical, domestic water, fuel oil, coal and natural gas. This documentation permits comparisons between the baseline year (FY 2003) and subsequent consumption and expenditures. Historical data plays an integral role in determining effective management strategies, consumption analysis and estimates for operating expenses, forecasting and metering.

Facility Condition Assessments

Facility Condition Assessments are conducted to identify and prioritize building systems and assets that need to be replaced. Using a state-of-the-art software application, the Agency catalogues asset information and work elements with asset deficiencies and solutions. This information, coupled with data from energy audits form the basis for the Agency's energy conservation measures and is also used to determine deficiencies, solutions, funding type and source, cost model, repair prioritization and scheduling, and identification of potential energy, water conservation, environmental and accessibility opportunities for proposed repairs.

These assessments generate data that is used to determine a building's Facility Condition Index rating (e.g., poor, fair, good, or excellent) and identifies costs associated with changes that would improve a building's rating.

1818

1818 — Architect of the Capitol Charles Bulfinch was hired by President James Monroe. During his tenure, Bulfinch constructed the U.S. Capitol's central section, including the Rotunda and the original dome.

As federal guidelines and industry standards change, the Agency's design standards continue to evolve.

Revision of Design Standards

Constructing and renovating facilities to extend their life span is consistent with Architect of the Capitol's entrusted stewardship values. To do this, it develops and maintains design standards applicable to all Capitol facilities within its jurisdiction that heighten commercial practices and institutional standards for the Capitol.

The Design Standards, for example, addresses sustainable design and stresses that projects shall be designed to conserve energy resources, improve environmental performance and use of environmentally preferable products. In FY 2007, specific sections of the design standards were revised to reflect strategic environmental investment opportunities and to include comprehensive energy models for design. In FY 2011, the design standards are receiving a complete review and update. To the extent practicable, projects follow Leadership in Energy and Environmental Design Green Building principles for a Silver rating. As federal guidelines and industry standards change, the design standards continue to evolve.

Facility Management Data Vision

The Architect of the Capitol is exploring methods to implement a campus information modeling system to create intelligent facilities and enable better data-based decisions. This system would utilize a variety of existing facility data systems — Geographic Information Systems, Building Information Models, Computer Aided Design drawings and others — to create a data model and user interface in support of planning, design, construction and operations.

In addition, the Architect of the Capitol is constructing a process to utilize Building Information Modeling to assist in the design and operation of the Capitol. Building Information Modeling is the next stage in the evolution of design software and expands the user's ability to model and imitate aspects of actual and virtual building structures in two and three-dimensional electronic format. Building Information Modeling will also help analyze a building's environmental management, simulate physical conditions and conduct virtual reality performance evaluations.

The "Virtual Capitol" demonstrates the Agency's interactive modeling capabilities.

Sustainability Framework Plan

The Architect of the Capitol developed a Sustainability Framework Plan — part of the Capitol Complex Master Plan — a plan that includes best practice management strategies and goals that are consistent with the Energy Policy Act of 2005 and Energy Independence and Security Act of 2007. The Agency tracks its progress toward these goals and continuously evaluates energy and environmental performance to increase sustainability and environmental impact to the Capitol.

Implementation of sustainable practices under the energy management program has resulted in a reduction of total energy and water consumption, less waste in landfills, more materials reused or repurposed, and increased recycling. Achievements include:

- Adjusted the U.S. Capitol Power Plant's fuel mixtures to use natural gas as the primary fuel source to meet the Capitol steam demands. The plant is being operated by digital controls installed in late FY 2009 on its steam boilers.

Storm water runoff at the U.S. Botanic Garden was reduced.

High-efficiency water filtration systems combine centrifugal separation and sand filtration to provide fresh water to the Capitol.

In addition, new steam auxiliary equipment has been installed to improve system reliability

- Reduced storm water runoff at U.S. Botanic Garden in collaboration with the U.S. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds. The runoff from the eastern portion of the Conservatory roof takes rainwater, slows it down, spreads it out and allows it to soak into the "rain garden." This first phase of the new garden is located on the east side of the Conservatory

- Purchased a new street sweeper to reduce storm water pollution and sediment runoff to local bodies of water

- Completed Rayburn cafeteria controls, daylight harvesting and LED light installation

Renewable Energy

Many organizations with a strategic energy conservation and management plan purchase green power to help the environment, meet environmental and conservation goals, and contribute to a more sustainable energy future. To avoid most of the environmental impact associated with traditional power generation and help protect human health and the environment, 100 percent wind electricity was purchased through renewable energy certificates as part of a broader energy reduction program.

In FY 2010, 350 million kilowatt hours of clean, renewable wind electricity were purchased from a utility company to help fulfill energy needs. This translates to a reduction of 175,000 tons of carbon dioxide emissions.

The Architect of the Capitol will continue to identify life-cycle cost effective opportunities for reducing greenhouse gas emissions and to inventory and report on its achievements in this area.

Recycling Programs

The Architect of the Capitol has a long-standing commitment to recycling, having started its recycling program in 1989. To improve performance, the Agency sought to increase office waste recycling by five percentage points and non-

The Agency has a long-standing commitment to recycling, having started its recycling program in 1989.

office (e.g., industrial) waste recycling by three percent from FY 2005 levels within three years. The Agency recycled 738 tons of non-office waste in FY 2008, which is a 45 percent increase over FY 2005 levels, far exceeding the targeted three percent. Since FY 2006, 100 percent of all computer and electronic waste, including monitors, computers, printers and other hardware has been recycled.

In FY 2009, the recycling program was further strengthened with the adoption of a new mission statement, goals and metrics to ensure increased recycling. New measures include recycling new sources of waste, including tracking wastes from construction, and demolition sites under contract and landscaping areas.

The current target is to increase the recycling rate by three percent by FY 2013 from FY 2008/FY 2009 levels.

Biobased Procurement

Biobased products are composed wholly or in significant part of biological products, including renewable agricultural materials (e.g., plant, animal and marine materials) or forestry materials made from plants (e.g., corn and soybeans) and reduce our dependence on foreign oil. The Energy Policy Act of 2005 requires the Architect of the Capitol to consider biobased procurement requirements found in the Farm Security and Rural Investment Act of 2002 and associated regulations issued by the U.S. Department of Agriculture.

Specifically, the Architect of the Capitol is developing a preference program to compel the use of biobased products, a promotion program, annual reviews and monitoring of its program and a program of public education for visitors to and occupants of the Capitol. The Agency developed a chapter of its Environmental Manual (Preferred Procurement Program for Biobased Products, January 4, 2007) outlining steps to achieve these requirements.

In FY 2010, the facilities staff at the House and Senate office buildings switched to using a vegetable-based hydraulic fluid in some of their operations. This environmentally friendly fluid, which is a biodegradable, nontoxic and renewable resource, is now being used in some elevators and trash bailers.

The Architect of the Capitol is continually looking for ways to improve its biobased procurement program and conducts an annual review of its program to determine if changes are needed. In FY 2009, the Agency modified its Intranet and Internet sites to include information on the use of biobased products and performed a review of its program to require contractors to evaluate biobased products newly identified by the U.S. Department of Agriculture. Additional activities included initiating the

In FY 2010, 49 new recycling containers were installed on the Capitol Grounds.

The boilers at the Capitol Power Plant have adjusted fuel mixtures to use cleaner natural gas as its primary fuel source.

The Capitol Power Plant generates chilled water for cooling 23 facilities across the Capitol.

effort to rewrite a chapter of the Environmental Manual (internal policy) related to the biobased procurement program and updating training for purchasing staff to address biobased procurement requirements.

By switching to biobased products, the Architect of the Capitol is helping to protect the environment, while continuing to maintain a high level of service to Congress and the Supreme Court.

Transition to Cleaner Fuels

The Architect of the Capitol transitioned to cleaner fuels by replacing many of its fleet vehicles with those that use Ethanol 85 fuel (e.g., to date, there are approximately 60 alternate-fuel vehicles in the fleet — a 30 percent increase from 2009) and installing an Ethanol 85 pump that may be used by flex-fuel vehicles in other Legislative Branch agencies' official fleets. In addition, shuttle buses use B20 biodiesel fuel. The boilers at the Capitol Power Plant have adjusted fuel mixtures to use cleaner natural gas as its primary fuel source.

Capitol Power Plant Energy Saving Initiatives

The Capitol Power Plant provides centralized utility services not available from other sources to Capitol facilities and serves a critical role in generating steam heating for 20 facilities across the Capitol and chilled water for cooling 17 facilities across the Capitol, including six buildings that are not managed by the Architect of the Capitol. From the time the Capitol Power Plant began operating, the Agency has worked to balance the needs of the Capitol with the Capitol Power Plant's production of steam and chilled water. This opportunity has allowed for the refinement of the Capitol Power Plant's operations to respond to the needs of the facilities and improve the efficiency of heating and cooling.

To meet long-term cooling needs, the Architect of the Capitol has developed a multi-phase

1820

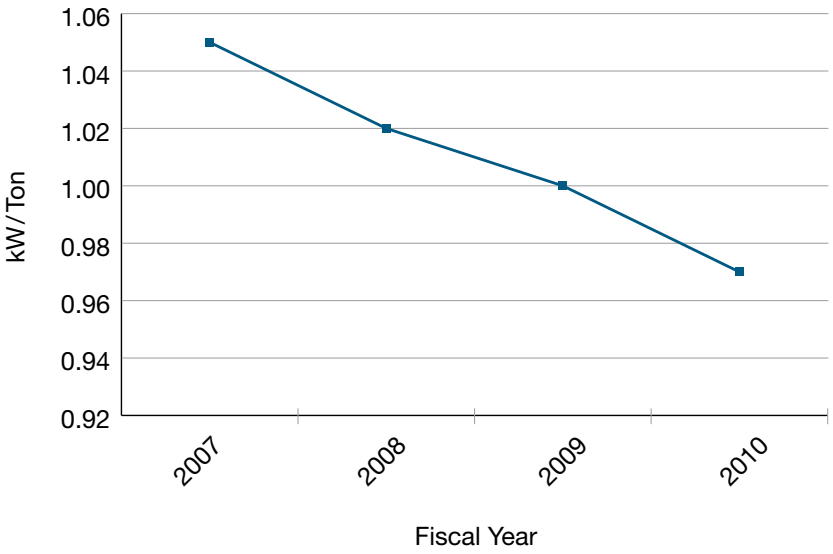
1820 — The U.S. Botanic Garden established by Congress to collect, grow and distribute plants from the U.S. and around the world that might contribute to the welfare of the American people.

modernization project to replace aging chillers, address structural concerns of the original West Refrigeration Plant and provide additional refrigeration capacity to the Capitol.

After careful review of the environmental impact of a range of energy-producing technologies, the Agency selected on-site power generation known as cogeneration to increase the efficiency of the Capitol Power Plant. Cogeneration is the use of a heat engine or power station to generate both electricity and useful heat simultaneously. It is one of the most common forms of energy recycling.

The proposed cogeneration system for the Capitol Power Plant includes a 7.5-megawatt combustion turbine and a heat recovery steam generator with integral duct burner that will significantly reduce emissions. To complement the review of the alternate technologies, the Architect of the Capitol investigated the use of backpressure steam turbogenerators and found them to be cost effective.

Figure 1 – Chilled Water Plant Performance Measure



Refrigerant Conversions and Efficiencies

A number of facilities have chillers and air conditioning units that contribute to reducing the Architect of the Capitol's carbon footprint. Steps are being taken to ensure the chillers are energy-efficient and environmentally friendly. The Construction Management Association of America Project Achievement award-winning West Refrigeration Plant Expansion project added three 5,400-ton chillers with variable speed pumping and free cooling capabilities.

Equipped with the new digital controls, the Plant is supplying chilled water for air conditioning more efficiently. This is reflected in the Chilled Water Plant's performance measure, which divides electricity consumption (in kilowatts) by chilled water output (in tons) and is a standard industry measure for efficiency. This figure decreased from 1.05 to 0.97 between FY 2007 and FY 2010; nearly an 8 percent improvement. This is reflected in Figure 1 above.

Cogeneration is the use of a heat engine or power station to generate both electricity and useful heat simultaneously.

Table 1: Recommendations and Progress	
GAO Recommendation	**AOC's Progress in FY 2010**
Establish a schedule for energy audits that considers cost-effectiveness.	Prioritized energy audits and created a four-year energy audit schedule with cost projections. Appropriated $1.8 million funding for energy audits in FY 2010, requested $600,000 for FY 2011.
Implement selected projects as part of an overall plan that considers cost-effectiveness, the extent to which they reduce emissions and options for funding them.	Implemented numerous energy efficiency projects throughout the Capitol, including: upgrading lighting systems, replacing steam system components and purchasing energy-efficient equipment and appliances.
Evaluate the adjustment of the Capitol Power Plant's fuel mix.	Burned 88% natural gas, 7% coal and 5% fuel oil during FY 2010.
Evaluate the purchase of renewable electricity from external providers.	Purchased 350 million kWh of renewable energy from a utility company.

Government Accountability Office Recommendations for Improving Energy Efficiency and Decreasing Emissions

In April 2007, the Government Accountability Office published a greenhouse gas emissions and carbon footprint calculation for the Legislative Branch offices, with the objective to reduce energy use and emissions. Significant progress was made in FY 2010, as detailed in Table 1.

Program Accomplishments

The Architect of the Capitol continues to meet the annual energy reductions specified by Energy Independence and Security Act of 2007. With facility space totaling 17.4 million square feet and 450 acres of paved and landscaped area, the Agency has a unique opportunity to demonstrate federal leadership within the facilities it administers.

Numerous strategies are developed with the common goal of improving energy efficiency. This section includes a listing of innovative program accomplishments detailing some of the progressive strategies implemented during FY 2010, including management-level decision making, enhanced metering, water conservation measures, pilot projects to test new strategies, and the development of Energy Savings Performance Contracts.

Energy Efficiency Initiatives

The Architect of the Capitol expanded its strategies to include alternative technologies and increased the potential for improved project integration and sequencing with pilot projects and low cost, no cost initiatives. These small-scale projects are used to test strategies and provide opportunities that extend across jurisdictions. Some of these include:

- Senate Energy and Environmental Showcase to educate the Senate staff on reduce, reuse and recycle actions that they can do in their offices
- Installing lighting motion sensors and a lighting curtailment program
- Ongoing heating, ventilation and air conditioning controls program to upgrade to newer technology as units are replaced to convert constant air volume systems to variable air volume systems
- Installation of dimmable ballast systems with daylight and occupancy sensors in overhead lighting to maintain consistent lighting levels in each office
- Replacing incandescent light bulbs with compact fluorescent lamps for energy savings
- Increasing the number of occupancy sensor light switches available for offices, conference rooms and committee rooms
- Installing motion sensor equipment and low-flow devices for water conservation in bathrooms
- Implementing a feasibility study to examine roof replacement with

During FY 2010, the Agency conducted multiple studies to identify projects to save energy.

integrated photovoltaic roofing systems for the Hart, Russell and Dirksen Senate Office Buildings; the Rayburn, Longworth, Cannon and Ford House Office Buildings; and the John Adams and James Madison Library of Congress Buildings

- Implementing metering policy, plan and program
- Making operational changes for energy savings include heating, ventilation and air conditioning nighttime setback and increasing chilled water supply temperature during colder outdoor temperatures
- Purchasing and leasing only Energy Star™ appliances and equipment and encouraging other entities to do the same
- Implementing a policy for leasing or purchasing alternate fuel vehicles
- Installing high-efficiency motors for various applications, including heating, ventilation, air conditioning, elevator renovations and other renovation projects

Energy-Saving Projects and Fiscal Efficiency

The Architect of the Capitol plans to use specific construction projects to obtain energy savings to achieve or exceed the required energy usage reduction in the next 10 years (e.g., the recently completed West Refrigeration Plant Expansion project). During FY 2010, multiple studies were conducted to identify projects to save energy. The challenge in this effort was to select the best projects, optimizing funding while evaluating the return on investment. For example, improving lighting design and efficiency in a Congressional office building might reduce the building's overall energy load significantly, and an investment in steam trap assessments and Capitol-wide monitoring may reap additional energy savings at the Capitol Power Plant, in which case the steam trap assessment project provides more energy savings.

Documenting payback and savings-to-investment ratios are crucial for smart, long-term lifecycle cost based decision making. This data, along with advanced metering and intuitive reporting tools will help achieve "world-class" status in terms of energy management.

Members of the Electrical Division installed new lighting ballasts across the Senate as part of the energy efficiency initiative.

Section II:

Performance Information

Preservation and Sustainability Performance and Accomplishments

As discussed in the Introduction, all projects follow a five-part, continuous cycle and closed-looped process — 1) assessment, 2) planning, 3) implementation, 4) outcome evaluation and 5) reassessment. This approach improves the overall project delivery process and ensures that the Architect of the Capitol focuses on the highest impact at the lowest possible cost; identifies deviations; and identifies, analyzes and corrects a problem with a system, product or process. Accomplishments are presented within the context of each phase of the business process.

Assessment

Sustainability, Energy and Water Management Plan

The Architect of the Capitol ensures that all renovation, new construction, operations and maintenance efforts incorporate measurable sustainability goals, performance targets, and implementation strategies that utilize best practices. The Sustainability, Energy and Water Management Plan informs and guides this effort, positions sustainability within the Capitol's security and historic preservation context, and provides an assessment framework for determining project return on investment, leveraging outcomes, and evaluating new opportunities. This comprehensive plan, which incorporates five key areas: energy, water, materials, health and wellness:

- Builds on the Architect of the Capitol Sustainability Master Framework Plan
- Includes sustainability goals that were benchmarked against leading agencies and organizations
- Is based on the Leadership in Energy and Environmental Design (LEED) green building rating system, the Building Research Establishment Environmental Assessment Method (BREEAM) and the Sustainable Sites Initiative (SITES) guidelines

Development of the Plan included a document review (e.g., AOC Capitol Complex Master Plan, AOC reports, energy audits, Energy Savings Performance Contracts, anticipated funding requests, and facility assessment information) and work sessions with sustainability experts to brainstorm potential sustainability goals. The resulting draft plan, which considers the most current technology available, recommends sustainability goals to include:

- Targets by topic (energy, water, materials, health and wellness), as well as activity type (new construction, renovation, operations and maintenance)
- Timeframe for goals starting from FY 2011
- Management initiatives that focus on revisions of existing Agency standards and policies or the establishment of new requirements

As environmentally responsible stewards to the over 450 acres of Capitol Grounds, the Agency has transitioned its vehicle fleet to include approximately 60 alternate-fuel vehicles in an effort to reduce fossil fuel consumption.

- Project-level initiatives that focus on specific technical strategies to achieve corresponding fiscal year targets

The final version of the plan, which is expected in FY 2011, will incorporate tracking, measurement and implementation tools and strategies, a template for documenting new construction, rehabilitation and maintenance and operations activities, consolidated reports on goals achieved, templates and checklists to measure sustainability goals, policies and procedures, a training plan and a delineation of staff responsibilities.

Building Envelope Study and Window Research

In preparation for the exterior envelope cleaning, repair and restoration project at the Russell Senate Office Building, architects, engineers and materials experts surveyed building conditions, analyzed repair options, and formulated recommendations that balanced the goals for sustainability. The condition of the building's 622 windows were surveyed, and three scenarios were tested: 1) repairing the existing windows, 2) retrofitting the existing windows with insulated glazing, and 3) replacing the windows with new energy-efficient ones.

The Office of Planning and Project Management Division and the Senate Superintendent's Office sought a design approach for the windows that was sensitive to the building's original design and one that would improve the window's energy efficiency. Using two state-of-the-art computer software packages, the team performed energy model calculations and estimated future expenditures — life cycle costs — for the next forty years.

Results showed that option two was the most cost effective, energy saving option.

These results were unexpected. The energy modeling and life cycle cost programs showed that retrofitting the existing windows with new glazing was, in fact, the most cost-effective, energy-saving option. From sustainability and historic preservation perspectives, repairing the retrofitting option was desirable because original building materials would be maintained and preserved.

Repairing damaged windows is a cost-effective, energy-saving and sustainable practice for building maintenance.

The Agency focuses on the highest impact at the lowest possible cost.

Design mock-ups for each window type will be developed, and funding will be requested in FY 2014 with construction anticipated through FY 2019.

Planning

Capitol Complex Master Plan and its Sustainability Framework Plan

The Capitol Complex Master Plan is a 20-year plan that provides Congress and the Architect of the Capitol with a roadmap for future campus development and facility decision-making. Included in the Capitol Complex Master Plan are nine Jurisdiction Plans, six Framework Plans and a Composite Plan.

From the Plan's initial development, the Architect of the Capitol recognized that the way in which we plan, design, construct and manage our built environment has a major impact on environmental issues (e.g., energy consumption, resource management, water conservation, pollution and environmental degradation). As a result, sustainability is woven into the fabric of the Capitol Complex Master Plan from the initial vision statement to the creation of the Master Sustainability Framework Plan.

The Capitol Complex Master Plan is a roadmap for future campus development.

Rain gardens, like the one pictured above at the U.S. Botanic Garden Conservatory, reduce storm water runoff.

Tasked with the management, maintenance and improvement of Capitol facilities, the Architect of the Capitol builds upon established and evolving sustainable design goals to support the preservation inherent in its stewardship role. To articulate these goals, the Capitol Complex Master Plan developed the Master Sustainability Framework Plan, which has four major themes and reflects a structure consistent with the Capitol's operational organization:

Energy and Water Resource Conservation and Utility Service

- Consider the utility structure of the Capitol infrastructure and grounds and its application in individual buildings. These services include power, heating, cooling and water and solid waste management

Storm Water Management and Landscape Practices

- Consider all vegetated, pervious and impervious surfaces that make up the exterior site of the Capitol. The handling of storm water runoff from rain is a primary consideration in the landscape category

Improved Indoor and Outdoor Environment

- Consider indoor and outdoor air quality and how both are affected by pollution, noise, material selection and construction practices

Materials Management and Operations Procedure

- Consider all materials — whether related to construction, daily uses and site maintenance or generated waste — that enter and exit the Capitol infrastructure and grounds and the procedures in place for managing these materials

1851

1851 — The U.S. Capitol underwent an expansion of the House and Senate wings. Hot water pipes were connected to boilers in the basement to warm the extension.

The Sustainability Master Framework Plan is an overarching document that provides employees a tool with which to plan and analyze all of their stewardship responsibilities. As the early and definitive document on sustainability, it has provided many strategies further developed from a planning and implementation standpoint.

From a planning perspective, the Architect of the Capitol analyzes all projects submitted in the annual fiscal budget from an energy efficiency and environmental quality standpoint.

Projects are also analyzed against a Leadership in Energy and Environmental Design (LEED) scorecard to determine their environmental benefits. For construction projects, this analysis serves to document the environmental qualities the project incorporates and identifies strategies that may have been missed but could be easily added prior to construction.

For study and design funding requests, the LEED analysis enables a more comprehensive and sustainable project scope. These scorecards will soon be replaced with a metric taken from the Sustainability, Energy and Water Management Plan, which is an immediate follow-on document to the Sustainability Framework Plan and provides a means to track and

Projects are analyzed against a LEED scorecard to determine their environmental benefits.

assess our progress in the goals that it establishes.

Other than the previously noted overarching guidance that will provide a more definitive roadmap, there have been many follow-on activities stemming from the Sustainability Framework Plan. Recent progress that follows the themes of the Plan include the following:

Energy and Water Resource Conservation and Utility Service

- The Architect of the Capitol continues to implement its energy audits as required by the Energy Independence and Security Act of 2007. These audits provide energy saving strategies that can help the jurisdictions target their facility maintenance dollars in an efficient manner

- The Architect of the Capitol is now proceeding with design requirements for cogeneration at the Capitol Power Plant. Cogeneration uses exhaust heat to generate steam. This will help the Architect of the Capitol engage in off-grid sources of power to limit its reliance on public utilities that have seen declining reliability in recent years

- In 2010, the Energy Team undertook a pilot study for wireless thermometers throughout the Ford House Office Building. This pilot is designed to better manage energy consumption and improve building occupant comfort

The Architect of the Capitol has begun a multi-phased Storm Water Management Study.

Water-filtering sponges keep potentially harmful contaminants from entering into the Anacostia and Potomac rivers.

Storm Water Management and Landscape Practices

- The Architect of the Capitol has begun a multi-phased Storm Water Management Study that begins with a review of all topographical information and, if funded, will extend into the FY 2012 fiscal year when strategies are explored based upon rainfall analysis. At the conclusion of this analysis, a roadmap for storm water best management practices will be completed and will inform all future projects on the Capitol
- Capitol Grounds, as part of a pilot study in November 2009, installed storm water-filtering sponges at seven locations across the Capitol. These sponges are designed to chemically bond with hydrocarbons that typically come from gasoline, diesel fuel and motor oil. The sponges lock in and contain the hydrocarbons, keeping these potentially harmful contaminants from entering into the Anacostia and Potomac rivers
- The Senate Office Building jurisdiction is engaged in implementing a green roof for the Hart Senate Office Building. This green roof will help reduce the urban heat island effect by cooling the roof surface and will also aid in reducing and filtering storm water runoff from its roof area

Improved Indoor and Outdoor Environment

- As early as 2007, the Design Guidelines were changed to incorporate low volatile organic compound materials and adhesives that contribute to poor indoor air quality. In 2010, the Architect of the Capitol commenced a more through and comprehensive review of its Design Guidelines that will further the improvements made to it years before
- As bike sharing becomes more popular in the District of Columbia, employees have helped contribute to its popularity by increasing the numbers that are biking to work and participating in the "National Bike to Work Day." Employees are seeing not only the benefits of reduced emissions across the metropolitan area, but also see the personal benefits as vital for maintaining good health

Materials Management and Operations Procedure

- In addition to improving the Design Guidelines for indoor air quality, the Architect of the Capitol will increase materials management by reducing its reliance on virgin materials, increasing acceptance of recycled content and implementing construction waste management as it continues to revise Design Guidelines
- The Architect of the Capitol is working to decrease waste going into landfills and has been making great strides in increasing the recycling rate. In FY 2010, the Capitol composted about 500 tons of food waste and food service packaging from the cafeterias. The Agency extended the compost collection services beyond the restaurant and cafeteria operations and into offices to separate compostable, biodegradable food and container products from the general wastestream. When requested Senate and

House Congressional offices were equipped with containers dedicated to these compostable wastes. Compostable wastes are then collected and processed with the restaurant and cafeteria wastestreams destined for commercial composting

- To help reduce water consumption, porcelain fixtures were upgraded in the House Office Buildings as part of the ESPC effort; however, the porcelain that would have gone into the waste stream was instead crushed and screened to process into new asphalt paving aggregate

Cannon House Office Building Renovation

Experts working on the Cannon House Office Building rehabilitation, a whole building renewal effort slated to meet Leadership in Energy and Environmental Design (LEED) for New Construction certification at the silver level, will utilize the Sustainability, Energy and Water Management Plan to determine and prioritize strategies and projects that holistically integrate sustainability, historic preservation, energy conservation and security.

