In-House Energy Management Plan

This plan formalizes the Ames Laboratory In-House Energy Management Plan and defines the responsibilities for implementation.

Comments and questions regarding this plan should be directed to the contact person listed below:

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1.0 REVISION/REVIEW LOG

This document will be reviewed once every year as a minimum.

Revision Number	Effective Date	Contact Person	Pages Affected	Description of Revision
0	**3/1/01**	**Vaclav**	**ALL**	**INITIAL ISSUE**
1	**10/1/02**	**Vaclav**	**ALL**	**Add CY2002 requirements.**
2	**2/1/03**	**Vaclav**	**ALL**	**Update usage data and add CY03, CY04 activities.**

2.0 PURPOSE AND SCOPE

The U.S. Department of Energy (DOE) has specified in DOE Order O 430.2A – DEPARTMENTAL ENERGY AND UTILITIES MANAGEMENT- energy reduction goals for its major facilities for FY 2005 and FY 2010. The DOE has directed DOE-owned and contractor-operated sites to develop an Energy Management Plan outlining how these energy reduction goals will be accomplished. This document is the Energy Management Plan for Ames Laboratory (AL) covering the period FY 2000 to FY 2010.

AL's Energy Management Plan is directed to four major areas, which are described in greater detail in the following sections.

3.0 RESPONSIBILITY

3.1 Responsibilities

Manager, Facilities Services: – is responsible for oversight of the Ames Laboratory IHEM program.

Plant Engineer: – is responsible for collection and reporting of data and monitoring progress toward defined goals.

4.0 PREREQUISITE ACTIONS AND REQUIREMENTS

None

5.0 IMPLEMENTATION SCHEDULE

This plan contains elements that are to be completed during calendar year 2003 and 2004 as well as long term goals that are targeted for CY 2010.

6.0 INTRODUCTION STATEMENT

The U.S. Department of Energy (DOE) has specified in DOE Order O 430.2A – DEPARTMENTAL ENERGY AND UTILITIES MANAGEMENT- energy reduction goals for its major facilities for FY 2005 and FY 2010. The DOE has directed DOE-owned and contractor-operated sites to develop plans outlining how these energy reduction goals will be accomplished. This document is the Energy Management Plan for Ames Laboratory covering the period FY 2000 to FY 2010.

The Ames Laboratory is a multi-program, government-owned, contractor operated, facility located at and operated by Iowa State University, Ames, Iowa. Ames Laboratory conducts basic research in the physical, chemical, and material sciences. Major objectives are the preparation, characterization, and evaluation of the properties of metals; their alloys and other solid state materials and the precise measurements and theoretical interpretation over wide temperature and pressure ranges.

Ames Laboratory is located on the Iowa State University Campus with 4 main buildings, which house research facilities, 6 buildings which provide for support functions and one ISU building in which the Laboratory has beneficial occupancy. More than 600 people work at Ames.

In the conduct of its research, Ames spent approximately $307,000 for 6.8 GWh of electricity and nearly $626,000 for other forms of energy in FY 2002. To help manage these expenditures, AL's Energy Management Plan is directed to four major areas, which are described in greater detail in the following sections. They are as follows:

- Meet DOE mandated goals.
- Meet operating contract performance measures.
- Procure energy at the lowest cost.
- Improve efficiency of energy consuming systems in the most cost-effective manner.

The format and content of this report is largely based on previous DOE ten-year plan requirements. However, we have made several changes to help identify specific goals, objectives and schedules. The level of detail presented for each of the major initiatives and specific goals identified in this program is commensurate with the limited energy conservation opportunities available to the Ames Laboratory due to its relative small size and minimal energy usage compared with other DOE sites. Additional detail will be included in future 10-year plan revisions as appropriate.

