

# **Tennessee Valley Authority Annual Report on Energy Management FY 2005**

(Including Department of Energy  
Reporting Guidance and Outline)

John E. Long, TVA Senior Energy Official  
Stephen L. Brothers, Manager, TVA Internal Energy Management Program (IEMP)

## OUTLINE AND INSTRUCTIONS FOR THE ANNUAL REPORT

- I. Management and Administration.** This section will describe (1) the agency's establishment of an energy management infrastructure and (2) the agency's use of management tools to implement Executive Order 13123.

### **A. Energy Management Infrastructure**

- 1. Senior Agency Official.** Identify the agency's senior energy official and describe the official's role and responsibilities.

**John E. Long is the designated Senior Energy Official and Executive Vice President of Administrative Services.**

**Stephen L. Brothers is the designated Chief Energy Manager and manages the TVA Internal Energy Management Program (IEMP) under Administrative Services.**

**David R. Zimmerman is the manager of Sustainable Design under Administrative Services.**

- 2. Agency Energy Team.** Identify the members of the team and describe the team's responsibilities.

**TVA formed the Agency Energy Management Committee (AEMC) to facilitate compliance with federal statutes, Executive Orders, federal regulations, TVA energy and related environmental management objectives, and obligations under the Environmental Protection Agency's (EPA) Green Lights Program (GL), EPA's Energy Star Buildings Program (ESB) and EPA's Energy Star Program (ESP). The AEMC serves as the agency energy team. This committee is comprised of representatives from each TVA organization responsible for energy management and associated environmental considerations in facility and general operations inside the agency. The AEMC provides an avenue for sharing lessons learned and replicating success. The members are:**

- **Stephen L. Brothers, chairperson for the AEMC;**
- **Kathryn E. Ellis, Transportation;**
- **David R. Zimmerman, Sustainable Design;**
- **David W. Stewart, Fossil;**
- **Aaron B. Nix, Facilities Management Environmental;**
- **William R. McNabb, Facilities Management O&M;**
- **Jay T. Grafton, Nuclear;**
- **Teresa S. Wampler, River System Operations and Environment;**
- **David R. Dinse, Research and Technology Applications;**
- **Bryan H. Jones, Information Services;**
- **Jonnie A. Cox, Facilities Management Projects;**
- **David A. Gordon, Heavy Equipment;**
- **Judy G. Driggans, Chief Financial Officer representative;**

- **Barry M. Gore, Power Systems Operations;**
- **V. Edward Hudson, Demand Side Management Program;**
- **Cicely Simpson, Federal Affairs;**
- **David R. Chamberlain, Customer Service and Marketing;**
- **Tina I. Broyles, Power Systems Operations alternate; and**
- **Sherri R. Collins, Office of General Counsel.**

## **B. Management Tools**

1. **Awards (Employee Incentive Programs).** Describe the agency's use of employee incentive programs to reward exceptional performance in implementing Executive Order (E.O.) 13123.

**TVA uses a "Winning Performance" process as a method to reward employees' efforts toward meeting agency goals. Examples of pay for performance goals include reduction in cost per square foot for building operations. Energy efficiency and sustainable improvements are contributors to reduced cost per square foot goals.**

2. **Performance Evaluations.** Describe agency efforts to include successful implementation of provisions of E.O. 13123 in the position descriptions and performance evaluations of senior energy officials, members of the agency energy team, heads of field offices, and facility/energy managers.

**To the extent to which employees are responsible for activities that are related to the objectives of E.O. 13123, their job descriptions contain reflective line items and their performance is evaluated in terms of the level to which they accomplish such goals.**

3. **Training and Education.** Describe activities undertaken to ensure that all appropriate personnel receive training for energy management requirements. (Note: The number of employees trained will be reported on the agency's Data Report and Energy Scorecard. Expenditures on training will also be reported on the Data Report). Describe agency outreach programs that include education, training, and promotion of ENERGY STAR<sup>®</sup> and other energy efficient and low standby power products for Federal purchase card users.

**TVA utilizes various methods of training to educate employees on the objectives of the IEMP which includes energy management requirements. Staff is educated on energy and environmental related topics through the TVA Employee Technical Training and Organizational Effectiveness (ETT&OE) group. The TVA Intranet and employee awareness programs are also used as tools to educate employees on how they impact energy use and efficiency both at work and home. Energy efficiency and information updates are provided on current federal requirements and regulations to employees, managers, and TVA customers upon request. Energy management and associated environmental training is provided to managers and employees as needed.**

4. **Showcase Facilities.** Highlight exemplary new or existing facilities that the agency has designated Showcase Facilities in FY 2005. Describe why the facilities are considered Showcase Facilities (i.e., discuss the facility design, the improvements made in energy or water efficiency, the use of renewable energy, etc.).

**The TVA Chattanooga Office Complex (COC) continued to be TVA's designated Showcase Facility for FY 2005. The COC, completed in 1986, encloses approximately 1.2 million square feet of floor area, and is made up of five interconnected buildings (Signal Place, Lookout Place, Blue Ridge, Missionary Ridge, and Monteagle Place). It integrates the use of passive energy strategies, energy management practices, and environmental programs and activities. Occupants' daily activities have been recognized as a major component in facility performance. Energy and environmental awareness programs have been established to inform the occupants of the impacts their actions have on this performance. The combinations of original design elements, energy and environmental activities, and aggressive energy reduction operation and maintenance efforts have resulted in the COC becoming a model facility.**

**During FY 2005, TVA continued to consolidate space to reduce cost. This resulted in an increase in the occupancy density of the COC. To offset the increased energy demand from this increased density, TVA continues to investigate energy efficiency measures and have implemented measures which include:**

- **Better placement of task lights resulting in reduction of numbers used;**
- **Use of digital lighting controls which can be operated from the users PCs;**
- **Orienting offices to better utilize daylighting over mechanical lighting;**
- **Use of more efficient T5 lighting in place of existing T8 and T12;**
- **Use of more efficient flat panel displays in place of conventional cathode ray tube displays; and**
- **Use of occupancy sensors in individual office spaces.**

## **ENERGY MANAGEMENT AND ASSOCIATED ENVIRONMENTAL EFFORTS**

**The COC performed better than TVA's target for facility design and the FY 2010 building energy reduction goal established in E.O. 13123. The COC's low energy consumption rate supports the reduction of CO<sub>2</sub> and other environmental impacts at the source.**

**Since initial construction, additional energy and environmental improvements have been implemented in the COC. One of these improvements was the design and installation of a chilled and hot water storage system for the COC and Monteagle Place (MP) buildings. The system allows the two buildings, through a symbiotic relationship, to better use site energy and reduce the need for source energy.**

### **COC Original Design Features:**

- VAV air handlers with full economizer capabilities;
- Energy Management and Control System (HVAC, Lighting, Fire);
- Heat recovery from MP chillers;
- Approximately 30 footcandles of ambient lighting supplemented with daylighting and task lighting;
- Renewable energy attributes such as daylighting; and
- Thermal storage through structural and fluid mass.

### **Additional Improvements:**

- Chilled water crossover piping allows the COC and adjacent facility to share chilled water and run the most efficient mix of chillers;
- Water fountains are heated and cooled through heat exchangers to better manage temperature and humidity in the building;
- Motion sensors and timers have been installed in the COC (i.e., conference rooms, restrooms, enclosed offices, closets, etc.);
- LED exit lights have been installed;
- Energy efficient lighting has been added;
- COC storage tanks are used for chilled and hot water storage (3 x 19,000 gallons);
- Heat exchangers and chilled water were used to cool the secondary water loop allowing the abandonment of rooftop evaporative coolers and associated fans, motors, and sump heaters;
- Equipment (i.e., fixtures, motors, ballasts, chillers etc.) was upgraded to energy efficient models as failures occurred;
- Variable Frequency Drives (VFDs) and energy efficient motors have been installed on all large air-handling units;
- The energy management system has been upgraded to be more user friendly;
- Chiller efficiencies have been evaluated so the most energy efficient mix of chillers can be run for operating conditions;
- Upgrading to more energy efficient equipment is evaluated during modifications (fixtures with T-8 lamps and electronic ballasts, etc.);
- Energy efficient motors are installed where applicable;
- During purchase of replacement parts, energy efficient and environmentally friendly materials were ordered and stocked;
- Chillers have been retrofitted to accept non-CFC refrigerant;
- Energy Star equipment was installed where applicable; and
- Building entry air locks with automated doors have been installed to reduce the infiltration of outside air.

## **ENVIRONMENTAL PROGRAMS AND ACTIVITIES**

**TVA demonstrates a commitment to environmental stewardship through the implementation of its environmental programs and activities at the COC. Examples of these efforts include, but are not limited to, toxic reduction, affirmative procurement, waste minimization, and recycling.**

**Toxic Reduction:**

TVA continues its efforts to reduce the amount of toxic chemicals used in its operation and maintenance activities for the building. The volume of toxic chemicals purchased in corporate office buildings has been reduced by over ninety percent since 1995. The COC is the largest single contributor to this effort.

**Affirmative Procurement:**

TVA reduces environmental impacts at the COC and other facilities through affirmative procurement of materials with recycled content. In FY 2005, TVA supported its Corporation-wide Affirmative Procurement Policy through the implementation of the revised Agency Affirmative Procurement Plan. During FY 2005, TVA purchased \$5.54 million of materials meeting guidelines established under the Resource Conservation and Recovery Act (RCRA) out of \$10.1 million (fifty five percent), and \$48.17 million of other recycled content materials.

**Waste Minimization and Recycling Programs:**

TVA is a Federal Charter Partner in the EPA “WasteWise Program.” Through this program, TVA has made a commitment to achieve results in three areas:

- 1) Waste prevention;
- 2) Collection of recyclables; and
- 3) Use of recycled materials.

This aligns with TVA’s mission of stimulating economic growth by protecting the Tennessee Valley’s natural resources and building partnerships for the public good. TVA has established the Solid Waste Leverage Team and a Solid & Hazardous Waste Regulatory Policy Team to support the “WasteWise Program.”

During FY 2005, TVA generated 23,705 tons of solid waste which includes corporate facilities such as the COC. TVA partners with a nonprofit organization which trains and develops work skills in mentally and physically challenged clients. These clients, in conjunction with their respective organizations, collect, sort, and market the recycled material from the COC. In addition to the typical office waste recycling, TVA continues its efforts in recycling fluorescent light tubes, oil, scrap metals, building materials, wood waste, and ballasts. TVA also utilizes a redeployment program which collects and redeploys used equipment and materials. During FY 2005, TVA deployed 12,512 tons of material and equipment through scrap contracts, auctions and sales, and donations.

Sustainable carpet is used throughout the COC. This carpet contains and uses high performance backing made from one hundred percent recycled content. TVA has an agreement with the carpet manufacturer to recycle carpet removed from the COC, which has kept used TVA facility carpet out of the landfill while saving an equivalent amount in raw materials.

5. **Other Energy and Related Environmental Initiatives:** Highlight new or existing energy and related environmental initiatives that the agency has accomplished in FY 2005. Provide a brief description of these initiatives.

## **INDUSTRIAL INITIATIVES**

**TVA provides end use technical assistance to their direct-served and distributor-served industrial and institutional customers. TVA works with these clients to help them identify and solve problems related to their use of energy in areas such as: manufacturing processes; environmental issues; and plant operations. The targeted segments, such as the automotive, machinery, forest products and food processing industries, as well as local water and wastewater treatment systems, are selected because of the large presence of such industries in the TVA service area, their high energy usage, or the availability of solutions for their existing problems. The TVA industrial marketing managers rely primarily on in-house expertise, but sometimes bring in consultants to assist these industrial clients.**

**The following are two examples of TVA energy assistance to industrial customers:**

1. **TVA representatives developed and co-chaired an in-house energy conservation team to identify and implement energy cost savings opportunities at the GM Spring Hill (Saturn) automobile assembly plant. The team achieved savings in excess of \$2 million in FY 2004 and over \$7 million since the beginning of the initiative six years ago. This includes electricity savings of over 44 million kWh in FY 2005.**
2. **Additionally in FY 2005, TVA's plant optimizations studies in the plastics products manufacturing and wastewater treatment sectors resulted in identifying and implementing energy conservation opportunities in excess of 1.4 million kWh per year.**

## **COMMERCIAL INITIATIVES**

**TVA works with Tennessee Valley commercial and institutional customers to provide solutions to their energy-related problems and to encourage the selection of energy efficient equipment. For example, TVA is working with schools, governments, offices, retail, healthcare, and other commercial segments to provide information on the various energy options available to them. As part of that effort, TVA provides feasibility studies conducted by independent private sector professional engineers to compare different types of systems on a life-cycle-cost basis. Also, if the customer is interested in closed loop geothermal heat pumps, TVA will provide test bores and thermal conductivity tests at the proposed project site to assist with the design of the ground heat exchanger. Furthermore, TVA sponsors continuing education for Tennessee Valley architects and engineers on the proper design and application of geothermal heat pumps. In the TVA service area, there are approximately 252 geothermal systems installed or in design as the result of TVA's promotion of this energy efficient technology.**

Demand for TVA assistance to commercial customers on energy-related problems continues to grow.