The Architect of the Capitol will use information gathered during pre-design studies to create a program of requirements to prioritize projects and inform the final design approach (e.g., windows and exterior façade, roof, historic spaces, site/landscape, mechanical, engineering, plumbing, security, hazardous materials, sustainability, architectural, historic preservation and parking).

The Cannon Pre-Design Studies dealt with a number of specific inquiries. The primary studies related to housing and construction-swing-space/phasing. The study explored how to minimize the number of moves any office would have to make, whether to swing space on the Capitol or elsewhere within the House Office Building Jurisdiction. The study evaluated the distribution of people and offices through the House of Representatives Jurisdiction, potential for increased sharing of resources between offices, ways to minimize energy usage and equipment purchases and distribution of space and amenities.

By determining requirements for each area beforehand and taking a whole building approach to design changes, the Architect of the Capitol can identify synergies that save space, time and cost, and ensure that occupant needs and satisfaction (e.g., natural daylight, views, thermal comfort and safety) are addressed.

The Architect of the Capitol is working to decrease waste going into landfills.

In 2010, the installation of a green roof demonstration project began on the Cannon House Office Building garage roof. The project will include installation of green roofs on six of the mechanical structures sitting on top of the Cannon Building courtyard-parking garage. These roofs will help control runoff of storm water, provide added insulation to the spaces below and improve the view of the member offices facing into the Cannon Building courtyard.



Three winning entries submitted by children during the International Children's Painting Competition.

International Children's Painting Competition

The U.S. Botanic Garden has been working with representatives from United Nations Environment Programme to support planning of the annual International Children's Painting Competition. Established in 1990 and sponsored by UNEP, the Japan-based Foundation for Global Peace and the Environment, Bayer Corporation and Nikon, the competition has since received over 508 million entries from more than 100 countries. It is open to children between the ages of 6 to 14 as a platform to demonstrate their knowledge of environmental dangers.

Entrants submit their drawings to one of six regional offices — Europe, Africa, North America, Latin America and the Caribbean, West Asia or Asia Pacific — where judging takes place. Each region chooses the winners from the entries submitted to their respective regions. First place regional winners win $1,000; an all expense paid trip to the North American World Environment Day, as well as a trip to the TUNZA International Children's Conference. The competition also awards second place prizes, region-specific prizes and a certificate to every child who participates.

The theme for 2011 is "Life in the Forests." Students are invited to produce original artwork that focuses on forests and their impact on the survival and well-being of people everywhere. A selection committee announces the winners on June 5, 2011.

Capitol Grounds Facilities Management Plan

Capitol Grounds' operations encompass and involve many facets of business not recorded or documented in one comprehensive management plan. Several management tools currently are used for asset management and maintenance planning (i.e., the Grounds Jurisdiction Plan, facility condition assessments, annual Line Item Capital Plan, 5-year Capital Improvement Plan, Transit Maintenance Analysis for fleet vehicle and equipment management).

In FY 2010, the Architect of the Capitol undertook a pilot study to create a comprehensive model facilities management plan that will provide life cycle stewardship

Capitol Grounds Portfolio of Asset Categories

- Trees, shrubs and herbaceous plants (275 acres)
- Lawns
- Sidewalks
- Roads and parking lots
- Irrigation and water system
- Fountains and water features
- Historic structures (Summerhouse, Olmsted Walls)
- Historic lamps, fixtures and decorations (statuary)
- Fueling stations
- Fleet vehicles and equipment (snow removal, horticulture)
- Miscellaneous fixtures (benches, trash and recycling containers)
- Special events equipment
- Storage facilities/grounds at Ft. Meade and DC Village

1865

1865 — An inventor named Samuel Gardiner installed a patented gas-lighting apparatus to illuminate the Dome interior, the Rotunda and the Tholos.

In FY 2010, the Agency undertook a pilot study to create a comprehensive model facilities management plan.

and annual and long-term budget forecasts for all Capitol Grounds assets. The goal for this activity is to create a plan that would:

- Provide guidance and direction to evolve current Capitol Grounds practices
- Provide a framework for merging data with management practices
- Validate and document the condition of the current asset inventory
- Highlight the structure for managing Capitol Grounds assets
- Serve as a framework to guide asset investment decisions, including operations, preventive maintenance, renewal, repair and construction and management of unsecured equipment
- Increase sustainability knowledge and practices
- Allow determination of the best physical space location(s) for an efficient organization

The final facilities management plan would delineate Capitol Grounds strategy, goals, emphasis (i.e., safety, serviceability and sustainability), benchmark results and comparative data from other campuses, and provide an inventory management and maintenance prioritization plan, implementation procedures, load management schedules and procedures and an operational analysis for staffing and budget. Routine, seasonal, special events and emergency maintenance will also be addressed in the plan.

Implementation

Maintaining Historic Structures Safely and Responsibly — Stone Study

Over the past 200 years, the architects and builders of America's historic structures on the Capitol used stone to face the buildings. At the heart of the campus is the U.S. Capitol, flanked by the House of Representatives, Senate, Library of Congress and Supreme Court. This collection was meant to be permanent and imposing to the capital city and the nation. Stone was a natural choice for long-lasting buildings.

As the stone ages, however, previously unseen faults in the stone can grow into cracks and weaken the stone with the potential to detach and fall to the ground unexpectedly. This deterioration can be aggravated by deferred maintenance of a building's exterior envelope. Properly pointing and sealing existing mortar joints and maintaining metal roofing and flashing in good condition is important for maintaining a watertight envelope and for safety.

Defects in stone are particularly dangerous at overhanging cornices, the decorative horizontal architectural elements at the highest point of a wall. Because these cornices are fully exposed to the elements, adverse weather conditions, and seasonal changes in temperature, the pull of gravity can cause them to fall.

Unfortunately, the defects that cause this are nearly undetectable until it is too late.

Although stone provides a solid long-lasting building material, cracks and fissures can weaken stone as it ages.

Quarried sandstone from Aquia Creek, a tributary of the tidal segment of the Potomac River in Northern Virginia, was used on the oldest parts of the U.S. Capitol Building. For other buildings, such as the Russell Senate Office Building, the stone was brought in from as far away as Vermont.

The Architect of the Capitol is entrusted with the care of these historic buildings and with the safety of occupants and visitors. Taking a proactive approach to the issue of decaying stone, experts are surveying problem areas, sounding the cornice stones with mallets to detect fissures or other non-visible defects. The stone surveys and testing have led to the removal of suspicious stones — mainly ornamental modillions — that were in danger of falling. In some areas, whole stone features like Corinthian column capitals have been wrapped with strong netting to prevent loose pieces from falling and hurting visitors and building occupants.

A multiyear examination and inspection of stone conditions and exterior surfaces began in 1997 at the Capitol Building. The resulting detailed drawings revealed complex problems due to the age of the stone, the type of stone (at least three different marbles, a variety of granites and a painted sandstone), and diverse weather exposures. This initial survey led to a multiphase project with a series of preservation initiatives that address stone concerns.

As part of the push to authorize the extension of the Capitol's East Front, photographers documented the deteriorated condition of the paint-encrusted sandstone. This evidence helped convince Congress that the best way to protect the stone from further decay was to build an addition over the old walls to take them out of the weather.

In a different approach taken to the restoration of the West Front, engineers first examined and evaluated each stone in terms of structural stability; this resulted in the preservation of approximately 60 percent of the original stone in that area.

More recently, the exterior marble at the Supreme Court was surveyed after a piece of the cornice fell from the entrance portico in 2006. Two years later, a similar accident happened at the Russell Building which prompted a thorough examination of its cornice.

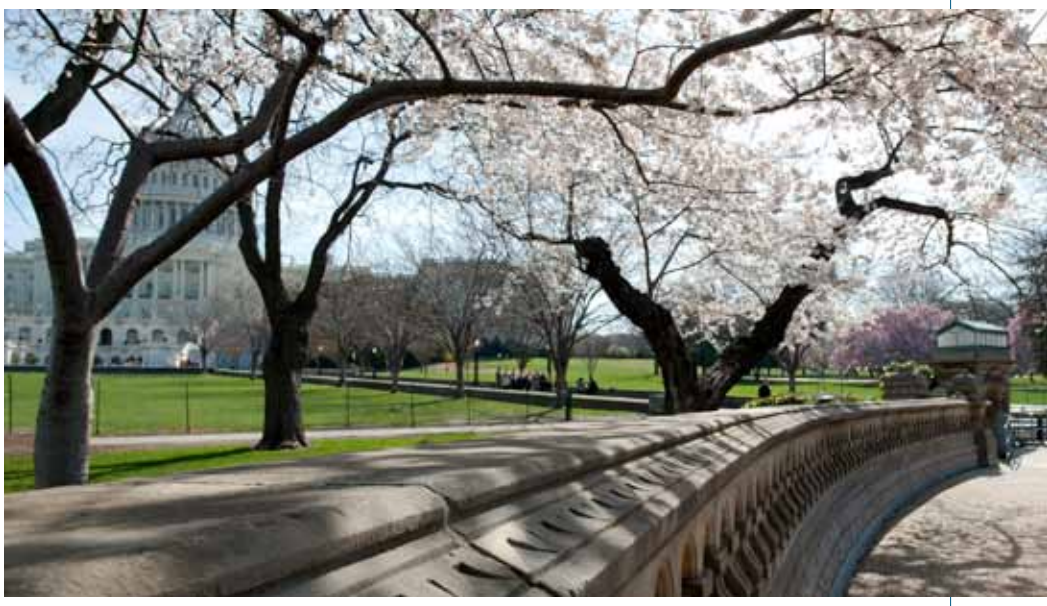
Because of its date and construction similarity, the Cannon House Office Building was tested at the same time, and several loose modillions were removed as a precaution. Several volutes — spiral ornaments — were discovered missing from the Ionic

columns on the Longworth House Office Building, which spurred a stone survey on that historic structure. Surveys have also been conducted on the Botanic Garden's Conservatory and on the Robert F. Taft Memorial, both of which showed evidence of stone deterioration and failure.

Stone inspection projects support stewardship and safety responsibilities and help ensure the continuing preservation of the historic resources. These treasures are held in trust for the nation. Taking precautions and maintaining historic resources responsibly will help guarantee that they will be handed down to succeeding generations in fine condition. Maintaining and preserving these treasures is the most sustainable action possible. Adequate maintenance will ensure that the structures can continue to function well into the next century.

Sustainable Construction Division Projects

In a push to increase its recycling and sustainability practices, in FY 2010, the Construction Division met with the Office of Planning and Project Management's sustainability and energy team. The group identified some energy saving or sustainable construction products. A set of product templates for creating awareness about these additional options is under development.



Stone is used as a predominant building material, not just in buildings, but also across the entire Capitol Grounds.

Recycling remained a high priority. In FY 2010, the Construction Division recycled over 450 tons of construction debris — which is more than double the amount of debris it sent to a landfill. The Construction Division works to recycle nearly all debris, including sawdust, from construction projects.

Where possible, it procures and installs high recyclable value products and sustainable products — low volatile organic compound paint, low energy lighting fixtures and motion and occupancy sensor controls for lighting and plumbing applications. These efforts, along with other innovations developed in concert with new House Office Building construction specifications, are the new standard for future Construction Division projects.

The Construction Division's Plumbing Branch performs energy efficient installations (e.g., new automatic flush valve technology on toilets that use ambient lighting to power them, sensor-operated soap dispensers and faucets, low flush volume toilets and urinals). Steam and chilled water control valves for air handlers and fan coil units are installed with digital computer controls, greatly reducing running time and enabling cost savings and energy reduction.

The Agency is entrusted with the care of these historic buildings and with the safety of occupants and visitors.

The Architect of the Capitol initiated a comprehensive study to survey exterior building conditions.

Russell Exterior Envelope Project — Window Research

In preparation for the upcoming design phase addressing the cleaning, repair and restoration of the exterior envelope of the historic Russell Senate Office Building, the Architect of the Capitol initiated a comprehensive study to survey exterior building conditions, analyze repair options and offer recommendations.

The architectural features evaluated were marble and granite façades, marble balustrades, courtyard limestone, mortar and caulking joints, birdproofing systems, decorative metal lighting and railings, wood windows and bronze doors.

The Russell Senate Office Building was examined in a variety of ways. In addition to surveying the façade from the ground with high-powered binoculars, a 150-foot crane allowed the architects, engineers and materials experts to study up close the conditions at the building's highest reaches.

Material samples were sent to laboratories to identify properties such as strength, water absorption and composition. During the off hours and weekends, the 622 windows were surveyed from the interior. The Senate Superintendent's Office was determined to find an approach that was sensitive to the building's original design and improved the windows' energy efficiency.

Balancing the goals for sustainability, reducing energy consumption and preservation, two state-of-the-art computer software packages were incorporated in the scope of the study.

The study provided important data and will be used to guide the design and construction phases. A holistic planning approach is essential when working with historically significant buildings of the caliber of the Russell Senate Office Building. Further, since finance is an important factor in making design choices, the study included a detailed cost model. The cost model supports a planning process and provides a basic understanding of future design and construction costs.

The Architect of the Capitol worked to develop a viable multi-year construction phasing plan that considered factors of cost, schedule, client disruption, historic preservation, energy, sustainability and security. Data from the Exterior Envelope Study will inform the approach and next steps taken for the Russell Senate Office Building.

U.S. Botanic Garden — Terrace Gardens

Dating from 1820, the United States Botanic Garden is one of the oldest botanic gardens in North America. One of 19 public gardens accredited by the American Association of Museums and operating under the jurisdiction of the Joint Committee on the Library, the Garden informs visitors about the importance and fundamental value of plants to the well-being of humans and our planet and highlights the diversity of plants worldwide.

The Terrace Gardens are a part of an overall effort to increase the sustainability in operations. By reducing the lawn footprint, there will be decreased mowing, chemical applications and storm water runoff. The new design will increase plant biomass to the landscape and increase habitat for pollinators. Anchoring the garden are several Liriodendron tulipifera 'Arnold,' a

1871

1871 — Steam heating replaced the coal burning stoves that had been used to warm the Rotunda, eventually replacing all of the furnaces in the U.S. Capitol's central building.

native larval host and nectar source for butterflies.

The first phase of the Terrace Gardens project, which represents an important part of the U.S. Botanic Garden's overall effort to increase the sustainability of its operations, was completed in May 2010. The project includes a rain garden on the East side of the Conservatory (*see sidebar*). This area is an inward-directed and enclosed space showcasing the aesthetics and functions of plants that grow in wet environments.

The design retains a pre-existing Ginkgo grove, Dawn Redwood and Magnolia. A planted depression was created between the existing trees and a boardwalk bridges the lower ground.

The second phase of the project began in September 2010 and is nearing completion; this extends from the National Garden butterfly planting to the first diagonal path leading onto the Entry Terrace. The design reduces the overall lawn footprint, resulting in decreased mowing, chemical applications and storm water runoff. The planting design will restore plant biomass to the landscape and increase wildlife habitat. An existing fully operating wind turbine provides a demonstration for visitors.

Rain Gardens: Lowering Runoff, Pollution and Flooding

Rain gardens capture storm water in a shallow depression, allowing the rainwater to slow down, spread out and soak naturally into the ground rather than be channeled into the storm sewer and potentially polluting nearby waterways. Rain gardens have many positive functions:

- Lowering the volume of erosion-causing runoff and associated pollutants flowing into street drains and the Chesapeake Bay
- Helping communities reduce drainage and flooding problems
- Replenishing underground water supplies
- Providing a useable and attractive habitat for flora and fauna benefitting the natural ecosystems

Completed in 2010, the U.S. Botanic Garden's rain garden built in a natural depression at the southeast corner of the Conservatory offers an attractive and beneficial landscaping solution. It receives water from three new externally fitted gutters. Two spouts flow directly into the depressed area and one into a rain barrel, a low-cost conservation device that can be used to reduce runoff and help delay and reduce peak runoff flow rates. The set-up seeks to mimic a natural hydrologic system where most of the rainfall seeps into the ground and slows down the first wash of water, which has the tendency to overextend the capacity of storm sewers.

Originally developed for a 2008 exhibition on sustainability, the rain garden, which is part of the Terrace Gardens project, was built as a showcase for the general public to see how rainwater can be used as a resource instead of as a waste product.

House Underground Garage East Renovation

The House Underground Garage East Renovation project involves a major renovation of the East Underground Garage. Originally built in 1968, the garage serves the House Office Buildings. The majority of the building is underground, consisting of multilevel parking areas, ramps, associated office for the security guards, egress stairways and a rooftop park.

Work/Life Program employees brainstorm ideas to improve health and well-being.

The garage has not been significantly altered since its construction, and now is in need of renovations as evidenced by deterioration of concrete and steel reinforcements. The garage underwent extensive evaluations to determine the extent of the structural deterioration and the scope of work that would be required to remediate the structure.

The sustainable efforts of the project will continue after construction is complete through the implementation of a Green Housekeeping program and the purchase of Green Power for the garage. Monitoring of these sustainability efforts also will continue to determine effectiveness of these programs and to provide data to inform future sustainable building projects.

Improving the Features of Building Architecture

As the Agency improves the features of building architecture — including light and air quality, thermal comfort, toxin avoidance and view of nature — it helps to create a healthy, healing environment that promotes efficiency and work place success. Of utmost concern are the issues of lighting, heating and controlling the work place environment for employee satisfaction.

The Architect of the Capitol makes a conscious effort to minimize the use of artificial light in all tenant occupied areas. In the U.S. Botanic Garden Production Facility, skylights

The Agency improves the features of building architecture — including light and air quality.

were installed as part of a major office renovation. This greatly reduced the use of energy for lighting and provided the building occupants with a more natural and comfortable work environment.

Similar examples of systems that encourage daylight harvesting — reducing lighting levels by taking into account light from windows — have been placed in the U.S. Capitol Building, various House Office Buildings and several Senate Office Buildings.

Allowing adjustment of light levels also improves productivity and employee satisfaction. Each jurisdiction, for example, has installed lighting fixtures that allow employees to adjust the amount and intensity of light. Similarly, dimmable

A building and its architecture can influence a person's health and well-being. While the main initiative of the building plans is to decrease energy consumption, a latent initiative includes improving these elements of the workplace in order to increase the comfort of its employees.

ballasts and multi-level switching lighting systems have been installed in the U.S. Capitol, House Office Buildings, Senate Office Buildings and the Library of Congress Office Buildings.

The quality of air and temperature, like lighting, affects productivity; when poor, it creates a distraction and increases environmental stress for employees. To address these potential distractions, systems that enable direct control of heating, ventilation and air conditioning systems were installed throughout the Capitol. The U.S. Botanic Gardens and the Capitol Power Plant each have easily accessible ways to adjust temperature and humidity; this furthers direct energy conservation, as well as favorably affecting air quality and employee comfort.

The U.S. Supreme Court utilizes building automation systems and remote control of heating, ventilation and air conditioning settings. These systems improve comfort levels and decrease distractions for employees, allowing for more focus on work tasks and less exposure to potential causes of illness.

Leading the way for air quality enhancements, the U.S. Botanic Garden Administrative Building had the first phase of a major renovation completed in FY 2010 — the installation of energy-efficient heating, ventilation and air conditioning units, electrical distribution and lighting systems.

Allowing adjustment of light levels also improves productivity and employee satisfaction.

This attempt to dramatically reduce energy use throughout the building was accompanied by air quality improvement measures.

Education Complement

The U.S. Botanic Garden also has made a conscious effort over the past years to educate the public through offering programs on sustainability, celebrating holidays like Earth Day and Endangered Species Day, providing outreach for family festivals, completing and distributing the *Sustainable Solutions: Guide to Sustainable Practices at the United States Botanic Garden*, and hosting exhibitions that highlight sustainability concepts and showcase the government's efforts in preparing for a sustainable future.

Efficient Land Use

The Planning Division continually addresses the issue of efficient land use. Rather than building new structures on undeveloped property, the Agency looks to revitalize and reuse the existing land base within the Capitol grounds.

Designing the Capitol as a working and walking community helps to increase air quality, decrease car pollution and other particulates that trigger asthma and promote exercise and wellness for all persons.

The U.S. Botanic Garden, along with many other buildings on the Capitol, has installed employee bike racks at the Conservatory. The new bike racks enable already avid riders to utilize bikes during the workday, as well as encourage others to do the same. Promoting these exercise habits will reduce the likelihood of obesity and related health problems among employees.

Senate Facilities

The renovation of the Senate Employees' Child Care Center incorporated products and materials (e.g., paints, adhesives, sealants, carpet tiles and cushion products) that emit a minimum number of volatile organic compounds. These safe and sustainable products help to ensure better indoor air quality and make the center a harmless environment for people of all ages, especially children, whose immune systems are more susceptible to toxic compounds.

The Agency is preserving the original aspects of the structure, replacing inappropriate alterations with replications of the original features.

The restoration of the Summerhouse replaces past inappropriate alterations with replications of the original features.

Major Congressional meeting spaces have also benefitted from sustainable material conversions. In the Dirksen Senate Office Building, a Rules Committee Event Room has been transformed with decorative acoustic wall panels that help to conceal former asbestos pegboards, as well as enhance acoustics in a setting that previously did not provide ample sound. These veneer wood panels are made of 100 percent pre-consumer recycled wood fiber core board and are Forest Stewardship Counsel Chain-of-Custody certified.

Summerhouse Rehabilitation Project

The Summerhouse rehabilitation project supports the strategic goals to improve the facility condition index of assessed facilities and to properly maintain the nation's heritage assets. The Agency is preserving the original aspects of the structure, replacing inappropriate alterations with replications of the original features and returning the surrounding landscape setting to original Frederick Law Olmsted intent.

The rehabilitation project has several water-consuming features that are being analyzed during the design process. These features include the fountain, the grotto, the landscaping and its irrigation system. The open system of the existing fountain will be replaced with a closed system that will save hundreds of thousands of gallons of water every year.

The grotto will have a series of programmable, timed valves to several zones within the grotto allowing for very precise metering to balance aesthetics with water conservation.

Efficient plant species are being designed into the project. All of the proposed species are tolerant of drought and can survive with little water. Additionally, many of the more invasive and noxious plants, which were part of the original plan, are being replaced with U.S. native species. The new plantings will also provide nectar for pollinators and butterflies.

While the plant selections are water efficient, no plant flourishes in intense and continued drought. Moreover, regular watering is essential to establish the plants and to maintain the ornamental effect that is so eloquently described by Olmsted in his letters about the Summerhouse landscape. Therefore, the irrigation system currently being designed uses rain sensors and other new technology to irrigate as efficiently as possible. It is estimated that a potential 15 – 20 percent savings may be achieved through this new system.

1880

1880 — Electric arc lighting was installed around the Capitol Grounds and some areas within the U.S. Capitol.

U.S. Capitol Christmas Tree

Six years ago, the Architect of the Capitol replaced the less efficient incandescent Capitol Christmas tree lights with more efficient and longer-lasting Light Emitting Diode (LED) lights as part of its commitment to implement energy-saving measures across the Capitol. Replacing the incandescent lights with LEDs has saved the Capitol 86 percent in seasonal energy use compared to past years and costs only about $1 per day to light the Christmas tree.

Decorated with 5,000 ornaments crafted by Wyoming citizens, the 2010 Capitol Christmas tree, a 67-foot Engelmann spruce from the Wyoming Bridger-Teton National Forest, featured over 10,000 environmentally-friendly LED lights.

The U.S. Capitol Christmas Tree uses longer-lasting LED lights, costing roughly $1 per day to light the tree.

Outcome Evaluation

Life Cycle Cost Analysis and Energy Modeling

The Senate has three principal office buildings, as well as several off-site facilities throughout the region. Built in 1909, the Russell Senate Office Building is the oldest of the buildings. The stone of the Russell Building has deteriorated over time due to the building's age and environmental factors. Additionally, the original windows of the building are not energy efficient.

The challenge is to renovate the exterior of the building and lower energy consumption, while preserving the historic fabric of the façade. To address this challenge, the Architect of the Capitol performed a study of the building's envelope with the goals of balancing sustainability, lowering energy consumption and historic preservation. Using high-powered binoculars and a 150-foot crane, a team of architects, engineers and materials experts studied the conditions at the building's highest reaches. The team also conducted energy model calculations and estimated life cycle costs of the building for the next 40 years.

The study resulted in numerous recommendations for the repair and replacement of marble and granite façades, marble balustrades, courtyard limestone, mortar and caulking joints, birdproofing systems, decorative metal lighting and railings, wood windows and bronze doors.

Significant steps towards reducing greenhouse gas emissions have been made.

Scope 1: Direct Emissions, generated directly by Capitol Hill facilities.

Scope 2: Indirect Emissions, those generated by others, such as emissions created when generating electricity consumed by Capitol Hill facilities.

Scope 3: Induced Emissions, include those generated by employees driving to and from work. Scope 3 emissions are not included in this report.

From sustainability and historic preservation perspectives, the project will retain and repair the original building materials and will capture the embodied energy contained within them.

Carbon Footprint and the Greenhouse Gas Emissions Report

Climate change is one of the most pressing environmental issues faced by the United States and other countries. The threat of climate change has far-reaching implications, from an increase in extreme weather events to rising sea levels and the loss of climate-sensitive species.

In 2007, the Government Accounting Office released a report — "Energy Audits Are Key to Strategy for Reducing Greenhouse Gas Emissions" — that included a carbon footprint calculation of emissions for the Legislative Branch Offices for FY 2006.

In the fall of 2009, in response to the threat of climate change, President Obama signed Executive Order 13514 — Federal Leadership in Environmental, Energy and Economic Performance. Among other sustainability-related elements, this executive order requires agencies to measure their greenhouse gas inventories and develop goals and strategies to significantly reduce their greenhouse gas emissions by 2020.