As indicated above, cost estimates as well as funding sources to implement many of the energy related initiatives identified in this document have yet to be completed and/or identified. With the elimination of the In-House Energy Management (IHEM) retrofit program in FY95, it can be difficult to find a viable method of funding to implement energy-related projects and programs. The use of programmatic or operational funds is nearly impossible, at present, due to mission-

related needs of each of the research departments and the high priority of other projects as ranked utilizing the Environment, Safety, Health and Infrastructure Management Plan Risk Ranking. While DOE recommends the use of Energy Savings Performance Contracts (ESPC's) to provide third-party funding, construction, and in some cases operation and maintenance, there are significant concerns with this approach.

7.0 POLICY STATEMENT

It is the policy of the Ames Laboratory to conserve energy with the goal of reducing energy use and costs to the lowest cost-effective levels while meeting the mission of the Ames Laboratory

8.0 ENERGY MANAGEMENT AT AMES LABORATORY

A. ORGANIZATION

Ames Laboratory does not have a dedicated Energy Management Group instead, all energy management functions are the responsibility of the Facilities Services Group, which is charged with maintaining the entire facility. The Facilities Services Group is responsible for the development, implementation and coordination of the Energy Management Plan, and for leading AL's effort to meet DOE's energy reduction goals.

B. GOALS

All of the goals identified in this document are intended to help reach one overall objective - to reduce energy use and costs to the lowest cost-effective levels while meeting the mission of the Ames Laboratory in accordance with DOE Order 430.2A, DEPARTMENTAL ENERGY AND UTILITIES MANAGEMENT Attachment 1, CONTRACTOR REQUIREMENTS DOCUMENT.

DOE Mandated Goals -

DOE Order 430.2A DEPARTMENTAL ENERGY AND UTILITIES MANAGEMENT sets energy reduction goals for all DOE sites. The goals are: (Items 2.d.(1)(a) through 2.d.(1)(d) of Attachment 1, CONTRACTOR REQUIREMENTS DOCUMENT of DOE Order 430.2A)

1. Reduce:

- Greenhouse gas emissions attributed to facility energy use by 30 percent by 2010 compared to such emissions levels in 1990.

- Energy consumption per gross square foot by 30 percent by 2005 and 35 percent by 2010 relative to 1985 for those facilities included within the Buildings energy reporting category.

The Bench Mark energy usage established for FY1985 at the Ames Laboratory is 259,100 BTU/SQ. FT. In FY2002 the Ames Laboratory consumed 260,589 BTU/SQ. FT. which is an increase of 1,485 BTU/SQ. FT. or approximately 0.5% from FY1985.

- Energy consumption per gross square foot by 20 percent by 2005 and 25 percent by 2010 relative to 1990 for those facilities included within the Industrial and Laboratory Facilities energy reporting category.

NOTE: Industrial facilities are defined in Executive Order 13123, Energy Efficiency and Water Conservation at Federal Facilities, as those facilities where the majority of energy use is not for typical energy use functions such as heating, cooling, and lighting. The Ames Laboratory does not have any industrial facilities making this goal NOT APPLICABLE to this site.

- Water consumption through water efficiency programs and plans to contribute to the Department's objective of accomplishing 80% of identified life cycle cost-effective water conservation actions by 2010 using the best management practices published by the Federal Energy Management Program as a guide.

During FY2002, Ames Laboratory used 7,174,400 gallons of water at a cost of $33,535.57. This compares with 21,202,320 gallons used during FY1987, **a reduction of 66.2%**.

2. Complete energy and water usage audits of all Ames Laboratory Facilities by June 2004.

C. PLAN

This section discusses ways AL plans to meet its energy management objectives. It includes directives from DOE Order 430.2A, DEPARTMENTAL ENERGY AND UTILITIES MANAGEMENT. These additional elements constitute goals themselves; each contributes to meeting the energy reduction goals discussed above.

(1) Implement life cycle cost-effective improvements, as identified during facility energy audits (item c below) on an annual basis, as funding is available, toward reducing:

- Greenhouse gas emissions attributed to facility energy use by 30 percent by 2010 compared to such emissions levels in 1990.

- Energy consumption per gross square foot by 30 percent by 2005 and 35 percent by 2010 relative to 1985 for those facilities included within the Buildings energy reporting category.

(2). Implementing water management through water efficiency programs and plans.

