THE Ames Laboratory

Creating Materials & Energy Solutions

U.S. DEPARTMENT OF ENERGY

Lab Plan

Fiscal Year 2011

Prepared: July 7, 2011

Ames Laboratory

Mission/Overview

The Ames Laboratory (AMES) was formally established in 1947 by the United States Atomic Energy Commission as a result of AMES' successful development of the most efficient process to produce high-purity uranium metal in large quantities for the Manhattan Project. Situated on the campus of Iowa State University, the management and operating (M&O) contractor, the Laboratory's mission is to create materials, inspire minds to solve problems, and address global challenges. AMES is the premier DOE national laboratory for research on rare earths. AMES operates the Materials Preparation Center (MPC) which prepares, purifies, fabricates and characterizes materials in support of R&D programs throughout the world. AMES also performs research for the DOE's applied energy technology and nonproliferation programs and, through its Work for Others (WFO) program, provides research and materials to the National Institute of Justice, Department of Defense, various law enforcement agencies, and corporations. AMES researchers have won 17 R&D 100 Awards from R&D Magazine, which selects the 100 most significant technical products and innovations each year. Educating the next generation of scientists is a key component of the research at AMES; since 1947, over 3000 Masters and Ph.D. degrees in science and engineering have been awarded to ISU students working on DOE funded projects.

Materials design, synthesis and processing, including rare earths; analytical instrumentation/device design/fabrication; materials characterization; catalysis; condensed matter theory (including photonic band gap and other novel materials); and separation science are key areas of expertise at AMES. These areas enable AMES to deliver its mission and customer focus, to perform a core role in the DOE laboratory system, and to pursue its vision for scientific excellence and pre-eminence in the areas of:

- Materials research directed towards energy technologies including alternatives for rare earths, optical, magnetic, intermetallic, and catalytic materials; studies of high temperature materials and materials in extreme conditions; and
- Analytical techniques and instrument development.

Current Core Capabilities

The Office of Science (SC) has identified 3 core capabilities at the Ames Laboratory.

Lab-at-a-Glance

Location: Ames, Iowa

Type: Single-program Laboratory

Contractor: Iowa State University

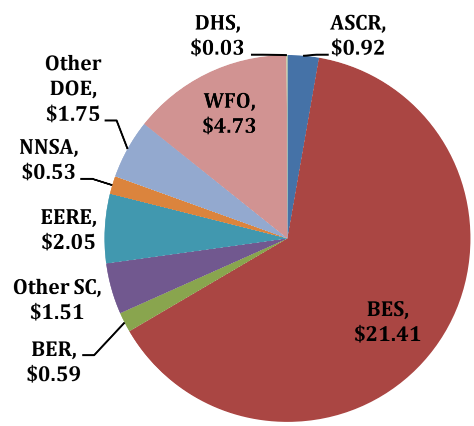
Responsible Site Office: Ames Site Office

Website: www.ameslab.gov

Physical Assets:
- 10 acres (lease–long term, no cost) and 12 buildings
- 327,664 GSF in buildings
- Replacement Plant Value: $73.1M
- Deferred Maintenance: $1.44M
- Asset Condition Index:
  - Mission Critical: 0.979
  - Mission Dependent: 0.967
  - Asset Utilization Index: 0.978

Human Capital:
- 307 Full Time Equivalent Employees (FTEs)
- 103 Joint faculty
- 53 Postdoctoral Researchers
- 70 Undergraduate Students
- 109 Graduate Students
- 0 Facility Users
- 1 Visiting Scientists

FY 2010 Funding by Source: ***(Cost Data in $M):***



FY 2010 Total Lab Operating Costs (excluding ARRA*)*: $33.5
FY 2010 Total DOE/NNSA Costs: $28.76
FY 2010 WFO (Non-DOE/Non-DHS) Costs: $4.7
FY 2010 WFO as % Total Lab Operating Costs: 14%
FY 2010 Total DHS Costs: $0.032

ARRA Obligated from DOE Sources in FY 2010: $0.0
ARRA Costed from DOE Sources in FY 2010: $1.54

1. **Condensed Matter Physics and Materials Science**

The theory, design, synthesis, processing and characterization of innovative, energy-relevant materials comprise one of the Ames Laboratory's primary research foci. The Laboratory is widely recognized for its leading work on rare earth metals and alloys, photonic band gap materials, metamaterials, magnetic materials, high temperature superconductors, surfaces, and biomaterials. It is also widely recognized for its ability to grow high quality samples of unusual materials, which it distributes all over the world; one such example being the iron arsenic samples being supplied to research organizations worldwide. The Lab's condensed matter physics and materials sciences teams develop and use cutting-edge techniques to study these systems, including X-ray and neutron scattering, and solid-state nuclear magnetic resonance (SSNMR). Computational methods such as quantum Monte Carlo simulations, electronic structure calculations, and classical and quantum molecular dynamics simulations are continually being pushed to new limits for 'taming the complexity' of new chemistry and material problems.