The executive order also requires agencies to follow specific guiding principles, detailed in the draft Federal GHG Guidance prepared by the Federal Energy Management Program, in developing their inventories and to report these inventories along with their budgets for the fiscal year to both the Office of Management and Budget and the Council on Environmental Quality.

Through energy efficiency upgrades and a transition to cleaner fuels for heating, the Architect of the Capitol has already made significant steps towards reducing its greenhouse gas emissions. The Architect of the Capitol first calculated its greenhouse gas emissions inventory in FY 2008, as part of its annual energy report to Congress. In this inventory, greenhouse gas emissions associated with Scope 1 and Scope 2 emissions were estimated. In FY 2010, the Architect of the Capitol chose to expand its inventory to correspond with the inventories being developed by federal agencies under EO 13514.

This expansion included a more detailed estimate of refrigerant leakage and an estimate of all Scope 3 emissions (employee commutes, transmission and distribution losses, business travel and waste emissions). While the Architect of the Capitol is not required to comply with Executive Order 13514, this expanded inventory will allow the Architect of the Capitol to benchmark and track its performance against federal agencies. By expanding its inventory and setting ambitious greenhouse gas reduction goals, the Architect of the Capitol plans to continue its leadership position in environmental sustainability in the federal government.

Energy conservation and greenhouse gas mitigation are key components of the overall Sustainability, Energy and Water Management Plan. The plan will:

- Measure its greenhouse gas "footprint"
- Identify internal and external benchmarks for greenhouse gas performance
- Set ambitious but achievable energy and greenhouse gas reduction goals
- Develop a mitigation program to achieve the greenhouse gas reduction goals

Since 2007, The Architect of the Capitol has reduced greenhouse gas emissions by 67 percent for the entire Capitol. A summary of greenhouse gas emissions in metric tons of carbon dioxide equivalents is found in the Table 2 in Appendix F.

This reduction in the carbon footprint has primarily been due to a decrease in the use of coal at the Capitol Power Plant and the purchase of renewable energy to offset emissions from the generation of electricity consumed in the Capitol. A summary of greenhouse gas emissions in metric tons of carbon dioxide equivalents is found in Chart 1 in Appendix F.

As part of completing its greenhouse gas inventory, the Architect of the Capitol also benchmarked its greenhouse gas emissions goals and performance against the portfolios of other similar buildings. Proposed goals were benchmarked against those of other agencies, as well as of local government leaders in sustainability, leading companies like Wal-Mart and Johnson & Johnson and leading universities.

The West Refrigeration Plant Expansion project increased Capitol Power Plant efficiency.

The goals are on par with or higher than all other federal agencies, all local governments, and all but a few private companies. From preliminary analysis of these building portfolios, it appears that the Architect of the Capitol is near the middle in terms of energy performance.

As the Architect of the Capitol continues to sub-meter steam and chilled water use, this benchmarking analysis can be further refined. With plans to benchmark its buildings using the Energy Star™ Portfolio Manager benchmarking tool, the Architect of the Capitol will be able to gather information pertinent to the refinement of the Agency's energy and greenhouse gas reduction goals, and provide context that will help track the progress and results of its reduction efforts.

In FY 2010, greenhouse gas emissions were reduced by 60 percent.

A fleet vehicle is filled with E-85 fuel to reduce greenhouse gas emissions.

Reassessment

Transportation

The Architect of the Capitol aims to reduce transportation-related energy consumption and greenhouse gas emissions associated with business travel by 50 percent, employee commuting by 50 percent and fleet vehicles by 80 percent by FY 2030.

To achieve this aim, the majority of fleet vehicles in use now run on Ethanol 85 fuel, biodiesel, or electricity. The revised Alternate Fuel Policy requires the purchase or leasing of alternate fuel vehicles when replacing aging vehicles in its fleet. To date, there are approximately 60 alternate-fuel vehicles in the fleet (a 30 percent increase from 2009).

The Architect of the Capitol, in an effort to offset carbon emissions associated with employees commuting to work, has instituted the Transit Benefits and Flexible Work Schedule programs. Thirty-six percent of the 2,600 employees use transit benefits to pay for public transportation to commute to work.

In addition, almost a quarter of all employees participate in the Flexible Work Schedule program. Together, these programs result in a 1.8-million-pound annual reduction in carbon dioxide emissions, which equates to removing approximately 153 passenger vehicles from the road. Further reductions are expected with the expansion of the Telework program, which has the potential to increase productivity and employee retention while reducing traffic congestion.

Energy conservation is central to the goals of effective stewardship.

The Capitol Complex Metering Program

Energy conservation is central to the goals of effective stewardship guided by principals of sustainability, fiscal integrity and responsible practices. The key to true energy savings is a system of real-time metering: accurate, timely and site-specific measurement of primary utility usage. The metering program provides an exemplary model of just such a system, employing building-level metering to monitor energy-saving progress and meet conservation goals.

Metering data reveals a building's energy profile and quantifies distribution system losses. The real-time metering and Utility Metering Enterprise System (i.e., reporting) systems identifies energy savings opportunities, and subsequently tracks, analyzes and optimizes energy conservation opportunities.

By targeting the highest energy consuming components and diagnosing and troubleshooting other problem areas, Architect of the Capitol can identify energy savings opportunities and reduce building operating costs. Metering allows building occupants and systems managers to become empowered, active participants in energy conservation measures with real-time data about specific energy use.

Metering provides data on long-term trending of temperatures, pressures and flows, as well as performance monitoring and verification of energy savings. Data obtained through the new metering system has led to the use of daylighting and other lighting control schemes, resulting in energy savings.

Congress has established goals and performance targets through FY 2015 to reduce energy consumption throughout the Capitol. With

1888

1888 — Chambers are electrified with incandescent arc lamps, installed by Manhattan Company, replacing the antiquated gas lanterns.

benchmarks set for FYs 2011, 2013, 2015, 2017, 2020 and 2030, metering will continue to be an essential part of measuring and meeting those energy conservation and Agency sustainability goals.

Energy Efficiency Performance and Accomplishments

Assessment

Sub-metering to Engineer Large-Scale Energy Savings

The Architect of the Capitol is responsible for overseeing more than 65 buildings and leased spaces located both on the Capitol and in remote facilities, consisting of more than 17.4 million square feet of buildings. These facilities consume substantial quantities of energy.

To meet the energy reduction goals and to comply with the Energy Independence and Security Act of 2007, the Architect of the Capitol is providing data to its clients from meters installed in each building. By studying data gathered by these meters, it can be determined where energy consumption can be managed and controlled, how to allocate energy usage and understand where energy can be saved due to inefficient equipment, bad habits and broken or inaccurate mechanical controls.

Additional data can be obtained through sub-metering. Installed throughout the distribution system with minimal disruption to building functionality, sub-metering devices monitor the effectiveness of energy reduction efforts, yield useful data to inform building occupants of their energy usage and allow determination of the success of energy-saving programs.

A comprehensive Utility Metering Enterprise System, which includes sub-metering, can give energy users the ability to track and respond to their own energy consumption and energy managers the tools to engineer large-scale energy savings. The system can deliver historical data, jurisdictional feedback and additional data from sub-metering.

In FY 2010, a study was conducted to evaluate different sub-metering technologies to determine which technology would best suit the needs of the Agency and to evaluate potential sub-meter locations in each electrical system for the best possible energy usage data to help with energy reduction. The set of options that were evaluated included:

- Maintain status quo
- Sub-meters in each substation
- Sub-meters at the plug-in breakers (Rayburn House Office Building only)
- Sub-meters in the distribution panelboards
- Sub-meters at all branch circuit panelboards
- Sub-meters on all branch circuits

Steam meters, like the one pictured below at the House Page Dorm, measure the facility's steam consumption.

The Agency is responsible for overseeing more than 65 buildings and leased spaces located both on Capitol Hill and in remote facilities.

Energy Savings Performance Contracts implement cost-effective, energy-efficient projects and guarantee performance delivery.

When building occupants leave lights and equipment on when not needed, energy is wasted. If users are made accountable for the energy that they consume whether at a facility or not, they are likely to become more conscious of turning off devices when not in use. If building occupants can see an immediate change in the building energy consumption as a result of their actions, the energy reduction initiatives have the potential to be much more successful.

Energy Savings Performance Contracts

Energy Savings Performance Contracts implement cost-effective, energy-efficient projects and guarantee performance delivery. These contracts play a significant role in helping to reach required long-term targets (reduce total energy usage by 30 percent in ten years), develop projects with minimal investment and fund projects with savings generated by the installed improvements.

Established in December 2009, The Senate Energy Savings Performance Contract, as well as others underway at the Capitol, will greatly improve the Agency's position in meeting its energy usage goals.

Building Energy Audits

Congress has mandated reduced energy consumption, based on a FY 2003 baseline, by 30 percent over a period of ten years (three percent per year). The Energy Independence and Security Act 2007 mandates energy audits are performed on Federal facilities that constitute at least 75 percent of facility energy use, in a manner that ensures that an evaluation of each such facility is completed at least once every four years.

Energy audits provide a means to determine what steps are most cost-effective in producing energy savings. All buildings were scheduled to have energy audits over a four-year time period. Buildings that were included in the Energy Savings Performance Contracts were surveyed before any changes were made to get a "before" snapshot of their energy use.

An initial four-year schedule for the entire campus was presented and then modified as funding became available to implement the audits. One company was initially selected to perform all of the audits. This was done to maintain a reasonable consistency of results from building to building.

Over half of the audits have been completed. The remainder either is underway or will begin shortly. The end of FY 2011 will complete the first four-year cycle of audits.

The audits, once completed, detail a number of energy conservation measures that could be applied to each building. These are converted into action plans, such as no cost/low cost maintenance items, requests for Capital Improvements Plan funding for larger projects, etc. Follow-up is performed to determine which items were completed, abandoned, planned for future budget years, etc.

Buildings will be re-surveyed to verify that they have successfully implemented their contracted projects and that the guaranteed energy savings is actually being received.

Another round of energy audits is being planned. They will be co-coordinated with a round of building retro-commissioning requirements.

Planning

Cogeneration

The Architect of the Capitol is pursuing cogeneration at the Capitol Power Plant. While the project will take a significant investment, cogeneration has many benefits — higher energy efficiency, lower carbon footprint, lower overall cost and higher energy system security and reliability. Implementing cogeneration would greatly assist with meeting the energy reduction goals outlined in the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007. Lastly, cogeneration can help the Agency meet new, more stringent emissions standards.

As discussed in the Strategic Long-Term Energy Plan, cogeneration was identified as the best option for increasing energy efficiency and security, as well as reducing environmental impacts.

Cogeneration uses a combination of combustion turbines and steam backpressure turbines to make electricity, utilizing the waste combustion heat to provide steam to heat the buildings. Implementation of cogeneration at the Capitol Power Plant is projected to represent a 24 percent reduction in energy consumption compared with the FY 2003 baseline, as well as a six percent reduction in greenhouse gas emissions, and a 98 percent reduction in hazardous air pollutant emissions over FY 2009 emissions rates.

Large centrifugal chillers, located in the Capitol Power Plant, provide cooling for Capitol facilities.

A recently awarded (FY 2010) Utility Services Energy Services Contract design project will add a cogeneration plant to the existing Capitol Power Plant and produce electricity for the plant and steam power for the Capitol. This project will significantly contribute to meeting the Agency's energy reduction goals, as well as emission requirements. The design work began in October 2010, and the project completion date is FY 2014.

Utility Distribution System Alternative Tunnels Study

The Architect of the Capitol, through the Capitol Power Plant, operates five walkable utility tunnels containing steam and chilled water pipes to serve the heating and cooling needs of the Capitol. The tunnels also serve as the pathway for telecommunications systems for the campus.

The housing of the utility distribution system in a network of narrow, antiquated tunnels has led to various ventilation, temperature, egress and ergonomic risks for tunnel entrants. The Architect of the Capitol is studying several approaches for improving the utility distribution system and the overall tunnel design parameters and codes.

The Agency has 266 virtual servers with plans to virtualize an additional 63 physical servers.

After careful review of several options, the Agency is focusing on evaluating alternative distribution concept to the customers, repair the tunnel on an annual basis, extend the life of the tunnel, or replace the tunnel outright. Completion of the study will result in concept plans, a schematic design and a budget model for a new and improved utility distribution system.

The Power to Save program educates staff and Capitol employees about sustainability and environmental stewardship goals.

Implementation

Server Virtualization

Computer server virtualization allows data center managers to run multiple virtual computers on a single physical machine. Server virtualization reduces overall energy use, greatly reduces the amount of space needed to house a datacenter and reduces the support needed for server operations.

The Architect of the Capitol's Information Technology Division performed a baseline and target server architecture assessment and developed estimates of potential energy and space savings from server virtualization. The assessment determined that the savings would be significant. The Agency has 266 virtual servers with plans to virtualize an additional 63 physical servers. All administrators of the technology receive training and notice of the latest upgrades and technologies, ensuring that the virtual environment is energy efficient, strong and safe.

Changing Behaviors and Saving Energy Through the Power to Save Outreach Program

The "Power to Save" program, which is integral to the continued success in energy conservation, educates staff and Capitol employees about sustainability and environmental stewardship goals. By communicating and reinforcing key concepts such as the importance of energy and resource efficiency to architectural quality, historic preservation and cost-effective operations, the "Power to Save" program has been effective in increasing the energy and resource awareness and motivating action on meeting sustainability and legislative goals set by Congress.

Sustainable design and operations create healthy and productive work environments for all Capitol employees. In FY 2010, the "Power to Save" program successfully communicated sustainability goals to employees and created opportunities for those employees to become active participants in energy reduction and sustainability programs. Future goals for the program include the redesign of the "Power to Save" web site to include a version of targeted information on the internal AOC Link and an external version on www.AOC.gov.

Outcome Evaluation

Rayburn House Office Building

In April of 2010, the Rayburn House Office Building upgraded the lighting and control systems within the Rayburn cafeteria. The system used multiple occupancy sensors, zoning, daylight harvesting, motorized blinds, light emitting diode (LED) lighting, different light levels and integration software to produce a 60 percent

1898

1898 — The famous gas explosion of the Senate small rotunda led to the authorization of complete electrification of the U.S. Capitol.

reduction in lighting energy. The system reduces light levels in the various seating and serving areas when there is no occupancy in the area. It turns all the lights off at night and on weekends when the space is empty.

The cafeteria area is a high visibility location for all employees and visitors. It serves as a constant reminder that the Architect of the Capitol is actively involved in energy reduction and supporting sustainability goals. The project was also featured and demonstrated on Earth Day 2010 during a speech by the Speaker of the House.

Business Process Re-Engineering and Campus Information Modeling

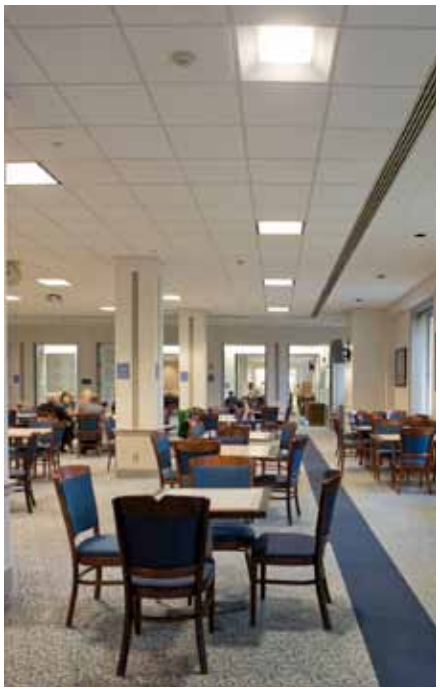
To address the need for an updated and streamlined project delivery business process and an information technology system to manage the workload, the Architect of the Capitol initiated the Business Process Re-Engineering Project. This effort allows the Agency to better identify, plan, deliver, track, measure and evaluate projects, including those for energy savings and sustainability across the Capitol.

This project will provide greater opportunities for integration of project and building data into a business information model, geographic information systems and other operational systems that will greatly assist in implementing initiatives. Ultimately, these efforts will provide the ability to:

- Increase data accessibility and sharing
- Create a sustained corporate memory
- Reduce duplication of data development
- Enhance and automate business practices
- Create "on-demand" access to essential decision-support information
- Enable Capitol project analyses/ solutions
- Improve integration/partnering efforts across the Capitol

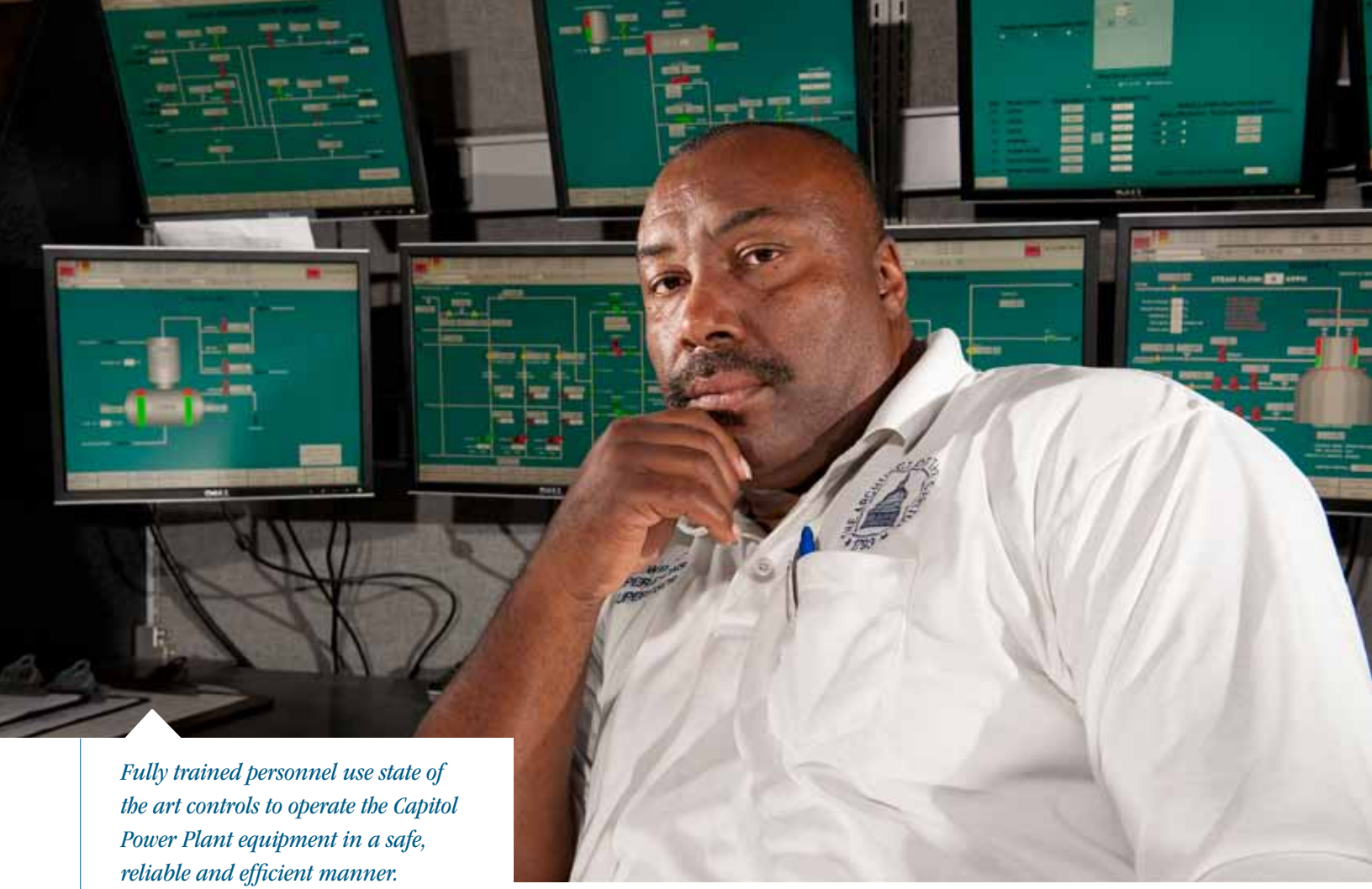
Facility Management Data Vision

The Architect of the Capitol is exploring methods of implementing a campus information modeling system to create intelligent buildings. This system would utilize three-dimensional graphics for design, modeling and operations inherent to building information modeling systems.



LED lighting was installed in the Rayburn House Office Building Cafeteria to increase energy efficiency.

Currently, the Architect of the Capitol is constructing a process to utilize Building Information Modeling (BIM) to assist in the design and operation of the Capitol. BIM is the next stage in the evolution of design software and expands the user's ability to model and imitate aspects of actual and virtual building structures in two and three-dimensional electronic format. BIM will also help analyze a building's environmental management, simulate physical conditions and conduct virtual reality performance evaluations.



Fully trained personnel use state of the art controls to operate the Capitol Power Plant equipment in a safe, reliable and efficient manner.

The Architect of the Capitol trained a core group of users in BIM software and began modeling selected facilities in order to build experience for future implementation.

In addition to BIM, the Architect of the Capitol is creating processes to use other cutting-edge Information Technology tools (e.g., Computer Aided Drafting, Geographic Information Systems and Computer Aided Facility Management). These tools will enable staff to be more efficient in its decision making with respect to building usage, modification, operations and maintenance.

Building Automation System

The Capitol's Building Automation System network (BASnet) monitors and controls a significant number of the mechanical systems across the Capitol, including the original temperature control system, and systems for energy management, elevator monitoring, central metering, cable television management and building lighting control.

Much has changed since the original master plan for the Building Automation System network was implemented a decade ago. Several other major systems at the Capitol have been installed, numerous new security requirements have been put in place, technology has changed and improved. Sustainability and energy use reduction have come to the forefront of factors influencing building design.

In FY 2010, the Architect of the Capitol embarked on redrafting the master plan for the Building Automation System network to meet these new realities. A new master plan will define the appropriate levels of funding, management and maintenance support needed for the network over the long term, and will enable the development of appropriate policies to implement it.

The final master plan is expected to guide the direction and

implementation of the Building Automation System network for the next 10 to 20 years. As part of the drafting process, the Agency has solicited comments and suggestions from all of the stakeholders that utilize the network and will incorporate these into the final master plan so that the plan reflects their needs.

One important goal of the planning effort is to define standards for the system architecture of the Building Automation System network both at the campus and at the building system level (e.g., workstation location, defining the qualities of sensors and actuators, sequences of operations, hardware used to connect workstations to building system controls, software, media and communication protocols).

Reassessment

Metering Program

Building-level metering is a critical part of an effective energy management program. The Architect of the Capitol is currently in the process of installing meters on various utility systems including electricity, natural gas, steam, chilled water, condensate return and drinking water consumption across the Capitol. To measure energy usage and savings, the Architect of the Capitol is installing improved utility meters that have the ability to collect, store and analyze real-time data on energy consumption. The new meters provide real-time data that will enable the Agency to effectively

Building-level metering is a critical part of an effective energy management program.

determine a building's energy profile and quantify distribution system losses, to target improvements to reduce energy consumption, as well as to help diagnose and troubleshoot problem areas for any under-performing buildings.

The Architect of the Capitol plans to establish the network infrastructure for and install approximately 320 utility meters by January 2013 and implement an accompanying Meter Maintenance Program. To date, 138 meters have been installed.

A Metering Enterprise System will function as an easy-to-understand, informational website for the Congressional staff and other building occupants on the Capitol's utility usage. Using the system, energy managers and operational staff can perform advanced utilities analysis of electricity, steam, chilled water and potable water and resulting carbon footprints. Completion date for the implementation of this enterprise system is January 2012.

Reliability-Centered Maintenance and Building Retro-Commissioning

The Architect of the Capitol is investigating procedures to extend the useful life of its facilities through reliability-centered maintenance and building commissioning and retro-commissioning. Reliability-centered maintenance is an optimum mix of reactive, time- or interval-based, condition-based and proactive maintenance practices.

Retro-commissioning focuses on ensuring that equipment and systems operate optimally and as designed during a building's life cycle. An operations and maintenance best practice, retro-commissioning relies on tuning up building systems to optimize performance. In FY 2010, a project to perform retro-commissioning in combination with an air handler study in two Library of Congress facilities, the John Adams and Thomas Jefferson Buildings was awarded. The project also included some limited work in the Dirksen Senate Office Building.

Despite the limited control and monitoring capabilities of the older pneumatic systems, the project identified a total of 68 issues in the John Adams Building and 116 issues in the Thomas Jefferson Building, mostly consisting of sensor calibration and malfunctioning valves and dampers. The potential annual savings from correcting these issues is more than $90,000. During the project contract, related energy

Elevator controls were upgraded in two Library of Congress buildings to eliminate "stop chasing" where several elevators respond to the same call.

conservation measures, including variable frequency and outside air damper controls were formulated as well.

System commissioning was included in the Energy Savings Performance Contracts awarded in 2010. Energy Savings Performance Contracts are innovative funding mechanisms that realize energy savings at no additional cost to taxpayers and provide for the design, acquisition, installation, testing, operation, and when appropriate, maintenance and repair of an identified energy or water conservation measure or series of measures. The contracts also provide on-the-job training for jurisdictional staff in the commissioning process so that staff becomes familiarized with the new systems' capabilities and energy savings strategies.

In the future, Energy Savings Performance Contracts will address the larger equipment necessary to achieve these improvements (i.e., air handlers and pumps) and are expected to realize energy- and cost-savings within two years. System commissioning and retro-commissioning will be included in the next five-year cycle of Facility Condition Assessments and Energy Audits for the major Capitol facilities.

Energy Intensity Reduction Performance

The Architect of the Capitol is taking steps to meet and exceed the energy conservation goal of 30 percent reduction in energy intensity by FY 2015 compared to the baseline value of FY 2003. This goal was set forth by Congress in the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007. This section of the report summarizes the FY 2010 energy performance with respect to the aforementioned goals.

In FY 2010, the Architect of the Capitol continued to implement projects that support a more energy efficient future and has made great strides in using management tools, such as Energy Saving Performance Contracts, implementing energy audits and installing steam and chilled water meters. These initiatives established useful and accurate metrics for managing jurisdictional energy consumption.

The energy data for FY 2010 is compiled in the Federal Energy

In FY 2010, the Agency continued to implement projects that support a more energy efficient future.

1910

1910 — The Capitol Power Plant completed construction and commenced operation in December.