## ENERGY SERVICES COMPANY (ESCO)

Since 1997, TVA's Energy Services Company has worked with customers to achieve 28,390,000 kWh of energy efficiency savings and 13.5 MW of cumulative peak demand reduction through performance contracting projects. More than \$42 million in improvements have been made at four military installations in the Valley; at one base the energy savings now exceed \$1 million per year. Under these performance contracts, the equipment cost is funded through the resulting savings on the energy bills.

## RESIDENTIAL INITIATIVES

TVA and its 158 public power distributors have a long history of residential energy-efficiency programs for the Valley. These programs are marketed under the brand name *energy right*<sup>®</sup>.

About 150 distributors participate in the various initiatives from the *energy right*<sup>®</sup> Program. These initiatives are described below:

*New Homes Plan* promotes all-electric, energy-efficient new homes. All homes built *energy right*<sup>®</sup> must meet a minimum rating in overall energy efficiency. Homes built at least 15 percent better than the minimum rating qualify as *energy right*<sup>®</sup> Gold while those built 30 percent better qualify as *energy right*<sup>®</sup> Platinum. During the summer of 2005, TVA began an ENERGY STAR certification promotion. To date, one hundred fifty six homes have been certified through 20 participating distributors.

*Heat Pump Plan* promotes the installation of high efficiency heat pumps greater than 12 Seasonal Energy Efficiency Rating (SEER) in homes and small businesses. Installation, performance, and weatherization standards have been established to ensure the comfort of the customer and the proper operation of the system. A Quality Contractor Network has been established for maintaining high installation standards. Through a third-party lender, TVA provides ten year financing for residential heat pumps with repayment through the consumer's electric bill.

*Water Heater Plan* promotes the installation of energy-efficient electric water heaters in homes and small businesses.

*New Manufactured Homes Plan* promotes the installation of high efficiency heat pumps in new manufactured homes.

*In Concert With The Environment* (in partnership with Nexus Energy Software) is a comprehensive environmental and energy education program directed to middle school and junior high school students. Student participants receive an energy survey to complete for their households. Results from the survey indicate the home's estimated annual and monthly energy usage by appliance and gives a number of energy, environmental and water recommendations for the student and their family to implement.

*energy right Home e-valuation*<sup>®</sup> (in partnership with Nexus Energy Software) allows residential customers to play an active role in saving energy in their homes. After completing an energy survey, customers receive a personalized report that breaks down the home's annual and monthly energy usage by appliance, and gives a number of energy recommendations as well as information about distributor products and services.

*Energy Depot for Homes* (in partnership with Enercom) is a web-based home energy audit for residential customers to complete interactively. Customers complete the survey and receive a detailed analysis of their energy use based on their answers and local electric and average gas rates.

*Energy Depot for Business* (in partnership with Enercom) is a web-based home energy audit for small business customers to complete interactively via the Web. Customers complete the survey and receive a detailed analysis of their energy use based on their answers and local electric and average gas rates.

*Energy Depot for Homes Comparison Tool* (in partnership with Enercom) provides residential customers with a way to compare energy use, costs, potential savings and paybacks for replacing existing heating and air conditioning systems, water heating and lighting.

More information is available at the *energy right*<sup>®</sup> website ([www.energyright.com](http://www.energyright.com))

These industrial, commercial, ESCO, and residential programs accounted for an estimated 45.4 MW of demand reduction in FY 2005.

## **DIRECT LOAD CONTROL (DLC)**

TVA and 13 of its power distributors are involved in a Direct Load Control program. This program involves power distributors installing radio controlled switches on their customers' air-conditioners and water heaters. During peak demand periods, TVA is allowed to curtail the power to this equipment. The power distributors receive a bill credit from TVA for each operable switch. The participating power distributors are allowed to determine the type of incentive given to their customers. Currently, TVA can curtail approximately 30 MW of load upon demand.

## **GREEN POWER SWITCH<sup>®</sup> (GPS)**

TVA and 12 public power companies launched GPS on Earth Day, April 22, 2000. GPS was the first program of its kind offered in the Southeast and provided consumers with an economical opportunity to participate in TVA's development of renewable energy resources. The program originally included supply from wind and solar energy sources. The program was expanded in FY 2001 to include electricity generated from a waste water treatment plant in Memphis, Tennessee. (For more details see Section II Energy Efficiency Performance, subsection B. Renewable Energy).

**The Generation Partners program supports GPS by providing additional green power supply to the Valley. The program provides support and incentives for homeowners and small businesses to install solar and wind generation. TVA will purchase 100 percent of the green power output at a rate of 15 cents per kWh.**

## **RESEARCH AND TECHNOLOGY APPLICATIONS**

**In support of TVA's efforts to continually improve its operations, Research and Technology Applications (R&TA) provides scientific and technological solutions to problems in the areas of generation, transmission and environmental compliance and evaluates emerging technologies that could benefit TVA and its customers in the future. TVA also works with partners in industry and academia to help bring technologies to the marketplace for the benefit of TVA's operations and its customers. Efforts in these areas are included in this report.**

**R&TA promotes sustainability by partnering with TVA Facilities Management to test and showcase sustainable technologies.**

**R&TA helps TVA fulfill its commitment to provide competitively-priced and reliable power while promoting environmental stewardship and economic development. R&TA works to help develop, demonstrate, and deploy new energy-related technologies for a better tomorrow.**

## **R&TA RECENT HIGHLIGHTS/ACCOMPLISHMENTS**

**New Technologies Demonstrated – R&TA's Technologies Demonstrated Indicator is a measure of the number of research and development technologies which are demonstrated for the first time at TVA facilities, at customer sites (distributor, directly served, and consumer), and through partnerships and collaborations.**

### **1. Hybrid Solar Lighting:**

**The Hybrid Solar Light (HSL) demonstration addressed key scientific hurdles associated with adaptive, full-spectrum solar energy systems and their associated applications in commercial buildings. Adaptive, full-spectrum solar energy systems represent a new, systems-level approach to solar energy that holds the promise of dramatically improving its end-use efficiency and affordability in two ways. First, it more efficiently uses different portions of the solar spectrum simultaneously for multiple end-use applications such as solar lighting and distributed power generation, e.g., combined solar light and power. Second, it continually optimizes solar energy end-use efficiency by adapting to real-time changes in end-use needs and external factors such as real-time electricity prices, solar availability, and ancillary services. The project goal was to validate the hypothesis that full-spectrum solar energy systems can improve by several-fold the nonrenewable energy displacement efficiency and affordability of solar energy in buildings. The demonstration culminated with the installation of an operational system at the American Museum of Science & Energy in Oak Ridge, Tennessee.**

- 2. Ozonation at Northwest Mississippi Regional Medical Center Laundry:**  
This project demonstrated an ozone system in a major hospital in Tupelo, Mississippi. A full size ozone unit was installed in the hospital's laundry. Benefits documented from the technology included reduced energy costs, reduced drying time, reduced chemical and detergent costs, reduced water and sewer costs, reduced labor and reduced linen replacement costs. Also, ozonation showed no deterioration in biological and biohazard levels when compared to conventional hospital laundry processes.
- 3. Electronic Bill Presentment:**  
National accounts that are served regionally by distributors of TVA power have requested the ability to view and pay bills electronically. Example: Lowe's has 56 locations in 35 distributor service areas and energy payments to our distributors are made from the corporate office. The ability to view and pay these bills electronically would reduce their administrative burden, reduce late fees, and allow them to easily compare energy usages between facilities. This project was an initial effort by TVA to develop such a program that crosses distribution boundaries for this customer class.
- 4. Breakaway Link:**  
A prototype of the electro-mechanical fuse (Breakaway Link) has been designed, manufactured and is being tested/demonstrated by EPRI, TVA and the Tullahoma Board of Public Utilities and Cookeville Electric Department served by TVA. The device limits storm damage to structures and service equipment by acting as a mechanical fuse that allows the connection to be severed both mechanically and electrically before the tension increases enough to damage the structure. It also assures that the service is electrically interrupted prior to complete separation.

### **Other Current Activities:**

- **TVA currently has an intensive green roof installed above the auditorium of the Chattanooga Office Complex, which is an Energy Star Building. Testing of a small green roof is underway at the Edney Building in Chattanooga to validate potential benefits of more extensive green roof systems. The systems used in the demonstration are geared toward the retrofit of existing structures and are designed to provide the storm water mitigation and thermal load leveling benefits to both building owners and communities. The demonstration will be tracked to determine if there is any significant carbon sequestration benefit in addition to energy and storm water benefits;**
- **Completed the installation of a Membrane Energy Recovery Ventilator (MERV) project at the Edney Building in Chattanooga. R&TA and Facilities Management partnered on this project using a TVA facility to demonstrate the new technology. The MERV unit pre-conditions the incoming fresh air to the building by using the exiting exhaust air stream. Monitoring indicated a membrane leakage problem which was corrected by the manufacturer. Project monitoring continues and will be completed in FY 2006;**
- **A project to measure the effect of installing motion sensors in individual work stations to save plug load energy used for task lights, computer monitors, and other in-office devices began in FY 05. Facilities Management will continue work on the project in FY 06. Preliminary results show that the energy use in the work stations has been reduced by around 50 percent;**
- **Completing a 20-year performance evaluation and a survey of passive TVA constructed wetlands technologies for acid drainage treatment;**
- **Working with McMinnville Electric System, TVA conducted test runs using biodiesel in place of petroleum diesel in reciprocating generators. Project includes testing a new NOx removal system. The system shows promise; it has reduced NOx by more than 90 percent;**
- **Received patent for new advanced low temperature power cycle. Plans are to seek partners in getting the new power cycle implemented with new gasification technologies;**
- **Continued a joint DOE, EPRI, and TVA project, the Carbon Capture and Water Emissions Treatment System (CCWESTRS), which will demonstrate integration of fossil power plant operations with terrestrial carbon sequestration technologies;**
- **Evaluating and demonstrating Demand Side Management (DSM) initiatives to prepare for future changes in the energy market place. Demonstrations underway include:**
  - **Net-Zero Energy House Kit**
  - **Smart Thermostat Load Management Demonstration**
  - **Three-Tier Energy Star Energy Efficiency Program**
  - **Renewable Energy and Job Creation in the TVA Region and;**
- **Continuing the “Energy Efficiency Education” market transformation initiative with the State of Tennessee.**

**II. Energy Efficiency Performance.** This section will highlight data calculated for reporting on the Data Report and the Energy Scorecard. The purpose of the section is to provide narrative information in support of these data.

**A. Energy Reduction Performance**

Site-Delivered vs. Source Energy—The factors used for converting the reporting units to Btu have a significant impact on how performance toward the energy efficiency goals and other goals of E.O. 13123 are measured. “Energy use” is defined as the energy that is used at a building or facility and measured in terms of energy delivered to the building or facility. Recognizing this, OMB and DOE will use Btu based on the site conversion factors for both electricity and steam as the primary measure of performance. However, because carbon emissions are generally proportional to source energy use, reductions in source Btu will also be considered more seriously than in the past.

The conversion factor for electricity of 3,412 Btu per kilowatt hour, the rate of consumption by the end-user on site, will be used for measuring performance. The difference between the site conversion rate and the estimated source conversion rate of 11,850 Btu per kilowatt hour is attributable to conversion losses associated with electric generation, as well as losses from transmission and power plant use. The site conversion factor for purchased steam is 1,000 Btu per pound. Generation inefficiencies and distribution losses are included in the source conversion factor of 1,390 Btu per pound.