The water efficiency programs are to include not less than four separate water efficiency improvement best management practices published by the Federal Energy Management Program. Implementation means incorporating water management plans into facility planning processes and operating plans; the application of appropriate operations and maintenance options; review of retrofit/replacement options within the last two years; and accomplishing those retrofit/replacement options that are life cycle cost-effective according the following schedule: 5 percent by 2002; 15 percent by 2004; 30 percent by 2006; 50 percent by 2008; and 80 percent by 2010.

(3) Complete energy and water usage audits of all Ames Laboratory facilities

The Order requires each site's Energy Management Program to "Demonstrate Annual progress of at least 10 percent toward completing energy and water audits of all facilities, either through energy savings performance contracts or utilities energy-efficiency service contracts or other means. Include the Energy Star Building label rating tool in facility audits of office buildings to support applications for the Energy Star Building label."

Ames Laboratory has prioritized its buildings for survey and has completed the survey of the HVAC system in Spedding Hall, and all of Wilhelm Hall which represents approximately 51% of Ames Laboratory space. Surveys of remaining Ames Laboratory buildings will be conducted as funds become available.

AL's energy audit plan is as follows:

- Complete Surveys of Buildings according to the following priority:
  Metals Development
  Spedding Hall water usage
  TASF
  Service Buildings

(4) Annual progress toward installing, by 1-1-05, in DOE-owned buildings, life cycle cost-effective energy and water conservation measures identified by facility audits.

With the demise of IHEM funding, AL will be aggressive seeking programmatic and operational funding for potential projects, identified by the surveys described above, that are deemed to be cost-effective. However, with the increased demands for funding throughout the laboratory it will continue to be difficult to find funds for energy measures.

(5) Annual progress toward qualifying office buildings for the Energy Star Building label by 12-31-02.

AMES has evaluated its buildings for qualification of the EPA Energy Star Building Label. Of the AMES buildings, only the TASF building meets the definition of an Office Building and therefore is the only AMES building eligible for the Energy Star Label. Evaluation of the TASF Building shows that the building does not qualify for Energy Star Label status as there is no sub-metering to provide building energy consumption data required to qualify for the Energy Star Label.

(6) Application of sustainable design principles to new buildings and building alterations. Compliance with 10 CFR 435, Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal buildings, from conceptual design through commissioning.

Ames has no new facilities under construction, in the design process or submitted in the budget cycle. Ames is cognizant of the need to utilize sustainable design guidelines and if funding is obtained for new buildings in the future, the sustainable design guidelines issued by DOE will be utilized.

(7) Designation of newly constructed facilities with significant public access and exposure as Showcase facilities to highlight energy efficiency and water efficiency and renewable energy improvements.

(8) Selection of DOE/EPA Energy Star products, including microcomputers and peripheral equipment, into guide specifications and acquisition systems. Where Energy Star products are not available, selection of products in the upper 25 percent of energy efficiency.

A listing of available Energy Star Products is available at www.energystar.gov. This listing includes products for facility maintenance, such as transformers, exit signs and traffic lights, as well as general office equipment such as copiers, computers, and scanners. This information has been forwarded to the AL Purchasing Department for their use. Procedures are in place within the Purchasing Department to ensure that Microcomputers and peripheral equipment comply with Executive Order 13123. Additionally, every effort is made to ensure that energy efficient and water-saving products are purchased when appropriate.

(9) Use of energy efficiency and water conservation as selection criteria when acquiring leased buildings, or when renegotiating or extending existing leases. Alternately, the selection of buildings that have the Energy Star Building label when leased space in such buildings is available.

The Ames Laboratory has no leased buildings. Ames Laboratory rents a small amount of laboratory space within several building belonging to Iowa State University. The utility costs associated with the rented space are included in the per-square-foot cost and are not billed separately. Should leasing be done in the future, the selection process will include energy efficiency and water conservation criteria.

(10) Continuous identification, through a system of surveys and inspections, and correction of energy conservation operational and maintenance deficiencies as benchmarked against Federal energy conservation operation standards that are correctable at low cost.