The Capitol Power Plant also provides steam and chilled water to buildings that are not managed by the Agency.

Management Program Energy Management Data spreadsheets attached to this report (Appendix E). The energy and water billing information contained in the attachments has some limitations, which should be considered when reviewing the data. On the Capitol, water is measured by supply volume only, without separate sewer volume metering.

The sanitary sewer flow is billed based on the water flow measured at 60 water meters. Sewer flow is overestimated as irrigation and cooling tower makeup, which is consumed and not returned to the sewer, is not submetered and subtracted from the metered usage. Not all individual buildings are fully metered for steam and chilled water consumption. Therefore, energy consumption is estimated based on Capitol Power Plant fuel inputs, rather than per-building consumption.

The Capitol Power Plant also provides steam and chilled water to buildings that are not managed by the Architect of the Capitol: steam to the Government Printing Office and Postal Square (approximately 2,794,900 square feet) and steam and chilled water to the Folger Library and Union Station (approximately 405,500 square feet). Steam and chilled water use must be adjusted to account for these buildings.

Exterior, site and street lighting are powered from the buildings, in some cases, and not metered separately. Therefore, facility electricity consumption for these exterior electrical loads can be included in the building energy intensity (British thermal unit per square foot) figures.

The following table and figure indicate progress in energy intensity reduction. Table 2 is a tabulation of the energy intensity reduction percentages (compared to the FY 2003 baseline), as required in the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 along with the Agency's measured reduction, for FYs 2006, 2007, 2008, 2009 and 2010.

The FY 2009 and FY 2010 measured reduction figures include the application of Renewable Energy Certificates, which was not included in the prior year's figures. The Department of Energy's Federal Energy Management Program guidance allows for the inclusion of Renewable Energy Certificates when calculating energy intensity reductions.

Figure 2 shows the same figures as in Table 2 except in graphical format, as well as indicating the required reduction percentages for FYs 2011-2015.

Without fully installed energy metering, it is difficult to measure where energy savings are realized. However, some indications in the available energy data improve understanding by helping to identify the largest energy reductions.

Table 2: AOC Measured Energy Intensity Reduction vs. Goals

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Architect of the Capitol Measured Reduction	6.5	6.7	10.7	15.3	17
Energy Policy Act of 2005	2.0	4.0	6.0	8.0	10.0
Energy Independence and Security Act of 2007	2.0	4.0	9.0	12.0	15.0

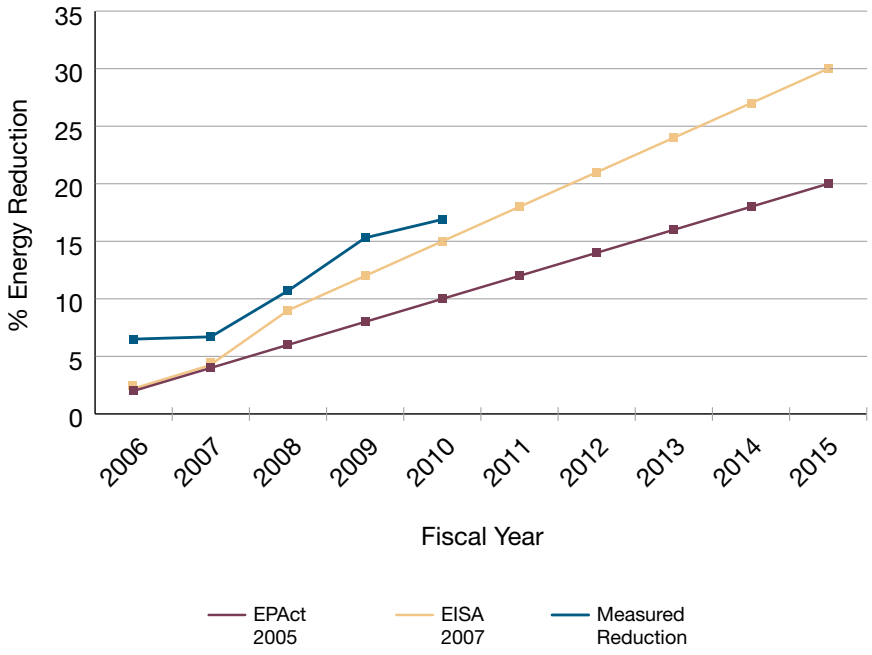
Figure 3 represents the energy use for Goal-Subject facilities. Total Goal-Subject energy use decreased by 5.4 percent compared to FY 2003. Total Goal-Subject square footage increased by 5.9 percent compared to FY 2003.

As a result, Goal-Subject energy intensity decreased by 11.7 percent compared to FY 2003. With the inclusion of renewable energy certificates, a total energy intensity reduction of 17 percent was realized, compared to the Energy Independence and Security Act of 2007 goal reduction of 15 percent for FY 2010.

The energy is divided by four uses:

- Capitol Power Plant Cooling — the energy used in the central chilled water plant. Chilled water is then supplied to most buildings for dehumidification and cooling
- Capitol Power Plant Heating — the energy used to generate steam, which is supplied to most buildings for heating, domestic hot water, humidification and food service
- Electricity — the total electricity purchased for all the buildings except the Capitol Power Plant
- Building Heating/Cooling (non-Capitol Power Plant) — is the natural gas, purchased steam and purchased chilled water for buildings not connected to the Capitol Power Plant

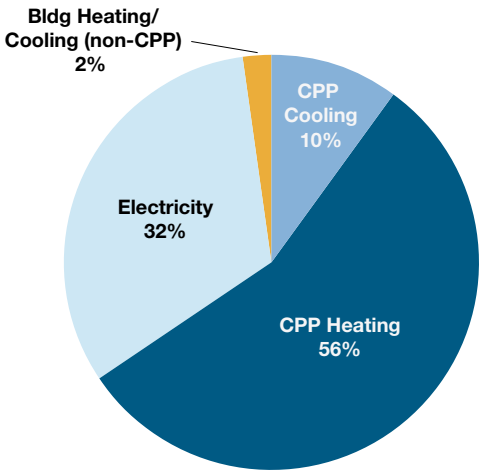
Figure 2 – AOC Energy Intensity Reduction vs. Goals



In FY 2010, the amount of heat used was 110,000 MMBTUs less than in FY 2003. In addition, cooling energy decreased by 68,000 MMBTUs; electricity use increased by 56,000 MMBTUs; and building heating/cooling (non-Capitol Power Plant) decreased by 35,000 MMBTUs.

The combined energy use for the same time period is shown in Figure 4. As expected, the Capitol Power Plant heating component

Figure 3 – AOC Energy Use FY 2010



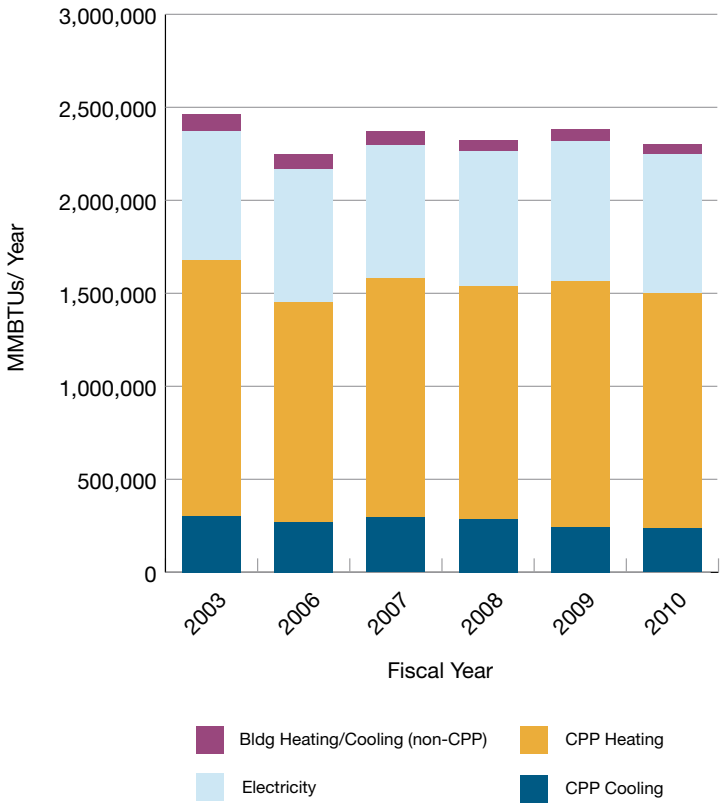
Heating was a major contributor to the energy reduction measured in FY 2010.

had the greatest impact since it consumed a large portion of the energy used for Goal-Subject buildings.

The data show that the changes and improvements made in the Capitol Power Plant West Refrigeration Plant made the plant more energy efficient, contributing to the energy reduction measured in FY 2010. Electricity consumption in the buildings increased by approximately 8.1 percent, which is largely reflected by the 5.9 percent increase in building area; heating and cooling decreased for non-Capitol Power Plant buildings and most of the savings were the result of improvements made at Ford House Office Building.

Heating was a major contributor to the energy reduction measured in FY 2010. Efficiencies gained with the maintenance and operations of the Capitol Power Plant boilers accounted for most of the savings, however, the milder winter weather was a contributing factor to these savings as well.

Figure 4 – AOC Goal-Subject Buildings Annual Energy Use in MMBTU per Year



Goal-Subject Buildings

The Architect of the Capitol applies the Department of Energy classification criteria and standards to report and compare results of energy and water conservation measures and performance. Under this program, all facilities are classified as either Goal-Subject (i.e., adhering to the Energy Policy Act of 2005 goals) or Goal-Excluded (i.e., exempt from the goals).

Within the Architect of the Capitol's portfolio of facilities, Goal-Subject buildings pose the greatest challenge to achieving significant energy savings. The U.S. Capitol Building, Senate, House and Library of Congress buildings alone represent the largest share of building square footage. The *Jurisdiction: Current Initiatives Section* of this report enumerates the many accomplishments attributable to the jurisdictions. While much of the energy saved is recorded at the Capitol Power Plant, each jurisdiction made significant strides in reducing its energy consumption in buildings, thus reducing its energy intensity.

Table 3: AOC Energy Consumption (MMBTU/YR)						
Energy Type	FY 2003 (MMBTU)	FY 2006 (MMBTU)	FY 2007 (MMBTU)	FY 2008 (MMBTU)	FY 2009 (MMBTU)	FY 2010 (MMBTU)
Electricity — Non-CPP	690,786	735,031	742,365	755,493	783,022	764,116
Electricity — CPP	379,122	356,216	374,683	361,472	333,828	333,408
Natural Gas	717,923	760,631	881,535	1,003,502	1,182,396	1,318,918
Fuel Oil	396,106	72,934	480	0	9,643	73,066
Coal	516,726	595,717	664,678	528,489	382,393	95,631
Purchased Steam	21,923	23,954	21,344	14,746	14,713	14,845
Purchased Chilled Water	40,872	28,319	20,666	14,467	15,433	13,932
Less Steam Supplied to Non-Architect of the Capitol Facilities and Supreme Court	-226,382	-224,540	-231,836	-253,143	-224,275	-195,183
Less Chilled Water Supplied to Non-Architect of the Capitol Facilities and Supreme Court	-75,199	-85,448	-80,176	-76,170	-89,666	-98,336
Less Excluded Security Energy	0	-14,473	-22,109	-25,735	-26,586	-17,122
Grand Totals	**2,461,877**	**2,248,341**	**2,371,630**	**2,323,121**	**2,380,901**	**2,303,275**

A breakdown of the energy use for Goal-Subject facilities is shown in Table 3. For those buildings that are not managed by the Architect of the Capitol, steam and chilled water are subtracted to properly show the energy consumption. A summary of the differences between FY 2003 and FY 2010 is further displayed in Figure 5. Note that Table 3 does not include application of Renewable Energy Certificates.

As with many large campuses, the Architect of the Capitol's facilities are constantly changing. Building floor area may be added or removed during renovation projects, or new buildings may be erected. With this continuous change in building area, it is difficult to compare energy consumption from year to year. In addition, comparisons to other facilities cannot be made because each facility is a different size.

However, by using "energy intensity," some comparisons can be made. For this analysis, energy intensity is expressed in KBTUs per gross square foot of building area (KBTU/GSF). Energy intensity for five years prior to FY 2010 is shown in Table 4.

Energy use has decreased since FY 2003, and building area has increased, primarily because of the addition of the Capitol Visitor Center. In the FY 2007 Energy and Water Conservation Management Report, the Architect of the Capitol included the energy used in the U.S. Capitol

As with many large campuses, the Architect of the Capitol's facilities are constantly changing.

1933

1933 — The Botanic Garden moved to its present location. The Longworth House Office Building, the second of four House Office Buildings, was completed.

In FY 2010, energy intensity was 11.7 percent less than measured in FY 2003.

and the Capitol Visitor Center, but only included the square footage of the United States Capitol. At the time, the Capitol Visitor Center was under construction and would have unfairly reduced reported energy consumption. During construction, there were few lighting, heating and air conditioning systems installed and operating. The Capitol Visitor Center's energy usage and square footage is included in this report, as the building systems are operating and the facility is complete.

In FY 2010, energy intensity was 152.6 KBTUs per gross square foot of building area, which is 11.7 percent less than 172.8 KBTU per gross square foot of building area measured in FY 2003. This value does not include the application of renewable energy certificates. Figure 6 indicates the reported energy intensity reduction from FY 2006 to FY 2010. The FY 2009 and 2010 values do include the application of renewable energy certificates.

Figure 5 – Energy Reduction: Goal-Subject Facilities MMBTU

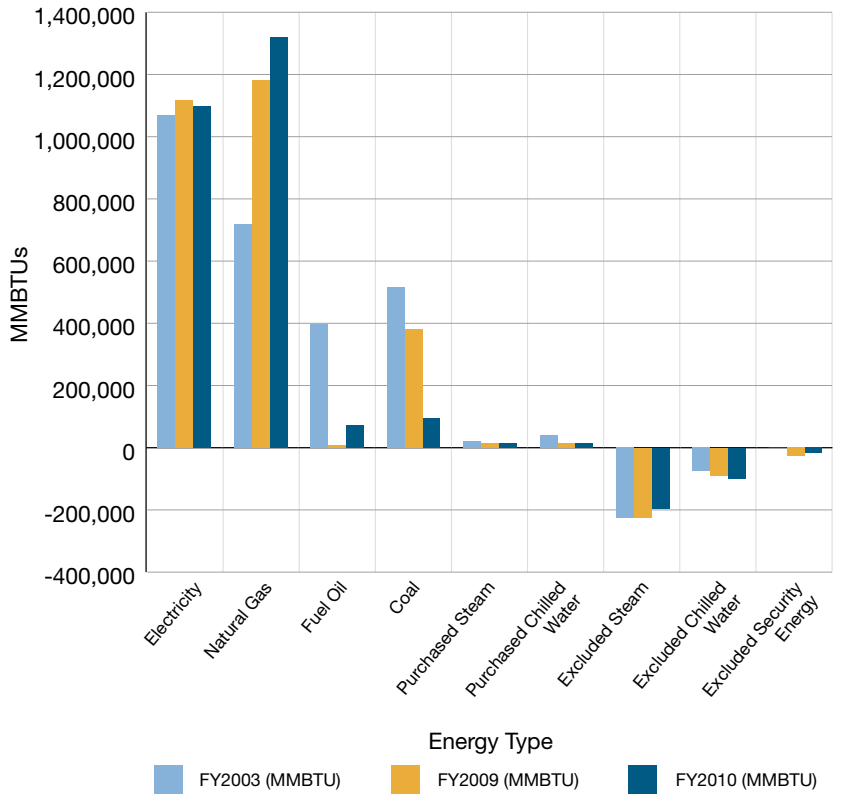


Table 4: AOC Energy Intensity Comparison

	FY 2003	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Total Energy Use (MMBTU/YR)	2,461,877	2,248,341	2,371,630	2,323,121	2,380,901	2,303,275
Gross Square Feet (GSF)	14,248,512	14,969,671	14,894,034	15,013,550	15,094,807	15,094,807
Energy Intensity (KBTU/GSF)	172.8	150.2	159.2	154.7	157.7	152.6

While energy use decreased, energy costs increased significantly beyond baseline values, mainly due to the following:

- Fossil fuel unit costs increased 78 percent between FY 2003 and FY 2010, and
- Electricity unit costs increased 95 percent between FY 2003 and FY 2010.

In Figure 7, the difference in energy cost is shown. Most of the heating and cooling for the buildings is measured in the Capitol Power Plant because meters were not yet installed in the buildings. For the most part, the energy shown for each building reflects electrical consumption.

An energy comparison between FY 2003 and FY 2010 and between FY 2009 and FY 2010 was completed for each building. The largest savings were the result of energy used in the Capitol Power Plant heating plant. The Ford House Office Building and the Capitol Power Plant chilled water plant also had a sizeable decrease in British thermal units consumed. The U.S. Capitol Building's energy use increased because of the addition of the Capitol Visitor Center. Figure 8 shows the changes in energy consumption for major facilities.

Figure 6 – Reported Energy Intensity Reduction Compared to FY 2003

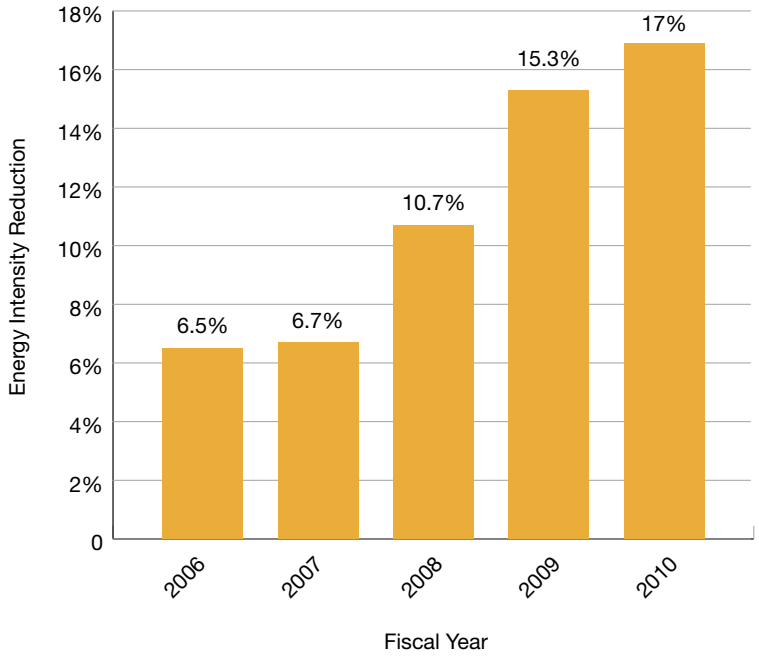


Figure 7 – Goal-Subject Energy Costs

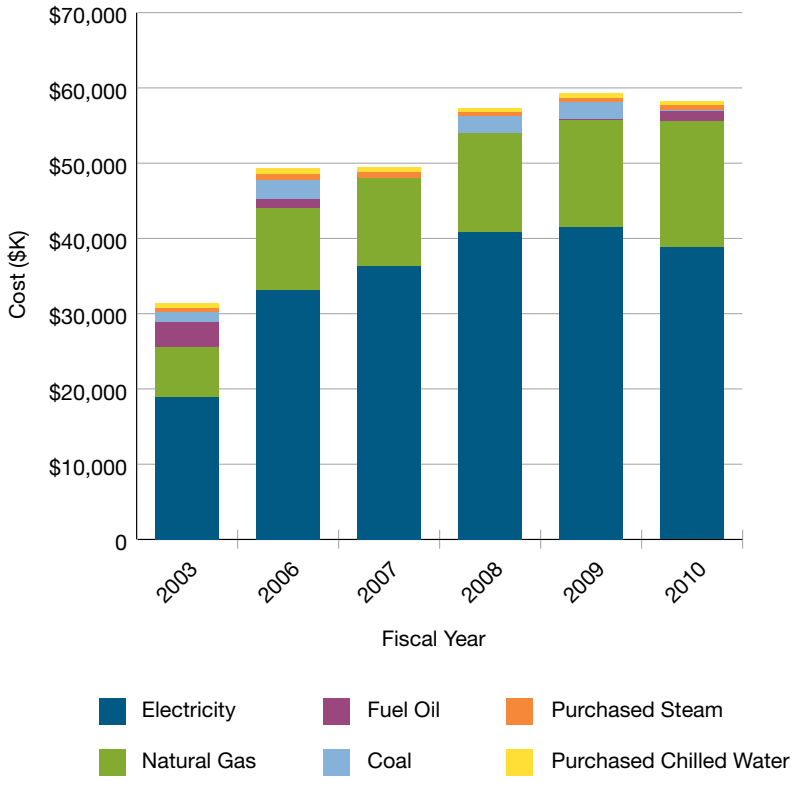
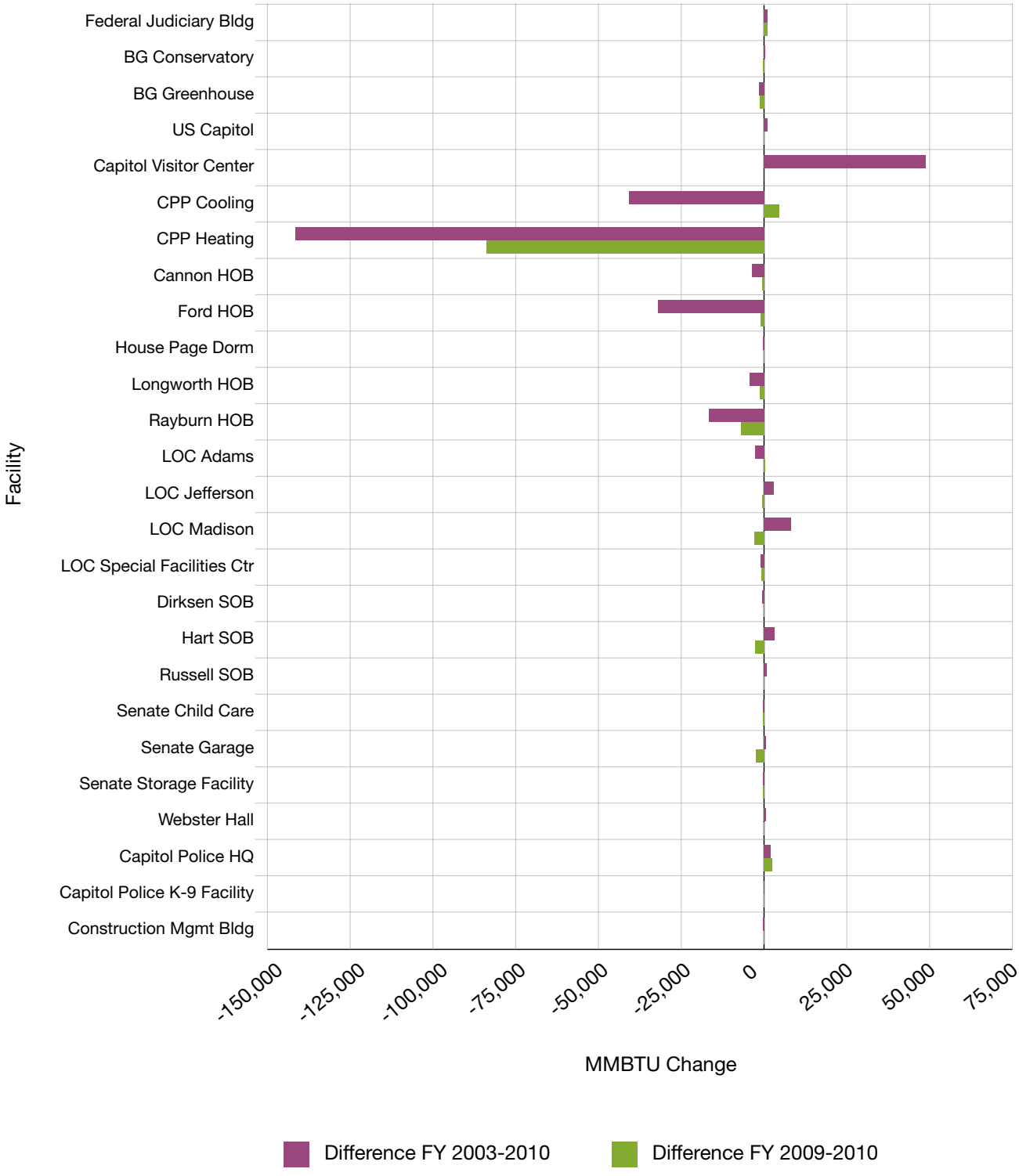


Figure 8 – MMBTU Increases and Reductions in AOC Facilities



Goal-Excluded Facilities

In this report, energy consumption and cost data are reported on for the Goal-Excluded facilities, even though they are not subject to the Energy Independence and Security Act of 2007 requirements and are not counted in overall reported energy reduction goals. The Architect of the Capitol is committed to decreasing energy use in them, wherever practicable.

Goal-Excluded facilities include: the Robert F. Taft Memorial, the Packard Campus for Audio Visual Conservation, the Library of Congress Book Storage Modules, parking lots and eight other security-related facilities. All other facilities are classified as Goal-Subject facilities.

Water Efficiency Performance and Accomplishments

Assessment

Water Consumption Reduction

Described as the world's most critical resource, fresh water has emerged as a priority crisis issue on national and global agendas. Increasing scarcity caused by the loss of watersheds and depletion of groundwater, drought, flooding, pollution, and threatens fragile ecosystems.

Water-energy nexus research shows that independent reductions in either water or energy lead to indirect reductions in the other.

Through discussions with industry and academia and legislative examination of the Capitol's water-energy nexus, the Architect of the Capitol and the House Water and Power Subcommittee found that conserving water automatically leads to significant energy savings — the added promotion of water reduction goals not only affects water conservation, but energy conservation and the associated financial savings as well.

The Agency considers water conservation a key environmental priority and places an increasing emphasis on sustainable water use. This emphasis allows the Architect of the Capitol to identify,

1939

1939 — The Ford House Office Building was built as the first general purpose Federal Office Building in Washington, D.C.

promote and implement sustainable water strategies. In an effort to meet water management goals, the Agency developed significant water saving projects that tackle water consumption from fountain, irrigation, kitchen, domestic and humidifier use. These efforts included:

- Completing water efficient plumbing fixture retrofits in all House Office Buildings including 1,500 restroom fixtures and 1,100 faucets
- Installing flow controls on the House Office Building fountains for better water management and condensate harvesting
- Developing a storm water pollution prevention plan
- Supporting funding for water savings initiatives

The Architect of the Capitol has also been formulating policies and actions to enhance and sustain the quality of local and ultimately national watersheds. As runoff from the Capitol flows into the Potomac and Anacostia rivers and eventually the Chesapeake Bay, the Capitol will need to put mitigation measures and goals in place. Specific action items and recommendations include:

Conserving water automatically leads to significant energy savings.