The current resurgence of interest in rare earth materials, including their properties, processing and reclamation, has put the Ames Laboratory in the international spotlight. The DOE AMES is the only National Laboratory with the background intellectual property, expertise, know-how and world-class researchers to develop new cost-effective processing techniques, improved properties and new materials to replace the rare earth metals that are becoming difficult to obtain. To enable critical new alloys, the Laboratory is investigating the fundamental origin for properties of rare earths governed especially by *4f electron* element behavior during alloy modifications; society would benefit greatly if we can control valence states of more abundant early lanthanides needed, e.g., for higher Curie temperatures and saturation magnetization in magnets.

Major sources of funding for this core capability include: The Office of Science's Basic Energy Sciences and Advanced Scientific Computing Research programs, the Office of Energy Efficiency and Renewable Energy, and Work for Others.

2. **Chemical and Molecular Science**

DOE Ames Laboratory research teams develop and apply theoretical, computational and experimental methods to study biological processes, catalysts, chemical reactivity, energy conversion and surface dynamics. World-leading research is conducted at the interface between homogenous and heterogenous catalysis enabling the design of new catalysts that combine the best characteristics of both. The Laboratory improves understanding of molecular processes for energy and security decision-making, and molecular design using new simulation and modeling techniques. These methods are made available throughout the world, including GAMESS used by over 150,000 registered users.

The Ames Laboratory enables new discoveries through the development of new techniques to characterize a broad range of materials at time scales and lengths scales never before possible. Single-cell analysis is a forte of the Ames Laboratory. The Laboratory's work also involves the sensitive detection of chemicals, including chemical imaging within biomaterials. Recent developments, for example, enable an unprecedented look inside living cells. AMES is also developing novel probes for imaging within plants. The Ames Laboratory is internationally recognized for the development of new solid-state nuclear magnetic resonance (SSNMR) methods, optical spectroscopy, mass spectrometry and microscopy. The techniques can be used in applications ranging from bioenergy to bioremediation to national security.

Major sources of funding for this core capability include: The Office of Science's Basic Energy Sciences, Biological and Environmental Research, and Advanced Scientific Computing Research programs, and Work for Others.

3. **Applied Materials Science and Engineering**

Civilization advances with the capability to create new or improved materials. Applying the fundamental knowledge derived from the Laboratory's basic computational, theoretical and experimental research, researchers at AMES create diverse research teams to invent, design, and synthesize new materials with specific energy- and environment-relevant properties. The Ames Laboratory develops, demonstrates, and deploys materials that accelerate technological advancements in a wide range of fields; from a lead-free solder that is used virtually in all electronics to a nanotube with the potential to deliver drugs or other materials to a specific site within a living cell. The Ames Laboratory is world-renowned for developing materials that improve energy efficiency and conversion, and reduce environmental impact. Key impacts of the Ames Laboratory's work in applied materials science and engineering include catalysts, ultra-hard materials, low friction materials, special magnetic alloys, high temperature superconductors, light-weight high-strength materials and engineering alloys that are responsive to energy and environmental concerns.

Renewed interest in rare earths and rare earth replacements has brought several potential industrial partners to the Laboratory. In fact, AMES has several new projects underway funded by DOE or by U.S. industrial partners. Discussions started last year to set the direction for AMES continue as the interest in rare earths availability and alternatives remain a national issue. AMES is working towards solutions in rare earths science to help assure new economically viable rare earth processing techniques, new non-rare earth materials for national defense and improved energy technologies such as traction motors and magnets, and new techniques to recover these metals from waste and scrap. AMES is working with key industrial partners to assure the availability of these metals or to find acceptable alternatives to critical materials such as neodymium-iron-boron magnets.

Major sources of funding for this core capability include: The DOE Office of Energy Efficiency and Renewable Energy programs, specifically, Biomass, Vehicle, and Industrial Technologies, as well as Work for Others.

