

Energy Efficiency and Natural Resource Conservation in Public Buildings



January 1, 2011

Arkansas Energy Office
Arkansas Economic Development Commission
900 West Capitol, Suite 400
Little Rock, AR 72201
www.arkansasenergy.org

FOREWARD

The Arkansas General Assembly authorized the Arkansas Energy Office to promulgate these Rules in Act 1494 of 2009. These Rules, in adherence with the Administrative Procedures Act, are effective January 1, 2011.

Arkansas adopts the *American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE), Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.*

To order copies of the ASHRAE Standard with update supplements contact:

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(501) 682-1370

Effective January 1, 2011

INTRODUCTION

Public buildings can be built, renovated and operated using sustainable, energy-efficient practices and technologies that save money, reduce negative environmental impacts and improve employee performance. Act 1494 was passed by the General Assembly to show that the State of Arkansas can design and operate its buildings in order to “Lead By Example”. The two programs established by Act 1494 are the Sustainable Public Buildings Program and the State Buildings Energy Management Program.

The main objectives of the Sustainable Public Buildings Program are to:

1. Avoid resource depletion of energy, water, and raw materials;
2. Prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and
3. Create buildings that are cost effective, habitable, safe, and productive.

State-owned buildings and buildings owned by an institution of higher education can be improved by establishing specific performance criteria and goals for sustainable, energy-efficient public buildings that are based on recognized, consensual standards with a scientifically proven basis and a history of successful performance.

The role of the Arkansas Energy Office (AEO) is to develop and administer policies, procedures and technical guidelines for compliance with the criteria and performance standards for the construction and renovation of major facilities. The AEO will also develop and administer guidelines for state agencies to manage energy, water and other utilities that will reduce total energy consumption per gross square foot, to the maximum extent practicable, for all existing state buildings. This energy management program is designed to achieve compliance with State Laws and Policies concerning energy efficiency goals through the implementation of energy conservation measures and monitoring of the utility costs and usage.

The main objectives of the State Buildings Energy Management Program are to:

1. Promote energy conservation in buildings owned by public agencies and institutions of higher education, and therefore reduce the rate of expenditures of public dollars;
2. Develop and adopt guidelines and technical guidance for compliance with the efficient energy management and operation of state buildings; and
3. Reduce the use of energy, in accordance with ACA § 25-4-406, twenty percent (20 %) by the end of fiscal year 2014 and thirty percent (30%) by the end of the fiscal year 2017. This reduction will be measured in total energy use per gross square foot per year compared to fiscal year 2008.

CHAPTER 1: ADMINISTRATION AND ENFORCEMENT

- A. **Title.** These Rules shall be known as *Sustainable Energy-Efficient Public Buildings (Lead By Example) or these Rules.*
- B. **Scope.** The Arkansas Energy Office (AEO) promulgates these Rules for the implementation of energy efficient measures in certain state buildings, and to adopt building energy standards for energy efficiency and conservation in sustainable state building design. The AEO will also develop educational and training guidelines for the various personnel that may be involved in implementation of energy measures required by these Rules.
- C. **Exempt buildings.** Buildings and structures indicated in Sections 1 through 3 below may be exempt from the provisions of these Rules, if the conditions below have been met.
1. **Major University Systems.** The boards of trustees for the University of Arkansas System, Arkansas State University System, the University of Central Arkansas, Henderson State University, Arkansas Tech University, and Southern Arkansas University are exempt from the provisions of these Rules if those institutions develop policies and procedures to meet the specific performance criteria and goals for a major facility or major renovation. These Rules do not preclude an institution of higher education from adopting the policies and technical guidelines for a major facility or major renovation established by the AEO under Chapter 3 and 4 of these Rules or affect the processes or exemptions under ACA§ 22-6-601.
 2. **Other Institutions of Higher Education.** The board of trustees of any institution of higher education that is not included under Chapter 1.C.1. of this section may be exempted from the provisions of these Rules by the Department of Higher Education using the procedures described in these Rules. These Rules do not preclude an institution of higher education from adopting the policies and technical guidelines for a major facility or major renovation established by the AEO under Chapter 3 and 4 of these Rules or affect the processes or exemptions under ACA§ 22-6-601.
 3. **Historic and Unique Buildings.** These Rules do not apply if the implementation of a measure to conserve energy, water, or other utility use conflicts with the requirements for a property to be eligible for, nominated to, or entered on the

National Register of Historic Places under the National Historic Preservation Act of 1966, P.L. 89-665; the Arkansas Register of Historic Places; is a historic building located within a historic district; is a historic building listed, owned, or under the jurisdiction of a Historic Properties Commission; or is a building that the AEO has exempted from these Rules because of its unique architectural characteristics or usage.

CHAPTER 2: DEFINITIONS

- A. **“ASHRAE”** - the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
- B. **“Commissioning”** - a systematic process of ensuring that building systems perform interactively according to the design intent and the Owner’s operational needs. This is achieved beginning in the predesign phase by documenting the design intent and continuing through construction, acceptance, and the warranty period with actual verification of performance, operation and maintenance (O&M) documentation verification and training of operating personnel. [See appendix E for further references.]
- C. **“Director”** - the Director of the Arkansas Energy Office.
- D. **“Economic life”** - the projected or anticipated useful life of a facility or mechanical system. The maximum study period is 25 years not including planning, design, construction and installation. This is referenced in 10 CFR 436A.
- E. **“Energy audits”** - a process for identifying energy conservation opportunities in a facility. There are four levels of energy audit: Walk-Thru Audit, Walk-Thru Analysis, Energy Survey and Analysis and Detailed Analysis of Capital Intensive Modifications. These classifications are as noted in *ASHRAE Procedures for Commercial Building Energy Audits, 2004* and Appendix B.
- F. **“Energy conservation measure”** - an installation or modification of an installation in, or a remodeling of, an existing building in order to reduce energy consumption and operating costs.
- G. **“Energy efficiency measure”** - actions taken that create a reduction in the energy used for a given service (heating, lighting, etc.) or level of activity.
- H. **“Energy Star Portfolio Manager, (ESPM)”** - an interactive energy management tool developed by the Environmental Protection Agency that allows managers to track and

assess energy and water consumption across the entire portfolio of buildings in a secure online environment.