AL has an excellent ongoing preventative maintenance program. On a regular basis, equipment is inspected and serviced to ensure that it is operating efficiently. Equipment schedules and service requirements are maintained in a computer database. AL's Operations and Maintenance Division continues a formal preventative maintenance steam trap testing program. Steam trap testing is conducted using ultrasonic and thermal diagnostic instruments. The results of the testing assist personnel in identifying and replacing defective steam traps.

Additionally, Ames Laboratory has an on-going Condition Assessment Survey program which continually evaluates the facilities identifying and prioritizing needed repairs. The program specifically evaluates building envelope and building systems for good condition and proper operation.

(11) Minimization of the use of petroleum-based fuels in DOE-owned buildings and facilities by switching to a less greenhouse gas intensive, non-petroleum based energy source such as natural gas or renewable energy source as measured at the end source when life cycle cost- effective. For buildings and facilities that use petroleum-based fuel systems, provide dual-fuel capability where cost-effective and practicable.

Ames Laboratory does not use petroleum-based fuel in its buildings or facilities.

(12) Increased use of alternative funding mechanisms in lieu of direct appropriations for energy efficiency improvements consistent with good business practices.

Ames Laboratory will pursue ESPC's where feasible.

(13) Increased number of trained energy managers as needed to ensure effective implementation of requirements.

The individuals charged with energy management at the Ames Laboratory are trained to levels commensurate with the actual level of energy usage and number of systems and buildings that require management.

(14) Increased use of off-grid generation systems, including solar hot water and solar electric supporting the Million Solar Roofs initiative, solar outdoor lighting, small wind turbines, fuel cells and other technologies, when such systems are life-cycle cost effective and offer other benefits.

To date, solar technologies have not been cost-effective at AL due to the relatively low cost of electricity. AL will continue to monitor improvements in renewable technologies and will utilize them when feasible.

(15) Increased purchase of electricity from less green-house intensive sources as measured at the source including, but not limited to, new advanced technology fossil energy systems, and other highly efficient systems.

Currently the City of Ames, the supplier of electricity to the Ames Laboratory, generates 10% of it power through the burning of Refuse Derived Fuel, a renewable resource.

(16) Control of electric, gas, and water loads to minimize utilities costs and mitigate the impact of sudden disruptions in the supply of energy, when appropriate and practical.

Ames Laboratory endeavors to install high efficiency equipment when performing upgrades and repairs. As upgrade opportunities occur, high efficiency motors are installed and, where appropriate and cost effective, variable frequency drives are installed to allow systems to reduce energy usage when demand is reduced.

(17) Performance evaluations to assess performance, and employee incentive programs to reward exceptional performance in reducing energy costs, water costs, and reducing greenhouse gasses.

(18) Outreach programs to motivate employees to modify behavior to become more efficient in their use of energy and water and to minimize waste. This would include periodic training on the proper operation of fume hoods and reviews of laboratory water usage.

(19) The ride share program continues as a cooperative venture with Iowa State University (ISU) for car-pooling and van pooling with ISU providing a clearinghouse for employees seeking car-pooling. Ames Laboratory employees are encouraged to establish independent car pools. The University also makes passenger vans available for Ames Laboratory personnel participating in van pooling. The possibilities for achieving general conservation in transportation are broader than those considered for this program.

The Ames Laboratory is an integral part of the Iowa State University campus. Our goals will entail an effort to achieve coordination with the University's program and to promote other modes of transportation such as bicycling and walking. Communication of ride

sharing information is accomplished using the Iowa State University and Ames Laboratory newsletters. Additionally, as part of the Iowa State University campus, the City of Ames public transportation system, Cy-Ride, is available to Ames Laboratory employees commuting from within the City of Ames.

(20) As the Ames Laboratory upgrades old plant systems, including building HVAC, an effort is being made to integrate them into a centralized digital control system to help ensure consistent operation, ease of control, increased monitoring capability and, ultimately, save energy. A comprehensive study of the expected energy savings has not been performed as the energy savings would be difficult, at best, to separate from any achieved by the system upgrade alone.