**TVA’s facility inventory and the type of activities for which these facilities are used continues to evolve as the agency faces new challenges. Facility information is updated through the AEMC. The AEMC remains the focal point for disseminating energy and related environmental information to TVA organizations and employees and implementing TVA’s Energy Plan (see Attachment 8). The AEMC is also responsible for the development of TVA’s Implementation Plan (see Attachment 6). To benchmark success, the AEMC utilizes many tools including the Energy Scorecard (see Attachment 2). The AEMC allows representatives to voice problems in meeting regulations and goals and share success stories which can then be applied throughout TVA. To benchmark success, the AEMC uses many tools including:**

**TVA NEW BUILDING DESIGN**

**TVA is designing new buildings to incorporate sustainable practices and to meet energy efficiency standards. New building designs are incorporating technologies such as daylighting, passive solar heating, geothermal heat pumps, advanced controls and non-toxic, recycle-content building materials.**

**TVA FACILITY IMPROVEMENTS**

**TVA implements various energy efficiency improvements in its facilities. Some examples of typical energy reduction improvements are as follows:**

- **New lighting systems using T-8 lamps, electronic ballasts and motion sensors have been installed in many existing buildings;**
- **New lighting systems using T-5 lamps, electronic ballasts, and varied control systems have been installed in existing buildings;**
- **Incandescent lights have been replaced with compact fluorescents in many facilities;**

- Occupancy sensors are being installed to control lighting and equipment in individual spaces, open offices and personal work stations;
- Old mercury vapor lighting and incandescent lighting was upgraded to metal halide and high pressure sodium lighting at various fossil sites and switch yards;
- Heating, ventilating, air conditioning, and exhaust hood systems have been added to TVA's Energy Management and Control System;
- Energy Management Control Systems have been added to control heat pump heating and cooling systems;
- Variable Frequency Drives have been added to building heating, ventilating, and air conditioning units;
- New high efficiency heat pump systems have been installed in many buildings to replace old window units and out of date package units;
- Existing air handlers have been rebuilt to improve efficiency;
- Existing chillers have been replaced and/or rebuilt to improve efficiency;
- Old, inefficient cooling towers were updated to a high efficiency system on one facility with a reduction in energy use of 33 percent;
- Old inefficient single glazed windows were replaced with double glazed windows;
- Motorized shades were installed to reduce solar heat gain and cooling loads;
- Renovated buildings had insulation installed in the ceiling and walls where applicable; and
- Older emergency generators were replaced with smaller ones which reduces fuel use and cost.

## **OPERATION AND MAINTENANCE ACTIVITIES FOR BUILDINGS**

**TVA continues to improve its energy efficiency and environmental stewardship through operation and maintenance activities. The following is a list of operation and maintenance practices and activities for FY 2005:**

- Recycle scrap metals, used oil, substation and communication station service batteries, and storm damaged or deteriorating steel structures;
- Recycle expired fluorescent lamps;
- Recycle or reuse waste material when feasible;
- Educate employees on energy efficiency;
- Encourage employees to implement energy efficient ideas and practices;
- Turn off equipment when not needed;
- Have custodians turn off building equipment after cleaning;
- Clean lamps, fixtures, and diffusers;
- Use the most efficient lamps available (i.e., screw-in fluorescent, screw-in halogen, screw-in high pressure sodium, energy efficient fluorescent lamps, etc.);
- Reduce lighting levels where light output exceeds requirements for the space;
- Install motion sensors to control lighting in rooms where economical (offices, restrooms, conference rooms, etc.);
- Install light switches or motion sensors in areas not currently controlled;
- Disconnect unnecessary lamps and ballasts;
- Disconnect unnecessary transformers;
- Install energy efficient electronic ballasts;

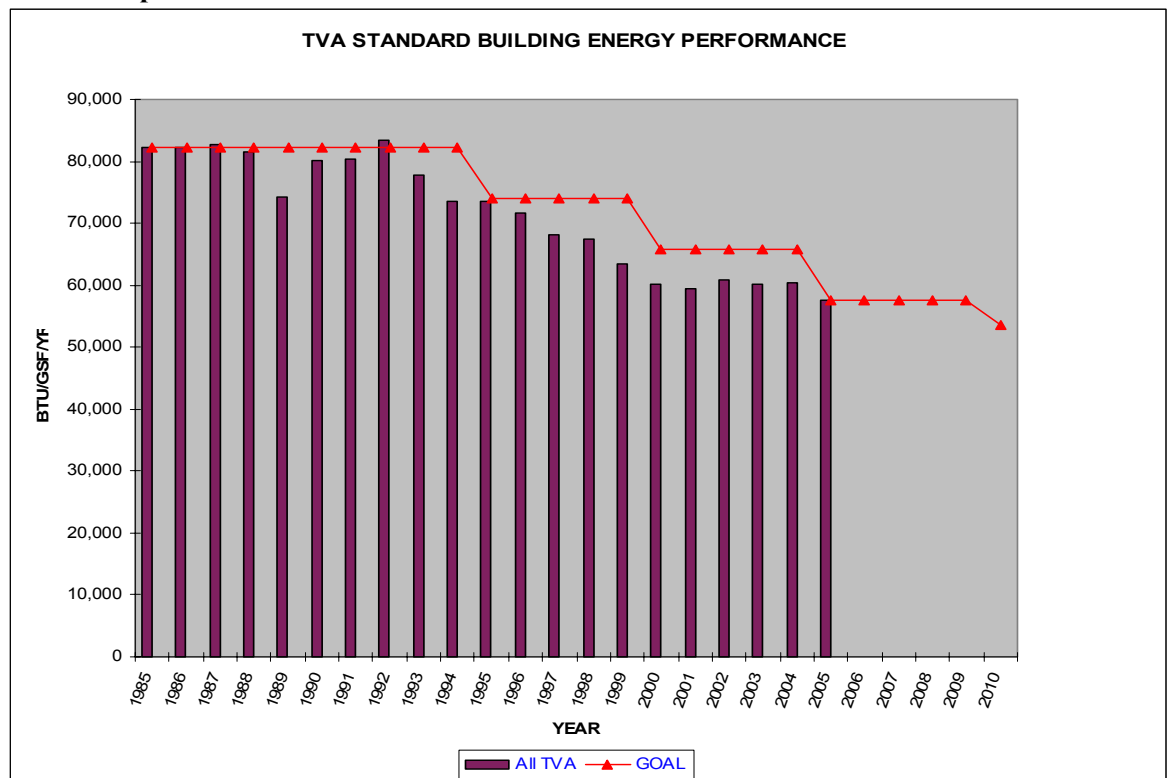
- Perform group relamping;
  - Install photocell control on outdoor lighting;
  - Rewire lamps to permit shutoff of unneeded lights;
  - Minimize the number of ballasts installed (use a four-lamp ballast, for two adjacent two-lamp fixtures);
  - Revise building operating procedures for efficiency and cost;
  - Install programmable thermostats and use the night and weekend setback features to reduce energy use during unoccupied periods;
  - Set thermostats in mechanical rooms and unoccupied areas so the least amount of energy will be used without causing the equipment to deteriorate;
  - Verify and calibrate all controls periodically, including time clocks;
  - Keep all outside doors and windows closed when heating or cooling, using vestibules properly;
  - Keep garage and warehouse doors closed as much as possible while heating or cooling;
  - Replace broken windows;
  - Replace missing insulation;
  - Add caulking where necessary;
  - Replace worn weather-stripping on windows and doors;
  - Reduce the amount of infiltration air where possible but always meet fresh air requirements;
  - Eliminate ventilation during unoccupied hours;
  - Operate exhaust fans only when required;
  - Verify that all outside air dampers are operating properly;
  - Operate HVAC in economizer mode when conditions are favorable;
  - Eliminate ductwork leaks;
  - Reduce ductwork and piping resistance where possible;
  - Avoid heating and cooling at the same time;
  - Change filters as recommended;
  - Clean HVAC coils;
  - Test and balance HVAC systems;
  - Optimize chiller operation;
  - Recycle waste heat when feasible;
  - Lower domestic hot water temperature;
  - Repair hot, chilled, or domestic water leaks;
  - Cut off nonessential gas to buildings during the summer;
  - When replacing motors, use properly sized energy efficient motors;
  - Balance three-phase loads;
  - Use cog-type belts for higher efficiency;
  - Eliminate steam trap leaks; and
  - Properly insulate hot water and steam lines to reduce energy loss.
1. **Standard Buildings:** Report energy use for standard buildings in units of Btu-per-gross-square-foot (Btu/GSF) for FY 1985 (the base year) and FY 2005. Report the percent change from FY 1985 and from the FY 2004. (Note: This information will be reported on the agency's Energy Scorecard). Discuss any extenuating factors that may be skewing the accuracy of this performance measure.

**Leased Space**—Each agency that controls its Federally-owned building space or directly pays the utilities in its leased space will report to DOE the agency’s aggregate energy consumption for various fuel types (see Data Report instructions). Reporting on leased buildings may pose some difficulty depending on the nature of the lease (partially serviced, fully serviced). In cases where an agency is responsible for paying utility bills for space that is leased, the agency is expected to report energy consumption for the leased space to DOE. If an agency is leasing from the General Services Administration, GSA is responsible for reporting.

**Delegated Space**—Agencies that have been delegated responsibility by GSA for operation and maintenance of buildings they occupy are required to report, to DOE, energy consumption for these buildings during the years the buildings are under their control. An agency should *not* adjust the FY 1985 baseline to reflect the addition of buildings delegated by GSA if those buildings were not under the agency’s control during the base year period. The FY 1985 consumption and square footage of any building delegated after FY 1985 is included in GSA’s FY 1985 baseline. To also include this square footage and consumption in the agency’s baseline would result in double reporting. The impact of delegation activity on the Btu/GSF rates of most agencies should be minimal. In cases where building delegations account for a large increase in the percentage of an agency’s building inventory and its Btu/GSF is greatly impacted, this situation will be documented in the text of DOE’s Annual Report to Congress.

**Lack of Base Year Data**—Comparisons to a FY 1985 base year will not be possible for agencies that had no buildings under their control during the base year. Where comparisons to the FY 1985 base year are not possible, that specific item in the data table will be footnoted as “not applicable” in the report. In order to maintain accurate data and comply with the legislation, FEMP will work with relevant agencies to determine alternative approaches that would minimize double counting, but provide comparative information on Btu/GSF consumption.

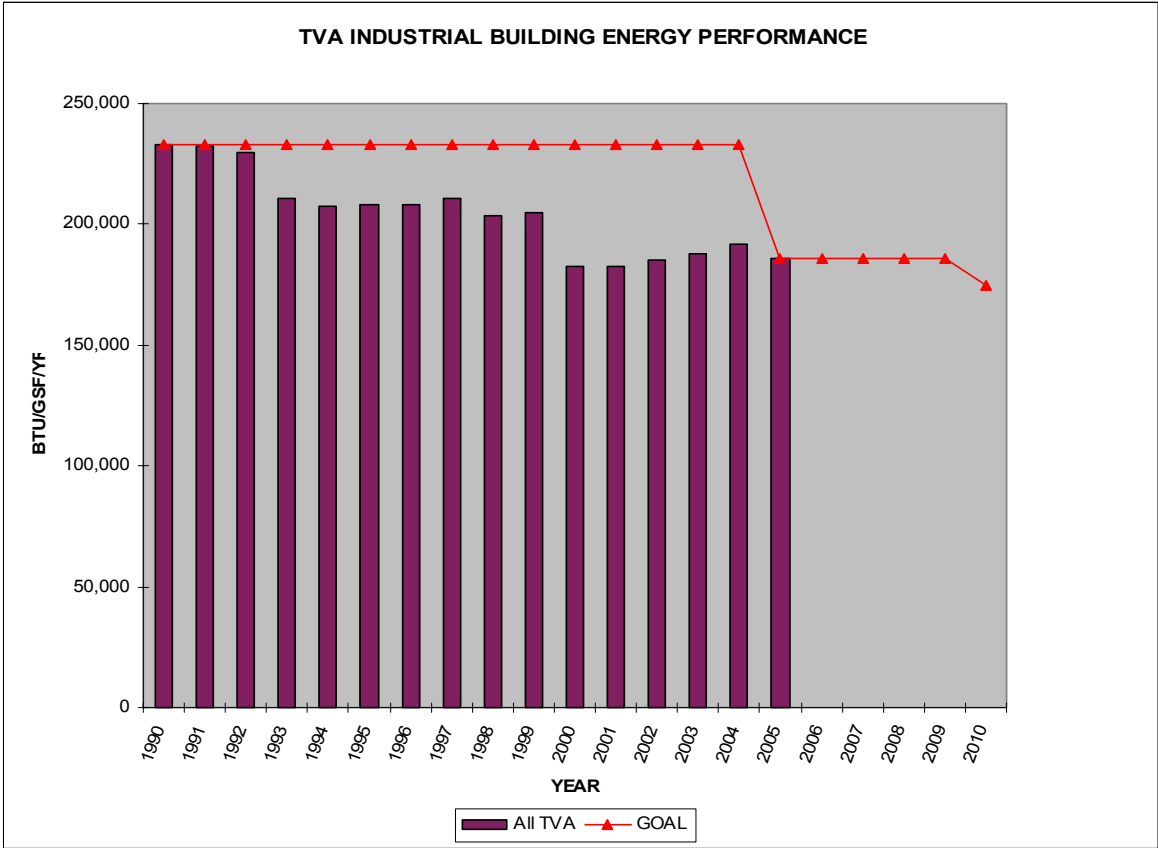
**TVA continues to reduce energy use in its facilities through the coordination of energy management efforts and implementation of energy efficiency improvements. TVA has ended FY 2005 with a Btu/GSF/Yr of 57,618 (including the renewable energy credit), which is a 30.04 percent reduction from FY 1985 and a four percent reduction from FY 2004.**



**Industrial and Laboratory Facilities:** Identify the facility inventory subject to this goal, referencing Section IV, Part D that lists the buildings included. Describe the performance measure(s) used (Btu/square foot, Btu/production unit, etc.). (Refer to FEMP web site for the guidance document *Section 203 Performance Goals for Industrial, Laboratory, Research, and Other Energy-Intensive Facilities* [www.eere.energy.gov/femp/pdfs/ecoguidancedoc.pdf](http://www.eere.energy.gov/femp/pdfs/ecoguidancedoc.pdf)).