- Developing support for a binding water reduction goal and target for the House Office Buildings in the range of 25 to 30 percent (i.e., the Agency plans to reduce water consumption 26 percent in the House Office Buildings by 2020 as compared to a 2008 baseline)
- Evaluating the Capitol's water-energy nexus
- Conducting a study to determine the amount of water used on the Capitol, to assess water conservation and cost reductions and assess water consumption and runoff patterns
- Designing practices to maximize water and energy cost savings
- Implementing best management practices for water savings

These actions will strengthen the effective resource conservation measures undertaken in the House of Representatives, especially for water, and extend them to benefit the Capitol. Interest in supporting a water reduction goal stems from the Agency's connection to local and regional watershed stewardship. Water conservation is also a pillar of the Architect of the Capitol's Sustainability, Energy and Water Management Plan, which is in development.

ESPCs Support Water Saving Initiatives

The House Energy Savings Performance Contracts are planning, constructing and evaluating the performance of various water-saving initiatives, which complement their energy-savings accomplishments. In the last three years, the House Office Buildings upgraded water fixtures with new, efficient components, saving 32,000,000 gallons in the last three years. These water conservation measures include:

- Installing new low-flow restroom fixtures, faucets and showerheads in all buildings
- Installing a condensate harvesting system for the West Court fountain make-up water in the Rayburn Building

Irrigation water efficiency is a sustainable and cost-effective means to meet the Capitol's water needs.

Rain gardens take advantage of natural processes to keep pollutants from entering local watersheds.

- Installing a showcase green roof in the central courtyard of the Cannon Building

During FY 2010, the Architect of the Capitol replaced 2,700 fixtures in House Office Buildings to save 32,000,000 gallons of water: 1,530 restroom fixtures reduced fixture water use by 56 percent; 1,140 faucets reduced faucet water use by 75 percent; and 30 showerheads reduced shower water use by 46 percent.

The House Energy Savings Performance Contracts will realize a 32 percent water reduction at a direct cost of $3.5 million (and a financing cost of approximately $7 million). Applying a similar ESPC approach.

Currently, there is considerably less information available on water consumption and costs or wastewater volumes and costs than exists on energy consumption and costs. To reduce water consumption, use water more efficiently and determine energy savings from reduced water demand, more information is needed about water use and costs related to Capitol facilities. Installation of additional meters to track building water and additional water quality testing across the Capitol are planned.

Sustainability Framework Plan

The Sustainability Framework Plan, a part of the Capitol Complex Master Plan, includes best practice strategies and tools for establishing an environmental footprint for the Capitol and addresses utility services and water conservation, storm water management and landscape practices, improved outdoor and indoor environments, materials management and operations procedures.

The plan emphasizes irrigation water efficiency, a sustainable and cost-effective means to meet the Capitol's water needs. Specific recommendations for irrigation water efficiency include: 1) Replacing on-site water use with high efficiency irrigation (e.g., captured rainwater or recycled site water) 2) Performing a soil and climate analysis to determine appropriate landscape type and design, and 3) Landscaping with indigenous plants to reduce or eliminate irrigation requirements. The figure for an Architect of the Capitol-wide water reduction goal

under the Sustainability Framework Plan is currently under development.

The Architect of the Capitol currently has two main projects contributing to storm water management development: a new sponge filtering system to improve storm water discharge, and the Storm Water Management Plan, which includes a site survey and study to inform the development of a comprehensive Capitol Complex Storm Water Pollution Prevention Management Plan. This plan will focus on ways to reduce the discharge of pollutants into the municipal storm drainage system to the maximum extent practicable, while being sensitive to the historic and operational nature of the Capitol.

In September 2010, the first two phases of a four-phase Capitol storm water management study were awarded, and Capitol Grounds initiated its review of a pilot program implanting sponges into seven of the campus' storm water drains for data collection. In conjunction with these efforts, the Architect of the Capitol met with the Water and Power Subcommittee's staff to collaborate on the development of a water footprint for the House Office Buildings.

Emerging Technology

Innovative smart technologies show great potential to boost water conservation, lower costs and improve environmental conditions. Smart technologies have been shown to pay for their installation within two or three years, due to savings on water bills.

An employee skims the fountain on the West Front of the U.S. Capitol to remove debris.

The Architect of the Capitol is actively pursuing smart water technology. Devices that monitor weather and soil conditions and determine exactly when landscapes need water — and how much water they need — help to keep greenery in peak condition and could reduce water consumption in the U.S. Botanic Gardens, for example, without sacrificing plant care.

The Architect of the Capitol is currently using smart technology in its storm water management with a new sponge filtering system. As part of a voluntary pilot study conducted in November 2009, the Agency installed storm water filtering sponges at seven locations. The Smart Sponges chemically bond with hydrocarbons that typically come from gasoline, diesel fuel and motor oil and are discharged into storm drains along with rainwater or snowmelt.

With this system, water entering the storm drain is diverted into two side boxes that contain the stringy white polymer sponge that keeps harmful hydrocarbon contaminants from entering the Anacostia and Potomac rivers and safeguarding the watershed.

As a leader in the implementation of sustainable technologies, the Architect of the Capitol will continue to explore emerging technologies and continue to educate its employees and others about the benefits of smart water technology, associated cost savings and decreased reliance on potable water reserves through increased use of recycled water.

The Senate Garage Fountain provides stunning views of the Capitol Dome.

Planning

Restoration of the Senate Garage Fountain and Senate Reflecting Pool

The Senate Garage Fountain is located in a landscaped courtyard between the U.S. Capitol and Union Station over the Senate's underground garage. Authorization for its construction, the terraces, and landscaping was given on March 4, 1929. The fountain was designed by architects Bennett, Parsons and Frost, and built under the direction of Architect of the Capitol David Lynn and operated for the first time on July 16, 1932.

Six smaller jets on a lower level surround the fountain, a hexagonal granite monolith with high jets of water spouting from its center. Lion-head spouts on the faces of the hexagon project streams of water into a large circular basin with a scalloped stone rim, over which the water spills into a larger oval basin. The hexagon is 25 feet across and the basin measures 85 feet by 100 feet.

From the oval basin, the water is piped underground to three sculpted stone bubbler fountains in the north wall of the terrace. The scalloped rims of their tiered basins repeat the pattern of the large fountain above. From there, the water is piped underground to the lower level of the 180-foot-by-80-foot reflecting pool.

Both the garage fountain and reflecting pool still use their original piping, valving and control systems. After decades of use, these systems are deteriorated, leaking and well past their useful life. Due to the antiquated pumping and piping systems and cracked flooring, both the fountain and the pool lose a substantial amount of water. The lack of modern filtration systems in both structures means that they have to be regularly drained and refilled to control biological growth, resulting in excessive water loss. Additionally, the water circulation mechanisms now in place do not meet current codes.

The Architect of the Capitol is embarking on a large-scale effort to install new, state-of-the-art water-conserving and energy-efficient equipment in coordination with new filtration and treatment systems. These efforts are expected to result in substantial water and energy savings while preserving the historic and ornamental fabric of the fountain and site.

1951

1951 — The electrical generation plant at the Capitol Power Plant was decommissioned, and modern steam and refrigeration plants were built to provide heating and cooling. Electricity is provided from public utilities.

Senate Garage Fountain Initiatives

- Convert the Senate Garage Fountain from a once-through to a recirculating system
- Install a high efficiency recirculation pumping and filtration system
- Install the appropriate controls and associated piping and wiring
- Install a disinfection system to purify the fountain water
- Replace the fountain's deteriorated make-up line
- Install a wind anemometer to reduce or shut off flow when the wind is excessive and carries water out of the fountain
- Install water and energy sub-meters to track the fountain's resource use

Senate Reflecting Pool Initiatives

- Install a circulating filtration system with biocide to control biological growth and the accumulation of debris. The circulation system will operate during a range of hours that minimize disturbances to the surface reflection
- Repair leaks
- Resurface and reseal the pool floor
- Apply a disinfection system that synergizes with the 24-hour continuous recirculation pumping and filtration system to allow for a constant supply of pristine pool water

Implementation

Water Efficiency Performance and Conservation: Neptune Fountain Restoration

The Neptune Fountain Restoration study, conducted in FY 2010, examined the existing conditions of the mechanical, electrical, plumbing and lighting systems of the historic fountain in the plaza located in front of the Library of Congress Thomas Jefferson Building. The Superintendent's Office originally thought that a leak in the workings of the fountain was causing the loss of water noted in monthly water bills.

However, the study determined that this loss of water was not the result of any leaking from the fountain basin waterproofing or from pipe breaches, but the result of the existing manual water make-up system. The fountain systems as a whole were well beyond their useful life. The study identified:

- Mechanical inefficiencies
- Excessive water use (an annual loss of 294,000 gallons of water per year)

- The lack of proper filtration and water disinfection
- Energy inefficiencies could be corrected and improved with new equipment
- Conversion to an automatic system regulated by a water level controller could drastically reduce water usage and energy costs and help contribute to overall energy savings goals

The Agency is updating the Bartholdi Fountain with the latest technology and making it energy efficient.

Construction in progress during the Bartholdi Fountain Renovation.

The modernization project anticipates the design phase to being in FY 2012 with the construction phase to follow.

Bartholdi Park Sustainable SITES Project

The Sustainable SITES Garden will integrate the construction of an updated garden, demonstrating the highest quality horticulture, and showcasing the principles of the Sustainable SITES Initiative by aligning site development and management practices with the functions of healthy ecosystems. The impetus for this project was an aging infrastructure and gardens surrounding a newly restored Bartholdi Fountain. Since this is a demonstration garden for the public, this was an opportunity to showcase sustainability features to homeowners. It will also provide sustainability education to a national audience of landscape architects, local, state and Federal governmental agencies, park and roadside managers and others responsible for the development and maintenance of large scale landscapes.

Through the Bartholdi Park Sustainable Site, a greater number of homeowners, professional landscapers and landscape architects can visit the park and learn about lowering resource use, improved wildlife habitat, reduced runoff, an enhanced "sense of place" and environments that are healthier for human use. Visitors will learn how residential lawns and gardens can contribute to existing water quality concerns.

The project is being successfully implemented through integral collaboration between the USBG, Sustainable SITES Initiative, expert consultants, and the Office of Planning and Project Management. The project is currently in design and funding has been requested for construction.

Since this project is planned to coincide with the Bartholdi Fountain Restoration project phases, it was important to plan and fund this project in the appropriate fiscal year. This project is integrated with the Northwest Fountain water conservation feature and will showcase the newly restored historic Bartholdi Fountain; therefore planning coordination with previous phases was essential. The timing of the garden refurbishment needed to be integrated with the irrigation system replacement, which is over 75 years old.

Bartholdi Fountain Renovation

The U.S. Botanic Garden includes Bartholdi Park, which displays the historic Bartholdi Fountain. Frederic Auguste Bartholdi, best known for creating the Statue of Liberty, on which he was working at the same

An employee tests water quality in a fountain filtration system.

time, created the cast-iron Bartholdi Fountain for the 1876 Centennial Exposition in Philadelphia. In 1877, Congress purchased the Bartholdi Fountain, and it was moved to its present location in Bartholdi Park in 1932.

The Architect of the Capitol is currently restoring this historic fountain to its original glory, updating the fountain with the latest technology and making it energy efficient. This multi-year, three-phase restoration builds on prior year efforts.

In the first phase, the sculpture was disassembled, removed by crane and sent to an off-site architectural metal specialist. The restoration included repairing the metal, replacing all interior mechanical and electrical components, and replacing the light fixtures with energy-efficient compact fluorescent fixtures that are similar in style to the sculpture's original gas sconces.

The second phase involved restoration of the concrete pedestal and basin and the basin lights, as well as installation of energy-efficient plumbing and electrical distribution systems. The project is now in its third phase, which involves replacing the existing underground utility vault and upgrading electrical service and plumbing equipment. The restoration of the utility vault is expected to yield recaptured groundwater for park irrigation.

The Architect of the Capitol is coordinating sidewalk and utility aspects of the restoration of the Bartholdi Fountain with the Sustainable Sites Initiative.

Outcome Evaluation

House Office Buildings Water Footprint Study

A long-term strategic goal is to identify, promote and implement water reuse strategies to reduce potable water consumption. In FY 2010, a water footprint revealed water savings of 22 percent for House Office Buildings during FY 2010 and 28 percent savings between FY 2007 and FY 2010. This equates to a water savings of over 22 million gallons in FY 2010 alone and 32 million gallons between FY 2007 and FY 2010. The footprint was an important illustration of the magnitude of potable water consumption reductions made on the Capitol.

The Architect of the Capitol is actively working to increase evaluation of water consumption and

A pilot program has been completed to reduce trash, debris and hydrocarbons in run-off that flows into the Capitol's storm drain system.

costs, as well as wastewater volumes and costs. Meters to track building water use have been installed to reduce water consumption, to use water more efficiently, and to garner savings from reduced water demand.

Upgrade and replacement of bathrooms fixtures, dishwashers, food steamers, pre-rinse spray valves and icemakers in food service, and clothes washers, showers and tub-spout diverters to more water-efficient equipment highly contributed to the water savings captured by the water footprint. Replacing this equipment with high-efficiency products, either low-flow or water-free, will continue to result in significant water consumption reduction.

Specific recommendations for defining facilities' water footprint and identifying water savings include: analyzing water consumption, analyzing water quality, installing additional water meters, evaluating the potential for water reuse, as well as following Environmental Protection Agency-recommended practices.

Reassessment

Storm Water Management

To address storm water runoff problems, Capitol Grounds in collaboration with the Project Management Division contracted a stormwater management study, which includes establishing existing conditions in terms of where and how storm water flows and how it is collected. The study results will inform the design of a pollution prevention and management program to reduce the discharge of pollutants to the storm drainage system.

The first two phases of a four-phase Capitol stormwater management study were awarded in September 2010. Capitol Grounds also initiated its review of a pilot program that involved implanting Smart Sponges into seven stormwater drains for data collection. The pilot program to reduce trash, debris and hydrocarbons in run-off that flows from parking lots into the Capitol's storm drain system was completed in FY 2010.

Ten catch basins at various locations around campus were fitted with collection trays that accumulated

Rain gardens are a best practice for water conservation and storm water management.

1965

1965 — Construction of the Rayburn House Office Building was completed.

Construction of the Capitol Visitor Center allowed the Olmsted fountains to be restored to their original glory.

845 lbs of litter and solid materials. The Smart Sponges chemically absorbed hydrocarbons as the stormwater passed through it and helped engineers to identify sources of contamination. Additional data from the pilot program has helped Capitol Grounds identify and correct problems in landscaping practices so there is less of an impact on stormwater runoff, a problem much larger than originally identified.

Because historic properties cannot make alterations to support active treatment, the cost for the stormwater runoff fees charged by the DC Water and Sanitation Authority based on hardscape square footage could be significant. Discussions are underway with the DC Department of the Environment for lowered fees based on passively reducing the impact of the runoff through the use of the Smart Sponges.

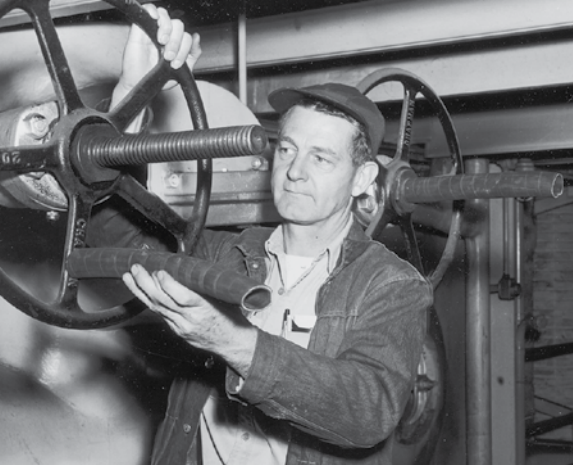
Water Intensity Reduction Performance

As mentioned, no water intensity reduction goals were established in either the Energy Policy Act of 2005 or the Energy Independence and Security Act of 2007. The Architect of the Capitol is committed to decreasing water use, wherever practicable. Water consumption is tracked and reported in a similar way to energy consumption.

Between FY 2003 and FY 2010, Goal-Subject facilities water consumption decreased by almost 12 percent, largely accounted for by a 24 percent decrease in Capitol Power Plant consumption — mainly attributed to new equipment installations (e.g., at the West Refrigeration Plant Expansion). This value is skewed, however, as a malfunctioning water meter at the U.S. Capitol underreported consumption.

Goal-Excluded facilities consumption increased 107 percent, which may have resulted from the creation of an artificially low baseline during shutdown and maintenance of the Capitol Grounds irrigation systems for the installation of backflow preventers in FY 2003. Installation of backflow prevention devices was required by the International Plumbing Code to prevent cross-contamination of potable water supplies.

The Agency is committed to decreasing water use, wherever practicable.



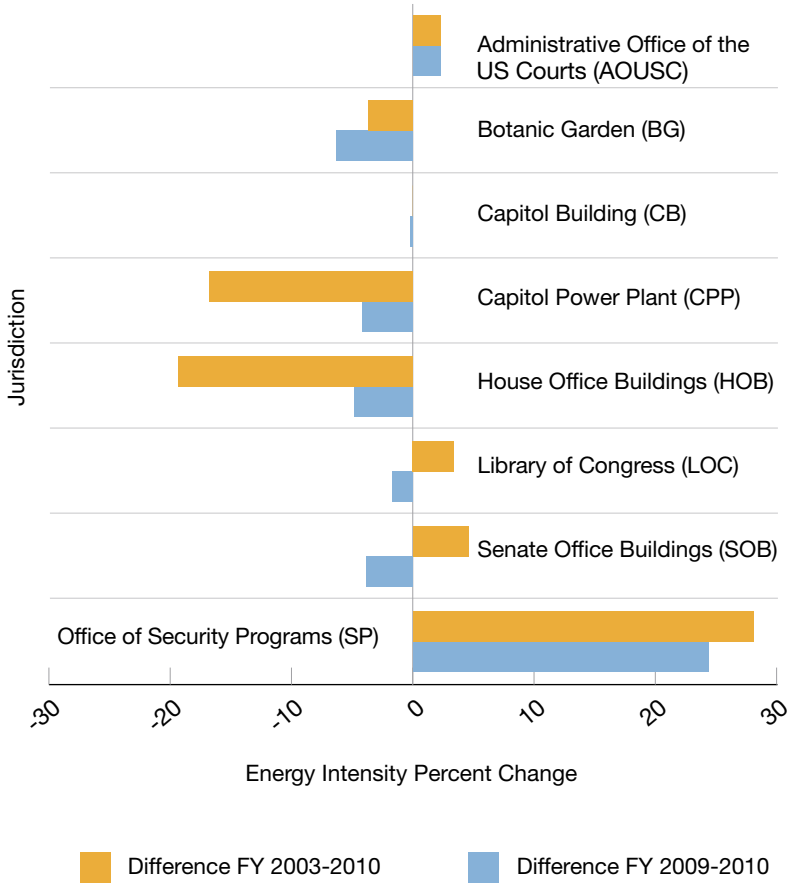
Section III:

Jurisdiction Accomplishments And Initiatives

Each of the jurisdictions plays a unique role in fulfilling the organization's mission and meeting its energy and water efficiency goals. This section presents each jurisdiction's contribution toward the Agency's energy and water conservation efforts.

Figure 9 summarizes the Goal-Subject performance by jurisdiction between FY 2003 and FY 2010 and FY 2009 and FY 2010.

Figure 9 – Goal-Subject Performance Summary by Jurisdiction



In 2010, the Capitol Power Plant marked its 100th year of service to the Capitol. In that century, the plant has undergone significant changes, including steam and chilled water provisions to heat and cool the Capitol.

Capitol Grounds

The Capitol Grounds jurisdiction is responsible for the care of approximately 234 acres of landscaping surrounding the U.S. Capitol and maintains the landscape and hardscape surfaces supporting and connecting Capitol facilities. Given the nature of this jurisdiction, a broader focus is placed on the potential for water savings and sustainability.

Historic Preservation, Water and Energy Savings Accomplishments

- Purchased an Alternative Fuel Vehicle
- Established an Outreach Program providing public tours on historic preservation showing how Frederick Law Olmsted was "ahead of his time" in his application of sustainable design in the 1880's
- Worked with the Historic Preservation Office to prepare a Cultural Landscapes Report for Capitol Square
- Prepared a scope of work for a four-phase Storm Water Management Plan. The Phase I document established locations and heights of storm drains
- Prepared a GIS tree identification plan to identify and locate significant plantings on the grounds
- Purchased and installed 49 outdoor recycling collection containers
- Purchased an electric lawn mower
- Supported the House with a drip irrigation zero planting installation on the Rayburn Terrace
- Worked with the Senate for a design of the Senate Rain Garden slated for installation in FY 2011

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Upgrade steam traps
- Use drought-resistant species in new plantings to improve water management in the irrigation systems and in six ornamental fountains
- Examine the feasibility of metering water use by fountains and irrigation systems to lower sewer charges
- Install Smart Sponge storm drain filtration systems to capture hydrocarbon runoff at nine locations. This will be expanded to additional locations
- Continue a commitment to plant 150 plants a year during the spring and fall planting season

The Capitol Grounds jurisdiction is responsible for the care of approximately 234 acres of landscaping.

A view of the West Front of the U.S. Capitol Building.

U.S. Capitol Building

The United States Capitol Building, with its iconic architecture, is one of the most distinctive buildings in the world and is both a working office building and the home of American democracy. Some Capitol Building functions cannot be interrupted and some building features cannot be altered. Despite these constraints, the Capitol Building continues to make strides in energy savings.

The Architect of the Capitol is in the process of rehabilitating the dome with the greater portion of the work planned to start in 2013 and be completed in 2015. Sustainability practices will be used throughout and include:

- Proper handling and disposal of any lead-containing paint chips
- Upgrade of existing mechanical ductwork, removal of hazardous materials and installation of new stainless steel insulated ductwork
- Installation of an energy efficient electrical system

A new energy efficient lighting system will be installed in the rotunda and skirt area to reduce energy consumption and provide enhanced color rendition and illumination. Heating and cooling of the skirt interior area will be added to stabilize temperature extremes. The upper inner dome interstitial space will receive conditioned ventilation to mitigate dew point occurrences and condensation collection on the outer surfaces of the inner dome. The inner rotunda will also receive a new temperature sensitive art monitoring system to constantly measure the climate for the protection of the interior fresco surfaces, statues, and historical paintings.

To preserve the historic fabric, our restoration professionals will apply an environmentally friendly epoxy coating system to protect the cast iron from deterioration and corrosion, and to seal the dome to minimize the air, water and dust infiltration.

Historic Preservation, Water and Energy Savings Accomplishments

- The AOC Energy Management Team awarded an Energy Savings Performance Contract task order for the Capitol Building, which will save 112,000 MMBTUs of energy when complete in FY 2013
- Completed Dimming System Replacement Project
- Completed the change from water-cooled refrigeration compressors to air-cooled compressors in the Senate Kitchen
- Installed outside air dampers which make all dampers zero leakage for energy efficiency
- Replaced all elevator cab lights with LED lighting
- Upgraded Elevator H9, which included an upgrade to the elevator control system and motor drive and resulted in energy savings

The United States Capitol Building is both a working office building and the home of American democracy.

1982

1982 — Construction of the Hart Senate Office Building was completed.

A new lighting system will reduce energy consumption.

- Completed energy audit for the U.S. Capitol Building
- Instituted energy curtailing load shedding as part of standard operating procedures
- Retrofitted the Capitol Visitor Center kitchen sink nozzles to reduce the output to ¾ gallon per minute, thereby conserving water and reducing lost overspray
- Began replacement of the Capitol Visitor Center gift shop lighting from 40-watt halogen to more efficient 4-watt LED fixtures
- Set the Capitol Visitor Center air handling units to operate with reduced minimum outside air based on actual visitor data
- Implemented a run-time schedule for the Capitol Visitor Center air-handling units, restroom and building-wide exhaust fans

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Implement energy conservation measures recommended in the U.S. Capitol Building Energy Audit
- Continue to offer sustainable alternatives to fireplace use
- Implement daylight harvesting study findings
- Implement premium efficiency motor study findings
- Continue to upgrade fluorescent light fixtures (fixture/lamp/ballast)
- Continue landscape waste recycling program in collaboration with the House Chief Administrative Officer
- Install a second steam sub-meter in the Capitol Visitor Center
- Complete replacement of the Capitol Visitor Center gift shop lighting from 40-watt halogen to more efficient 4-watt LED fixtures
- Initiate a program to shut down and winterize the Capitol Visitor Center fountains in the winter

Continuing Energy Savings Performance Contract Measures

- Upgrade direct digital controls for heating, ventilation and air conditioning units
- Adjust temperature and humidity settings by season
- Maximize/implement unoccupied/holiday temperature setbacks

LED lighting is retrofit to provide a more energy-efficient alternative.

- Minimize/eliminate simultaneous heating (reheat) and cooling
- Replace Air Handling Unit 18 and upgrade the system to a variable air volume system
- Retrofit lighting and controls to replace existing fixtures with more efficient alternatives
- Install occupancy sensors in select locations
- Install dimmable systems/ballasts in various locations

A view of the front portico of the Longworth House Office Building.

House Office Buildings

The House Office Buildings jurisdiction includes three major office buildings and one annex building for the House of Representatives. The Cannon and Longworth House Office Buildings are the oldest, having been constructed in 1908 and 1933, respectively. Built in 1965, the largest of the House's buildings is the Rayburn House Office Building, at 2.3 million square feet. The Ford House Office Building was originally constructed for the Executive Branch in the 1930s and was transferred to the House in 1974.

FY 2010 was a very productive year for the House in energy-savings initiatives and actual savings, due in no small part to the renovation efforts in the Ford Building.