Science Strategy for the Future

DOE's vision is for AMES to be the nation's premier research institute in critical areas of condensed matter, its related technologies, and the strategic applications of advanced materials. Dramatic energy efficiency improvements require new ways of harvesting and converting energy from one form to another, enabled by new materials with enhanced functionalities. Over the next 10 years, AMES will focus its efforts on developing improved energy-conversion techniques, materials for energy efficiency, and new integrated methods to discover and process materials more efficiently with desired functionalities. AMES excels in the areas of materials processing methods, computational and theoretical materials science, rare earths, catalysts, magnetic and photonic materials, and analytical instrumentation development. AMES links basic and applied research across the scientific spectrum to achieve and maintain an impressive record of technology transfer success. AMES solves challenging problems by engaging multidisciplinary teams of world-renowned experts, including researchers from other National Laboratories and universities.

The Ames Laboratory's proposed initiatives are designed to transform the Nation's energy future and fill critical technological gaps. These initiatives build upon the Laboratory's core capabilities and components for excellence: people, inspiration, innovation, collaboration, agility, and safety. The Ames Laboratory's research will continue to help lead the way for the U.S. to reduce energy demand, innovate with new materials, control energetic processes, and use the Nation's biorenewable resources.

Infrastructure/Mission Readiness

Overview of Site Facilities and Infrastructure

The Ames Laboratory is a Government-owned, contractor-operated facility located on the campus of and operated by Iowa State University (ISU) in Ames, Iowa. There is no federally owned land at the site (See The Ames Laboratory Land Use Plan, (https://www.ameslab.gov/content/land-use-plan). Instead, the Laboratory is situated on approximately 10 acres of state-owned land on the ISU campus under long-term, no cost lease. The lease line can be adjusted to accommodate new Laboratory facilities in the future (see Attachment C). The real property assets include 12 buildings that total 327,664 gross square feet. The three laboratory research buildings represent over 70% of the area and have an average age of 57 years. The newest research building in the inventory was constructed 50 years ago. The average age of the entire inventory (prorated by area) is 48 years. The buildings are highly utilized with an Asset Utilization Index (AUI) of 0.978. The buildings have been well maintained over their lifetimes and are currently in good condition as indicated by an Asset Condition Index (ACI) of 0.978. However, the research buildings were designed and built for the research needs and activities of the 1950's. As such, even though they are in good condition, they do not provide the effective and efficient infrastructure needed to support current and future research activities at the cutting edge of materials research. Staffing in FY2010 was 307 full time staff (FTEs). In addition there were also approximately 400 associates who perform research in the Ames Laboratory facilities. There are also two other real property assets defined in the Facility Information Management System (FIMS), an electrical switch pit and parking lot.

Being located on the University campus, allows the Laboratory to take full advantage of the infrastructure services provided by ISU, such as steam, chilled water, water and sewage service, compressed air, grounds maintenance, telecommunication systems, and roads without the need for Federal investment to construct, maintain, or recapitalize. The availability of these services allows the Laboratory to focus on maintaining and operating its research and support buildings. The relationship with ISU also enables the Laboratory to use space in University–owned buildings through a space usage agreement without investing in permanent space or long-term leases (33,000 nusf in 11 buildings).

No real estate actions are planned for FY 2011 or FY 2012.

Table 1. SC Infrastructure Data Summary

Replacement Plant Value ($M)		73.1
Total Deferred Maintenance ($M)		1.44
Asset Condition Index	Mission Critical	0.979
	Mission Dependent	0.967
	Non-Mission Dependent	N/A
Asset Utilization Index	Office	0.964
	Warehouse	1.000
	Laboratory	0.977
	Housing	N/A
Prior Year Maintenance ($M)		1.142

Facilities and Infrastructure to Support Laboratory Missions

The Ames Laboratory is dedicated to providing facilities and infrastructure that will effectively support its mission now and into the future. AMES also strives to be an effective steward of the DOE assets entrusted to it by managing them with a long-term view which is quality driven, looks at the life cycle of the assets, utilizes best industry practice, and is commensurate with the value and mission impact of the asset. This management links real property asset planning, programming, budgeting, and evaluation to program mission projections and performance outcomes. Resources are directed to facilities and infrastructure in the context of the overall needs and operation of the Laboratory to carry out its mission.