- I. **“Energy Price Indices and Discount Factors for Life-Cycle Cost Analysis”**- National Institute of Standards and Technology (NISTR) 85-3272-24, is the source document to be used for life-cycle cost analysis for energy, water conservation, and renewable energy projects. This publication is a supplement for NIST Handbook 135, Life-Cycle Costing Manual and the indices are updated annually.

- J. **“Gross square footage”** - expressed in square feet, is the total area to include rooms and supporting functions used by the occupants of a building. This would include offices, hallways, corridors, lobbies, atria, conference rooms, auditoria, fitness areas, storage areas, stairways, elevator shafts, etc. Gross square footage is computed by physically measuring or scaling measurements from the outside faces of exterior walls.

- K. **“Institution of higher education”** - a state-supported university or college.

- L. **“International Performance Measurement and Verification Protocol (IPMVP)”** - a uniform way to implement and measure energy and water savings.

- M. **“Life-Cycle Cost Analysis, (LCCA)”** – means an analytical technique that considers the costs of owning, using, and operating a facility over its economic life including the following:
 - 1. Initial costs;
 - 2. System repair and replacement costs;
 - 3. Maintenance costs;
 - 4. Operating costs, including energy costs; and
 - 5. Salvage value.

- N. **“Major facility”** - a construction project larger than twenty thousand (20,000) gross square feet of occupied or conditioned space. “Major facility” does not include a transmitter building or a pumping station.

- O. **“Major renovation”** - a building renovation project that:
 - 1. Costs more than fifty percent (50%) of the building’s current insured value;
 - 2. Is larger than twenty thousand (20,000) gross square feet of occupied or conditioned space; and
 - 3. Is funded in whole or part by the state.

- P. **“Measurement & Verification (M&V)”** - quantifies the savings being obtained. This applies to initial savings and long term savings. Since the persistence of savings has been shown to decrease with time, long term M&V provides data to make these savings sustainable. M&V must be cost effective, so that the cost of measurement and the analysis does not consume the savings. M&V will be performed in accordance with the guidelines established in the International Performance Measurement and Verification Protocol, 2002.
- Q. **“Public agency”** - a state agency, office, officer, board, department, or commission.
- R. **“Retrocommissioning”** - The application of the commissioning process to existing buildings. Retrocommissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retrocommissioning can often resolve problems that occurred during design and construction, or address problems that have developed throughout the building’s life. In all, retrocommissioning improves a building’s operations and maintenance procedures to enhance overall building performance.
- S. **“Recommissioning”** - The process of re-verifying the performance of building systems that have been commissioned previously to ensure the systems continue to operate according to the design intent or current operating needs. Recommissioning may be initiated periodically or in response to a building renovation or a change in usage.
- T. **“Separate utility meters”** - a meter installed to monitor the usage of each utility type; electricity, fuel oil, natural gas, water, and other utilities installed at each building undergoing a major facility construction or renovation project.
- U. **“Standards”** - Sustainable Public Building Standards.
- V. **“Sustainable energy efficient public building”** - means a public building that, by complying with this rule, has the most economical energy and water efficiency for that type of building.
- W. **“Sustainable public building”** - A state-owned, public building that integrates building materials and methods that promote environmental quality, energy conservation, economic vitality, and social benefit through the design, construction, and operation of the building; a building that merges sound, environmentally responsible practices into one design that looks at the environmental, economic, and social effects of a building or built project as a whole; and the design encompasses:
1. Efficient management of energy and water resources;
 2. Management of material resources and waste;
 3. Protection of environmental quality;

4. Protection of health and indoor environmental quality;
 5. Reinforcement of natural systems; and
 6. Integrating the design approach.
- X. **“Water conservation measure”** - an installation or modification of an installation in, or a remodeling of, an existing building or the surrounding grounds in order to reduce water consumption.

CHAPTER 3: SUSTAINABLE ENERGY-EFFICIENT PUBLIC BUILDINGS RULES (LEAD BY EXAMPLE)

- A. **General** - The Sustainable Energy-Efficient Public Buildings Rules (Lead By Example) are established to promote energy efficiency in buildings owned by public agencies and institutions of higher education.
- B. **AEO Role** - Under the Sustainable Energy-Efficient Public Buildings Rules for public agencies, the AEO shall develop and issue policies and technical guidelines to establish procedures and methods for compliance with the criteria and the performance standards for a major facility or a major renovation under Chapter 4. The AEO will administer an energy management program and provide guidance designed to achieve compliance with the requirements of Chapter 6 through implementation of energy conservation measures.
- C. **Institutions of Higher Education Role** - Under the Sustainable Energy-Efficient Public Buildings Rules, each institution of higher education, under its own governance, shall develop policies and technical guidelines to establish procedures and methods for compliance with the criteria and performance standards for a major facility and a major renovation under Chapter 4. Institutions of higher education may also develop and implement an energy management program. If an institution of higher education chooses to develop and implement an energy management program, the institution may either develop and administer its own program or they may adopt the State Building Energy Management Program set forth in these Rules.
- D. **State Agency Role** - Each State agency is responsible for complying with these Rules to ensure the proper design, construction and operation of new major facilities and major renovations, as well as to implement energy management plans and guidelines. The appointment and training of an Energy Manager is necessary to ensure a central point of contact with regard to compliance with these Rules. The level of training for the agency Energy Manager needs to be consistent with the complexity of the agency facilities. State agencies will be required to submit annual reports to the AEO as required by these Rules in order to monitor agency efforts to reduce utility consumption and allow the

agency to be recognized for their efforts and achievements. Each agency is responsible for the monthly updating of their ESPM accounts in order to provide an accurate record of energy efficiency efforts and progress, and is consistent with the agencies' requirements under the Governor's Executive Order #09-07 issued May 28th, 2009 (see Appendix E).