Report energy use (in the designated performance measure) for industrial and laboratory facilities for FY 1990 (the base year) and FY 2005. Report the percent change from FY 1990 and from the FY 2004. (Note: This information will be reported on the agency’s Energy Scorecard). Discuss any extenuating factors that may be skewing the accuracy of this performance measure.

**TVA has ended FY 2005 with a Btu/GSF/Yr of 185,799, which is a 20 percent reduction from FY 1990 and a three percent reduction from FY 2004.**



2. **Exempt Facilities:** Refer to Section IV E—a list of exempt facilities and an explanation of why they were exempted. (Refer to DOE’s *Criteria for Exempting Facilities from the Goals of Executive Order 13123 and Guidance for Reporting Exemptions* [www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf](http://www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf)).

Although buildings found exempt according to the criteria are not subject to the requirements of Sections 202 and 203 of Executive Order 13123, DOE will continue to collect energy consumption data for these buildings under the new reporting category of “Exempt Buildings.” This ensures that accurate reporting on overall Federal energy consumption is maintained.

**TVA has a long history of demonstrating stewardship toward energy reduction and will continue to work toward reducing energy use in its generation, transmission and related energy intensive buildings. Energy reduction in these buildings has become increasingly more difficult given the majority of the energy consumption in these buildings is largely attributed to process energy (generation and transmission of electricity). In recognition of the above and the fact that only so much can be done to make these buildings more efficient in a cost effective manner, TVA, in discussion with DOE, has decided to exempt these buildings. Attachment 5 contains a list of TVA’s exempt facilities.**

**The following is a list of projects implemented in FY 2005 or planned for future implementation related to energy/water efficiency and sustainability in these exempt facilities.**

## **POWER SYSTEM OPERATIONS EFFICIENCY**

**TVA’s Power Systems Operations’ staff considers energy efficiency and environmental impacts for each project and activity. Following is a list of activities which have been completed in FY 2005 or planned for future implementation:**

- **The Power System Optimization and New State Estimator Projects will improve TVA’s ability to operate the power system confidently with decreased margin as a result of increased wide-area awareness of current state and contingency options;**
- **Reactive Power: Optimizing the power factor of electrical supply helps minimize losses associated with the transmission of electricity. TVA has installed new capacitors at the Tazewell Substation;**
- **Reactive Power: The PSO Optimal Power Flow Initiative gives promise for future minimization of losses using an optimized voltage schedule and minimizing new construction of reactive devices through optimal placement. This project is still in its initial phase of implementation;**
- **Construction of New Lines: New lines help to ensure that electricity can be delivered reliably for the minimum transmission loss. The environmental impact of new lines is minimized through careful design and route selection, study of all possible alternatives including new technologies, and realizing the best performance from existing resources, as well as a detailed process for public involvement. A new 161-kV line was constructed from Pandora-Shouns;**

- **Alternatives exercised to avoid or delay new construction included:**
  - **An operating guide was implemented for Kingston Fossil Plant that avoided construction of a Kingston-Rockwood transmission line due to maintenance outages;**
  - **A Kingston operating guide also delayed the need for the Kingston-Oak Ridge National Lab new transmission line;**
  - **A Kemper operating guide was implemented February 16, 2005, to allow units to remain stable for system faults without a new transmission line being required;**
  - **A Paradise operating guide along with a re-evaluation of system planning criteria resulted in a revision of the ambient temperature assumed for transmission line maintenance outage contingencies. These refinements allowed upgrade of the Lost City-Bowling Green line to be deferred; and**
  - **Line upgrades were completed for New Albany-Northwest New Albany, Gallatin-Lafayette, and Norris-Lafollette transmission lines. This allowed for additional transmission capacity in these areas without any new right-of-ways.**
- **Line Loops: Like new lines, designing a system with sufficient connections to the transmission system enables supply to consumers to be achieved most directly while enhancing reliability and minimizing losses. New construction includes delivery points at Fordtown, Clinton (newly looped line), Culleoka, Hickory Withe, New Providence, Galloway, Wolftever, Screaming Eagles, Battlefield, North Haven, Georgia Mountain, South Hollywood, Compton Lane, Hopewell (South Waverly and Bulls Gap converted to 161), and Mimms;**
- **Replaced obsolete relays with more efficient solid-state relays on the Davidson, Tennessee-Johnsonville Fossil Plant transmission line and at the Leighton, AL, 46kV Substation;**
- **Replaced environmentally hazardous breakers at Nance (1 oil), Paradise (5 gas), Norris (1 oil), Oxford (1 oil), Ardmore (1 oil), Browns Ferry (4 gas), and Farley (3 oil), Alcoa (1 oil), and Centerville (1 oil);**
- **Tertiary shunt reactors were replaced at Sullivan with air core units;**
- **Bus voltage transformers were replaced at Centerville to reduce pcb threat to nearby water;**
- **Early generation SF6 gas bus at Maury 500-kV Substation was replaced to reduce SF6 leaking into the environment;**
- **Continued installing steel poles instead of wood reducing the number of trees cut; replacing 1,734 existing wood poles with steel poles;**
- **Installed over 2,408 steel cross arms for failing wooden cross arms;**
- **Continued yearly repair or replacement of a significant number of HVAC units as they were determined to no longer provide a high level of reliability. High efficiency electric heat pumps were used exclusively. Each through wall and window heat pump unit and central system heat pumps was required to have a SEER rating of 10 or higher;**
- **Smaller modular switchhouses which are more energy efficient are now being installed instead of the old block switchhouses of the past; and**
- **Replaced 23 obsolete compressors for air blast breakers with more efficient units.**

## HYDRO EFFICIENCY

The table below accounts for both completed and on-going projects at TVA hydro plants in FY 2005. These projects are aimed at increasing overall hydro efficiency by reducing energy consumption, maintaining plant availability, lowering maintenance costs, and increasing megawatt capacity. They also support environmental stewardship in that environmental impacts are included as part of the project development process. In addition, by maximizing hydro efficiency, TVA is able to burn less fossil fuel, reducing the amount of carbon released into the atmosphere.

TVA's hydro modernization is of particular importance in terms of energy management. This initiative, designed to ensure the availability of reliable hydroelectric generation in the future, has improved the facilities' efficiency by an average of approximately five percent since its inception in 1992. When completed around 2015, TVA's modernization program will have increased the hydro system's power output by more than 700 MW. TVA's automation program, another key energy management initiative, also is reducing operating costs and increasing hydro efficiency.

Plant Name	Project Name	Cost (\$000's)
Hydro System	Modernization Program	20,097
Hydro System	Asset Preservation/Recovery Projects	24,810
Hydro System	Remoting and Automation	2,957
Hydro System	Safety/Fire Protection/Regulatory Projects	19,449
Hydro System	Miscellaneous Small O&M Projects	13,807
Hydro System	Miscellaneous Small Capital Projects	4,219
	Total All Projects	85,339

## NUCLEAR EFFICIENCY

TVA Nuclear considers energy efficiency and environmental impacts for each project and activity. Many projects were initiated or completed in FY 2005 to maintain plant availability, increase electrical generation, or reduce environmental effects from equipment failure. The following is a list of energy management and sustainability projects completed in FY 2005 or planned for future implementation at TVA Nuclear plants.

**NUCLEAR ENERGY PROJECTS COMPLETED IN FY 2005**

<b>Plant Name</b>	<b>Project Name</b>	<b>Cost (000's)</b>
<b>Browns Ferry</b>	<b>Installed a spent reactor fuel storage facility. Permits continued Browns Ferry Nuclear Plant operation long term.</b>	<b>30,121</b>
<b>Sequoyah</b>	<b>Rebuilt an essential raw cooling water pump. Improved pump efficiency.</b>	<b>690</b>
<b>Sequoyah</b>	<b>Replaced the Unit 2 high pressure turbine rotor. Gained 8.3 MWe in additional generation.</b>	<b>9,378</b>
	<b>Total All Projects</b>	<b>40,027</b>

**NUCLEAR ENERGY PROJECTS IN PROGRESS IN FY 2005 OR PLANNED FOR FUTURE IMPLEMENTATION**

<b>Plant Name</b>	<b>Project Name</b>	<b>Cost (000's)</b>
<b>Browns Ferry</b>	<b>Extend the NRC operating license expiration date for all three reactors by 20 years.</b>	<b>18,209</b>
<b>Browns Ferry</b>	<b>Increase Unit 2 and 3 electrical output by 110 MW/hr per Unit.</b>	<b>185,561</b>
<b>Browns Ferry</b>	<b>Restart the Unit 1 reactor, 1280 Mwe/hr</b>	<b>1,800,000</b>
<b>Browns Ferry</b>	<b>Install a condenser cooling water monitoring system. Permits identification of steam cycle condenser thermal efficiency (heat rate) losses.</b>	<b>682</b>
<b>Brown Ferry</b>	<b>Replace portions of the U2 condenser tube cleaning system. Improves steam cycle efficiency (heat rate).</b>	<b>1,400</b>
<b>Brown Ferry</b>	<b>Replace portions of the U3 condenser tube cleaning system. Improves steam cycle efficiency (heat rate).</b>	<b>1,350</b>
<b>Browns Ferry</b>	<b>Replace Unit 3 control bay chillers. Removes ozone depleting refrigerant.</b>	<b>6,855</b>
<b>Sequoyah</b>	<b>Improve Unit 2 heat rate by replacing the steam generators</b>	<b>296,512</b>
<b>Sequoyah</b>	<b>Rebuild 6 essential raw cooling water pumps. Improves pump efficiency.</b>	<b>5,672</b>

Watts Bar	Improve Unit 1 heat rate by replacing the steam generators	216,662
Watts Bar	Increase annual Watts Bar Dam electrical generation 3 MW/hr by raising Watts Bar Nuclear Plant design and license basis ultimate heat sink temperature.	893
Watts Bar	Rebuild 4 essential raw cooling water pumps. Improves pump efficiency.	3,356
Watts Bar	Replace safety related chillers. Removes ozone depleting refrigerant.	28,557
Watts Bar	Convert non-safety related chillers non-ozone depleting refrigerants.	2,214
Browns Ferry Sequoyah Watts Bar	Install oil containment and other oil spill prevention measures required by the recent change to 40CFR112.	4,002
	Total All Projects	2,571,925

## FOSSIL EFFICIENCY

Fossil Power Group (FPG) has made significant improvements in reducing the number of forced outages and load reductions at its fossil power plants since the implementation of the Failure Prevention Initiative in June 2000 and the Human Performance Initiative in the Spring of 2001. In FY 2005, FPG reduced the Equivalent Forced Outage Rate (EFOR) to its lowest level in history since all 59 generating units have been in operation. This improvement in system-wide performance means fewer generating unit startups which improves unit operational efficiency and helps reduce the delivered cost of power.

Two additional Selective Catalytic Reduction (SCR) systems were brought online to remove nitrogen oxide (NOx) during the 2005 summer ozone season. This brings the total number of operating SCRs on TVA's fossil system to 20. In total, these SCRs and other removal equipment reduced summer system-wide NOx emissions by about 80 percent compared to 1995 levels. TVA's environmental efforts are continuing via ongoing and future projects and include the addition of SCRs or alternative technologies to achieve further reductions in nitrogen oxide emissions; fuel switch changes and the addition of scrubbers to achieve further reductions in SO2 emissions; and the addition of equipment to mitigate SO3 and improve opacity.

Many energy management and related environmental projects were completed at TVA Fossil plants during FY 2005. These projects included heat rate improvements, maintaining plant availability, reducing energy consumption, lowering maintenance costs, environmental stewardship, and increasing overall efficiency.