The Mission Readiness tables (attached) provide a summary of the condition of the facilities from a mission readiness point of view, now and into the future. These tables list the core capabilities and the investments required to make the facilities and infrastructure fully capable to meet the mission needs within the 10-year planning window. In accordance with the definitions from the Mission Readiness Model, the research buildings are currently considered "Partial." This means that deficiencies require minor resources (work-arounds) to ensure achievement of mission; investments to return to mission ready, if capital, are within the GPP limit. The facility capital improvements are possible within the GPP limit of $10M per project but the current level of GPP funding does not allow the Laboratory to undertake those projects. Two mission critical needs identified during the mission readiness process are space for sensitive research instruments and scientific computation space. State of the art instruments, such as electron microscopes, demand infrastructure requirements for vibration, noise, temperature control, dust, power quality and electromagnetic interference to perform to their full potential. In the Laboratory's existing facilities, space for these sensitive instruments is not available without extensive modifications and, even then, they must be sited in locations that are marginally acceptable. Installation into marginal space compromises the ability to achieve optimal data results. Current scientific computation facilities are filled to capacity so that future expansion will require allocating new space for new systems within research bays while trying to provide adequate cooling and increased electrical demands in a room not designed for those increased requirements.

Strategic Site Investments

The Ames Laboratory embraced the Office of Science SLI Infrastructure Modernization Initiative that has the goal of the SC laboratories operating thoroughly modernized complexes by the end of the ten-year period (FY2010-FY2020). The Modernized facilities will encompass the following characteristics:

- Safe, Secure, and Environmentally Sound Infrastructure

- A Highly Productive Working Environment
- Efficient Operations and Maintenance

As part of this effort, the Ames Laboratory developed a modernization strategy. The primary component of the original plan was to replace the Metals Development Building with a new state of the art, LEED compliant building that would address the critical needs of the Laboratory. At last year's Lab Planning Meeting, it was suggested that Laboratory Management look for ways to meet the Laboratory's highest priority needs with smaller projects. The following portion of this plan will convey what the Laboratory sees as its highest priority needs for consideration by DOE's Office of Science. The Laboratory sees two options for funding the construction projects, SLI or GPP, and the Laboratory seeks advice as to how to package these requests.

1. Sensitive Instrument Facility

In this infrastructure initiative, AMES proposes a sensitive-equipment facility, especially for high-resolution TEM and STM, to resolve a critical issue with vibration and other environmental effects that limit the Laboratory's current characterization capabilities. This facility would consolidate several of the CĀM-2C special-use apparatus into a single facility and resolve these issues. This Facility will provide specialized space for current and anticipated state-of-the-art instrumentation such as high resolution transmission electron microscopes and scanning probe microscopes. This meets one of the critical gaps identified in AMES' mission readiness process.

The space that currently exists within Ames Laboratory is marginally adequate for instruments presently in use and is unacceptable for today's state-of-the-art instruments (see chart at right). In order to quantitatively assess the need for new space, a consulting firm was retained to measure floor vibration, electromagnetic interference (EMI) and acoustic intensity levels at ten locations in existing Ames Laboratory space that might be candidates for installations. Using the requirements for a current state-of-the-art transmission electron microscope, none of the ten locations met the installation criteria. While some of these locations might be made to work with extensive modification, the instruments would not be able to perform to their maximum ability.

Location	Vertical Vibration	Horizontal Vibration	DC EMI	AC EMI	Accoustic Vibration
MD #1	N	Y	Y	N	N
MD #2	N	N	N	N	N
MD #3	N	N	N	N	N
MD #4	N	N	Y	N	N
SPH #1	Y	Y	Y	N	N
SPH #2	N	N	Y	N	N
SPH #3	N	N	N	N	N
HWH #1	Y	Y	Y	N	N
HWH #2	N	N	Y	Y	N
HWH #3	Y	N	N	N	N

Figure 1. Identification of Building Floors that meet FEI Electron Microscope Requirements.

This project will build a facility with six instrument bays, sample prep lab, control rooms, and staff support space. The electron microscope bays will provide vibration isolation, acoustic separation and control, EMI control, strict control of air flow and strict ambient temperature and humidity control. The facility design has been organized to optimize the site and program elements. In a compact, space efficient envelope, the building is planned to be approximately 11,000 gross square feet and will provide 7,000 net square feet of usable space (i.e., 64% is usable space).