CHAPTER 4: SUSTAINABLE PUBLIC BUILDING STANDARDS FOR A MAJOR FACILITY OR A MAJOR RENOVATION

A. The following minimum standards apply to a major facility:

1. A major facility of a public agency or an institution of higher education shall be designed, constructed, and certified to at least a ten percent (10%) reduction below the baseline energy consumption determined in accordance with the Performance Rating Method of Appendix G of the ASHRAE, Standard 90.1-2007, as existed on January 1, 2009-. The design engineer/ architect certifies conformance by adding the following statement on their final design prints for a project:

“I certify that to the best of my knowledge these plans and specifications are as required by the ACA 25-4-404. Name/Signature/Title/Date”

2. Item 1 of this section applies to a major facility project that has not entered the schematic design phase before the effective date of this Rule, January 1, 2011.
3. An exception or a special standard for a specific type of building or building facility that is found in the ASHRAE, Standard 90.1-2007, is included in the ASHRAE, Standard 90.1-2007, under subdivision (a)(1) of this subsection. This supersedes any preceding code requirement.

B. The following minimum standards apply to a major renovation:

1. A major renovation of a public agency or an institution of higher education shall be certified to at least a ten percent (10%) reduction below the baseline energy consumption determined in accordance with the Performance Rating Method of Appendix G of the ASHRAE, Standard 90.1-2007, as existed on January 1, 2009. The design engineer/architect certifies conformance by adding the following statement on their final design prints for a project:

“I certify that to the best of my knowledge these plans and specifications are as required by the ACA 25-4-404. Name/Signature/Title/Date”

2. Item 1 of this section applies to a major facility renovation project that has not entered the schematic design phase before the effective date of this Rule, January 1, 2011.

C. Construction under either Item A or Item B of this subsection requires:

1. Indoor water systems shall be designed and constructed to use at least twenty percent (20%) less potable water than the indoor water use baseline calculated for the building after satisfying the fixture performance requirement, after meeting the 2006 Arkansas Plumbing Code.
2. Outdoor potable water and/or harvested groundwater systems shall be designed to use water efficient landscape materials and irrigation strategies, including water reuse and recycling, with the goal to reduce potable water consumption by at least fifty percent (50%) of the water that would have been consumed otherwise.
3. Commissioning for Major Facilities/Major Renovations - Commissioning practices shall be employed and tailored to the size and complexity of the building and its system components. Each building component and each energy and water system shall be identified as soon as possible and incorporated into the commissioning process at the earliest phase of the construction process possible. Commissioning shall continue through the initial operation of the building until the commissioning agent has ensured that the owner's building systems have been tested and perform according to the design intent and building operators are properly trained.
4. Measurement and Verification for Major Facilities/Major Renovation - The project design team, construction team and the public agency shall jointly determine what level of measurement and verification is appropriate for the size and complexity of the building or its energy and water system components. To ensure that measurement and verification of performance of a major facility meets this section's standards:
 - a) At a minimum, a separate utility meter for electricity, natural gas, fuel oil, and water shall be installed for each building in accordance with established guidelines of the United States Department of Energy under Section 103 of the Energy Policy Act of 2005. The public agency or institution of higher education and the building designers shall:

- i. Compare metered data from the first twelve (12) months of the building's operation with the energy and water design target:
and
 - ii. Report the performance results of that comparison to the AEO or to the governing board of the institution of higher education.
 - b) If the report under Item ii of this section shows that the building's average energy or water consumption over the one-year period after the date of beneficial occupancy is more than the baseline consumption determined in accordance with the Performance Rating Method of Appendix G of the ASHRAE, Standard 90.1-2007, as existed in January 1, 2009, the designer, the owner public agency or the owner institution of higher education, the contractor, the Contract Manager at Risk, and the commissioning agent shall investigate, determine the cause for the failure to achieve this section's performance standards; and recommend corrections or modifications to meet this section's performance standards.
- D. If the AEO or the institution of higher education determines the ASHRAE, Standard 90.1-2007 is not practicable for a major facility or major renovation, the AEO or the institution of higher education shall determine a practicable alternative standard for the design and construction for that major facility or major renovation.

CHAPTER 5: PURCHASE OF A CONSTRUCTED OR RENOVATED BUILDING

- A. A public agency shall not purchase a building that:
 1. Does not meet the design and construction standards that were applicable for a comparable State building at the time of its construction; or
 2. Had a major renovation that did not meet the standard for energy and water efficiency that was applicable for a comparable building at the time of the major renovation.
- B. This section does not apply to:
 1. The purchase of a building that has historic, architectural, or cultural significance;
 2. A building that is acquired by devise or gift; or
 3. A building that is purchased for demolition.

CHAPTER 6: STATE BUILDINGS ENERGY MANAGEMENT PROGRAM

- A. **General** - The AEO will promote and develop guidelines and provide technical guidance for state agencies to manage energy, water and other utilities that will reduce total energy consumption per gross square foot for all existing state buildings. The AEO will further administer an energy management program designed to achieve compliance with energy efficiency goals through implementation of energy conservation measures and development of an energy and water cost and use database.

- B. **Energy Manager** - To coordinate this program each agency will assign one person in their organization as the Energy Manager. The name of this person shall be given to the AEO and updated as changes are made. The Energy Manager will coordinate energy efficiency efforts for the agency and be responsible for reporting required by this program. The Energy Manager should also be responsible for reviewing and approving capital improvement projects and maintenance projects to ensure compliance with the Agency's energy management program and compliance with this program.

- C. **Energy Management Plan Elements** - There are many facets to the development of the energy efficiency program. The key program areas for energy efficiency in state facilities are strategic energy planning, energy and water usage and cost tracking, life cycle cost analysis, energy efficient procurement practices, energy efficiency measures, building performance and energy training. Reductions in energy use per square foot of gross floor area will be achieved through implementation of these key program areas.

1. Strategic Energy Plans:

The AEO will require Strategic Energy Plans from state agencies to insure state agencies have developed and implemented plans intended to reduce total energy consumption per gross square foot for existing state buildings by twenty percent (20%) by 2014 and thirty percent (30%) by 2017 based on energy consumption for the fiscal year 2008.

Strategic Energy Plans for all agencies will be submitted once every 5 years to include annual updates each year on October 31st. The 5 year plan and updates must be uploaded to the Arkansas Energy Office website www.arkansasenergy.org for AEO review and approval. All agencies are required to report unless specifically exempted by law.