The following is a representative list of projects completed in FY 2005:

<b>Plant</b>	<b>Project Name</b>	<b>Cost (000's)</b>
Cumberland	CUF--U1 Replace Row 11 Blades on BFPT 1A	258
Cumberland	CUF--U1 Replace Row 11 Blades on BFPT 1B	367
Cumberland	CUF--Upgrade Spare HP Rotor to High Capacity Blades	2,317
Gallatin	GAF--U3 IP Turbine Replace Nozzle Block	703
Gallatin	GAF--U2 North Main Condenser Retube	473
John Sevier	JSF--U3 Replace Long & Rotary Sootblowers	1,281
Kingston	KIF--U5 Replace Economizer	307
Kingston	KIF--U6 Replace Economizer	428
Kingston	KIF--U5 Replace Air Preheaters	304
Kingston	KIF--U6 Replace Air Preheaters	317
Shawnee	SHF--U1-4 Replace Sootblowers and Controls	2,690
Widows Creek	WCF--Replace PCB Containing Transformers	816
	<b>Total All Projects</b>	<b>10,261</b>

The following is a representative list of ongoing and/or future projects:

<b>Plant</b>	<b>Project Name</b>	<b>Budget (000's)</b>
Allen	ALF--U1-3 Combustion Optimization	1,847
Allen	ALF--U2 Retube #8 Feedwater Heater	1,448
Bull Run	BRF--U1 Replace Economizer Tubes	11,865
Colbert	COF--U5 Combustion Improvement Project	12,905
Colbert	COF--Replace PCB Containing Transformers	1,168
Cumberland	CUF--U2 Replace HP Feedwater Heaters 2A & 2B	5,454
Cumberland	CUF--U2 Replace Row 11 Blades on BFPT 2A	466
Cumberland	CUF--U2 Replace Row 11 Blades on BFPT 2B	487
Gallatin	GAF--U3 Retube #3 HP Feedwater Heater	492
Gallatin	GAF--U1 Main Condenser Retube	954

<b>Gallatin</b>	<b>GAF--U4 IP Nozzle Block and Rateau Blade Replacement</b>	<b>592</b>
<b>John Sevier</b>	<b>JSF--U1-4 Replace Main Steam Flow Nozzles</b>	<b>1,145</b>
<b>John Sevier</b>	<b>JSF--U3 Replace Sootblowers</b>	<b>1,159</b>
<b>John Sevier</b>	<b>JSF--U1 Retube #5 LP Feedwater Heater</b>	<b>279</b>
<b>John Sevier</b>	<b>JSF--U2 Retube #6 LP Feedwater Heater</b>	<b>302</b>
<b>Johnsonville</b>	<b>JOF--U5 Economizer Replacement</b>	<b>2,215</b>
<b>Johnsonville</b>	<b>JOF--U5 Combustion Controls Replacement</b>	<b>3,022</b>
<b>Johnsonville</b>	<b>JOF--U9 Combustion Controls Replacement</b>	<b>2,275</b>
<b>Kingston</b>	<b>KIF--U9 Replace Air Preheaters</b>	<b>444</b>
<b>Kingston</b>	<b>KIF--U9 Replace Economizer</b>	<b>650</b>
<b>Paradise</b>	<b>PAF--U3 Replace 4A &amp; 4B HP Heaters</b>	<b>3,119</b>
<b>Widows Creek</b>	<b>WCF--U7 Upgrade Boiler Feed Pump Turbines</b>	<b>5,570</b>
	<b>Total All Projects</b>	<b>57,858</b>

3. **Non-Fleet Vehicle and Equipment Fuel Use:** Refer to the Data Report to identify the fuel use for non-fleet vehicles and other equipment not captured by the Federal Automotive Statistical Tool (FAST) reporting system. Discuss trends in the use of each type of fuel and methods employed to reduce fuel use.

**Vehicle Fleet Consumption**—In the past, GSA’s Agency Report of Motor Vehicle Data (Form SF-82) collected acquisition, fuel consumption, and fuel cost data for motor vehicles directly from vehicle fleet managers. The SF-82 was replaced by the Federal Automotive Statistical Tool (FAST), an internet based reporting platform. FAST eliminates the need to report fuel consumption data for fleet motor vehicles to FEMP on the Data Report. FAST now collects this data, including alternative fuel consumption data reported under Sections 303 and 308 of EPACT, and this information is forwarded to FEMP for inclusion in the Annual Report to Congress. For more information on FAST, please contact Shab Fardanesh of DOE’s Vehicle Technologies Program at (202) 586-7011.

## **FLEET FUEL EFFICIENCY**

**TVA’s fleet strategy is to examine current vehicle use and replacement and where feasible, choose replacement vehicles that are most efficient. TVA, as a major provider of electricity, will continue to make use of alternative fueled vehicles (AFVs), including those that use electric power, and acquire additional vehicles to meet requirements under EPAct92. TVA has recognized the value of hybrid electric vehicle technology in reducing fuel consumption, increasing versatility, and promoting electric propulsion and has included these vehicles in its fleet. TVA created a hybrid-fleet program in FY 2002 which is a partnership effort between TVA’s Energy Management and Fleet Management organizations. In FY 2005, TVA added five hybrid gas/electric vehicles and 20 AFV’s to its fleet bringing the total number of hybrid vehicles to 25 and AFV’s to 54.**

**During FY 2005, TVA gasoline fuel usage was reduced by nine percent compared to FY 2004 while diesel fuel use decreased by 15 percent compared to FY 2004.**

## **VEHICLE FUEL EFFICIENCY OUTREACH PROGRAMS**

**TVA encourages employees to use mass transit systems, vans for group travel, and car pools, when available and feasible. The use of coordinated TVA and vendor delivery, pickup routing schedules, and just-in-time delivery is utilized throughout TVA. This coordinated effort reduces deadheading and avoids double handling and, multiple trips to the same sites.**

**The TVA service area covers all of Tennessee and portions of six other states; therefore, employees are widely dispersed and often travel significant distances to attend meetings and presentations. TVA continues to install technologies which enable employees to travel less and conduct more meetings from their remote work sites. The reduction of required travel realized through telecommunication improvements has resulted in a savings of fuel and related expenses.**

- Meeting Place - This technology enables audio conferencing, real-time online document collaboration, and remote presentations among employees at different locations. Employees can participate in audio conferencing without operator assistance, simultaneously share, view, and edit documents from computers, and conduct and participate in remote presentations without having to travel. On average, over 2,150 such meetings are held monthly using this system;**
- Video Conference Rooms - TVA has 53 video conference rooms throughout the Tennessee Valley service area. Approximately 1,311 video conferences were held in FY 2005, eliminating the need for travel to these meetings;**
- PC Efficiency - TVA replaced approximately 2,500 computers in FY 2005 with new units that have the latest energy saving features. It is policy to enable all energy saving features available in new computers so the maximum possible energy savings can be realized; and**
- Monitor Efficiency - TVA Information Services, TVA Facilities Management, and the Environmental Protection Agency worked cooperatively to significantly enhance TVA enterprise-wide computer monitor efficiency during FY 2004 which led to an estimated savings of \$190,000 in FY 2005. In late FY 2005, Information Services also standardized on newer LCD monitor technology that uses less power than standard CRT monitors.**

## **HEAVY EQUIPMENT**

**TVA continued the utilization of the Total Base Number (TBN - measure of oil's alkaline) value as an oil indicator. This effort has resulted in a reduction in TVA's oil consumption due to extended oil drain intervals. Accordingly, the oil change interval in some of the smaller diesel engines has changed to 320 hours or 10,000 miles to protect TVA's equipment. Turbo pre-cleaners are being used on tractor scrapers and dozers to lengthen air filter life and extend oil change intervals. Air filter indicators used on TVA's equipment have reduced filter changes (especially oil bath type), and have additionally provided better engine protection. TVA also used turbo pre-cleaners to reduce contaminants entering the engines along with air filter indicators to insure dirty filters are identified and changed resulting in increased engine efficiency.**

**TVA continued using Fuel Mag with small compressors to kill bacteria and spores that grow in fuel that is stored for long periods of time. Its use should decrease the amount of contaminated fuel that has to be disposed. These units can also eliminate down time due to filter and fuel injector plugging.**

**TVA's maintenance shops use filter crushers to get all possible oil out of filters before disposal. Three maintenance facilities are using oil burners to heat their facilities using TVA's generated used oil.**

**These projects provide TVA with the benefits of reduced potential of adverse environmental impacts from spillage of waste oil and fuel, increased operational efficiency, increased availability of units, and decreased cost due to reduction in oil consumption.**

**TVA incorporates EPA emission standards in specifications for both on-road and off-road trucks. TVA also is in constant communication with equipment providers on their emission standards and latest engine components to insure the best and most economical equipment is used.**

## **FEDERAL VEHICLE FUEL EFFICIENCY**

**The following tables show a comparison of TVA's annual mileage and miles per gallon (mpg) performance for sedans and light trucks from FY 1975 through FY 2005.**

## ANNUAL MILEAGE

FY	Miles Driven		Percent Increase/(Decrease)	
	Sedans	Trucks*	Sedans Base Yr. 75	Trucks* Base Yr.79
75	12,222,850	N/A	0	N/A
76	14,698,600	N/A	20	N/A
77	14,331,650	N/A	17	N/A
78	14,101,300	N/A	15	N/A
79	13,779,900	25,947,000	13	0.0
80	14,788,300	25,989,000	21	0.2
81	14,922,450	27,655,000	22	7
82	24,714,480	24,878,000	4	(4)
83	12,125,848	25,122,699	(1)	(3)
84	11,760,288	24,947,558	(4)	(4)
85	11,958,251	21,237,202	(2)	(18)
86	12,359,000	24,954,488	1	(4)
87	12,905,706	24,064,000	6	(7)
88	12,650,124	24,008,436	3	(7)
89	11,312,417	22,599,061	(7)	(13)
90	15,665,480	23,516,512	28	(9)
91	19,175,027	24,120,233	57	(7)
92	23,264,550	24,318,622	91	(6)
93	25,557,833	25,702,300	109	(1)
94	29,766,173	23,947,797	144	(8)
95	30,096,968	23,996,720	146	(8)
96	28,388,572	24,998,289	132	(4)
97	20,298,902	24,343,292	66	(6)
98	7,124,589	26,623,769	(42)	3
99	7,939,345	21,335,796	(35)	(18)
00	9,723,679	27,701,582	(20)	5
01	9,290,949	25,242,686	(24)	(3)
02	10,793,620	23,520,150	(12)	(9)
03	11,788,288	26,175,474	(4)	1
04	10,689,531	29,911,323	(13)	15
05	9,215,499	29,575,499	(25)	14

\*Figures for Trucks include both light duty (<8500 lbs GVWR) & medium duty (8501 – 16000 lbs GVWR).

## MPG PERFORMANCE

FY	Annual MPG			Percent Increase/(Decrease )		
	Sedans Base Yr. 75	Trucks*		Sedans Base Yr. 75	Trucks*	
		Base Yr. 79	4 x 2		4 x 4	Base Yr. 79
75	15.1	N/A	N/A	0	N/A	N/A
76	15.0	N/A	N/A	(1)	N/A	N/A
77	15.6	N/A	N/A	3	N/A	N/A
78	16.2	N/A	N/A	7	N/A	N/A
79	16.3	11.6	8.2	8	0	0
80	17.9	12.0	8.3	19	3	1
81	19.2	13.2	7.9	27	14	(4)
82	22.7	14.2	8.5	50	22	4
83	26.2	16.0	9.8	74	38	20
84	27.5	16.4	9.5	82	41	16
85	26.9	16.1	10.2	78	39	24
86	27.6	18.2	10.8	83	57	32
87	26.6	17.5	11.4	76	51	39
88	24.6	15.3	11.0	63	32	34
89	28.3	15.9	13.1	87	37	60
90	28.4	15.7	11.6	88	35	41
91	29.6	18.2	15.7	96	57	91
92	27.7	21.2	12.4	84	83	52
93	31.9	17.3	13.6	105	49	66
94	29.8	15.5	12.9	97	34	57
95	31.2	14.5	13.4	107	25	63
96	29.1	13.2	12.7	66	14	44
97	28.3	14.2	12.7	87	22	44
98	26.6	15.4	14.4	76	33	76
99	25.4	12.8	11.9	68	10	45
00	26.3	13.7	12.8	74	18	56
01	26.6	13.9	13.2	76	20	61
02	26.0	14.1	12.9	72	22	57
03	27.4	14.0	12.7	81	21	55
04	28.2	15.2	13.4	87	31	63
05	27.3	14.8	13.4	81	28	63

\*Figures for Trucks include both light duty (<8500 lbs gross vehicular weight rating (GVWR)) & medium duty (8501 - 16000 lbs GVWR).