Total cost is estimated at $9.3M. Iowa State University has a proposal submitted to NIST to build a very similar facility on campus, and Ames Laboratory proposes to co-locate the DOE facility with the ISU facility. This will provide great synergy by encouraging greater collaboration and providing access to a broader set of resources in both capacity and capability. If ISU is not able to build their facility, a location adjacent to existing Ames Laboratory facilities will be selected. Ames proposes that GPP funds be used for the facility. With the aid of the Laboratory's Contractor, locations for the proposed building have been identified and conceptual architectural plans have been developed. AMES anticipates that construction cost savings could be obtained if AMES combines this facility with one proposed to be constructed by the Laboratory Contractor. Alternatively, this project could be combined with other facility and infrastructure mission needs such as the Scientific Computing Facility to develop a line item project if a lower level of SLI funds became available.

Figure 2. Architectural Sketch of Sensitive-Equipment "Pod" Building with instrumentation and control rooms on the ground floor and preparations and small instruments, data analysis and visualization equipment on the second floor.

2. Scientific Computing Facility

This project will build a dedicated scientific computing facility that will provide for the current and future computing facility needs of the Laboratory. AMES proposes to build a dedicated stand-alone facility to house AMES' computers, to address DOE's expanding computer needs, reduce energy consumption, improve heat management, consolidate cluster management, and free up usable lab space not designed for housing computers. The current computational facilities, developed due to critical need without having critical infrastructure, are filled to capacity and scattered throughout the Laboratory's facilities in space originally designed for bench science and lack the full complement of features that are part of modern computing centers, such as raised floors, redundant systems, or energy efficient components. Expansion requires remodeling additional bays to house new machines; including additional requirements for HVAC and electricity.

The new facility would be designed to utilize the latest techniques for energy efficiency that are not possible when modifying existing space. The facility would be approximately 10,000 square feet and provide approximately 5,000 square feet for computers and 2,000 square feet of ancillary space including offices for the cluster support staff. The estimated cost is $9.9M. Ames proposes that GPP funds be used for the facility, however, if a lower level of SLI funds became available, this project could be combined with other facility and infrastructure mission needs, such as the Sensitive Instrument Facility, to develop into a line-item project.

3. Center for Rare Earth and Energy Related Materials

As discussed in the Major New Initiatives section, a new initiative is being proposed for a Center for Rare Earth and Energy Related Materials (CREEM). The Center will require office space for administrative and scientific staff, general laboratory space and some high bay space. Significant space consolidation, reassignment and remodeling will be required to accommodate those needs within the existing footprint. Space in this Center will be a combination of assigned space, space vacated as a result of the proposed new facilities and from consolidation of existing space enabled by adoption of modern technologies. Existing space will have to be remodeled to accept these people, their equipment and research operations. The vacated space will then need to be prepared for the new center. As part of the mission readiness process, it became clear that there is a need for a more strategic way to deal with existing space. As is currently the case, a program may have space in several different buildings. The creation of a dedicated CREEM provides an opportunity to enable programs to consolidate their operations into a more efficient footprint and to consolidate space for the new center. Initiatives are already under way to remove unused equipment to free up space in existing labs. An example of this is the removal of an un-used extrusion press. Removing under-utilized equipment will allow the metal fabrication functions of both the Materials Preparation Center and the Engineering Services Group to be consolidated into one area. Providing a consolidated area for the new center will require that people be relocated out of targeted space. The facility renovation cost for the new center is estimated to be $6.5M.

AMES' infrastructure needs could be funded as individual GPP projects or consolidated into one improvement project under SLI. In discussion with key DOE individuals, AMES will develop an overall strategy (GPP vs. SLI; GPP and SLI; replace vs. refurbish) for meeting the Laboratory's infrastructure needs. There are several decisions points that affect AMES' strategy:

1) for the Sensitive Instrument Facility: if the Laboratory's Contractor decides to build a facility for their use, cost savings may be realized by the Laboratory by partnering on the design and construction of the facility;
2) the Scientific Computing Facility will help the Laboratory meet energy savings requirements;
3) the CREEM will help meet National critical needs; and
4) all three facilities impact Ames' contribution to DOE's missions.