Historic Preservation, Water and Energy Savings Accomplishments

- Showcased the retrofit of the Rayburn Cafeteria lighting with daylight harvesting LED fixtures in an Earth Day event hosted by the Speaker of the House and Stephen Ayers, Architect of the Capitol
- Issued a joint report with the House Chief Administrative Officer's office on Earth Day on sustainability progress made by the House
- Refurbished four air handling units in the penthouse of the Ford House Office Building including new coils, dampers and direct digital controls
- Replaced the roof of the Rayburn House Office Building, which increased insulation values and reduced urban heat island effects by the installation of a white, high albedo membrane
- Completed energy audits for the Cannon House Office Building and the East and West Underground Garages
- Co-hosted an energy awareness and advocacy event focused on building occupants. Over 2,000 House Members, their staff and Architect of the Capitol employees attended the event
- Conducted gap analysis reporting with the Inspector General's Office
- Consolidated computer servers to a space in the Ford House Office Building to increase efficiency
- Expanded compost collection to the Ford House Office Building
- Conducted a Water Footprint Study resulting in the identification of water conservation savings of 23 percent

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Continue the "My Green Office" program by visiting 350 member's offices and discussing measures the staff can take to reduce energy use
- Continue analysis of energy use throughout the House buildings, focusing on building's Delta T and Demand Reduction
- Renovate the Rayburn House Office Building fountain for energy and water savings
- Perform Retro-commissioning

and re-commissioning of building HVAC systems not affected by the Energy Savings Performance Contract; continue a five-year cyclical process in coordination with facility condition assessment and energy audit after completion of Energy Savings Performance Contract

- Expand preventative maintenance program
- Coordinate preventative maintenance program with facility condition assessment program
- Recycle construction waste using off-site recycling company to separate, weigh and recycle construction waste
- Purchase Energy Star™ equipment whenever possible
- Continue implementing electronics recycling program by sending select loads of e-waste to other agencies
- Continue to use sustainable construction materials
- Continue Green Cleaning Program
  - use Green Seal-approved products and procedures, where applicable

Continuing Energy Savings Performance Contract Measures

- Energy-Efficient Lighting Upgrades
  - Upgrade existing lighting fixtures with new high-efficiency electronic ballasts and bulbs
  - Reduce the number of lamps where appropriate
  - Install occupancy sensors in garages to reduce light levels when unoccupied
  - Install occupancy sensors in storeroom hallways
  - Install lighting controls in Longworth House Office Building corridors for daylight harvesting to turn off lighting near windows when not needed
- Heating, Ventilation and Air Conditioning Upgrades
  - Upgrade building heating, ventilation and air conditioning controls system with new wireless sensor technology, and replace old pneumatic controls with direct digital controls system
  - Install CO_2 sensors in committee rooms to control ventilation automatically when spaces are not occupied
  - Modify constant volume systems to variable air volume systems when possible
  - Seal ducts to eliminate air leaks as part of a pilot duct-sealing program in the Ford and Rayburn House Office Buildings
  - Install variable frequency drives on pumps and motors throughout the Cannon, Longworth and Rayburn House Office Buildings
  - Modify air handler humidification tanks to save water during summer months
  - Install dedicated server cooling and off-hour occupancy load controls to allow improved scheduling of large air handling units
- Water Conservation Upgrades
  - Reduce water use in bathroom fixtures with new flush valves, aerators and toilets
  - Upgrade kitchen equipment (e.g., sink nozzles, garbage disposals and ice machines)
  - Install condensate water storage system for fountain water makeup
  - Install water meters on fountains and irrigation systems to lower sewer charges
- Steam Trap Replacement
  - Survey existing traps
  - Replace failed traps
  - Relocate inaccessible traps in the Longworth House Office Building sub-basement to facilitate future maintenance

The Hart Senate Office Building is the youngest of the three principal buildings housing the U.S. Senate.

Senate Office Buildings

The Senate has three principal office buildings, as well as several off-site facilities throughout the region. Built in 1909, the Russell Senate Office Building is the oldest of the buildings. The Dirksen Senate Office Building was occupied in 1958 and was expanded with the construction of the Hart Senate Office Building in 1982.

Historic Preservation, Water and Energy Savings Accomplishments

- The Architect of the Capitol Energy Management Team awarded an Energy Savings Performance Contract task order for the Senate Buildings, which will save 188,000 MMBTUs of energy when complete in FY 2013
- Conducted a wind turbine study
- Completed energy audit for the Dirksen Senate Office Building and the Taft Memorial
- Conducted research on the feasibility of a car charging station in the Senate parking facility
- Installed clean steam generators
- Installed two new air handling units in Dirksen Senate Office Building along with direct digital controls
- Conducted a Historic Preservation Study of the Russell Senate Office Building exterior envelope, leading to a design for preservation of the exterior stone and wood windows
- Installed magnetic induction lights in the Hart Senate Office Building truck tunnel
- Continued with the installation of dimmable ballasts with daylight sensors in the Dirksen Senate Office Building begun in FY 2009. Eight additional rooms were completed in FY 2010
- Upgraded TV lights to LEDs in SH-216 and SD-366 Energy and Natural Resources Committee Hearing Room
- Held Fall and Spring Senate Energy and Environmental Showcases
- Researched sustainable floor cleaning techniques

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Continue the construction debris recycling program
- Continue composting waste from kitchens of Senate offices and Dirksen Senate Office Building dining facilities
- Discuss energy savings tips in weekly superintendent meetings
- Post energy messages on electronic directories in all Senate Office Buildings
- Install motion sensors in closets, kitchenettes and conference rooms
- Continue an open forum for energy questions and suggestions at Save_Energy_Ideas@Architectoftheapitol.gov
- Continue energy study for the server closets
- Implement Night Custodial Division “Lights Out” program during night cleaning operations. Nighttime custodians turn off any lamps or overhead lights they encounter
- Conduct energy audits in member offices to show staff ways to reduce energy

1987

1987 — Renovation of the West Front of the U.S. Capitol was completed ahead of schedule and under budget. More than 30 layers of paint were removed, and damaged stonework was repaired or replicated.

- Continue to implement and use bottleless water coolers
- Coordinate various energy savings related projects with facility condition assessments
- Expand preventive maintenance program
- Continue with recycling programs
- Continue to replace incandescent lights with LED lights
- Install green roof above the Hart and Dirksen Senate Office Buildings tennis courts
- Install building-wide metering system to monitor use of electricity, steam, chilled water and domestic water
- Install daylight harvesting, bi-level and solar lighting systems in the Hart and Dirksen Senate Office Buildings in support of demand-side reduction efforts
- Replace motors with high efficiency models
- Replace steam traps in the Russell Senate Office Building
- Replace Hart Senate Office Building steam and chilled water heat exchangers and pumps
- Upgrade Hart Senate Office Building fountain pumping system

Continuing Energy Savings Performance Contract Measures

- Upgrade heating, ventilation and air conditioning systems to direct digital controls
- Install dimmable ballast system throughout the rest of the Hart and Dirksen Senate Office Buildings
- Replace end-of-life transformers with high-efficiency units in Dirksen and Russell Senate Office Buildings
- Install carbon monoxide sensors in garages to control ventilation
- Reprogram/retrofit heating, ventilation and air conditioning units to use economizer cycles
- Minimize outdoor air during unoccupied periods
- Minimize/eliminate simultaneous heating, reheat and cooling
- Maximize/implement unoccupied/holiday temperature setbacks
- Upgrade variable air volume systems
- Secure non-critical exhaust fans during unoccupied hours

Construction of the Library of Congress Thomas Jefferson Building was completed in 1897.

Library of Congress

The Library of Congress, the nation's oldest federal cultural institution, serves as the research arm of Congress. It is also the largest library in the world, with millions of books, recordings, photographs, maps and manuscripts in its collections. The three principal buildings of the Library of Congress are the Thomas Jefferson Building, built in 1897; the John Adams Building, constructed in 1938; and the James Madison Memorial Building, opened in 1980.

There are several additional Library of Congress buildings that house support services (e.g., the Fort Meade Book Storage Modules and the Packard Campus Audio Visual Conservation Center). These rare-book and audio-visual collections require extraordinary efforts to maintain and preserve. Their mission requires high-energy consumption, which places them in the Goal-Excluded category.

Historic Preservation, Water and Energy Savings Accomplishments

- Conducted air handler and retro-commissioning studies
- Completed energy audit for the James Madison Memorial Building
- Added scrap metal collection to the recycling program
- Upgraded the boiler in the Special Facilities Center

A number of storm windows in the Jefferson Building were retrofit to increase energy efficiency while maintaining the historic profile of the building.

- Upgraded elevators in the Thomas Jefferson Building and James Madison Memorial Building including new controls that eliminate "stop chasing" where several elevators respond to the same call, thus saving energy
- Reviewed the Library of Congress data center as part of a campus-wide chilled water Delta T study
- Finalized the shutdown sequence begun in FY 2009 for all buildings

- Upgraded the dishwashing equipment in the James Madison Memorial Building Cafeteria with new controls and a heat exchanger
- Relamped 63,000 30-watt fluorescent tubes with energy efficient 25-watt tubes in the James Madison Memorial Building
- Replaced one bathroom stack in the Adams Building
- Completed a study of the Neptune Fountain water circulation system
- Undertook a pilot project to add a one-inch double-pane storm panel to the exterior of the Thomas Jefferson Building's windows. This will maintain the historic profile of the window

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Adjust the lighting controller for all buildings to sweep "lights off" two hours earlier (9 p.m.)
- Adjust the Thomas Jefferson Building book stack light-time from two hours to 15 minutes "on" time; have received 180 new timers for this effort
- Continue to look for opportunities to use compact fluorescent light bulbs and light emitting diodes
- Replace light fixtures for energy efficiency, lighting quality and material preservation

The Library of Congress, the nation's oldest federal cultural institution, serves as the research arm of Congress.

- Coordinate with Library senior management to discuss energy savings goals and projects
- Install Building Automation System to test, adjust and balance heating, ventilation and air conditioning for the Jefferson and James Madison Memorial Buildings
- Install draft barriers within buildings to prevent each building from functioning as a flue or chimney
- Install lighting retrofit and controls
- Install reduced wattage fluorescent lamps and occupancy sensors
- Install high-efficiency motors for heating, ventilation and air conditioning equipment
- Implement water conservation measures
- Renovate the James Madison Memorial Building Cafeteria dining area with a daylight harvesting system with LED lighting. Reduction in heat output of the lighting fixtures will help reduce the air conditioning loads on the cafeteria

The Capitol Power Plant celebrated its centennial in FY 2010.

Capitol Power Plant

The Capitol Power Plant began operations in 1910 to serve the U.S. Capitol Building and the developing Capitol. Having once provided electricity and steam, it has since evolved to provide steam and chilled water to Capitol facilities. In the Architect of the Capitol's efforts to achieve energy savings, the Capitol Power Plant plays a pivotal role. The Plant continues to reduce its electrical consumption with the installation of three new chillers and a newly installed distributed control system will help achieve continued energy efficiency.

Historic Preservation, Water and Energy Savings Accomplishments

- The Capitol Power Plant reduced its energy use by four percent in FY 2010 compared to FY 2009
- Purchased 350 million kWh of renewable energy from a utility company
- Adjusted the Capitol Power Plant's fuel mix to burn 88 percent natural gas, seven percent coal and five percent fuel oil
- Performed a chilled water audit on the efficiencies established in the introduction of the West Refrigeration Plant Expansion

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Implement best practices for regular boiler cleaning and minimize boiler contamination
- Develop modeling of chiller and steam system performance to provide automated feedback on inefficient operations
- Continue improving utility management system to allow facility managers to assess pertinent information regarding utility billing and consumption
- Evaluate retrofit potential of variable frequency drives on pump motors
- Study retrofitting existing/oversized motors with ultra/premium energy efficient motors
- Continue efforts to replace plant steam traps

1997

1997 — Architect of the Capitol Alan M. Hantman was appointed by President Bill Clinton and confirmed by the Senate. Hantman was the first to be appointed under the new selection legislation of 1989.

United States Botanic Garden

Congress established the United States Botanic Garden in 1820. After residing due west of the Capitol, the Botanic Garden was relocated to the southwest corner of the U.S. Capitol at the eastern edge of the National Mall. The Botanic Garden Conservatory, National Garden and Bartholdi Park are the most visible of its facilities. The Botanic Garden's Administration Building is located in Bartholdi Park, along with the historic Bartholdi Fountain. The Botanic Garden is a museum featuring living collections, several sustainability demonstration projects and maintains a Production Facility at DC Village, located in Southeast Washington, D.C.

Historic Preservation, Water and Energy Savings Accomplishments

- Purchased three hybrid vehicles utilizing E85 Fuel
- Released Landscapes for Life report, a homeowner (web-based) version of SITES (www.landscapeforlife.org)
- Installed Phase I and II of the Terrace Garden Project
- Hired a plant health specialist to work with staff to lead an integrated pest management program from propagation through display resulting in healthier plant collections and public displays
- Employed integrated pest management practices resulting in healthier living collections, energy savings and the use of fewer resources, including pesticides
- Changed air handler scheduling to reduce energy consumption
- Participated in the Agency's demand response goal in an effort to reduce electrical demand
- Diverted 32,000 lbs. of paper, glass, plastic and cardboard from waste stream to be recycled
- Diverted 638,000 lbs. of green waste from waste stream to be composted
- Completed water use audits and draft of energy audit, both of which will be used in prioritizing methods to meet reduction goals
- Completed work with EPA on site storm water study and implemented new Rain Garden as first project
- Contracted to develop sustainable master plan design of Bartholdi Park as Sustainable Sites Initiative (SITES) Pilot Project
- Developed home owner (web-based) version of SITES (www.landscapeforlife.org)

One of the three E-85 fuel vehicles introduced to the Botanic Garden fleet in FY 2010.

- Led Federal Work group for the White House Council on Environmental Quality
- Worked with EPA Fellow (Ph.D. candidate at Rutgers) on historical study of Square 575 and landscape architecture construction design class using Square 575 as a case study
- Added permeable paving under OSP parking on both north and south sides of Independence Avenue
- Received American Public Gardens Association's Award for Program Excellence for SITES
- As a Sustainable Sites Executive Committee member, the U.S. Botanic Garden provided guidance for the implementation of 165 pilot sustainability sites initiatives in 34 states — three percent of the projects were in Canada, Iceland and Spain
- Upgraded shade cloth and added high efficiency fan in Hawaiian House (SE corner) to improve conditions for collections and reduce energy use

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Begin oversight of Pilot Project phase of SITES with 163 pilot projects
- Develop a plan for permeable paving and accessible sidewalks
- Continue a process to change to efficient light fixtures at DC Village
- Continue installation of drip and efficient irrigation in all growing areas at DC Village
- Continue the holiday and other exhibits following on the save, reuse and reduce theme
- Continue public and office recycling programs
- Continue use of invasive species policy to educate public and cull, as possible, invasive plants in collection
- Decrease numbers and frequency of spraying and increasing use of beneficial insects
- Reuse and recycle plastic nursery pots in the Production Facility
- Reduce waste of leftover plants by growing select plants in Botanic Garden nursery pots
- Introduce bird and bat boxes to the grounds to aid in insect control
- Convert the lawn areas around the Conservatory into ornamental planting beds, reducing turf and increasing plant biomass and year round interest

Office of Security Programs

Through its Office of Security Programs jurisdiction, the Architect of the Capitol is responsible for the maintenance, care and operation of buildings, grounds and security enhancements of the Capitol Police. The Capitol Police's daily functions are supported by the Office of Security Programs, which is responsible for managing all internal security programs and perimeter security kiosks, serving as the primary police operations liaison with the Capitol Police and leading interagency emergency preparation coordination.

The Office of Security Programs maintains several key facilities including the Eney, Chestnut, Gibson Memorial Building and leased space in the Fairchild Building. There are several facilities in DC Village under the Office of Security Programs jurisdiction, as well as off-site facilities.

Historic Preservation, Water and Energy Savings Accomplishments

- Designed first phase of networked daylighting and occupancy sensor based lighting controls system and simultaneous upgrade of existing fluorescent fixtures, lamps and ballasts in Police Headquarters
- Improved lighting color rendition of PC screens in key areas of Police Headquarters

The Capitol Police's daily functions are supported by the Office of Security Programs.

- Installed exterior LED lamps and fixtures at Intermediate Off-Site Delivery Facility, DC Village screening tent and Police Headquarters
- Installed interior LED lamps and fixtures in high bay area of Intermediate Off-Site Delivery Facility
- Initiated replacement of 8-10 outdated fan coil units and associated pneumatic controls with modernized equipment throughout Police Headquarters
- Initiated installation of 30 electrical sub-meters throughout Police Headquarters and integration into existing, centrally-located computerized control system
- Improved toilet area ventilation and associated exhaust fan scheduling including integration into existing computerized control system in Police Headquarters
- Installed eight instantaneous domestic water heaters throughout an off-site facility
- Initiated installation of T5 fluorescent fixtures, lamps and ballasts in an off-site facility. One-hundred-and-fifty fixtures have been completed
- Developed policies for daylight harvesting
- Hired an energy manager

Continuing Historic Preservation, Water and Energy Savings Initiatives

- Finalize energy management plan
- Continue expansion of networked daylighting and occupancy sensor based lighting controls system and simultaneous upgrade of existing fluorescent fixtures, lamps and ballasts in Police Headquarters
- Install exterior LED lamps and fixtures at the Police Maintenance Building

The Eney, Chestnut, Gibson Memorial Building is the home of the Capitol Police Headquarters.

- Continue replacement of outdated fan coil units and associated pneumatic controls with modernized equipment throughout Police Headquarters
- Continue installation of T5 fluorescent fixtures, lamps and ballasts in an off-site facility
- Begin improving efficiency of data centers through the installation of modular, vertical, in-row chilled water cooling at Police Headquarters
- Install electrical pulse meter in Police Headquarters
- Install variable frequency drives and premium efficiency motors for the fan coil and reheat coil hot water systems in Police Headquarters
- Retro-commission key control and HVAC equipment in Police Headquarters
- Develop and implement air handling unit energy-saving strategies
- Develop and implement unoccupied and holiday setbacks, as well as seasonal space temperature and humidity control setpoints
- Expand computerized controls systems in Police Headquarters and Police Maintenance Building and expand existing remote monitoring and control intranet access to the Fairchild Building. Thereafter, provide demand response revenue through staging of integrated daylighting, cooling coil discharge air temperature increases and decreased variable frequency drive speeds, as well as through approved emergency generator operations
- Develop and install Vending Miser, PermaFrost and Synch drive applications
- Reduce hot water flow rates in showerheads and faucets
- Install infrared heat in high bay areas in Police Maintenance Building
- Continue Capitol Police vehicle policy to ensure that all new vehicles are equipped with hybrid engines
- Install a variable speed centralized chiller in an off-site facility
- Install variable frequency drives on air handling unit supply and return fans and chilled and hot water pumps in an off-site facility
- Reduce size of control air compressor in an off-site facility
- Install demand control ventilation in an off-site facility
- Install addressable lighting system in an off-site facility
- Convert T8 lamps, ballasts and fixtures to T5 lamps, ballasts and fixtures in an off-site facility

Architect of the Capitol Stephen T. Ayers at a hearing with Capitol Police Chief, Philip Morse.

2008

2008 — The Architect of the Capitol's ethanol fueling station opened for flex-fuel vehicles in the Legislative Branch agencies' official fleets.

Supreme Court of the United States

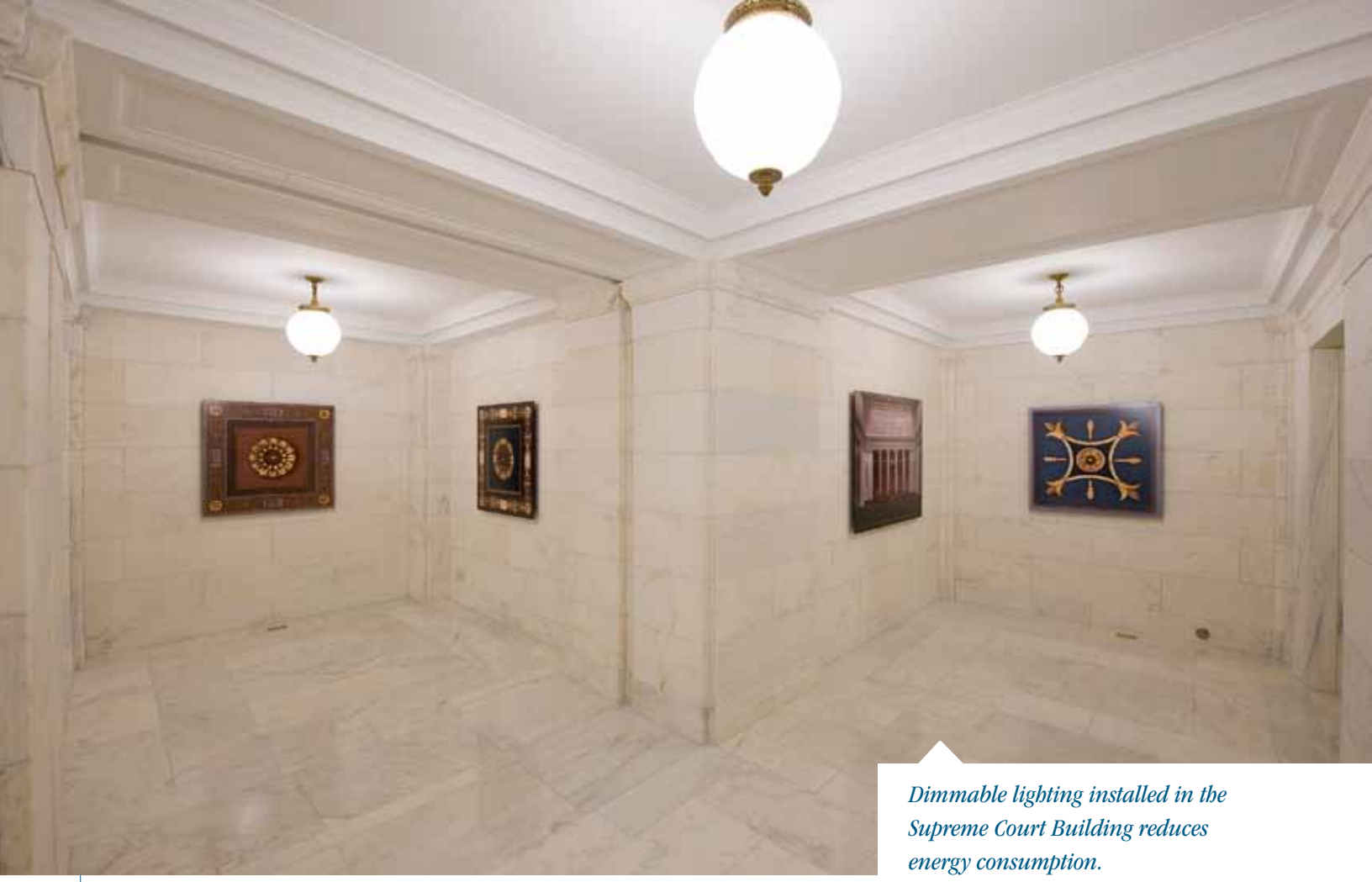
The Architect of the Capitol's Supreme Court jurisdiction is responsible for the operations, maintenance and historic preservation of the Supreme Court buildings and grounds. The Supreme Court Building was erected in 1935 on its present site on the Capitol. In 1993, the Thurgood Marshall Federal Judiciary Building was constructed to house the Administrative Office of the United States Courts. The Supreme Court differs from other jurisdictions in that the funding to care for the building and grounds of the Supreme Court and Thurgood Marshall Federal Judiciary Building is appropriated from the Judicial Branch.

Historic Preservation, Water and Energy Savings Accomplishments

Supreme Court

- Replaced air handling units with new units featuring high efficiency motors and variable frequency drives. Air handling units are capable of and programmed to run in air economizer mode, using outside air when practical
- Installed a new Building Automation System incorporating direct digital control and variable air volume dampers. These controls allow technicians to remotely adjust HVAC settings, automate trouble alerts and precisely control office comfort levels rather than a whole zone

The Supreme Court of the United States was moved out of the U.S. Capitol and into the Supreme Court Building in 1935.



Dimmable lighting installed in the Supreme Court Building reduces energy consumption.

- Replaced all steam traps on convection units
- Replaced original single pane 75-year-old windows on the ground, 1st and 2nd floors with new energy efficient windows
- Installed compact fluorescent down lighting in all general lighting applications
- Retrofitted historic incandescent corridor fixtures with electronic ballasts and CFLs
- Replaced T12 lighting with electronic ballasts and T5 or T8 high output linear pendant up lighting for all interior offices
- Replaced original incandescent/ quartz decorative bronze pendant lighting with compact fluorescent lighting for all exterior offices
- Installed dimming systems for the entire first floor, including a central monitoring system. Normal high presets at between 85 – 90 percent power level allowing less energy consumption and extending the life of the lamps. The system includes preset "mood" lighting levels
- Initiated a project to review and purchase automated lighting controls for all Agency offices, storage rooms and mechanical areas. The survey was completed and is moving forward with selection and installation of devices
- Installed air curtains at new loading docks
- Completed modernization of most of the elevators (excluding cabs) (included replacement of controllers and motor drives)
- Revised Supreme Court fountain operation run times from continuous operation to reduced timed operations (saves energy

and chemicals used to treat the fountain water)

- Developed mock-ups for energy efficient upgrades to Courtroom and exterior building lighting. Implemented Courtroom Bench down lighting upgrade, resulting in 95 percent load reduction

Continuing Historic Preservation, Water and Energy Savings Initiatives

Supreme Court

- Complete central connection of power monitoring
- Implement approved upgrades to Courtroom and exterior building lighting
- Upgrade exterior landscaping to reflect the nature of the original design while incorporating current technology to provide a more sustainable and manageable solution. Items currently under consideration include
  - Hardy and sustainable foliage to include shrubs, plants and trees
  - Water drainage designed to assist in irrigation of plants
  - Automated exterior building and landscape lighting
  - Automated sprinkler system with backflow devices
- Retrofit of elevator position indicator lamps
- Review installation of air curtains at garage entrances
- Use of high efficiency motors for all replacement motors
- Maintenance of equipment to obtain designed efficiency, such as the timely cleaning of coils and replacement of filters

Old steam trap.

New steam trap.