## **PROCUREMENT OF ALTERNATIVE FUELED VEHICLES**

**As a major supplier of electricity, TVA is particularly interested in supporting the use of electric vehicles (EVs). TVA has incorporated EVs into its fleet operations and supports power distributors and local communities with EV technology demonstrations. TVA is also utilizing electric vehicles at its plant sites to reduce fuel consumption and emissions.**

**TVA currently has the following EVs:**

- **1 U.S. Electricar Prism sedans**
- **1 Solectria Ford sedans**
- **5 GEM electric cars**
- **44 EZGOs electric vehicles**

**B. Renewable Energy:** Discuss agency's policy and efforts to encourage purchase and generation of electricity and thermal energy from renewable energy sources. (Note: The quantitative information related to this section [see below] will be reported on the agency's Data Report and Energy Scorecard. On the Energy Scorecard, self-generated renewable energy use and purchased renewable energy use will be aggregated into a single value). The Federal Renewable Energy Working Group recently released three clarifying guidance documents related to the renewable energy goal:

- Clarifications to E.O. 13123 Reporting Guidance for 2005 Annual Reporting on Renewable Energy
- E.O. 13123 Renewable Power/REC Procurement Guidance
  - FY05 Renewable Power/REC Procurement Guidance: Third Party Verification

These documents are available at

[www.eere.energy.gov/femp/about/legislation.cfm](http://www.eere.energy.gov/femp/about/legislation.cfm) .

## **GREEN POWER SWITCH® (GPS)**

**TVA and 12 public power companies launched GPS on Earth Day, April 22, 2000. GPS was the first program of its kind offered in the Southeast and provided consumers with an economical opportunity to participate in TVA's development of renewable energy resources. The program originally included supply from wind and solar energy sources. The program was expanded in FY 2001 to include electricity generated from methane gas at a waste water treatment plant in Memphis, Tennessee.**

**Sixteen solar generating facilities are presently operating in Tennessee, Kentucky, Alabama, Virginia and Mississippi. One commercial scale wind power generation site has been operational since November 2000. TVA has agreed to purchase, from a new project developer, Invenergy TN LLC, 27 megawatts of new wind energy for the next 20 years. Fifteen 1.8 megawatt wind turbines were added to the existing three wind turbines currently located on Buffalo Mountain in Anderson County, Tennessee. These units became operational December 2004. GPS also benefits from generation produced from an eight megawatt waste water treatment methane gas project located at TVA's Allen Fossil plant near Memphis, Tennessee. The GPS program is managed through TVA's Marketing Organization.**

Under the GPS program, residential customers can purchase green power blocks of 150 kWh each, at a cost of \$4.00 per block. These blocks represent approximately 12 percent of a typical home's monthly energy use. Commercial and industrial customers can sign up for the 150 kWh blocks based on the amount of energy they use each month. When two blocks of GPS are purchased each month for one year, the associated reduction of atmospheric carbon dioxide is equivalent to planting an acre of trees in the Tennessee Valley. As of September 30, 2005, there were 8,318 residential customers purchasing 14,860 blocks and 433 business customers purchasing 15,301 blocks for a total of 30,161 purchased blocks of green power.

Today there are 90 TVA power distributors and one direct-served customer participating in the GPS program throughout the Tennessee Valley. TVA plans to continue expanding the GPS program by offering it to additional power distributors as renewable energy supplies allow.

TVA launched the Generation Partners Program in support of Green Power Switch. The Generation Partners program pays participants for 100 percent of their green power output at a rate of 15 cents per kWh for the generation produced from solar and wind installations on participants' home or small business. The energy from Generation Partners is used to supply renewable energy for Green Power Switch.

TVA's GPS and Generation Partners programs were awarded the State of Tennessee Energy Leadership Award in 2005.

## **RENEWABLE ENERGY TECHNOLOGY MONITORING**

TVA identifies and evaluates emerging renewable energy technologies in support of its strategic needs. The renewable energy program provides data to support debate on renewable energy policy; monitors advancements in renewables to keep TVA organizations and customers informed on technology issues; and demonstrates and develops the most viable technologies in the areas of bio-energy, waste-to-energy, wind, solar, and other renewable resources.

TVA's Green Power Switch program is the primary driver for renewable energy technologies at TVA. However the potential for national Renewable Portfolio Standards (RPS) and carbon constraint legislation still exists and could become drivers in the future. Renewable energy portfolios are currently mandated in 18 states and although it was defeated, an amendment for a national RPS was proposed during the 2005 energy bill conference hearings. In anticipation of renewable portfolio mandates and in response to customer needs, TVA continues to assess and evaluate new and advanced renewable technologies. Project plans include developing and demonstrating large scale biomass gasification for production of electricity and value-added products from regional biomass, and evaluating other advanced renewable energy supply options in wind and solar.

1. **Self-generated renewable energy:** Identify/estimate energy use from electricity self-generated from renewable sources (photovoltaics, wind turbines) and renewable energy thermal projects (solar thermal, biomass, geothermal). Also report energy generated on Federal lands or by projects facilitated by your agency, but which may be sold to other parties. Agencies should report the annual energy generated from all renewable energy systems installed after 1990 and in place during FY 2005.

**Through TVA's GPS program, TVA utilizes photovoltaics, wind, and methane as part of its mix to provide renewable energy to its customers (for more information see Section II. B. Renewable Energy, Green Power Switch and see Attachment 1).**

2. **Purchased renewable energy:** Identify the renewable (i.e., wind, solar, geothermal, biomass) energy component of power purchases under competitive contract in megawatt hours. Agencies should report what portion of total purchased renewable energy should be applied to standard buildings, energy intensive facilities, or exempt facilities. (Note: Guidelines for counting renewable energy projects and purchases of electricity from renewable energy sources toward agency progress in reaching their goals and information on the Federal renewable energy goal are available on the FEMP web site [www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf](http://www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf).)

**Through the TVA GPS program, TVA purchased 1,170 MWh for use in its Knoxville Office Complex, Chattanooga Office Complex, and Huntsville office.**

**TVA committed to a 20 year Power Purchase Agreement with Invenergy TN, LLC, for 27 additional megawatts of large scale wind power. The expansion consists of 15, 1.8 megawatt wind turbines at the existing Buffalo Mountain wind site in east Tennessee.**

**The Green Power Switch Generation Partners demonstration continued to allow residential and small commercial customers to install solar/wind generation and sell their power to TVA's Green Power Switch program. In FY 2004, GPS Generation Partners was expanded to allow larger, demand-metered customers to participate with solar generation only. More information on the demonstration may be found at [www.gpsgenpartners.com](http://www.gpsgenpartners.com).**

- C. **Petroleum:** Identify petroleum-based fuels (fuel oil, LPG/propane) used in buildings in FY 1985 and in FY 2005 and the percentage change from FY 1985. (Note: The FY 2005 data will be reported on the Data Report and the Energy Scorecard).

**TVA consumed 10,700 gallons of petroleum in building operations in FY 2005, which is a decrease of 51 percent from the FY 1985 baseline of 21,920 gallons.**

**D. Water Conservation:** Identify/estimate water consumption and cost by the agency in FY 2005 and outline any agency-specific issues related to collection of water consumption data. (Note: This information will be reported on the Data Report and the Energy Scorecard.)

<http://www.eere.energy.gov/femp/about/legislation.cfm> Also in this section, highlight activities undertaken to improve water efficiency. Discuss progress in developing Water Management Plans and implementing Best Management Practices for efficient use of water. For more information, refer to DOE's *Guidance to Establish Water Efficiency Improvement Goal for Federal Agencies* on the FEMP web site [www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf](http://www.eere.energy.gov/femp/pdfs/eoguidancedoc.pdf).

**During FY 2005, energy surveys including water were conducted at multiple TVA sites.**

**TVA consumed 158,100,000 gallons of potable water in FY 2005 with an estimated cost of \$331,600. These numbers exclude the water consumption of the exempt buildings.**

**TVA considers water management plans as part of its operation and maintenance activities. As part of these activities, more than 271 facilities have been covered, representing over 4.3 million GSF.**

**To date, TVA has implemented the Best Management Practices (BMPs) in more than 11 percent of its gross square footage.**

**III. Implementation Strategies:** The purpose of this section is to identify and describe the use of strategies to reduce energy consumption and improve energy efficiency. It is not expected that each agency will have employed every strategy; rather, each strategy identified in E.O. 13123 is listed below to remind agency officials of the existence of these strategies and to encourage their use where practical and life-cycle cost effective. Agencies should provide highlights of the following strategies their energy management programs employed during FY 2005:

- Life-Cycle Cost Analysis
- Facility Energy Audits
- Financing Mechanisms
  - Energy-Savings Performance Contracts (ESPCs)
  - Utility Energy Services Contracts (UESCs).
- Use of ENERGY STAR<sup>®</sup> and Other Energy-Efficient Products
- ENERGY STAR<sup>®</sup> Buildings
- Sustainable Building Design
- Energy Efficiency in Lease Provisions
- Industrial Facility Efficiency Improvements
- Highly Efficient Systems, i.e., combined cooling, heating, and power
- Distributed Generation
- Electrical Load Reduction Measures

**TVA implements many energy management measures through a number of strategies which include the following:**

### **AGENCY ENERGY MANAGEMENT COMMITTEE**

**TVA Agency Energy Management Committee is a forum for sharing of information and success stories on energy efficiency efforts for application across the agency.**

### **NEW CONSTRUCTION**

**TVA combines teams of designers to incorporate energy efficiency and sustainability at the start of new building designs.**

### **RENOVATION**

**TVA takes advantage of renovation activities by incorporating energy efficiency and sustainability into its spaces that are being reconfigured for change.**

### **OPERATIONS & MAINTENANCE**

**Operation and maintenance (O&M) personnel are the front line, used to identify potential energy and sustainable problems and opportunities on a daily basis. O&M staff take corrective action where needed and seek help from engineering, energy and sustainable staff to resolve technical issues when necessary.**

**Examples of O&M activities are the efficient operation of building EMCS systems, the placement of controls on lighting and other energy consuming equipment, addition of insulation in buildings, replacement of old glazing with newer high efficiency glazing, and replacement of inefficient lighting when actions are determined to be life-cycle cost effective. In addition TVA considers efficiency improvements in its industrial, power plant and transmission operations when life-cycle cost effective.**

**As part of its operation and maintenance function, TVA has an emergency curtailment procedure which reduces energy use in its buildings during energy emergencies.**

### **VEHICLE FUEL**

**TVA looks at its overall fleet and business needs on a continuous basis to match the work needs of each individual to the most efficient vehicle. TVA investigates efficient vehicles such as hybrid cars and adds these vehicles to its fleet to meet business needs. TVA also investigates ways to extend the life cycle of vehicles, especially special purpose vehicles. TVA's detailed Fleet Strategy is provided as Attachment 9.**

**A. Life-Cycle Cost Analysis:**

TVA's Energy Plan provides that life-cycle analysis will be used in making investment decisions regarding energy/water efficiency and sustainable practices.

**B. Facility Energy Audits:**

TVA has evaluated building inventory for potential energy conservation measures. These facilities are being re-evaluated in accordance with E.O. 13123 and TVA's Memorandum of Understanding with the EPA. During FY 2005, TVA surveyed its facilities located at 28 hydro plant sites.

**C. Financing Mechanisms:**

Projects for facilities are primarily funded through renovation, operation, maintenance, and modernization efforts. Projects covered under general operations are ranked for economic benefit compared to other TVA projects to determine funding availability and implementation status and are funded mainly through the capital budgeting process. TVA considers the use of ESPCs and UESCs where cost effective and in the best interest of the agency and its customers. During FY 2005, TVA did not utilize these financing mechanisms.

**D. ENERGY STAR<sup>®</sup> and Other Energy-Efficient Products:**

TVA's Energy Plan provides that TVA will strive, where cost-effective, to meet the Energy Star Building criteria for energy performance and indoor environmental quality in eligible facilities to the maximum extent practicable as described by Section 403(c) of E.O. 13123. This includes purchasing Energy Star and other energy efficient products when feasible.

TVA continues its efforts to buy materials that have positive environmental qualities including soy ink, rechargeable batteries, low mercury lamps, and non-toxic supplies. TVA also purchases materials that meet sustainable architecture criteria. These are non-toxic building materials that have recycled content, and their creation, use, and disposal does not damage the environment.

**E. Energy Star<sup>®</sup> Buildings:**

TVA currently has two facilities that meet the ENERGY STAR<sup>®</sup> Buildings criteria. These are the Chattanooga Office Complex and the Edney building, which represent 11 percent of TVA's overall corporate square footage.