4. New Research Building

If Ames experiences significant growth, then the facilities proposed above will meet some of the Laboratory's immediate needs for specialized space but will fall short of long-term facility needs. Ames Laboratory's present buildings are all more than half a century old. They have been well maintained over the years, but lack the features needed to accommodate modern research needs. Space utilized at the Laboratory continues to develop in a fragmented direction and fails to meet the needs of the researchers due to the constraints imposed by the Laboratory's existing buildings. A new facility will support collocation of research teams to work on common problems and allow better utilization of current buildings. It will provide a preferred work environment that will help attract and retain high quality staff and will also contribute to increasing staff productivity and facilitate the collaboration and teaming approach that characterizes research at AMES. A building with flexibility designed into it will allow space to be reconfigured quickly and efficiently when there are changes in research activities and technologies. There will be areas for collaborative meetings that have the technological tools to facilitate interactions both within the lab and with researchers working remotely.

The proposed building will have the capability to efficiently deal with the more stringent ventilation requirements of working with new and advanced materials that may be more toxic or reactive. It will include office, laboratory and conferencing space for the research staff. The building will be designed to achieve LEED Gold Certification and will utilize natural light and renewable energy where possible. The focused application of current technology and design will achieve energy savings (>50%) that would not be possible within the Laboratory's existing buildings. The staff housed in this building will have access to the resources housed in the Sensitive Instrument Facility and the Scientific Computing Facility which will reduce the need for specialized space in the new building. It is anticipated that AMES would be able to reduce the amount of space rented from ISU. AMES has not developed an estimate for size or cost of the facility, so for this year's IFI Crosscut the Laboratory has input the estimates for the MD Replacement Building contained in the SLI schedules. Ames Laboratory will need to update the Laboratory's gap analysis and design criteria as AMES and DOE further discuss and develop this plan.

5. Energy Savings Performance Contract

AMES was unable to utilize funding for energy savings projects through an Energy Savings Performance Contract (ESPC) due to beryllium contamination discovered in Spedding Hall and Wilhelm Hall. The ESPC partner had identified projects that would generate savings of 15% in energy consumption and 16% of water consumption. The project included stack lining, lighting upgrades and low-flow water fixtures. Though the ESPC was discontinued, AMES is using overhead and GPP funds to complete the conservation projects.

6. Current GPP Program

Historically, AMES' GPP funding level has been relatively constant in the range of $0.5 to $0.6M per year, which is less than 1% of AMES' replacement plant value. ARRA funding of $1.7M was received in FY2009 for Phase 1 of an improvement project that was completed in FY2010. The limited GPP funding requires that larger projects be phased in over several years. A heating, ventilating, & air conditioning (HVAC) upgrade project in Spedding Hall is currently in progress with existing GPP funding. This project will upgrade the existing systems of heating, ventilating and air conditioning (HVAC) and makeup air controls in Spedding Hall to improve the safety, reliability, energy efficiency and flexibility of the systems. The existing system has been in service for nearly 50 years and cannot provide the level of control, air balance, reliability and safety monitoring that is beneficial for laboratory activities. The HVAC system will be upgraded for variable air volume operation which will provide temperature control in each space independently. Because the size of the project is much greater than the annual GPP funding level, it is phased over several years using GPP funds into FY2013. Once the HVAC upgrade project is completed, GPP funding will be directed to other projects as defined by the Laboratory's planning process. Projects will include Energy Conservation Projects; Access Control; Upgrade Windows; Upgrade Electrical Distribution System in Spedding Hall; and Upgrade of Handicapped Access. Additional GPP projects for capital improvement projects in Metals Development Building will need to be incorporated into GPP plans. The space modernization project will systematically take out-of-date research space out of service and completely refurbish it to modern standards. This will provide the resources to restructure and reorganize space utilization to improve the work environment for research operations. Unused and underutilized space will be reclaimed and modernized. This will allow research programs to be housed for more efficient operations. It will also create the space needed to house new planned initiatives. The complete list of the GPP funding plan will be included in the Integrated Facilities and Infrastructure (IFI) Budget Crosscut.

7. Maintenance

The maintenance program consists of maintenance and repair activities necessary to keep the existing inventory of facilities in good working order and extend their service lives. It includes regularly scheduled maintenance, corrective repairs, and periodic replacement of components over the service life of the facility as well as the facility management, engineering, documentation, and oversight required to carry out these functions. Historically, the facilities have been well maintained so that the service lives of the buildings have been extended. The historical data shows that the Laboratory has been able to control and slightly reduce deferred maintenance levels with modest levels of indirect funded maintenance, allowing AMES to operate with a 1.8% target Maintenance Investment Index. Historical experience shows that the current levels of expenditures have been adequate to maintain the facilities. Therefore, future maintenance funding levels are projected by escalating the maintenance budget to continue this level of effort.