Each agency shall include in their Strategic Energy Plan a description of the agency's goals and strategies to meet the 2014 and 2017 goals and a plan for continued energy efficiency efforts. The plan must document the current status of the agency in implementing energy efficiency improvements, report

the success and challenges of the program to date, and describe the plans to continue improvements.

At a minimum, the Strategic Plan must include the following:

- a) Cover letter from the agency director, which includes a signed acknowledgement showing the director's approval of the plan.
- b) Explanation for why the agency has or has not achieved the goals of its Strategic Energy Plan.
- c) List of the energy efficiency projects planned for the next five years and a timeline for completion of these energy projects
- d) An updated inventory of facilities is required by agencies owning or leasing buildings. An Excel template is provided on the AEO website for this purpose.

A suggested Strategic Plan Outline is provided in Appendix A. More detailed templates and guidelines for plans will be available from the AEO website.

2. Energy Usage and Cost Tracking using Energy Star Portfolio Manager (ESPM):

ESPM shall be used by each agency to organize their data to establish a baseline of energy usage for fiscal year 2008 and track subsequent energy, water and other utility usage and costs. Each agency must establish accounts in ESPM. To establish accounts, facility and utility bill data must be gathered and entered into the accounts, starting with data for July, 2007. These accounts must be updated on a monthly basis. The Energy Manager in each agency will be the point of contact for information in this database. Agencies will give the AEO "Share" permission to view and use the account data in ESPM. This data will allow verification of the energy savings by the agency for each facility and will be aggregated to show the energy savings by an agency and state agencies as a whole. The AEO will consider changes in the baseline of an agency on a case by case basis. Requests for changes to the baseline should be forwarded to the Director of the Energy Office

3. **Life Cycle Cost Analysis (LCCA):**

A LCCA shall be performed by state agencies on all building energy and water designs related to state agency facilities. Methods for performing a LCCA are listed in Appendix C. The AEO requires the use of NISTIR 85-3273-21 Energy Price Indices and Discount Factors for Life-Cycle Cost. Alternative LCCA methods and indices/discount factors may be used only upon approval by the AEO. Projects must consider the economic life of the building system and components when making this determination. The results of the LCCA must be reported to AEO and the report must include economic assumptions used in the calculations.

4. **Energy Efficient Procurement Practices:**

- a) Agency purchasing practices must provide the maximum interchangeability and compatibility of equipment components when energy management equipment is proposed for any facility of a public agency. This is not intended to require agencies to sole source purchasing of equipment or limit the agencies to only one protocol, but to encourage open sources of energy management equipment consistently applied within any given state owned building.
- b) The Department of Finance and Administration has developed policies, procedures, and standards to ensure that public agency purchasing practices include:
 - i. Requirements concerning the use of financial instruments for energy savings, including energy performance contracting, that stipulates the delivery of measurable and pre-determined energy savings;
 - ii. Requirements to purchase equipment based on lists of energy-efficient product specifications for different categories of equipment;
 - iii. Requirements to purchase equipment that has efficient energy consumption in all modes, including standby mode;
 - iv. Using, where applicable, life-cycle cost analysis. Procurement regulations R11:19-11-229 & R3:19-11-234 describe requirements for life-cycle costing;
 - v. Requirements to replace or retrofit existing equipment with the equipment listed in sections ii and iii;
 - vi. Requirements to purchase or rent energy-efficient buildings or parts thereof.

- c) State agencies will implement a program whereby all of the following low cost energy conservation measures shall be fully implemented no later than January 1, 2012:
- i. Lighting Systems – the installation of exit signs that employ light-emitting diode (LED) technology: the replacement of incandescent light bulbs with compact fluorescent light bulbs; and where appropriate, the installation of occupancy sensors or optical sensors.
 - ii. Water Systems – The installation of aerators in sink faucets that reduce the flow of water to a rate of no more than five-tenths gallons per minute (.5 gpm); the installation of shower heads with a flow rate equal to or less than 2.0 gallons per minute; where appropriate the resetting of hot water heaters to a water temperature of 130 degrees; the training of staff to monitor the use of irrigation systems and to base the use of the system on the moisture content of the soil.
 - iii. Heating, Ventilation, and Air-conditioning (HVAC) Systems – For HVAC equipment that is subject to replacement, review the heat load calculation and proposed specifications for the replacement HVAC equipment to ensure that it is not oversized; and, for building automation systems that are programmable, the training to ensure that these systems are properly programmed and maintained.
 - iv. For retrofit of existing buildings that require no significant expenditure of funds: Disconnect lamps in drink vending machines. Use power save feature on computers, monitors, copiers, fax machines and other office equipment. Purchase only Energy Star office equipment and appliances.

5. Building Performance - Energy Audits, Recommissioning and Retro-Commissioning:

Energy Managers should periodically evaluate the performance of the facilities used by the agency. In order to perform an adequate investigation, the Energy Manager should determine if the facility needs justify an energy audit or a more intensive recommissioning or retrocommissioning. Proper evaluation of facilities will identify energy efficiency measures that need to be taken to improve the performance of the facility. The AEO recommends audits or commissioning activities be performed every 5 years. Appendix B contains supplemental information for the different levels of auditing that can be performed on buildings. The Agency energy manager shall ensure that architects licensed by the Arkansas State Board of Architects or professional

engineers licensed by the Arkansas State Board of Registration for Professional Engineers and Land Surveyors are engaged to provide energy audit or commissioning services when such services involve the practice of architecture or engineering in accordance with Arkansas Code Annotated § 17-15-101 et seq and 17-30-101 et seq respectively.

6. Energy Training:

The AEO will offer education and training as funds are available. The education program will include various levels of training relating to the design, operation and maintenance of facilities, life-cycle cost analysis, energy audits, retro-commissioning and energy management. The training will be open to energy managers, chief financial officers, facility managers, capital project coordinators of public agencies, architects and engineers.