**F. Sustainable Building Design:**

TVA is incorporating sustainable design criteria into renovation and new construction efforts. TVA is in the process of reviewing its building inventory in an effort to reduce inefficient, high cost, underutilized space. This consolidation effort provides an opportunity to further practice sustainable efforts such as:

- Renovate space using removable, reusable wall systems;
- Recycle and recondition office furniture and panel systems;
- Install recyclable carpet tiles and low VOC finishes; and
- Upgrade lighting systems using T-5 and T-8 lamps, room and personal work station occupancy sensors, and internet based digital lighting control systems.

All of these efforts are being done as part of an agency sustainable program under TVA's IEMP.

**TVA continues to buy materials that have positive environmental qualities and include those that meet RCRA requirements and other recycled content materials. Examples of environmental products purchased include soy ink, rechargeable batteries, low mercury lamps, and non-toxic supplies and movable/reusable wall systems in place of drywall. TVA also purchases materials that meet sustainable architecture criteria. These non-toxic building materials have recycled content, and their creation, use, and disposal minimize environmental impacts.**

**G. Energy Efficiency in Lease Provisions:**

**Where applicable, TVA uses model lease provisions based on those recommended by the General Services Administration (GSA) and such provisions will be incorporated into new and renewed leases provided they are cost-effective. The model lease provisions address energy, sustainability and water efficiency.**

**H. Industrial Facility Efficiency Improvements:**

**TVA looks for opportunities to improve energy efficiency in its industrial facilities. Energy savings opportunities include lighting, HVAC, motor, and building control. For more information see also Section II. Energy Efficiency Performance, A. Energy Reduction Performance, 2. Exempt Facilities.**

**I. Highly Efficient Systems:**

**TVA considers the implementation of high efficiency systems as mentioned above when it is life-cycle cost effective.**

**J. Distributed Generation:**

**TVA is a utility; however, the use of distributed generation, where applicable, is considered.**

**K. Electrical Load Reduction Measures:**

**As part of its operation and maintenance function, TVA has an emergency curtailment procedure which reduces energy use in its buildings during energy emergencies.**

**IV. Data Tables and Inventories. Include the items listed below:**

- **FY 2005 Annual Energy Management Data Report:** A Data Report is included as Attachment 1. No Data Report for revisions to past years' energy data has been included.
- **Energy Scorecard for FY 2005:** A Scorecard is included as Attachment 2.
- **Goals of Executive Order 13123 and NECPA/EPACT (optional):** This table was prepared by OMB/DOE and is attached (see Attachment 3).
- **Industrial and Laboratory Facilities Inventory:** This inventory list includes the following information: building name and building location (city and state) (see Attachment 4).

- **Exempt Facilities Inventory:** This inventory includes the following information: building name, building location (city and state), and justification for exempt status (see Attachment 5).

V. **Attachment.** Attach a FY 2006 Implementation Plan to this FY 2005 Annual Report. Consult Attachment 6, *Guidance for Preparing the Federal Agency Implementation Plan for FY 2006*.

- 1) **FY 2005 Annual Energy Management Data Report (electronic file “Attachment 1\_DataReport\_12-05.xls”)**
- 2) **Energy Scorecard for FY 2005 (electronic file “Attachment 2\_Scorecard\_12-05.doc”)**
- 3) **Goals of Executive Order 13123 and NECPA/EPACT (electronic file “Attachment 3\_E.O.\_13123\_Goals\_12-05.doc”)**
- 4) **Industrial & Lab Buildings (electronic file “Attachment 4\_Industrial\_Lab\_12-05.xls”)**
- 5) **Exempt Facilities Inventory (electronic file “Attachment 5\_Exempt Facilities\_12-05.xls”)**
- 6) **Implementation Plan including Guidance for Preparing the Federal Agency Energy Management Implementation Plan for FY 2006 (electronic file “Attachment 6\_Implementation\_Plan\_12-05.doc”)**
- 7) **Reporting Units and Conversion Factors for Federal Energy Management Reporting (electronic file “Attachment 7\_Conversion\_Factors\_12-05.doc”)**
- 8) **TVA Energy Plan 12-2-05 (electronic file “Attachment 8\_TVA Energy Plan\_12-05.doc”)**
- 9) **TVA Fleet Strategy FY 2005 (electronic file “Attachment 9\_Fleet Strategy\_12-05.doc”)**

**Attachment 1**  
**FY 2005 ENERGY MANAGEMENT DATA REPORT**

Agency: Tennessee Valley Authority  
Date: 12/23/2005

Prepared by: Stephen L. Brothers  
Phone: 423-751-7369

**PART 1: ENERGY CONSUMPTION AND COST DATA**

**1-1. Standard Buildings/Facilities**

Energy Type	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Site-Delivered Btu (Billion)	Est. Source Btu (Billion)	Est. Carbon Emissions (Metric Tons)	
Electricity	MWH	156991.9	\$9,824.4	\$0.06 /kWh	535.7	1,860.4	26,804	
Fuel Oil	Thou. Gal.	10.7	\$20.4	\$1.90 /gallon	1.5	1.5	30	
Natural Gas	Thou. Cubic Ft.	4,463.9	\$39.1	\$8.76 /Thou Cu Ft	4.6	4.6	67	
LPG/Propane	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0.0	0	
Coal	S. Ton	0.0	\$0.0	#DIV/0! /S. Ton	0.0	0.0	0	
Purch. Steam	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0	
Other	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0	
		<b>Total Costs:</b>	<b>\$9,883.9</b>		<b>Total:</b>	<b>541.7</b>	<b>1,866.4</b>	<b>26,900</b>
Standard Buildings/Facilities (Thou. Gross Square Feet)		<b>9,333.0</b>			<b>Btu/GSF:</b>	<b>58,046</b>	<b>199,983</b>	
					<b>Btu/GSF w/ RE Purchase Credit:</b>	<b>57,618</b>	<b>199,556</b>	
					<b>Btu/GSF w/ RE &amp; Sec. 502(e) Credit:</b>	<b>57,618</b>	<b>199,556</b>	

**1-2. Industrial, Laboratory, Research, and Other Energy-Intensive Facilities**

Energy Type	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Site-Delivered Btu (Billion)	Est. Source Btu (Billion)	Est. Carbon Emissions (Metric Tons)	
Electricity	MWH	22,050.4	\$0.0	\$0.00 /kWh	75.2	261.3	3,765	
Fuel Oil	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0.0	0	
Natural Gas	Thou. Cubic Ft.	0.0	\$0.0	#DIV/0! /Thou Cu Ft	0.0	0.0	0	
LPG/Propane	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0.0	0	
Coal	S. Ton	0.0	\$0.0	#DIV/0! /S. Ton	0.0	0.0	0	
Purch. Steam	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0	
Other	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0	
		<b>Total Costs:</b>	<b>\$0.0</b>		<b>Total:</b>	<b>75.2</b>	<b>261.3</b>	<b>3,765</b>
Energy-Intensive Facilities (Thou. Gross Square Feet)		<b>404.9</b>			<b>Btu/GSF:</b>	<b>185,799</b>	<b>645,286</b>	
					<b>Btu/GSF w/ RE Purchase Credit:</b>	<b>185,799</b>	<b>645,286</b>	
					<b>Btu/GSF w/ RE &amp; Sec. 502(e) Credit:</b>	<b>185,799</b>	<b>645,286</b>	

**1-3. Exempt Facilities**

Energy Type	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Site-Delivered Btu (Billion)	Est. Source Btu (Billion)	Est. Carbon Emissions (Metric Tons)
Electricity	MWH	370,891.1	\$0.0	\$0.00 /kWh	1,265.5	4,395.1	63,325
Fuel Oil	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0.0	0
Natural Gas	Thou. Cubic Ft.	0.0	\$0.0	#DIV/0! /Thou Cu Ft	0.0	0.0	0
LPG/Propane	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0.0	0
Coal	S. Ton	0.0	\$0.0	#DIV/0! /S. Ton	0.0	0.0	0
Purch. Steam	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0
Other	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0.0	0
		<b>Total Costs:</b>	<b>\$0.0</b>		<b>Total:</b> 1,265.5	4,395.1	63,325
Exempt Facilities (Thou. Gross Square Feet)		18,646.7			Btu/GSF:	67,866	235,702
					Btu/GSF w/ RE Purchase Credit:	67,866	235,702
					Btu/GSF w/ RE & Sec. 502(e) Credit:	67,866	235,702

**1-4. Non-Fleet Vehicles and Other Equipment**

	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Btu (Billion)	Est. Carbon Emissions (Metric Tons)
Auto Gasoline	Thou. Gal.	2,412.9	\$4,494.0	\$1.86 /gallon	301.6	5,836
Diesel-Distillate	Thou. Gal.	807.1	\$1,598.1	\$1.98 /gallon	111.9	2,233
LPG/Propane	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0
Aviation Gasoline	Thou. Gal.	72.5	\$194.2	\$2.68 /gallon	9.1	171
Jet Fuel	Thou. Gal.	45.9	\$115.0	\$2.51 /gallon	6.0	115
Navy Special	Thou. Gal.	0.0	\$0.0	#DIV/0! /gallon	0.0	0
Other	BBtu	0.0	\$0.0	#DIV/0! /MMBtu	0.0	0
		<b>Total Costs</b>	<b>\$6,401.3</b>		428.6	8,356

**1-5. WATER CONSUMPTION, COST AND EFFICIENCY MEASURES**

	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)
Water	Million Gal.	158.1	\$331.6
Best Management Practice Implementation Tracking Data			
Number of facilities* in agency inventory			1,000
Number of facilities with completed water management plans			70
Number of facilities with at least four (4) BMPs fully implemented			3

\*number in the agency inventory, can be buildings, bases, or campuses

**1-6. RENEWABLE ENERGY/RENEWABLE ENERGY CERTIFICATE PURCHASES IN FY 2005**

(Only include renewable energy purchases from resources developed after 1990)

Description of <i>Each</i> Renewable Energy Purchase (examples below, insert additional rows as necessary for each separate purchase)	Amount Purchased (MWH)	or	Amount Purchased (Million Btu)	State or Region of Generation or Source	End Use Category (Standard, EI, or Exempt)
Electricity from Renewable Source	1,170.0		0.0	TN valley	Standard
Renewable Energy Certificates	0.0		0.0		EI
Natural Gas from Landfill/Biomass	0.0		0.0		Exempt
Renewable Thermal Energy	0.0		0.0		
Other Renewable Energy (describe)	0.0		0.0		
Total All Purchases	1,170.0		0.0		
Total Purchases for Standard Buildings	1,170.0		0.0		
Total Purchases for Energy Intensive Facilities	0.0		0.0		
Total Purchases for Exempt Facilities	0.0		0.0		

**1-7. SELF-GENERATED RENEWABLE ENERGY INSTALLED AFTER 1990**

	Consumption Units	Total Annual Energy	Energy Used by Agency*
Electricity from Renewables	MWH	3,630.0	30.0
Natural Gas from Landfill/Biomass	MMBtu	0.0	0.0
Renewable Thermal Energy**	MMBtu	0.0	0.0
Other Renewable Energy_HMOD*** (1)	MMBtu	37,030.4	0.0

\*Energy used by agency equals total annual generation unless a project sells a portion of the energy it produces to another agency or the private sector. It can equal zero in the case of non-Federal energy projects developed on Federal land.

\*\*Examples are geothermal, solar thermal, and geothermal heat pumps, and the thermal portion of combined heat and power projects. Energy savings from geothermal heat pumps should be based on energy savings compared to conventional alternatives like air-to-air heat pumps. If only electricity savings are known, multiply kWh savings by 3,412 to estimate renewable energy BTUs.

\*\*\*For other renewable energy that does not fit any category, fill in the type, units used, annual consumption and cost, and include any additional information in your narrative submission. For example energy displaced by daylighting technology or passive solar design.

(1) - This value represents TVA hydro modernization (HMOD) for FY2005 facility use.

**1-8. TOTAL RENEWABLE ENERGY USE AS A PERCENTAGE OF FACILITY ELECTRICITY USE**

Renewable Energy Use (BBtu)	Facility Electricity Use (BBtu)	RE as a Percentage of Electricity Use
53.4	1,876.4	2.8%

**PART 2: ENERGY EFFICIENCY IMPROVEMENTS**

**2-1. DIRECT AGENCY OBLIGATIONS**

(Agencies may attach their final OMB Circular A-11 Energy and Transportation Efficiency Management Exhibit in lieu of completing Table 2-1.)