There are currently no excess facilities at the Ames Laboratory and none are planned.

Trends and Metrics

Performance measures are utilized to link facility and infrastructure performance to outputs and outcomes. Broad-based measures are used so that a small sample of key results can provide a high level, integrated grasp of the stewardship of DOE assets at the Ames Laboratory. The DOE corporate wide measures defined in the Real Property Asset Management Order are the Asset Condition Index and the Asset Utilization Index. These values are reported directly in the DOE Facility Information Management System (FIMS) as well as being incorporated in the Laboratory Performance Evaluation and Measurement Plan (PEMP). AMES continues to perform well in the measures with high values for Asset Utilization and Asset Condition that continue to improve, though it's important to note that even when old buildings are maintained in good condition, it does not guarantee that they can provide infrastructure that meets the mission needs of cutting-edge research. This observation certainly is reflected in an ACI of 0.978 but mission readiness ratings of "Partial" for Core Capabilities. In the 2010 EOY PEMP, Section 7, there were two notable outcomes identified; both of these outcomes met expectations resulting in an overall grade of B+.

The Ames Laboratory continues in the process of improving and documenting the Ames Laboratory Mission Readiness process. A peer review is scheduled for FY 2011. This year's mission readiness interviews with Laboratory Management, Program Directors, key researchers and Functional Managers were led by the Assistant Director for Scientific Planning, the Chief Operations Officer and the Facilities Services Manager. All three have participated as reviewers on peer reviews. The input and insight obtained from these interviews was incorporated into the Laboratory infrastructure plans. The process helps Laboratory management and facilities personnel to have an excellent understanding of the facility condition and needs. In addition to the mission readiness process, the preparation of the Mission Need Statement for the New Research Building utilized broad stakeholder input in the planning process. Key researchers provided valuable input into the limitations of existing facilities and the characteristics of a new facility that would enhance their effectiveness. A study committee with key researchers, the Budget Officer and the Facilities Services Manager was created by the Director to perform a needs analysis on scientific facilities. This work provided an excellent starting point for identifying the capability gaps in the Facilities and Infrastructure. It was this gap analysis that identified the need for both a Sensitive Instrument and a Scientific Computing Facility.

Table 2. Facilities and Infrastructure Investments (BA in $M) –Impact to Asset Condition Index

	2010 Actual	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Maintenance ($M)	1.1	1.9	1.1	1.2	1.2	1.4	1.6	1.6	1.7	1.7	1.8	2.4
Deferred Maintenance Reduction[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excess Facility Disposition	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IGPP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GPP	0.6	0.6	7.1	9.9	10.4	2.2	1.3	1.2	1.2	1.2	1.2	1.2
Line Items	0	0	0	0	0	0	0	0	6.0	18.0	26.0	7.0
Total Investment	1.7	2.5	8.2	11.1	11.6	3.6	2.9	2.8	8.9	20.9	29.0	10.6
Estimated RPV		73.1	74.8	76.5	78.3	89.4	101.3	103.6	106.0	108.5	111.0	170.5
Estimated DM		1.47	1.49	1.51	1.36	1.38	1.40	1.41	1.43	1.45	1.47	1.48
Site-Wide ACI		0.980	0.980	0.980	0.983	0.985	0.986	0.986	0.986	0.987	0.987	0.991