The AEO shall develop one level of education and training requirements for the chief financial officer of each public agency that is appropriate for the chief financial officer's level of involvement in projects under this section. The AEO shall develop, for each public agency that is responsible for the payment of the agency's utilities, another higher level of education and training requirements for the facility manager of the agency that is appropriate for the facility manager's level of involvement in projects under this section. This level of education and training shall also be a requirement for the capital project coordinator of an agency involved in a project under this section. The AEO shall develop a highest level of education and training requirements for the architects and mechanical design engineers that are involved in the design of projects under this section that is appropriate for their level of involvement in these projects.

CHAPTER 7: ADVISORY COMMITTEE OF THE ARKANSAS ENERGY OFFICE

A. The Director of the Arkansas Energy Office of the Arkansas Economic Development Commission shall create an advisory committee composed of:

1. Representatives from the design and construction industry who are involved in public works contracting;
2. Persons from public agencies and higher education who are responsible for overseeing public works projects or for developing energy efficiency programs and policies; and
3. Other persons that the Director considers to have useful information.

- B. Advisory committee members shall serve at the pleasure of the Director.
- C. The committee shall provide advice on the implementation of these Rules, including recommendations regarding:

1. An education and training program for persons who are involved in the implementation of these Rules to include specific education and training criteria that are appropriate for the various roles with respect to levels of involvement in projects subject to these Rules or the roles regarding the operation and maintenance of the facility;
2. An ongoing evaluation or feedback process to help the AEO administer and implement this section;
3. Water-efficiency and energy-efficiency requirements, in addition to making recommendations to the AEO regarding revising standards for water and energy efficiency.

CHAPTER 8: PERFORMANCE REVIEW AND REPORT

- A. The AEO, to the extent funds are available, shall conduct a performance review of the Sustainable Energy Efficient Public Building Rules that include at least the following:
 1. An identification of the costs of implementing energy efficient and water efficient building standards in the design and construction of a major facility or major renovation;
 2. An identification of the operating savings attributable to the implementation of energy efficient and water efficient building standards, including savings in energy, water, utility, and maintenance costs;
 3. An identification of any impact on employee productivity from the application of the standards under these Rules;
 4. An evaluation of the effectiveness of the application of the standards under these Rules;
 5. Recommendations on whether stricter standards or additional criteria for sustainable buildings should be used other than those in effect;

6. Recommendations on the expansion of this program to include additional types of projects, and or include smaller major facility construction or renovation projects; and
 7. Recommendations for other changes regarding sustainable, energy efficient building standards supported by the AEO findings.
- B. No later than December 1, 2010 and each year thereafter, the AEO shall report to the co-chairs of the Legislative Council its findings under Section 8A and recommended changes, if any.
- C. Institutions of Higher Education named in Chapter 1. Major University Systems, shall follow such reporting requirements as may be required by their Board of Trustees' or Departments' policies and procedures.

APPENDIX A: STRATEGIC ENERGY PLAN OUTLINE

Strategic Energy Plans are a critical aspect of the development of an energy efficiency program for a state agency. Below is a suggested outline for agencies to use:

Strategic Energy Plans Outline

1. Cover Letter by the Agency Director
2. Agency Executive Summary
3. Goals and Strategies
4. Environmental Compliance Issues
5. Proposed Capital Projects
6. Proposed Energy and Water Conservation Measures
7. Consideration of Cogeneration and Renewable Technologies
8. Energy Related Contract Review
 - a. Review of the use of natural gas contracts
 - b. Review of electrical rate structures
 - c. Detail use of Energy Saving Performance Contracts
9. Key Performance Indicators (KPI) – such as energy use index (EUI) measured in MMBTU/sqft/year and energy cost index (ECI) measured in \$/sqft/year
 - a. Agency level
 - b. Detailed listing by ESPM Facility
10. Summary and Conclusion
11. Attachments
 - Timeline to 2017
 - List of Energy Efficiency projects for the next 5 years
 - Explanation of variations from planned reductions

APPENDIX B: ENERGY AUDITS AND AUDIT PROCEDURES

A. The American Society of Heating Air Conditioning and Refrigeration Engineers (ASHRAE) *Procedures for Commercial Building Energy Audits, 2004*, has developed standard energy audit levels. There are four levels of commercial energy audits recognized by the AEO and three of them conform to ASHRAE's standards. The ASHRAE procedures should be reviewed for additional information and requirements for Levels 1-3 audits. Below is a brief description of these audits:

1. **Overview or Walk-Thru Audit** - Overview audits are the least expensive type of commercial energy audit. They involve walking through a facility, identifying energy conservation opportunities, interviewing facility personnel, and quickly reviewing the facility's utility bills. The overview audit is fine for smaller organizations and those on a budget that want some quick tips on how they can reduce their energy usage and costs. It basically gives a road map of what to do.
2. **ASHRAE Level 1 – Walk Through Analysis** - ASHRAE Level 1 audits are more intensive than Overview Audits and are used for clients who are seeking Leadership in Energy and Environmental Design-Existing Building status. The ASHRAE Level 1 audit focuses on low-cost/no-cost energy conservation measures, and provides a list of higher cost energy conservation measures. In addition to tasks performed in the Overview Audit, in the ASHRAE Level 1 audit, energy and energy cost savings are reported for each energy conservation opportunity. An energy balance is performed, which breaks out energy usage into different end uses.
3. **ASHRAE Level 2 – Energy Survey and Analysis** - ASHRAE Level 2 audits include a more detailed building survey, financial projections, and energy analysis than ASRHAE Level 1 audits. Basically, ASHRAE Level 2 audits will identify all appropriate energy conservation measures for a facility, and a financial analysis will be performed based on implementation costs, operating costs, and attainable savings. You will know for each energy conservation measure, the amount to be saved, the amount the measure will cost, and the amount of time it will take for the measure to pay for itself. In addition, ASHRAE Level 2 audits will discuss any changes to operations and maintenance procedures. ASHRAE Level 2 audits are used by clients who are seeking LEED-EB status and are normally less expensive than Retro-Commissioning. With ASHRAE Level 2 audits, realistic savings reports with regard to baseline

operating costs should be provided. These reports will stress the expected return on investment, and projected savings will be presented.