D. PLAN STRATEGY

In order to meet DOE and AL energy management goals, AL employs a multi-faceted strategy. A major focus of the strategy is to negotiate the lowest-cost contracts with energy suppliers, while providing the most flexibility to AL's programmatic activities. At the same time, AL constantly monitors energy and water usage to detect and quickly correct any unusual usage. This section describes some recent and planned activities in these areas.

(1) Electrical Power Purchases

AL is located within the service territory of the Ames Municipal Electric System. As Iowa has not de-regulated electric power, AL must purchase its electricity from the City of Ames. Currently, the Ames Municipal Electric System has rates that are well below the national average and are lower than any of the utilities in the central Iowa, averaging approximately 4.6¢ per kWh for FY 2002. The City recently negotiated a new fuel supply contract which should keep rates stable for the foreseeable future.

(2) Steam and Chilled Water Purchases

The Ames Laboratory does not operate a central plant for producing steam or chilled water. All steam and chilled water is purchased directly from Iowa State University.

(3) Natural Gas Purchases

Ames Laboratory utilizes a minimal amount of natural gas to heat the support buildings. The total usage for FY 2002 was 2,812,004 cu ft. at an average cost of $5.29 per K cu. ft. All but a tiny fraction is purchased from Alliant Utilities. The remainder, less than 2000 cu. ft. per year, is purchased from Iowa State University.

E. TRACKING PROGRESS

Several reports and indicators are used to track AL progress for our various energy initiatives. They are continually updated and modified to improve their usefulness. Some are identified below:

(1) Monthly Plant Engineering Energy Usage Review

This report is prepared monthly as a precursor to the Quarterly Energy Conservation Report and is used to assess AL's operating energy usage. The data on this report is analyzed to identify any unusual usage and allow AL to correct any unusual conditions. Included are indicators for energy use/square foot, energy cost savings based on base year FY85, electricity cost, electricity load factor and others.

(2) Quarterly Energy Conservation Performance Report

This report is prepared quarterly and submitted electronically to DOE. Included are energy consumption and cost data for buildings, processes, and vehicles.

(3) In-House Energy Management Annual Report

At the conclusion of each fiscal year, the Energy Management Group at AL completes an evaluation of the IHEM program, its projects, achievement toward its goals and the AL Mission. This evaluation is based on energy cost and consumption data and a subjective assessment of the effectiveness of energy management efforts and is presented to the DOE as the Annual Report on In-House Energy Management.

(4) Audit Progress

At the conclusion of each fiscal year, the Energy Management Group at AL completes an evaluation of the IHEM program, its projects, achievement toward its goals and the AL Mission. This report includes an update on the status of the required audits and is presented to the DOE as part of the Annual Report on In-House Energy Management.

F. CY 2003 ACTIVITIES

During CY 2003 the Ames Laboratory plans to complete an energy and water usage survey of the Metals Development Building. Due to the scope of this project, completion will be contingent upon securing adequate funding.

Ames Laboratory will prepare IHEM project proposals for feasible life-cycle cost effective energy conservation projects identified by the audits described previously.

Ames Laboratory will continue to monitor fume hood operation to encourage energy saving practices.

Ames Laboratory will continue to upgrade lighting to more energy efficient fixtures and ballasts in those laboratories and offices being refurbished.

Ames Laboratory will begin implementing life-cycle cost effective energy and water conservation measures identified in the building surveys.

G. CY 2004 ACTIVITIES

By early CY 2004 the Ames Laboratory plans to complete all energy and water usage surveys. Due to the scope of this project, completion will be contingent upon securing adequate funding.

Ames Laboratory will prepare IHEM project proposals for feasible life-cycle cost effective energy conservation projects identified by the audits described previously.

Ames Laboratory will continue to monitor fume hood operation to encourage energy saving practices.

Ames Laboratory will continue to upgrade lighting to more energy efficient fixtures and ballasts in those laboratories and offices being refurbished.

Ames Laboratory will continue implementing life-cycle cost effective energy and water conservation measures identified in the building surveys.

9.0 POST PERFORMANCE ACTIVITIES

NONE