Technical Facilities and Infrastructure (Assumes TYSP Implemented)									
Core Capabilities		Mission Ready, Current				Key Buildings	Facility and Infrastructure Capability Gap	Action Plan	
		N	M	P	C			Laboratory	DOE
Condensed Matter Physics and Materials Science	Now			X		SPH, HWH, MD	Note 1	▪ SPH. HVAC Upgrade (GPP) ▪ Remodel SPH. Auditorium (Indirect) ▪ Sensitive Instrument Facility (GPP) ▪ Scientific Computing Facility (GPP) ▪ Renovation for CREEM (GPP)	▪ SIF (SLI/>GPP) Note 2 ▪ SCF (SLI/>GPP) Note 2 ▪ CREEM (SLI/Program)
	In 5 Years				X	SPH, HWH, MD,			
	In 10 Years				X	SPH, HWH, MD			
Chemical and Molecular Science	Now			X		SPH, HWH, MD	Note 1	▪ SPH. HVAC Upgrade (GPP) ▪ Remodel SPH. Auditorium (Indirect) ▪ Sensitive Instrument Facility (GPP) ▪ Scientific Computing Facility (GPP) ▪ Renovation for CREEM (GPP)	▪ SIF (SLI/>GPP) Note 2 ▪ SCF (SLI/>GPP) Note 2 ▪ CREEM (SLI/Program)
	In 5 Years				X	SPH, HWH, MD,			
	In 10 Years				X	SPH, HWH, MD			
Applied Materials Science and Engineering	Now			X		SPH, HWH, MD	Note 1	▪ SPH. HVAC Upgrade (GPP) ▪ Remodel SPH. Auditorium (Indirect) ▪ Scientific Computing Facility (GPP)	▪ SCF (SLI/>GPP) Note 2
	In 5 Years				X	SPH, HWH, MD,			
	In 10 Years				X	SPH, HWH, MD			

N = Not M = Marginal P = Partial C = Capable
SPH = Spedding Hall HWH = Harley Wilhelm Hall MD = Metals Development Building

Note 1 The buildings are in good shape but are old and do not provide the modern infrastructure to serve current research paradigms. They cannot provide the flexibility, efficiency, environmental control, and preferred working environment that is possible with new research buildings. Specialized space is needed for increasingly sensitive instruments, such as electron microscopes. Existing space is not adequate because the vibration levels, noise levels and electromagnetic interference do not meet the installation requirements needed for the instruments to perform to their capability. The computation facilities are filled to capacity so that expansion requires creating new space or retiring existing computers to create space. Existing auditorium facilities limit the effectiveness of large group meetings and presentations due to outdated A/V, limited network access, inflexible space with fixed seating and outdated furnishings. It also presents a poor image of the laboratory for program reviews, visitors and staff.

Note 2 (SLI/>GPP) AMES has several projects that are needed in order to allow the facility to support the science planned for the next 10 years. The projects cost less than $10M each and would qualify for GPP funding. However, AMES' current level of funding ($610K/year) is inadequate to fund the proposed projects in a timely manner. Another option is to consolidate the projects into one SLI project and but fund them as separate milestones as funding becomes available.

Support Facilities and Infrastructure (Assumes TYSP Implemented)							
Real Property Capability	Mission Ready Current				Facility and Infrastructure Capability Gap	Action Plan	
	N	M[b]	P	C		Laboratory	DOE
Work Environment				X	▪ Services such as recreational/fitness, child care, cafeteria etc. are provided to the Ames Laboratory by Iowa State University in accordance with the operating contract. ▪ The age of the research buildings makes it difficult to provide modern energy efficient preferred office facilities.	Systematic Space Modernization (GPP)	
User Accommodations				X	▪ Visitor housing is available near the site by private enterprises. The size of the laboratory does not support a dedicated visitor center. Visitors are served by host personnel in existing laboratory facilities.		
Site Services				X	▪ Many site services such as fire service, emergency medical and library services are provided by offsite personnel or the contractor. ▪ Onsite services such as storage and shop facilities are capable.		
Conference and Collaboration Space			X		▪ Existing auditorium facilities limit the effectiveness of large group meetings and presentations due to outdated A/V, limited network access, inflexible space with fixed seating and outdated furnishings. It also presents a poor image of the laboratory for program reviews, visitors and staff. ▪ Adequate amount of conference room space is available but A/V and network capability is not uniformly available. Space for large gatherings is limited. ▪ Collaboration space is very limited and is not integrated architecturally.	Remodel Spedding Auditorium (Indirect) Systematic Space Modernization (GPP)	
Utilities				X	▪ Utility services are provided by the contractor, the municipality, and private enterprise. The Lab is working on projects designed to conserve energy and make the buildings more compliant with DOE's sustainability initiatives	Energy Conservation Projects (GPP/Indirect)	
Roads & Grounds				X	▪ Roads and grounds are provided and maintained by Iowa State University in accordance with the operating contract.		
Security Infrastructure				X	▪ Fifteen year old electronic access control has been upgraded to current proximity technology (FIPS 201 compliant). Coverage is being expanded on the site to begin replacing pin and tumbler locks.	Upgrade Access Control (GPP)	
N = Not, M = Marginal, P = Partial, C = Capable							