4. **ASHRAE Level 3 – Detailed Analysis of Capital Intensive Modifications**

This level of engineering analysis focuses on the potential capital-intensive projects identified in the Level 2 analysis and involves more detailed field data gathering as well as a more rigorous engineering analysis. It provides detailed project cost and savings calculations with the high level of confidence required for major capital investment decisions. This audit alternatively is called a comprehensive audit, detailed audit, or technical analysis audit. It expands on the Level 2 audit by providing a dynamic model of energy use characteristics of both the existing facility and all energy conservation measures identified. The building model is calibrated using actual utility data to provide a realistic baseline against which to compute operating savings for proposed measures. Extensive attention is given to understanding not only the operating characteristics of all energy consuming systems, but also the situations that cause load profile variations on both an annual and a daily basis. Existing utility data is supplemented with sub-metering of major energy consuming systems and monitoring of system operating characteristics.

APPENDIX C: ADDITIONAL RESOURCES

Operations and Maintenance:

O&M Best Practices – A Guide to Achieving Operational Efficiency – Federal Energy Management Program (FEMP) - Free from FEMP:

http://www1.eere.energy.gov/femp/program/operations_maintenance.html

Life-Cycle Cost Analysis:

American Society for Testing and Materials (ASTM) Standards on Building Economics 917-02:

<http://www.astm.org/Standards/E917.htm>

Federal Building Life-Cycle Cost (BLCC): Free from FEMP:

<http://www1.eere.energy.gov/femp/program/lifecycle.html>

Federal Life-Cycle Costing *NIST Handbook 135 (HB 135, Life-Cycle Costing Manual for the Federal Energy Management Program)*

<http://www.bfrl.nist.gov/oa/publications/handbooks/135.pdf> Free from FEMP

ATHENA® EcoCalculator for Common Building Assemblies:

<http://www.athenasmi.org/tools/ecoCalculator/>

NIST Building for Environmental and Economic Sustainability (BEES):

<http://www.wbdg.org/tools/bees.php>

Facility Energy Decision System (FEDS):

<http://www.pnl.gov/FEDS/> Free from PNL

Metering Best Practices:

Department of Energy "Metering Best Practices Guide, 2007."

<http://www1.eere.energy.gov/femp/pdfs/mbpg.pdf> Free from FEMP

Energy Modeling Software:

eQuest: Free from DOE:

<http://www.doe2.com/equest/>

DOE-2: Free from DOE:

<http://www.doe2.com/>

e+, Energy Plus Free from EERE:
<http://apps1.eere.energy.gov/buildings/energyplus/>

Trane Trace 700:
<http://www.trane.com/CPS/Uploads/UserFiles/CDS%20files/TRACE/CDS-SLB005-EN.pdf>

Carrier “Hourly Analysis Program” (HAP):
http://www.commercial.carrier.com/commercial/hvac/general/0,,CLI1_DIV12_ETI11936,00.html

Energy Soft/EnergyPro:
<http://www.energysoft.com/>

Federal Energy Management Program (FEMP), Building Life-Cycle Cost (BLCC) Programs:
Free from FEMP:

http://www1.eere.energy.gov/femp/information/download_blcc.html#blcc5

DOE process for commercial energy code compliance: Free from DOE:
http://www.energycodes.gov/implement/determinations_com.stm

Measurement and Verification:

International Performance Measurement and Verification Protocol, IPMVP, 2002

Available electronically at <http://www.doe.gov/bridge>

email: orders@ntis.fedworld.gov
online ordering: <http://www.ntis.gov/ordering.htm>

Commissioning and Recommissioning Buildings

American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)
Journal:
<http://www.newcomb-boyd.com/pdf/ASHRAE%20Wiggins.pdf>

Building Commissioning Association (BCxA):
www.bcxa.org

Building Commissioning Guide, Office of Energy Efficiency and Renewable Energy Federal
Energy Management Program, U.S. Department of Energy:
http://www1.eere.energy.gov/femp/pdfs/commissioning_fed_facilities.pdf

California Commissioning Guide for Existing Buildings:
<http://www.documents.dgs.ca.gov/green/commissioningguideexisting.pdf>

Cx Assistant Commissioning Tool:
www.ctg-net.com/edr2002/cx/

The Building Commissioning Handbook, Second Edition by John A. Heinz & Rick Casault, The Building Commissioning Association, 2004:
<http://www.bcxa.org/resources/index.htm>

U.S. General Services Administration (GSA), *The Building Commissioning Guide*:
<http://www.wbdg.org/ccb/GSAMAN/buildingcommissioningguide.pdf>

Portland Energy Conservation, Inc. (PECI):
<http://www.oregon.gov/ENERGY/CONS/BUS/comm/docs/retrocx.pdf?ga=t>

APPENDIX D: ENERGY CONSERVATION MEASURES AND EXAMPLES

Some examples of energy conservation include the following:

Energy Conservation Measure Descriptions

Lighting

Install new and/or retrofit lighting fixtures

Fluorescent lighting

This measure applies to buildings where existing fluorescent lighting is not up to date. In most cases, existing lighting has T12 lamps and magnetic ballasts. Older buildings have standard magnetic ballasts while newer construction may have energy-efficient magnetic ballasts.

This measure consists of upgrading T12 fixtures to new T8 lamps and electronic ballasts, upgrading exit signs, and lighting controls and installing occupancy sensors where economical. In areas with long burn hours, the fixture retrofit may also include a specular reflector to increase fixture efficiency.

Incandescent Lighting

This measure applies wherever incandescent lighting still exists and has more than "occasional" burn hours. The upgrade consists of either a) replacing the incandescent lamp with a compact fluorescent lamp, or b) installing a new light fixture with an either a compact or linear fluorescent lamp.

Install Occupancy Sensors

This measure consists of installing occupancy sensors in classrooms, laboratories, offices and other areas where lights may be left on while the area is unoccupied. In small rooms, wall switch occupancy sensors may be adequate. In larger rooms, it may be necessary to use ceiling or corner mounting locations.

Install new and/or retrofit exit light fixtures

This measure consists of upgrading all existing incandescent and fluorescent lamp exit signs to newer lamp technology such as an LED light source. The measure can be accomplished by installing new exit signs or retrofitting the existing exit signs with upgrade kits as applicable.