	FY 2005		Projected FY 2006	
	(MMBTU)	(Thou. \$)	(MMBTU)	(Thou. \$)
Direct obligations for facility energy efficiency improvements, including facility surveys/audits		\$278.0		\$300.0
Estimated annual savings anticipated from obligations	2,231.0	\$40.0	2,500.0	\$45.0

**2-2. ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPC)**

	Annual savings (MMBTU)	(number/Thou. \$)
Number of ESPC Task/Delivery Orders awarded in fiscal year & annual energy (MMBTU) savings.	0.0	0
Investment value of ESPC Task/Delivery Orders awarded in fiscal year.		\$0.0
Amount privately financed under ESPC Task/Delivery Orders awarded in fiscal year.		\$0.0
Cumulative guaranteed cost savings of ESPCs awarded in fiscal year relative to the baseline spending.		\$0.0
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).		\$0.0
Total payments made to all ESP contractors in fiscal year.		\$0.0

**2-3. UTILITY ENERGY SERVICES CONTRACTS (UESC)**

	Annual savings (MMBTU)	(number/Thou. \$)
Number of UESC Task/Delivery Orders awarded in fiscal year & annual energy (MMBTU) savings.	0.0	0
Investment value of UESC Task/Delivery Orders awarded in fiscal year.		\$0.0
Amount privately financed under UESC Task/Delivery Orders awarded in fiscal year.		\$0.0
Cumulative cost savings of UESCs awarded in fiscal year relative to the baseline spending.		\$0.0
Total contract award value of UESCs awarded in fiscal year (sum of payments for debt repayment and other negotiated performance period services).		\$0.0
Total payments made to all UESC contractors in fiscal year.		\$0.0

**2-4. UTILITY INCENTIVES (REBATES)**

	Annual savings (MMBTU)	(Thou. \$)
Incentives received and estimated energy savings	0.0	\$0.0
Funds spent in order to receive incentives		\$0.0

**2-5. TRAINING**

	(number)	(Thou. \$)
Number of personnel trained/Expenditure	191	\$28.7

Attachment 2

**FY 2005 Federal Agency Energy Scorecard**

<b>Department/Agency Name</b>	<b>Contact Name and Phone</b>
Tennessee Valley Authority	Steve Brothers (423) 751-7369
<b>Name of Senior Energy Official</b>	<b>Signature of Senior Energy Official</b>
John E. Long	

<b>Did your agency . . .</b>	<b>Yes</b>	<b>No</b>	<b>Anticipated Submittal Date</b>																								
1. Submit its FY 2005 energy report to OMB and DOE by January 1, 2006 (Sec. 303)?	X		12-23-2005																								
2. Submit a FY 2006 Implementation Plan by January 1, 2006 (Sec. 302)?	X		12-23-2005																								
<b>Did your agency . . .</b>	<b>Yes</b>	<b>No</b>	<b>Comments</b>																								
3. Implement or continue to use renewable energy projects at Federal installations or facilitate the siting of renewable generation on Federal land in FY 2005 (Sec. 204)? (Report all self-generated renewable energy from projects installed after 1990; refer to Table 1-7 on the Energy Management Data Report)	X		<p>If yes, how many projects and how much energy generated? (Specify unit: MWH or MMBtu)</p> <table> <tr> <td></td> <td># Projects</td> <td>Energy</td> <td>Unit</td> </tr> <tr> <td>Solar</td> <td><u>1</u></td> <td><u>30</u></td> <td><u>MWH</u></td> </tr> <tr> <td>Wind</td> <td><u>3</u></td> <td><u>3,600</u></td> <td><u>MWH</u></td> </tr> <tr> <td>Thermal<sup>1</sup></td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Biomass</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Other RE<sub>(A)</sub></td> <td><u>42</u></td> <td><u>10,853</u></td> <td><u>MWH</u></td> </tr> </table>		# Projects	Energy	Unit	Solar	<u>1</u>	<u>30</u>	<u>MWH</u>	Wind	<u>3</u>	<u>3,600</u>	<u>MWH</u>	Thermal <sup>1</sup>	_____	_____	_____	Biomass	_____	_____	_____	Other RE <sub>(A)</sub>	<u>42</u>	<u>10,853</u>	<u>MWH</u>
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Biomass	_____	_____	_____																								
Other RE <sub>(A)</sub>	<u>42</u>	<u>10,853</u>	<u>MWH</u>																								
4. Purchase energy generated from new renewable energy sources in FY 2005 (Sec. 204)? <sup>2</sup> (Refer to Table 1-6 on the Energy Management Data Report)	X		If yes, how much: <u>1170</u> MWH or _____ MMBtu																								
5. Invest direct FY 2005 appropriations in projects contributing to the goals of the Order (Sec. 301)? (B)		X	If yes, how much: \$ _____																								
6. Specifically request funding necessary to achieve the goals of the Order in its FY 2007 budget request to OMB (Sec. 301)? (Refer to OMB Circular A-11, Section 25.5, Table 2) (B)		X	If yes, how much: \$ _____																								
7. Perform energy audits of 10% of its facility space during the fiscal year (Sec. 402)? (C)	X		What percentage of facility space was audited during the FY? <u>8</u> % How much facility space has been audited since 1992? <sup>3</sup> <u>131</u> %																								
8. Issue to private-sector energy service companies (ESCOs) any energy savings performance contract (ESPC) delivery orders (Sec. 403(a))? (Refer to Table 2-2 on the Energy Management Data Report) (D)		X	How many? _____ Annual savings (MMBtu): _____ Total investment value <sup>4</sup> : \$ _____ Cumulative guaranteed cost savings: \$ _____ Award value: \$ _____																								

1 Examples are geothermal, solar thermal, and geothermal heat pumps. Thermal energy from geothermal heat pumps should be determined as follows: Thermal energy = Total geothermal heat transferred – electrical energy used.

2 “New” renewable energy means sources developed after 1990.

3 Should be greater than 100% if all facility space has been audited at least once since 1992.

4 Investment value includes design, materials, labor, overhead, and profit but excludes contractor’s financing costs and government’s administration costs. Using investment value allows comparison with other traditional execution methods such as appropriated and working capital funded projects.

Did your agency . . .	Yes	No	Comments
9. Issue any utility energy services contract (UESC) delivery orders (Sec. 403(a))? (Refer to Table 2-3 on the Energy Management Data Report) (E)		X	How many? _____ Annual savings (MMBtu): _____ Total investment value <sup>4</sup> : \$ _____ Cumulative cost savings: \$ _____ Award value: \$ _____
10. Incorporate energy efficiency requirements into relevant acquisitions (Sec. 403(b)(3))? (F)	X		See TVA Energy Plan
11. Adopt and apply the sustainable design principles (e.g., Whole Building Design Guide, Leadership in Energy and Environmental Design (LEED)) to the siting, design, and construction of new facilities or major (budget line item) renovations begun in FY 2005 (Sec. 403(d))? (G)	X		Number of new building (or major renovation) design/construction projects in FY 2005 <sup>5</sup> : <u>1</u> Number of these projects that can or will be certified under LEED <sup>5</sup> : <u>0</u>
12. Provide training to appropriate personnel <sup>6</sup> on energy management (Sec. 406(d))? (H)	X		Number of appropriate personnel trained: <u>191</u> Total number of appropriate personnel: <u>191</u>
13. Implement any additional management tools (Sec. 406)?	X		Check all that apply: Awards: <u>X</u>  Performance Evaluations: <u>X</u>  Showcase Facilities: <u>X</u> Number of Showcase Facilities designated in fiscal year: <u>1</u>
14. Establish Water Management Plans (WMPs) and implement at least 4 Best Management Practices (BMPs) in at least 20% of agency facilities (Sec. 207, 503(f))? (I)	X		Number of facilities with WMPs and 4 BMPs: <u>3</u> Number of facilities in agency inventory: <u>1,000</u>

**NOTE: Provide additional information below if a “No” reply is used for any of the questions above.**

<sup>5</sup> Count projects only once, regardless of phase. For example, if in FY 2005, your agency had 10 new building or major renovation projects, of which 2 can be LEED certified, then report 10 and 2, respectively, in the spaces provided. If the project was designed and reported on in response to this question in a previous year, do not report it as a new project in FY 2005, even if construction commenced or continued in FY 2005.

<sup>6</sup> Appropriate personnel include the agency energy management team as well as Federal employees and on-site contractors who are energy or facility managers, operations and maintenance workers, design personnel, procurement and budget staff, and legal counsel.

Please enter data from annual energy report pertinent to performance toward the goals of Executive Order 13123	Base Year	Previous Year (2004)	Current Year (2005)	% Change (Current vs. Base)
15. Site Energy Efficiency Improvement Goals (Sec. 202). 1985 Base Year	82,357 Btu/Ft <sup>2</sup>	60,448 Btu/Ft <sup>2</sup>	58,418 Btu/Ft <sup>2</sup>	(29)%
16. Industrial/Energy Intensive Facilities Goals (Sec. 203). 1990 Base Year	232,662 Btu/unit	191,732 Btu/unit	185,799 Btu/unit	(20)%
17. Source Energy Use (Sec. 206). 1985 Base Year (J)	N/A	1,918.6 BBtu	1,842.1 BBtu	N/A
18. Water Conservation Goal (Sec. 207). 2000 Base Year	173.1 MGal	169.2 MGal	158.1 MGal	(9)%
19. Renewable Energy (Sec. 204) Energy used from self-generation and RE purchases (K)	N/A	125.3 BBtu	125.3 BBtu	N/A

Abbreviation Key: Btu/Ft<sup>2</sup> = British thermal units per gross square foot

Btu/unit = British thermal units per unit of productivity (or gross square foot when such a unit is inappropriate or unavailable)

MGal = Million gallons

MMBtu = Million British Thermal Units

BBtu = Billion British Thermal Units

RE = Renewable energy

N/A = Not applicable

- (A) This value represents a very small percentage of renewable power from hydro modernization and is based on projects covering multiple units and the number of effected facilities.
- (B) TVA is self funded through its power operations and does not request appropriations to support its statutory mission; therefore, TVA has not submitted any such requests.
- (C) Since FY 1992, TVA has evaluated 100-percent of its buildings, and plans to reevaluate facilities as needed to implement cost effective energy management objectives and/or update portfolio information.
- (D) TVA considers the use of ESCOs where cost effective and in the best interest of the agency and its customers.
- (E) TVA is a utility.
- (F) TVA incorporates energy efficiency language where appropriate.
- (G) TVA has a sustainable design program which applies to new construction and renovation.
- (H) This includes employees not specified under sec. 406(d) since all employees play an important part in energy management.
- (I) TVA has developed an agency wide water plan. TVA has implemented 4+ BMPs in three of its facilities accounting for 20% of TVA's total facility square footage.
- (J) 1985 source data is unavailable since a large portion of these facilities were under the "General Operations Plan" from 1985-1990.
- (K) The source conversion factor was used for this value (11,600 Btu/kWh).

## Attachment 3 Goals of Executive Order 13123 and NECPA/EPACT

### Executive Order 13123

Category	Goal	Comments
Greenhouse Gas Emissions	30% reduction by 2010	Base year is 1990. DOE will calculate agencies' progress toward this goal and report it on agencies' annual energy scorecards
Energy Efficiency		
Standard Buildings	<ul style="list-style-type: none"> <li>• 30% improvement by 2005</li> <li>• 35% improvement by 2010</li> </ul>	Base year is 1985
Industrial and Laboratory Facilities	<ul style="list-style-type: none"> <li>• 20% improvement by 2005</li> <li>• 25% improvement by 2010</li> </ul>	Base year is 1990
Exempt Facilities	N/A	Despite lack of quantitative goal, agencies should implement strategies to improve energy efficiency at these facilities.
Renewable Energy	<ul style="list-style-type: none"> <li>• Implement renewable energy projects</li> <li>• Purchase electricity from renewable energy sources</li> <li>• Install 2,000 solar energy systems at Federal facilities by 2000</li> <li>• Install 20,000 solar energy systems at Federal facilities by 2010</li> </ul>	Installation of Federal solar energy systems will help support the Million Solar Roofs initiative
Petroleum	Reduce petroleum use	Switches to alternative energy sources should be life-cycle cost effective
Source Energy	Reduce use of source energy	Accomplish by undertaking projects that are life-cycle cost effective
Water Conservation	Reduce water consumption*	Accomplish via life-cycle cost effective measures, energy-savings performance contracts, or other financing mechanism

### NECPA/EPACT

Energy Efficiency	20% improvement by 2000	Base year is 1985
Financing	Undertake all energy efficiency improvement projects that have a simple payback period of 10 years or less by 2005	E.O. 13123 expands this goal by mandating that any energy efficiency project that is life-cycle cost effective be undertaken
Audits	Conduct audits for energy efficiency on 10% of facilities annually	E.O. 13123 includes language supporting this goal

\* FEMP has established water efficiency improvement goals as directed by the Executive Order. Agencies must implement Water Management Plans and Best Management Practices according to the following schedule:

05% of facilities by 2002

15% of facilities by 2004

30% of facilities by 2006

50% of facilities by 2008

80% of facilities by 2010

For more detail, see the FEMP guidance document Water Efficiency Improvement Goal for Federal Agencies