Thurgood Marshall Federal Judiciary Building

- Conduct daylight harvesting study
- Continue development and refinement of the recyling program
- Conduct an energy audit
- Support and collaborate with the Administrative Office of the U.S. Courts on their separate yet related green initiative program

Section IV:

Looking Ahead

In keeping with the current sustainability goals and the need for increased transparency and fiscal accountability, the Architect of the Capitol will continue to utilize a holistic approach to evaluate the costs and benefits of projects at every scale. For FY 2010 and coming fiscal years, the Agency will stand by its commitment to responsible use of tax dollars in the construction, operations and maintenance of the historic and iconic buildings and grounds entrusted to its care.

In addition to a continued focus on historic preservation and stewardship as powerful tools to accomplish sustainability, emphasis on high return on investment, saving energy, and implementing responsible and sustainable practices, the Agency will:

- Strengthen effective resource conservation measures, especially for water and spread them for the benefit of the entire Capitol
- Evaluate energy and water usage for appropriate prioritization of projects and to meet reduction goals
- Explore new and smart technologies that save energy and help meet performance targets
- Determine a relative assessment of the amount of water used to assess water conservation and cost reductions, as well as to assess the Capitol's water consumption and runoff patterns
- Continue to serve our leaders and their constituents in the most, effective and sustainable way possible while preserving our national treasures

Building Automation System Network Master Plan

Meeting energy management goals requires the incorporation and strategic use of new technologies. The BASnet, or Building Automation System network, is one such advance that updates the original temperature control systems across the Capitol, and addresses several additional building systems including energy management, elevator monitoring, central metering and building lighting controls.

To increase energy efficiency on the Capitol, the Architect of the Capitol has begun work on redrafting the master plan for the Building Automation System network (BASnet) to meet these new realities. A final master plan — with an FY 2012 completion date — will define the appropriate levels of funding, management and maintenance support needed for the network over the long term, and will enable the development of appropriate policies to implement it. The final master plan is expected to guide the

Each day, the uniquely skilled painters, plasterers and masons work vigorously to preserve the limestone, marble, ornate tile, guilded ceilings, and decorative plasters that make up the majestic interiors of the Capitol Buildings.

direction and implementation of the Building Automation System network for the next 10 to 20 years.

Sub-metering Study

To meet the energy reduction goals and to comply with the Energy Independence and Security Act of 2007, the Architect of the Capitol is providing data to its clients from meters installed in each building. Additional sub-metering devices monitor the effectiveness of energy reduction efforts, yield useful data to inform building occupants of their energy usage and allow determination of the success of energy-saving programs.

In FY 2010, a study was conducted to evaluate different sub-metering technologies to determine which would best suit the needs of the Agency and to evaluate potential sub-meter locations in electrical systems for the best possible energy usage data to help with energy reduction. Electrical systems within the U.S. Capitol and Rayburn House Office Buildings were studied with the goal of applying the most feasible options and recommendations to these and other Agency facilities.

The Architect of the Capitol plans to establish the network infrastructure for and install approximately 320 primary utility meters by January 2013 and implement an accompanying Meter Maintenance Program. To date, 138 primary utility meters have been installed. In addition, a parallel effort to install additional sub-meters will be considered as major electrical systems within Agency facilities are upgraded.

Historic Preservation Guidelines

The Architect of the Capitol is steward to iconic, historically significant and aging landmarks that pose significant challenges to the professionals entrusted with their preservation. To ensure proper maintenance and favorably impact the quality of the services, the Agency is preparing preservation manuals or "building guides."

These reference documents, written for project managers, superintendents and staff, contain a compilation of easy-to-use information on the origins and care of historic building materials, original conditions, plans, alterations and special challenges. The architectural and historical facts, construction details, original material sources, repair and maintenance guidelines will ensure that preservation and maintenance actions are properly informed. The useful and practical information will have a substantial impact on the quality and consistency of the preservation services provided.

Each of the guides will include a summary of a building's history, a statement of significance and CAD-generated floor plans that will provide a quick reference to specific

Historic preservation guidelines will help staff, such as this Stone Mason, preserve the fabric of the historically significant and aging landmarks maintained by the Agency.

To increase energy efficiency at the Capitol, the Agency has begun redrafting the master plan for the Building Automation System network.

In FY 2011, the Architect of the Capitol will pursue additional energy and water savings initiatives such as:

- Explore alternative fuel options and technologies (e.g., biofuels, carbon sequestration, and synthetic coal)
- Update and revise design standards to reflect most up-to-date energy guidelines for all projects
- Replace exterior lighting and provide two-way controls
- Increase biodiversity of the Capitol and improve landscape performance
- Planting trees to support low-cost carbon sequestration
- Conduct feasibility assessments for rainwater harvesting and for additional rain gardens
- Investigate the feasibility of on-site renewable energy generation to offset building energy costs within historic preservation constraints
- Create incentives and programs for building occupants to use alternative transportation
- Expand the number of staff Leadership in Energy and Environmental Design (LEED) Accredited Professional or Green Associate certified (currently at 25)
- Expand the number of staff certified as Corporate Social Responsibility (CSR-P) practitioners

areas of high, medium or low preservation concerns. Guides for 19 Capitol buildings are underway way. The Longworth House Office Building was completed in FY 2010. The remainder will be completed in FY 2011 and FY 2012.

Sustainability, Energy and Water Management Plan

The FY 2010 Architect of the Capitol Sustainability, Energy and Water Management Plan, a follow-on document to the Sustainability Framework Plan, is a comprehensive 20-year plan that includes goals and metrics to chart progress toward a greater incorporation of sustainability throughout the Capitol.

The draft plan, completed in FY 2010, will incorporate tracking, measurement and implementation tools and strategies. It will also include:

- A template for documenting new construction, renovation and maintenance and operations activities
- Consolidated reports on goals achieved
- Templates and checklists to measure sustainability goals, policies and procedures
- A training plan and a delineation of staff responsibilities
- A section on how to address historic preservation as an element of sustainability

Two planning charettes with experts and Agency staff were conducted in FY 2010. The final version of the plan, which will include targets and project initiatives, is expected in FY 2011.

Sustainability and Energy Division

In FY 2011, the Architect of the Capitol will establish a Sustainability, Energy and Water Conservation Division, a new unit in the Office of Planning and Project Management that will oversee sustainability initiatives, planning and program development and execution of various sustainability and green buildings projects, programs and advisory services for the Capitol.

A new division director, who will report to the Chief Sustainability Officer, is expected to plan and execute major Agency green buildings and sustainability programs, and provide key input to policy development and implementation of strategic plans for mission-essential goals and programs. The FY 2011 hire is expected to provide oversight of design and engineering

2010

2010 — Architect of the Capitol Stephen T. Ayers, AIA, LEED AP, was nominated by President Barack Obama and confirmed by the Senate.

initiatives, assist with development, implementation, and achievement of goals and standards for sustainability, green building design, energy efficiency and savings.

The Sustainability, Energy and Water Conservation Division will be staffed by seven or eight professional experts who will perform work related to studies of diverse environmental issues, evaluate program effectiveness and management processes, projects and systems as they relate to sustainability, and track and monitor results. The division's work plans include projects focusing on:

- Green investment and energy efficiency
- Water conservation
- Indoor air quality
- Waste reduction associated with building operations and maintenance
- Construction of more sustainable building sites

Cogeneration Project

In FY 2010, the Architect of the Capitol moved forward with plans to design the U.S. Capitol Power Plant cogeneration project, which will lead to significant energy savings and reduced regional emissions.

The Capitol Visitor Center skylights provide both natural lighting and stunning views of the Capitol Dome.

The Architect of the Capitol is pursuing cogeneration at the Capitol Power Plant and in FY 2010 awarded a Utility Energy Services Contract to add a cogeneration plant to the existing Capitol Power Plant and to produce electricity for the plant and steam power for the Capitol.

This project will significantly contribute to meeting energy reduction goals, as well as emission requirements. The design work began in October 2010, and the project completion date is FY 2014.

As noted, implementation of cogeneration at the Capitol Power Plant is projected to represent a 24 percent reduction in energy consumption compared with the FY 2003 baseline, a six percent reduction in greenhouse gas emissions and a 98 percent reduction in hazardous air pollutant emissions over FY 2009 emissions rates.

Energy Savings Performance Contracts

Energy Savings Performance Contracts — innovative funding mechanisms that realize energy savings at no additional cost to taxpayers — provide for the design, acquisition, installation, testing, operation, and when appropriate, maintenance and repair of an identified energy or water conservation measure or series of measures. They play a significant role in helping to reach required long-term targets (reduce total energy usage by 30 percent in ten years), develop projects with minimal investment and fund projects with

Energy reduction projects at the Capitol Power Plant will continue to drive energy and water savings performance.

savings generated by the installed improvements.

In FY 2011 we will begin substantial construction on all the ESPC measures in the Capitol, Senate and House Office buildings. Work includes upgrades to HVAC, lighting and plumbing systems.e insulation covers.

Cannon House Building Renovation

The Cannon House Office Building, which was completed in 1908, has deteriorated over time and is in urgent need of repair. Renovations are needed to maintain the integrity and safety of this facility and reduce the likelihood of unplanned outages and associated costs.

In FY 2010, an audit and several pre-design studies were conducted on the Cannon House Office Building, providing data for creating a program of requirements to prioritize projects, informing the final renovation design approach, identifying synergies that save space, time and cost and ensuring that occupant needs and satisfaction are addressed.

Experts working on the renovation, a whole building renewal effort, seek to meet Leadership in Energy and Environmental Design (LEED) for New Construction certification at the silver level, will utilize the Sustainability, Energy and Water Management Plan to determine and prioritize strategies and projects that holistically integrate sustainability, historic preservation, energy conservation and security.

The Architect of the Capitol plans to renovate this facility over the next eight years as part of a long-term effort to reduce maintenance backlogs and execute major renewal projects to sustain all Capitol facilities.

Whole System Integrated Design for Project Planning and Implementation

Building performance tracks design intent, and buildings with a strong energy and water focus, typically have outstanding energy and water performance. The best performing buildings take an integrated approach to sustainable design, site development, water savings, energy efficiency, materials selection, and indoor environmental quality. This approach is a valuable model for operating and managing historic structures because of the opportunities presented for preservation-sensitive sustainable innovation.

The whole building approach provides the framework for continued leadership in the preservation of historic resources and operating in the spirit of stewardship. The Architect of the Capitol approaches facilitates planning and project implementation that addresses environmental, financial, and occupant satisfaction in aggregate and effective oversight of the delivery process. Through systematic analyses and leveraging whole building design strategies, multiple benefits can be achieved; buildings can be operated efficiently and cost-effectively throughout their life cycle. This whole system integrated design approach, which

is a shift from typical planning and design processes:

- Relies more heavily on specialists' expertise and stakeholder input throughout various project phases
- Involves sustainability and preservation specialists on project teams during concept development, planning, design and project execution
- Requires exploration of the impact that green building and sustainable design has on building occupants
- Involves two-way communication with stakeholders about the project progress

An Integrated Approach for High-Performance Buildings

Moving forward, the Architect of the Capitol will incorporate whole building design concepts to its planning, design and project implementation processes to meet complex project demands and create high-performance buildings. Exploration of effects of sustainably designed buildings on occupant satisfaction, productivity, creativity and work will continue, in addition to the other benefits of:

- Ensuring focus on opportunities to meet sustainability goals, while avoiding or minimizing adverse effects to historic buildings and structures
- Matching investments in sustainable measures with sustainable operations and maintenance practices
- Demonstrating leadership in the preservation of historic resources

Using whole building design principles and concepts to understand, evaluate and coordinate the interrelationships and interdependencies with the Capitol building systems will ensure that the best overall performance now and in the years to come is achieved.

Mission: Historic Preservation, Stewardship and Sustainability

Saturated with elements that embody our nation's art, history and politics, the U.S. Capitol represents the essence of our country's history, a much-frequented tourist destination for thousands of visitors, and the working seat of the U.S. government. Carefully balancing preservation and the need for ongoing building performance improvement, the Architect of the Capitol's proactive leadership, ongoing sustainability, and energy and water conservation efforts will ensure the long-term preservation of our nation's historic architectural treasures.

The Agency has a long history of designing projects and initiatives with a cost savings and sustainability stewardship approach.

The Architect of the Capitol has a long history of designing projects and initiatives with a cost savings and sustainability stewardship approach. Sustaining the home of American democracy through sustainable design, construction, operations and maintenance, in addition to implementing forward-thinking conservation programs and effective use of resources is what we do best and what we will continue to do in the years to come.

Paint analyses are one of many strategies used to preserve the history of our nation's treasures.

Appendix

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URS Corporation

Appendix

List of Abbreviations and Acronyms

ADA	Americans with Disabilities Act
AHUs	Air Handling Units
AIA	American Institute of Architects
AOC	Architect of the Capitol
BAS	Building Automation System
BG	United States Botanic Garden
BIM	Building Information Modeling
BIPV	Building-Integrated Photovoltaics
BLCC	Building Life Cycle Cost Program
Btu	British Thermal Unit
Btu/SF	British Thermal Unit per Square Foot
CAD	Computer-Aided Design
CAO	Chief Administrative Officer
CB	Capitol Building Jurisdiction
CBECS	Commercial Buildings Energy Consumption Survey
CCMP	Capitol Complex Master Plan
CD	Construction Division
CFL	Compact Fluorescent Lamp
CG	Capitol Grounds Jurisdiction
CHOB	Cannon House Office Building
CIP	Capital Improvements Plan
CMMA	Construction Management Association of America
CPBG&S	United States Capitol Police Buildings, Grounds and Security Jurisdiction
CPP	Capitol Power Plant Jurisdiction
CRV	Current Replacement Value
CVC	Capitol Visitor Center
DCS	Digital Control System
DDC	Direct Digital Controls
DES	Detailed Energy Study
DOE	Department of Energy
E-85	Ethanol-85
E-E	Energy Efficient
ECMs	Energy Conservation Measures
EFU	Electric Functional Unit
EISA 2007	Energy Independence and Security Act of 2007
EPA	Environmental Protection Agency
EPAct 2005	Energy Policy Act of 2005
ERP	East Refrigeration Plant
ESCO	Energy-Service Contractor
ESPC	Energy-Savings Performance Contract
FCA	Facility Condition Assessment
FCI	Facility Conditions Index
FEMP	Federal Energy Management Program
FGGM	Fort George G. Meade, Maryland
FM	Facilities Management
FY	Fiscal Year
GAO	Government Accountability Office
GIS	Geographic Information Systems
GPO	Government Printing Office
GSA	General Services Administration
HID	High Intensity Discharge

Appendix

List of Abbreviations and Acronyms

HOB	House Office Buildings Jurisdiction
HVAC	Heating, Ventilation and Air Conditioning
IATF	Interagency Energy Management Task Force
ISWG	Interagency Sustainability Working Group
IT	Information Technology
ITD	Information Technology Division
JAB	John Adams Building
JMMB	James Madison Memorial Building
KBTU	Thousand British Thermal Units
kWh	Kilowatt-Hour
LEED	Leadership in Energy and Environmental Design
LEED AP	Leadership in Energy and Environmental Design Accredited Professional
LHOB	Longworth House Office Building
LOC	Library of Congress
MEP	Mechanical, Electrical and Plumbing
MMBTU	Million British Thermal Units
MMBTU/GSF	Million Btu per Gross Square Foot
MT CO_2e	Metric Tons of Carbon Dioxide Equivalents
MWH	Megawatt Hours
NIST	National Institute of Standards and Technology
OSP	Office of Security Programs
PCAVC	Library of Congress' Packard Campus for Audio Visual Conservation Center
PEC	Program for Energy Conservation
PIC	Project Information Center
PL	Public Law
PM	Preventative Maintenance
PMD	Project Management Division
PPM	Office of Planning and Project Management
PVC	Photovoltaic Cell
RCx	Retro-Commissioning
RHOB	Rayburn House Office Building
SC	Supreme Court Building
SECCC	Senate Employees Child Care Center
SITES	Sustainable Sites Initiative
SOB	Senate Office Buildings Jurisdiction
SP	Security Program
TAB	Testing, Adjusting and Balancing
TJB	Thomas Jefferson Building
TMFJB	Thurgood Marshall Federal Judiciary Building
USBG	U.S. Botanic Garden Jurisdiction
USGBC	U.S. Green Building Council
U.S.C.	United States Code
USCP	United States Capitol Police
VAV	Variable Air Volume
VFDs	Variable Frequency Drives
VOC	Volatile organic compound
WRP	West Refrigeration Plant
WRPE	West Refrigeration Plant Expansion
YTD	Year-to-Date

Appendix A

Energy Policy Act (EPAct) of 2005, Public Law (PL) 109-58, Sections 101, 102 and 1829

TITLE XVIII — Studies

SEC. 1829. Energy and Water Saving Measures in Congressional Buildings.

(a) IN GENERAL – The Architect of the Capitol, as part of the process of updating the Master Plan Study for the Capitol complex, shall –

(1) carry out a study to evaluate the energy infrastructure of the Capitol complex to determine how to augment the infrastructure to become more energy efficient.

(A) by using unconventional and renewable energy resources,

(B) by incorporating new technologies to implement effective green building solutions,

adopting computer-based building management systems, and

(iii) recommending strategies based on end-user behavioral changes to implement low-cost environmental gains, and

(C) in a manner that would enable the Capitol complex to have reliable utility service in the event of power fluctuations, shortages, or outages,

(2) carry out a study to explore the feasibility of installing energy and water conservation measures on the rooftop of the Dirksen Senate Office Building, including the area directly above the food service facilities in the center of the building, including the installation of –

(A) a vegetative covering area, using native species to the maximum extent practicable, to –

insulate and increase the energy efficiency of the building,

(ii) reduce precipitation runoff and conserve water for landscaping or other uses,

(iii) increase, and provide more efficient use of, available outdoor space through management of the rooftop of the center of the building as a park or garden area for occupants of the building, and

(iv) improve the aesthetics of the building, and

(B) onsite renewable energy and other state of-the art technologies to –

- improve the energy efficiency and energy security of the building or the Capitol complex by providing additional or backup sources of power in the event of a power shortage or other emergency,
- reduce the use of resources by the building, or

(iii) enhance worker productivity; and

(C) not later than 180 days after the date of enactment of this Act, submit to Congress a report describing the findings and recommendations of the study under subparagraph (B).

(b) AUTHORIZATION OF APPROPRIATIONS – There is authorized to be appropriated to the Architect of the Capitol to carry out this section $2,000,000 for each of fiscal years 2006 through 2010.

Appendix B

Energy Independence and Security Act (EISA) of 2007, Sections 431, 432, 501–505

TITLE V — Energy Savings in Government and Public Institutions

Subtitle A – Federal Programs

Subtitle A – United States Capitol Complex

SEC. 431. Energy Reduction Goals for Federal Buildings.

Section 543(a)(1) of the National Energy Conservation Policy Act (42 U.S.C. 8253(a)(1)) is amended by striking the table and inserting the following:

"Fiscal Year Percentage Reduction

2006.....2
2007.....4
2008.....9
2009.....12
2010.....15
2011.....18
2012.....21
2013.....24
2014.....27
2015.....30."

SEC. 432. Management of Energy and Water Efficiency in Federal Buildings

Section 543 of the National Energy Conservation Policy Act (42 U.S.C. 8253) is amended by adding at the end the following:

(f) USE OF ENERGY AND WATER EFFICIENCY MEASURES IN FEDERAL BUILDINGS. –

(1) DEFINITIONS. – In this subsection:

(A) COMMISSIONING. – The term 'commissioning', with respect to a facility, means a systematic process –

(i) of ensuring, using appropriate verification and documentation, during the period beginning on the initial day of the design phase of the facility and ending not earlier than 1 year after the date of completion of construction of the facility, that all facility systems perform interactively in accordance with the design documentation and intent of the facility; and

(II) the operational needs of the owner of the facility, including preparation of operation personnel; and

(ii) the primary goal of which is to ensure fully functional systems that can be properly operated and maintained during the useful life of the facility.

(B) ENERGY MANAGER. –

(i) IN GENERAL. – The term 'energy manager', with respect to a facility, means the individual who is responsible for –

(I) ensuring compliance with this subsection by the facility; and

(II) reducing energy use at the facility.

(ii) INCLUSIONS. – The term 'energy manager' may include –

(I) a contractor of a facility;

(II) a part-time employee of a facility; and

(III) an individual who is responsible for multiple facilities.

Appendix B

(C) FACILITY. –

(i) IN GENERAL. – The term 'facility' means any building, installation, structure, or other property (including any applicable fixtures) owned or operated by, or constructed or manufactured and leased to, the Federal Government.

(ii) INCLUSIONS. – The term 'facility' includes –

(I) a group of facilities at a single location or multiple locations managed as an integrated operation; and

(II) contractor-operated facilities owned by the Federal Government.

(iii) EXCLUSIONS. – The term 'facility' does not include any land or site for which the cost of utilities is not paid by the Federal Government.

(D) LIFE CYCLE COST-EFFECTIVE. – The term 'life cycle cost-effective', with respect to a measure, means a measure, the estimated savings of which exceed the estimated costs over the lifespan of the measure, as determined in accordance with section 544.

(E) PAYBACK PERIOD. –

(i) IN GENERAL. – Subject to clause (ii), the term 'payback period', with respect to a measure, means a value equal to the quotient obtained by dividing –

(I) the estimated initial implementation cost of the measure (other than financing costs); by

(II) the annual cost savings resulting from the measure, including –

(aa) net savings in estimated energy and water costs; and

(bb) operations, maintenance, repair, replacement, and other direct costs.

(ii) MODIFICATIONS AND EXCEPTIONS. – The Secretary, in guidelines issued pursuant to paragraph (6), may make such modifications and provide such exceptions to the calculation of the payback period of a measure as the Secretary determines to be appropriate to achieve the purposes of this Act.

(F) RECOMMISSIONING. – The term 'recommissioning' means a process –

(i) of commissioning a facility or system beyond the project development and warranty phases of the facility or system; and

(ii) the primary goal of which is to ensure optimum performance of a facility, in accordance with design or current operating needs, over the useful life of the facility, while meeting building occupancy requirements.

(G) RETRO-COMMISSIONING. – The term 'retro-commissioning' means a process of commissioning a facility or system that was not commissioned at the time of construction of the facility or system.

(2) FACILITY ENERGY MANAGERS. –

(A) IN GENERAL. – Each Federal agency shall designate an energy manager responsible for implementing this subsection and reducing energy use at each facility that meets criteria under subparagraph (B).

Appendix B

(B) COVERED FACILITIES. – The Secretary shall develop criteria, after consultation with affected agencies, energy efficiency advocates, and energy and utility service providers, that cover, at a minimum, Federal facilities, including central utility plants and distribution systems and other energy intensive operations, that constitute at least 75 percent of facility energy use at each agency.

(3) ENERGY AND WATER EVALUATIONS. –

(A) EVALUATIONS. – Effective beginning on the date that is 180 days after the date of enactment of this subsection and annually thereafter, energy managers shall complete, for each calendar year, a comprehensive energy and water evaluation for approximately 25 percent of the facilities of each agency that meet the criteria under paragraph (2)(B) in a manner that ensures that an evaluation of each such facility is completed at least once every 4 years.

(B) RECOMMISSIONING AND RETRO-COMMISSIONING. – As part of the evaluation under subparagraph (A), the energy manager shall identify and assess recommissioning measures (or, if the facility has never been commissioned, retro-commissioning measures) for each such facility.

(4) IMPLEMENTATION OF IDENTIFIED ENERGY AND WATER EFFICIENCY MEASURES. – Not later than 2 years after the completion of each evaluation under paragraph (3), each energy manager may –

(A) implement any energy- or water-saving measure that the Federal agency identified in the evaluation conducted under paragraph (3) that is life cycle cost-effective; and

(B) bundle individual measures of varying paybacks together into combined projects.

(5) FOLLOW-UP ON IMPLEMENTED MEASURES. – For each measure implemented under paragraph (4), each energy manager shall ensure that –

(A) equipment, including building and equipment controls, is fully commissioned at acceptance to be operating at design specifications;

(B) a plan for appropriate operations, maintenance, and repair of the equipment is in place at acceptance and is followed;

(C) equipment and system performance is measured during its entire life to ensure proper operations, maintenance, and repair; and

(D) energy and water savings are measured and verified.

(6) GUIDELINES. –

(A) IN GENERAL. – The Secretary shall issue guidelines and necessary criteria that each Federal agency shall follow for implementation of –

(i) paragraphs (2) and (3) not later than 180 days after the date of enactment of this subsection; and

(ii) paragraphs (4) and (5) not later than 1 year after the date of enactment of this subsection.

(B) RELATIONSHIP TO FUNDING SOURCE. – The guidelines issued by the Secretary under subparagraph (A) shall be appropriate and uniform for measures funded with each type of funding made available under paragraph (10), but may distinguish between different types of measures project size, and other criteria the Secretary determines are relevant.

Appendix B

(7) WEB-BASED CERTIFICATION. –

(A) IN GENERAL. – For each facility that meets the criteria established by the Secretary under paragraph (2)(B), the energy manager shall use the web-based tracking system under subparagraph (B) to certify compliance with the requirements for –

(i) energy and water evaluations under paragraph (3);

(ii) implementation of identified energy and water measures under paragraph (4); and

(iii) follow-up on implemented measures under paragraph (5).

(B) DEPLOYMENT. –

(i) IN GENERAL. – Not later than 1 year after the date of enactment of this subsection, the Secretary shall develop and deploy a web-based tracking system required under this paragraph in a manner that tracks, at a minimum –

(I) the covered facilities;

(II) the status of meeting the requirements specified in subparagraph (A);

(III) the estimated cost and savings for measures required to be implemented in a facility;

(IV) the measured savings and persistence of savings for implemented measures; and

(V) the benchmarking information disclosed under paragraph (8)(C).

(ii) EASE OF COMPLIANCE. – The Secretary shall ensure that energy manager compliance with the requirements in this paragraph, to the maximum extent practicable –

(I) can be accomplished with the use of streamlined procedures and templates that minimize the time demands on Federal employees; and

(II) is coordinated with other applicable energy reporting requirements.

(C) AVAILABILITY. –

(i) IN GENERAL. – Subject to clause (ii), the Secretary shall make the web-based tracking system required under this paragraph available to Congress, other Federal agencies, and the public through the Internet.

(ii) EXEMPTIONS. – At the request of a Federal agency, the Secretary may exempt specific data for specific facilities from disclosure under clause (i) for national security purposes.