Replace existing HID lighting with high intensity fluorescent technology

Large areas with high ceilings are good candidates for new high-bay light fixtures using the more efficient high output fluorescent lamp technology such as T-5 fluorescents. This upgrade measure will apply gymnasiums, warehouse space, and high bay workshops. Interior spaces such as libraries and atrium areas, which may currently use HID lighting, could also be good candidates for this upgrade. In addition to the lighting energy savings (about 50% vs. metal halide) the new lighting is "instant on" and can be controlled with occupancy sensors and dimming controls to produce even more savings.

Replace existing Parking-lot lighting with high intensity fluorescent technology

This measure should incorporate the latest technology in outdoor florescent lighting fixtures

and controls.

Controls

Install/activate outdoor reset controls

This measure consists of the installation of improved controls, which measure the temperature of outside air. They adjust the boiler water temperature to optimize heating system efficiency by reducing water temperature to the minimum required to provide heat satisfactorily. The upgraded controls also turn off the circulating pumps when the building requires no heat. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or deactivated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install/activate night setback controls

This measure consists of the installation of new temperature controls, which lower temperatures during unoccupied periods in the heating season – primarily nights, weekends and vacation breaks. The same setback controls may also apply to air-conditioning during the cooling season. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or de-activated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install premium efficiency motor(s) and/or variable speed drives

This measure consists of replacing standard efficiency motors with premium efficiency motors and installing variable speed drives on pumps and/or fans, which run at constant speed but have variable loads. The measure is normally limited to motors larger than 2 HP and with run times greater than 2500 hours per year.

Install/activate economizer cooling

This measure applies to those facilities that have air-conditioning systems and lack the capability to cool the facility using outside air. It requires the addition of economizer controls that measure the temperature and humidity of outside air and use it for cooling whenever feasible. In some facilities, equipment may exist that is designed to perform this function, but it may be inoperable, malfunctioning or de-activated. In these situations, the control will be upgraded, replaced or activated to perform this function.

Install demand controlled ventilation

This measure consists of installing the equipment necessary to control outside air brought into the building (or a particular area within a building) according to its occupancy. Spaces without demand control ventilation are generally designed to provide ventilation based on the maximum possible occupancy for the space. During periods of lower occupancy, the space may be significantly over ventilated and use unnecessary energy. In most cases, this measure requires an indoor air quality (IAQ) sensor, a variable damper on the outside air inlet and a control system that varies the damper opening according to the real time IAQ. Gymnasiums, auditoriums and other large areas that have widely varying occupancy are good candidates for this measure.

Install intelligent fan controls on kitchen and lab ventilation hoods

This measure consists of installing specialized fan controls or exhaust hoods that can regulate the kitchen or lab hood exhaust fan speed according to the actual cooking or

occupancy activity being performed under the hood. The systems often use variable speed drives on the exhaust fan motors.

Install small energy management system (EMS) with remote access

This measure consists of the installation of a small, microprocessor-based energy-management system (EMS), or the upgrade of an existing EMS system, which will schedule and control the main energy consuming equipment in the building. In addition to optimizing the building's control functions the system will be capable of remote access so its conditions can be monitored from anywhere using a phone or Internet link.

In particular, the system must be capable of remote monitoring of space temperatures and the status of boilers, furnaces, pumps, fans and AC units. The EMS system must be capable of interfacing with existing EMS equipment and controls unless a completely new system is more economical.

HVAC & Plumbing Measures

Install more efficient heating equipment

Most of the heating systems utilize either a warm air furnace or a hot water boiler. Fuel is predominantly oil although gas and propane are available in some locations. This measure consists of replacing the existing furnace or boiler with a new, more efficient unit (based on AFUE) or replacing rooftop units. Multiple modular boilers are preferred over large single units. Also, facilities using natural gas or propane for fuel should consider high efficiency condensing boilers.

Install more efficient Air Conditioning (AC)

Many buildings have areas with air conditioning to ensure student and staff comfort during the summer months. These small AC systems vary in age, size and efficiency. This measure is for the installation of more efficient (higher SEER) new AC units. Many of these new units have dual stage compressors so they operate at lower power (and higher efficiency) for all but the peak summer days.

Install new higher efficiency water heater

This measure consists of replacing an old water heater with a new, higher efficiency water heater or heat pump water heater. Heat pump water heaters are particularly effective in buildings that use a boiler to produce domestic hot water during the heating months. With a heat pump water heater the main boiler can then be shut down. Other improvements in water heaters include units with pilot-less ignition, a flue-gas damper, thick exterior insulation and a high efficiency heat exchanger. The most efficient units use a burner with a forced-draft fan. This measure will also consider the installation of an instantaneous water heater, which may be more applicable for areas that only need hot water for hand-washing type activities.

Install water conserving plumbing fixtures and devices

This measure will replace or retrofit existing inefficient water-consuming plumbing fixtures such as toilets, urinals and faucet aerators with new water conserving lower-flow fixtures, devices and controls. Measures should be considered to control costs and usage of outside watering for landscaping purposes.

Building Envelope

Add additional glazing panel and/or retrofit existing glazing system

This measure consists of adding an interior or exterior glazing panel to the existing window system to boost energy efficiency and reduce air infiltration. Alternatively, a retrofit of the entire existing glazing system should be considered where economically feasible.

Increase ceiling/roof insulation

This measure consists of adding insulating material to the ceiling or roof areas of buildings that presently have little or no ceiling/roof insulation. In most cases it will consist of additional fiberglass bats, rigid panel insulation or blown-in insulation.

Alternative Work Items

Install small high efficient boiler for summer use

This measure consists of the installation of a small "pony" boiler for use during the spring, summer and fall periods. When possible, the unit should be a condensing boiler, which operates at very high efficiency when at low load.

Replace existing rooftop heating/ac units

This measure will investigate the economical replacement of the existing roof top heating and cooling equipment with higher efficiency units.

Weather-stripping, sealing and caulking

This measure consists of lowering the air infiltration rate of buildings through the application of weather-stripping materials, caulking and sealants around exterior fenestrations. Old and deteriorated materials shall be removed prior to the application of new materials.

APPENDIX E: EXECUTIVE ORDER

STATE OF ARKANSAS
EXECUTIVE DEPARTMENT
PROCLAMATION

EO 09-07

TO ALL TO WHOM THESE PRESENTS COME -- GREETINGS:

EXECUTIVE ORDER TO ENCOURAGE THE REDUCTION OF ENERGY CONSUMPTION BY STATE AGENCIES AND THE ENVIRONMENTAL IMPACT OF STATE AGENCY OPERATIONS

WHEREAS: Arkansas State government is a highly visible model for Arkansas's citizens, businesses, industries, and local governments; and

WHEREAS: The daily activities and routine operations of State government have a significant impact on the quality of Arkansas's environment and consumption of scarce natural resources; and

WHEREAS: The cost of energy continues to rise, and traditional sources of non-renewable energy continue to be depleted at a rapid pace; and

WHEREAS: State government is a leading consumer of energy throughout the State; and

WHEREAS The systematic evaluation, adoption, and implementation of simple practices and policies in all Executive Branch Agencies can lead to significant cost savings to taxpayers, while promoting the national interest by eliminating wasteful and unnecessary energy consumption and by reducing the negative environmental impact of State government operations;

NOW, THEREFORE, I, MIKE BEEBE, acting under the authority vested in me as Governor of the State of Arkansas, do hereby order the following:

1. All Executive Branch Agencies under the jurisdiction of the Governor shall, with the assistance of and in consultation with the Arkansas Energy Office, the Arkansas Building Authority, the Department of Finance and Administration's Office of Procurement, and the Department of Information Systems, begin developing individual agency Strategic

Energy Plans (SEPs) with the twin goals of 1) reducing each agency's annual maintenance and operating budget devoted to energy consumption, and 2) promoting agency operations and practices that will reduce, to the extent practicable, the environmental impact of the agency's overall operation.

2. Each SEP must contain detailed provisions for the collection and periodic monitoring of data on the agency's annual energy use, which shall include the collection and monitoring of data that will permit the agency to evaluate with specificity where and how energy is used. To facilitate the collection and evaluation of such data, each agency shall utilize available evaluative tools and criteria, such as the United States Environmental Protection Agency's Energy Star for State Government tool or the United States Green Building Council's Leadership in Energy & Environmental Design (LEED) certification program.

3. Following the collection and evaluation of the aforementioned data, each agency shall develop and adopt a detailed plan for the reduction of annual agency energy costs and agency environmental impact. In developing such plans, each agency shall adopt, to the extent consistent with existing law, policies and practices that mandate or encourage nocost or low-cost energy conservation measures for all State-owned and leased buildings and office spaces, which may include but shall not be limited to the following:

(a) The development of new, or the revision of existing, standards and criteria for purchasing or using materials, products, and services:

(1) That align with the Environmental Protection Agency's Energy Star Qualified Products program;

(2) That consider the availability of bio-based products, as required by Act 542 of 2005;

(3) That express a preference for the purchase of products that are made from, and/or packaged with, recycled materials, and products that are, themselves recyclable in whole or in part;

(b) The establishment of criteria for vehicle purchases that, to the extent appropriate for the vehicles' intended use, will result in a more fuel-efficient agency and State-vehicle fleet;

(c) The establishment, within agencies, of recycling programs for paper and plastic waste, and the participation in any statewide equipment recycling program that may be established for equipment that can be utilized by other State agencies;

(d) Implementation of policies and practices that will reduce energy consumption attributable to lighting systems, including, but not limited to:

(1) Policies that ensure that lighting systems are turned off during nonoperating hours;

(2) The conversion to more energy-efficient lighting systems and bulbs as existing systems and bulbs warrant repair or replacement, including the use of occupancy light sensors to prevent energy waste in unoccupied buildings;

(3) Maximizing use of natural lighting whenever possible and consistent with temperature control; and

(4) Removal and reduction of other non-essential lighting.

(e) Measures to ensure that HVAC systems operate at reduced levels during nonoperating hours;

(f) Policies and practices designed to ensure that all electrically-powered equipment, including computer equipment, is turned off when not in use, and that personal computers are configured with default settings that ensure that computers go into “sleep” after 30 minutes or less of non-use;

(g) Policies and practices designed to reduce the use of paper, including but not limited to:

(1) The phasing-out of the use of personal on-desk printers and the establishment of multi-user print stations that include printers, copiers, and scanners;

(2) The use of duplexer add-ons to printers that automatically print dual-side prints of multi-page documents;

(3) The setting of typeface fonts and default page margins in word-processed or other agency-printed documents, so as to maximize paper use;

(4) Encouraging and requiring, where appropriate, the use of electronic, “paperless” communication between agency employees, in lieu of printed materials.

(h) The establishment of agency-wide policies designed to reduce “plug load” attributable to the use of non-essential appliances, such as personal coffee makers, toasters, space heaters, refrigerators, microwave ovens, fans, televisions, radios, etc.

(i) The establishment of training programs for agency employees in the implementation of low- and no-cost operation and maintenance conservation measures, and the designation and training of agency supervisory personnel, who will be responsible for monitoring and enforcing energy-efficiency measures within the agency.

4. Each affected agency shall transmit a copy of its SEP to the Office of the Governor, along with a proposed timeline for implementation of each aspect of its plan, on or before October 31, 2009.

5. Legislative, Judicial, and other constitutionally-independent agencies or entities not under the Governor's jurisdiction are encouraged to voluntarily participate in and comply with the provisions of this Order.

6. The provisions of this Order supplement, not supplant or repeal, any and all applicable statutory provisions governing procurement and State agency operations. Nothing in this Order shall be construed or interpreted as limiting in any way any agency's ability to adopt and implement additional policies and procedures, consistent with existing law, that are designed to reduce agency energy consumption and environmental impact.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Arkansas to be affixed at the Capitol in Little Rock on the 28th day of May, in the year of our Lord 2009.

ORIGINAL SIGNED

MIKE BEEBE, GOVERNOR

ORIGINAL SIGNED

CHARLIE DANIELS, SECRETARY OF STATE