(8) BENCHMARKING OF FEDERAL FACILITIES. –

(A) IN GENERAL. – The energy manager shall enter energy use data for each metered building that is (or is a part of) a facility that meets the criteria established by the Secretary under paragraph (2)(B) into a building energy use benchmarking system, such as the Energy Star™ Portfolio Manager.

(B) SYSTEM AND GUIDANCE. – Not later than 1 year after the date of enactment of this subsection, the Secretary shall –

Appendix B

(i) select or develop the building energy use benchmarking system required under this paragraph for each type of building; and

(ii) issue guidance for use of the system.

(C) PUBLIC DISCLOSURE. – Each energy manager shall post the information entered into, or generated by, a benchmarking system under this subsection, on the webbased tracking system under paragraph (7)(B). The energy manager shall update such information each year, and shall include in such reporting previous years' information to allow changes in building performance to be tracked over time.

(9) FEDERAL AGENCY SCORECARDS. –

(A) IN GENERAL. – The Director of the Office of Management and Budget shall issue semiannual scorecards for energy management activities carried out by each Federal agency that includes –

(i) summaries of the status of implementing the various requirements of the agency and its energy managers under this subsection; and

(ii) any other means of measuring performance that the Director considers appropriate.

(B) AVAILABILITY. – The Director shall make the scorecards required under this paragraph available to Congress, other Federal agencies, and the public through the Internet.

(10) FUNDING AND IMPLEMENTATION. –

(A) AUTHORIZATION OF APPROPRIATIONS. – There are authorized to be appropriated such sums as are necessary to carry out this subsection.

(B) FUNDING OPTIONS. –

(i) IN GENERAL. – To carry out this subsection, a Federal agency may use any combination of –

(I) appropriated funds made available under subparagraph (A); and

(II) private financing otherwise authorized under Federal law, including financing available through energy savings performance contracts or utility energy service contracts.

(ii) COMBINED FUNDING FOR SAME MEASURE. – A Federal agency may use any combination of appropriated funds and private financing described in clause (i) to carry out the same measure under this subsection.

(C) IMPLEMENTATION. – Each Federal agency may implement the requirements under this subsection itself or may contract out performance of some or all of the requirements.

(11) RULE OF CONSTRUCTION. – This subsection shall not be construed to require or to obviate any contractor savings guarantees.

SEC. 501. Capitol Complex Photovoltaic Roof Feasibility Studies

(a) STUDIES – The Architect of the Capitol may conduct feasibility studies regarding construction of photovoltaic roofs for the Rayburn House Office Building and the Hart Senate Office Building.

(b) REPORT – Not later than 6 months after the date of enactment of this Act, the Architect of the Capitol shall transmit to the Committee on Transportation

Appendix B

and Infrastructure of the House of Representatives and the Committee on Rules and Administration of the Senate, a report on the results of the feasibility studies and recommendations regarding construction of photovoltaic roofs for the buildings referred to in subsection (a).

(c) AUTHORIZATION OF APPROPRIATIONS – There is authorized to be appropriated to carry out this section $500,000.

SEC. 502. Capitol Complex E–85 Refueling Station

(a) CONSTRUCTION – The Architect of the Capitol may construct a tank and pumping system for E–85 fuel at or within close proximity to the Capitol Grounds Fuel Station.

(b) USE – The E–85 fuel tank and pumping system shall be available for use by all legislative branch vehicles capable of operating with E–85 fuel, subject to such other legislative branch agencies reimbursing the Architect of the Capitol for the costs of E–85 fuel used by such other legislative branch vehicles.

(c) AUTHORIZATION OF APPROPRIATIONS – There is authorized to be appropriated to carry out this section $640,000 for fiscal year 2008.

SEC. 503. Energy and Environmental Measures in Capitol Complex Master Plan.

(a) IN GENERAL – To the maximum extent practicable, the Architect of the Capitol shall include energy efficiency and conservation measures, greenhouse gas emission reduction measures, and other appropriate environmental measures in the Capitol Complex Master Plan.

(b) REPORT – Not later than 6 months after the date of enactment of this Act, the Architect of the Capitol shall submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Rules and Administration of the Senate, a report on the energy efficiency and conservation measures, greenhouse gas emission reduction measures, and other appropriate environmental measures included in the Capitol Complex Master Plan pursuant to subsection (a).

SEC. 504. Promoting Maximum Efficiency in Operation Of Capitol Power Plant.

(a) STEAM BOILERS –

(1) IN GENERAL – The Architect of the Capitol shall take such steps as may be necessary to operate the steam boilers at the Capitol Power Plant in the most energy efficient manner possible to minimize carbon emissions and operating costs, including adjusting steam pressures and adjusting the operation of the boilers to take into account variations in demand, including seasonality, for the use of the system.

(2) EFFECTIVE DATE – The Architect shall implement the steps required under paragraph (1) not later than 30 days after the date of the enactment of this Act.

(b) CHILLER PLANT –

(1) IN GENERAL – The Architect of the Capitol shall take such steps as may be necessary to operate the chiller plant at the Capitol Power Plant in the most energy efficient manner possible to minimize carbon emissions and operating costs, including adjusting water temperatures and adjusting the operation of the chillers to take into account variations in demand, including seasonality, for the use of the system.

Appendix B

(2) EFFECTIVE DATE – The Architect shall implement the steps required under paragraph (1) not later than 30 days after the date of the enactment of this Act.

(c) METERS – Not later than 90 days after the date of the enactment of this Act, the Architect of the Capitol shall evaluate the accuracy of the meters in use at the Capitol Power Plant and correct them as necessary.

(d) REPORT ON IMPLEMENTATION – Not later than 180 days after the date of the enactment of this Act, the Architect of the Capitol shall complete the implementation of the requirements of this section and submit a report describing the actions taken and the energy efficiencies achieved to the Committee on Transportation and Infrastructure of the House of Representatives, the Committee on Commerce, Science, and Transportation of the Senate, the Committee on House Administration of the House of Representatives, and the Committee on Rules and Administration of the Senate.

SEC. 505. Capitol Power Plant Carbon Dioxide Emissions Feasibility Study and Demonstration Projects.

The first section of the Act of March 4, 1911 (2 U.S.C. 2162; 36 Stat. 1414, chapter 285) is amended in the seventh undesignated paragraph (relating to the Capitol Power Plant) under the heading "Public Buildings", under the heading "Under the Department of Interior" –

(1) by striking "ninety thousand dollars:" and inserting $90,000.", and

(2) by striking "Provided, That hereafter the" and all that follows through the end of the proviso and inserting the following:

(a) DESIGNATION – The heating, lighting, and power plant constructed under the terms of the Act approved

April 28, 1904 (33 Stat. 479, chapter 1762) shall be known as the 'Capitol Power Plant'.

(b) DEFINITION – In this section, the term 'carbon dioxide energy efficiency' means the quantity of electricity used to power equipment for carbon dioxide capture and storage or use.

(c) FEASIBILITY STUDY – The Architect of the Capitol shall conduct a feasibility study evaluating the available methods to capture, store, and use carbon dioxide emitted from the Capitol Power Plant as a result of burning fossil fuels. In carrying out the feasibility study, the Architect of the Capitol is encouraged to consult with individuals with expertise in carbon capture and storage or use, including experts with the Environmental Protection Agency, Department of Energy, academic institutions, non-profit organizations, and industry, as appropriate. The study shall consider –

(1) the availability of technologies to capture and store or use Capitol Power Plant carbon dioxide emissions,

(2) strategies to conserve energy and reduce carbon dioxide emissions at the Capitol Power Plant, and

(3) other factors as determined by the Architect of the Capitol.

(d) DEMONSTRATION PROJECTS –

(1) IN GENERAL – If the feasibility study determines that a demonstration project to capture and store or use Capitol Power Plant carbon dioxide emissions is

Appendix B

technologically feasible and economically justified (including direct and indirect economic and environmental benefits), the Architect of the Capitol may conduct 1 or more demonstration projects to capture and store or use carbon dioxide emitted from the Capitol Power Plant as a result of burning fossil fuels.

(2) FACTORS FOR CONSIDERATION – In carrying out such demonstration projects, the Architect of the Capitol shall consider –

(A) the amount of Capitol Power Plant carbon dioxide emissions to be captured and stored or used,

(B) whether the proposed project is able to reduce air pollutants other than carbon dioxide,

(C) the carbon dioxide energy efficiency of the proposed project,

(D) whether the proposed project is able to use carbon dioxide emissions,

(E) whether the proposed project could be expanded to significantly increase the amount of Capitol Power Plant carbon dioxide emissions to be captured and stored or used,

(F) the potential environmental, energy, and educational benefits of demonstrating the capture and storage or use of carbon dioxide at the U.S. Capitol, and

(G) other factors as determined by the Architect of the Capitol.

(3) TERMS AND CONDITIONS – A demonstration project funded under this section shall be subject to such terms and conditions as the Architect of the Capitol may prescribe.

(e) AUTHORIZATION OF APPROPRIATIONS – There is authorized to be appropriated to carry out the feasibility study and demonstration project $3,000,000. Such sums shall remain available until expended.

Appendix C

Resource Conservation Policy Statement

UNITED STATES GOVERNMENT
MEMORANDUM

ARCHITECT OF THE CAPITOL
WASHINGTON, DC 20515

Office of the Architect of the Capitol
SB-15, 8-1793

DATE: September 8, 2009

TO: Senior Leadership Team; Assistant Architect; Superintendents; Director, Utilities and Power Plant Operations; Director, Office of Security Programs; Facilities Manager, Supreme Court of the United States; Executive Director, U.S. Botanic Garden; and Division Directors

FROM: Stephen T. Ayers, AIA, LEED AP
Acting Architect of the Capitol

SUBJECT: Resource Conservation Policy Statement

I am pleased to provide you with the attached Resource Conservation Policy Statement. The attached document demonstrates AOC's commitment to reducing our use of natural resources as we serve Congress. This document has been developed to include feedback received from AOC jurisdiction management to ensure AOC's resource conservation program will meet the needs of AOC and our clients.

Please contact Mr. James Styers of the AOC Environmental Branch at 6-6636 or via email at jstyers@aoc.gov if you have any questions.

Doc. No. 090325-03-01

Appendix C

Washington, DC 20515

ARCHITECT OF THE CAPITOL
RESOURCE CONSERVATION POLICY STATEMENT

The Architect of the Capitol is fully committed to good stewardship through sustainable business practices while accomplishing our mission of preserving, maintaining, and enhancing the national treasures entrusted to our care. For our resource conservation program to be effective, each of us must play an active role. The following initiatives will ensure our success:

- Reduced Consumption of Resources: Organizational projects shall strive to reduce our impact on the environment by reducing the consumption of energy, water, and materials through use of sustainable building design and construction principles. Organizations shall purchase or lease office, automobile, and any other equipment that is energy efficient and otherwise minimizes the use of resources. Facility operating practices shall be optimized to reduce the consumption of energy, water, and materials.

- Use of Environmentally Preferable Products: Organizations shall use procurement practices to obtain environmentally preferable products (products that reduce consumption of resources and the volume and toxicity of wastes) when they are reasonably priced, meet specifications, and can be attained in time to fulfill the demand. Consumable materials containing recycled content shall be utilized when practicable.

- Source Reduction and Recycling: Organizations shall support pollution prevention activities and reduce the amount of waste at the source. Hazardous material inventory management practices shall be instituted to prevent ordering these materials in excess of the quantity necessary for immediate use. Wastes that cannot be reduced at the source shall be recycled to the maximum extent practicable.

Employees and supervisors shall be provided the necessary training to meet the requirements of this policy, and to convey expectations for resource conservation. Resources shall be made available to assist organizations in procuring environmentally preferable materials.

By promoting sustainability through sound environmental management principles, we will set a positive example for visitors to the U.S. Capitol Complex and to the rest of the nation, while helping to preserve our natural environment for future generations.

Stephen T. Ayers, AIA, LEED AP
Acting Architect of the Capitol

9/3/09
Date

Doc. No. 090325-03-01

Appendix D

FY 2010 Energy Management Data Report

Part 1: Energy/Water Consumption and Cost Data

1-1. EPACT GOAL-SUBJECT BUILDINGS							
Energy Type	**Consumption Units**	**Annual Consumption**	**Annual Cost (Thou. $)**	**Unit Cost ($)**		**Site-Delivered Btu (Billion)**	**Est. Source Btu (Billion)**
Electricity	MWH	0.0	$0.0	$0.00	/kWh	0.0	0.0
Fuel Oil	Thou. Gal.	521.9	$1,336.1	$2.56	/gallon	73.1	72.4
Natural Gas	Thou. Cubic Ft.	1,280,502.9	$16,773.1	$13.10	/Thou Cu Ft	1,318.9	1,318.9
Coal	S. Ton	3,416.0	$169.0	$49.47	/S. Ton	95.6	95.6
Purch. Steam	BBtu	14.8	$606.0	$40.82	/MMBtu	14.8	20.6
Purch. Chilled Water	BBtu	13.9	$497.2	$35.77	/MMBtu	13.9	13.9
Excluded Steam (-)	BBtu	(195.2)	($5,884.8)	$30.15	/MMBtu	(195.2)	(271.3)
Excluded Chilled Water (-)	BBtu	(98.3)	($1,475.0)	$15.00	/MMBtu	(98.3)	(98.3)
Excluded Security (-)	BBtu	(17.1)	($593.1)	$34.64	/MMBtu	(17.1)	(17.1)
Purch. Renew. Electric.	MWH	321,665.7	$39,383.7	$0.12	/kWh	1,097.5	0.0
Purch. Renew. Other	BBtu	0.0	$0.0	$0.00	/MMBtu	0.0	0.0
		Total Costs:	$50,812.2		Total:	2,303.3	1,134.7
FY 2010 Goal Subject Buildings Gross Square Feet (Thousands)		15,094.8			Btu/GSF:	152,586	75,173
Goal Subject Buildings FY 2003 Baseline (Btu/GSF)		172,678			Btu/GSF w/ RE Purchase Credit:	143,431	

Appendix D

1-2. EPACT Goal Excluded Facilities							
Energy Type	**Consumption Units**	**Annual Consumption**	**Annual Cost (Thou. $)**	**Unit Cost ($)**		**Site-Delivered Btu (Billion)**	**Est. Source Btu (Billion)**
Electricity	MWH	0.0	$0.0	$0.00	/kWh	0.0	0.0
Fuel Oil	Thou. Gal.	340.0	$829.6	$2.44	/gallon	47.6	47.2
Natural Gas	Thou. Cubic Ft.	15,654.4	$132.9	$8.49	/Thou Cu Ft	16.1	16.1
Purch. Steam	BBtu	0.0	$0.0	$0.00	/MMBtu	0.0	0.0
Purch. Chilled Water	BBtu	0.0	$0.0	$0.00	/MMBtu	0.0	0.0
Excluded Steam (+)	BBtu	195.2	$5,884.8	$30.15	/MMBtu	195.2	271.3
Excluded Chilled Water (+)	BBtu	98.3	$1,475.0	$15.00	/MMBtu	98.3	98.3
Excluded Security (+)	BBtu	17.1	$593.1	$34.64	/MMBtu	17.1	17.1
Purch. Renew. Electric.	MWH	28,868.1	$2,383.1	$0.08	/kWh	98.5	0.0
Purch. Renew. Other	BBtu	0.0	$0.0	$0.00	/MMBtu	0.0	0.0
		Total Costs:	$11,298.5		Total:	472.9	450.1
FY 2010 Excluded Facilities Gross Square Feet (Thousands)		4,345.0			Btu/GSF	108,833	103,587
Goal Excluded Facilities FY 2003 Baseline (Btu/GSF)		89,836			Btu/GSF w/ RE Purchase Credit:	108,833	

1-3. ALL RENEWABLE ENERGY USE (INCLUDING NON-ELECTRIC) AS A PERCENTAGE OF FACILITY ELECTRICITY USE		
All Renewable Energy Use (Billion Btu)	**Total Facility Electricity Use (Billion Btu)**	**RE as a Percentage of Energy Use**
1,196.0	1,196.0	100.0%

1-4.1 WATER USE INTENSITY AND COST				
Potable Water	**Annual Consumption (Million Gallons)**	**Annual Cost (Thou. $)**	**Facility Gross Square Feet (Thou.)**	**Gallons per Gross Square Foot**
Buildings & Facilities Water Usage	340.4	$3,107.6	14,926.8	22.8
				Percent
Approx. percentage of reported water consumption that is estimated:				0%
Is the FY 2007 Agency water intensity baseline preliminary or final?				Final

Appendix D

Part 2: Energy Efficiency Improvements

2-1. DIRECT AGENCY OBLIGATIONS				
	FY 2010		Projected FY 2011	
	(Million Btu)	(Thou. $)	(Million Btu)	(Thou. $)
Direct obligations for facility energy efficiency improvements, including facility surveys/audits		$1,800.0		$600.0
Estimated annual savings anticipated from obligations	0.0	$0.0	0.0	$0.0

2-2. ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPC)		
	Annual savings (Million Btu)	(number/Thou. $)
Number of ESPC Task/Delivery Orders awarded in fiscal year & annual energy (MMBTU) savings.	300,494.0	2
Investment value of ESPC Task/Delivery Orders awarded in fiscal year.		$52,378.4
Amount privately financed under ESPC Task/Delivery Orders awarded in fiscal year.		$64,202.8
Cumulative guaranteed cost savings of ESPCs awarded in fiscal year relative to the baseline spending.		$141,528.4
Total contract award value of ESPCs awarded in fiscal year (sum of contractor payments for debt repayment, M&V, and other negotiated performance period services).		$141,013.5
Total payments made to all ESPC contractors in fiscal year.		**$0**

Appendix E

FY 2010 Energy Management Performance Summary

Goal Performance				
Energy Management Requirement	**FY 2003 Btu/GSF**	**FY 2010 Btu/GSF**	**Percent Change FYs 2003-2010**	**FY 2010 Goal Target**
Reduction in energy intensity in facilities subject to the EPACT goals	172,678	143,431	-17.0%	-15.0%
Renewable Energy Requirement*	**Renewable Electricity Use (MWH)**	**Total Electricity Use (MWH)**	**Percentage**	**FY 2009 Goal Target**
Eligible renewable electricity use as a percentage of total electricity use	348,533.7	348,533.7	100.0%	
Water Intensity Reduction Goal*	**FY 2003 Gallon/GSF**	**FY 2010 Gallon/GSF**	**Percent Change FYs 2003-2010**	
Reduction in potable water consumption intensity	27.2	22.8	-16.2%	
Metering of Electricity Use	**Cumulative # of Buildings Metered**	**Cumulative % of Electricity Metered**	**Cumulative % of Buildings Metered**	**FY 2012 Goal Target**
Standard Electricity Meters in FY 2010	45	100.0%	100.0%	100%
Advanced Electricity Meters in FY 2010	0	0.0%	0.0%	Maximum Extent Practicable
Total Electricity Meters in FY 2010	45	100.0%	100.0%	
Federal Building Energy Efficiency Standards			**Percent of New Building Designs**	**FY 2007 forward Goal Target**
Percent of new building designs started since beginning of FY 2007 that are 30 percent more energy efficient than relevant code, where life-cycle cost effective:			0%	100%

Investments in Energy and Water Management		
Sources of Investment	**Investment Value (Thou. $)**	**Anticipated Annual Savings (Million Btu)**
Direct obligations for facility energy efficiency improvements	$1,800.0	0.0
Investment value of ESPC Task/Delivery Orders awarded in fiscal year	$52,378.4	300,494.0
Investment value of UESC Task/Delivery Orders awarded in fiscal year	$0.0	0.0
Total	$54,178.4	300,494.0
		Percentage
Total investment as a percentage of total facility energy costs		88%
Financed (ESPC/UESC) investment as a percentage of total facility energy costs		104.3%

* The Architect of the Capitol does not have a Legislative mandated goal for water reduction.

Appendix F

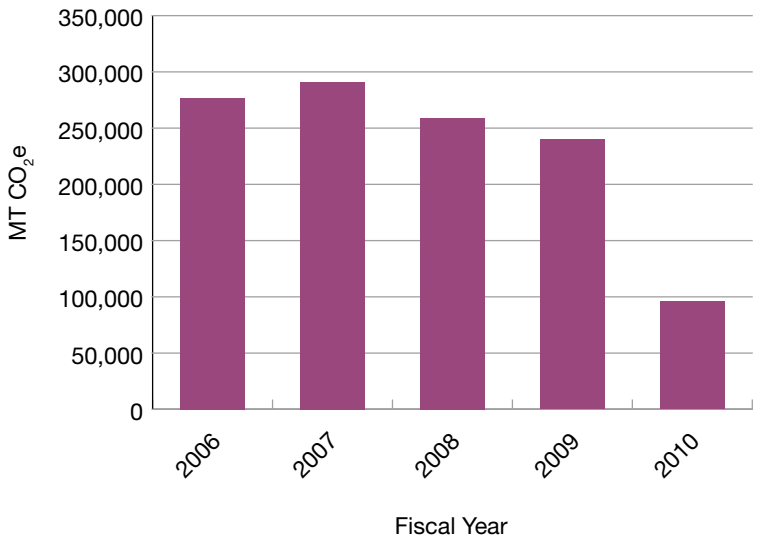
FY 2010 Carbon Emissions Report Summary

In 2007 the Government Accounting Office (GAO) released a report entitled "Energy Audits Are Key to Strategy for Reducing Greenhouse Gas Emissions." This report included a carbon footprint calculation of emissions for the Legislative Branch Offices for Fiscal Year (FY) 2006. Since that time, the Architect of the Capitol has continued to track the carbon footprint, for AOC maintained facilities, on an annual basis. A summary of greenhouse gas emissions, in metric tons of carbon dioxide equivalents (MT CO2e) is found in the table and chart below.

Table 1 - Greenhouse Gas Emissions by Fiscal Year

Fiscal Year	MT CO2e
2006	277,000
2007	291,000
2008	259,000
2009	240,000
2010	96,000

Chart 1 – Greenhouse Gas Emissions by Fiscal Year



Appendix F

Table 2, which breaks down the FY 2010 greenhouse gas emissions by source, is found below. The values shown include both goal-subject and goal-excluded facilities.

Table 2 - Capitol Carbon Footprint Summary	
(in Metric Tons of Carbon Dioxide Equivalents)	**FY 2010**
Direct Emissions (Scope 1)	
Combustion of coal in the Capitol Power Plant	9,045
Combustion of oil in the Capitol Power Plant	5,377
Combustion of natural gas in the Capitol Power Plant	69,645
Refrigerant Equipment Leakage	1,854
Consumption of purchased natural gas (13 accounts)	2,291
Consumption of oil at the NAVCC	3,503
Consumption of diesel fuel for 30 emergency generators	309
Gasoline use by the AOC (E Street Garage & BG@ Blue Plains)	450
Indirect Emissions (Scope 2)	
Consumption of purchased electricity (49 accounts)	0
Consumption of purchased renewable electricity	349
Consumption of purchased chilled water (for Ford HOB)	2,044
Consumption of purchased steam (for Ford HOB)	1,125
Total (in Metric Tons of Carbon Dioxide Equivalents)	**95,992**

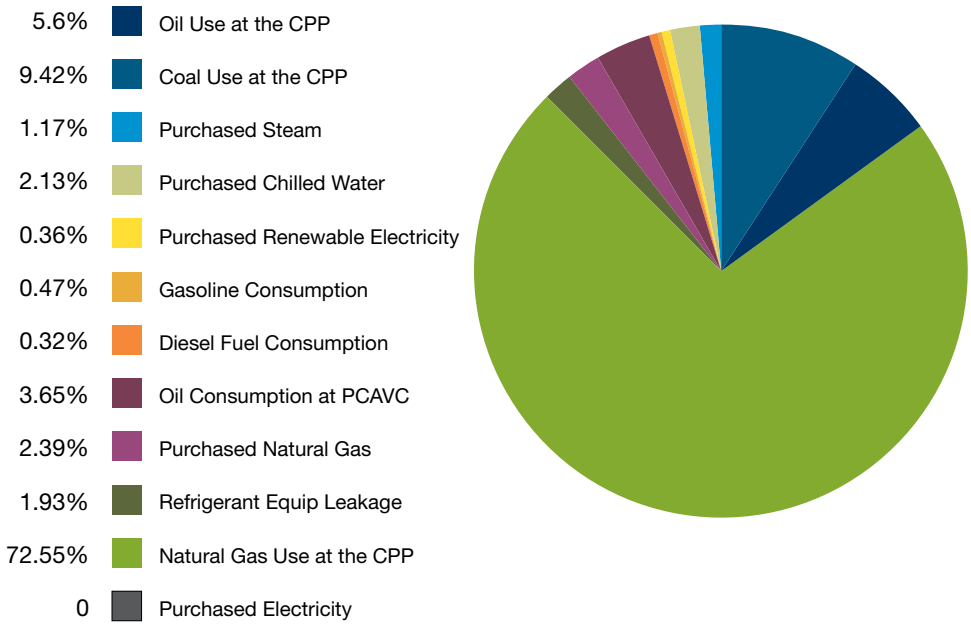
Direct emissions 96 percent (Scope 1 Emissions) are those generated directly by Architect of the Capitol maintained facilities. The combustion of fuels at the Capitol Power Plant (CPP) is the leading Scope 1 contributor. Indirect emissions (Scope 2) are those generated by others, such as emissions created when generating electricity consumed by Architect of the Capitol facilities. Induced emissions (Scope 3) include those generated by employees driving to and from work. Scope 3 emissions are not included in this report.

The Capitol Complex has reduced its greenhouse gas emissions by 67 percent over the last three years. This reduction in the carbon footprint has primarily been due to a decrease in the use of coal at the CPP and the purchase of renewable energy credits. Since 2007, renewable electricity credits have been purchased to offset emissions from the generation of electricity consumed in the Capitol Complex. The emission values, presented in Table 2 above, are also illustrated in Pie Chart 2 on page 112.

Appendix F

In FY 2006 electricity, generated by conventional methods, comprised 60 percent of the Architect of the Capitol's 290,000 metric tons of gas emissions. In FY 2010 renewable energy, mostly from wind turbines, generated 100 percent of the electricity consumed by the Capitol Complex, reducing the electricity portion of the carbon footprint to less than 1 percent. Future reductions in greenhouse gas emissions can be provided by reductions in energy consumption.

Chart 2 – AOC Carbon Footprint Breakdown for FY 2010



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