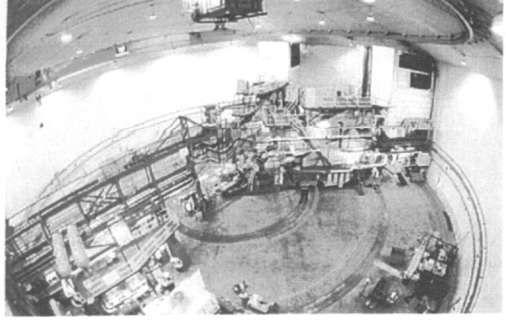
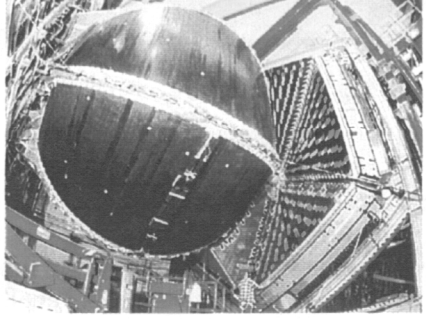
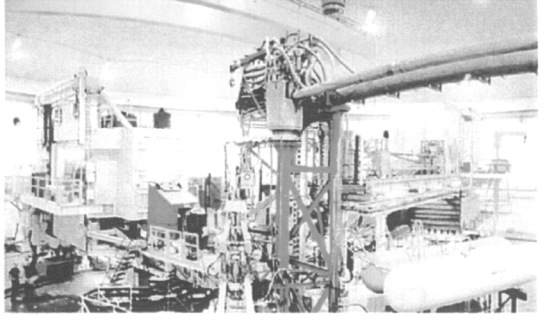
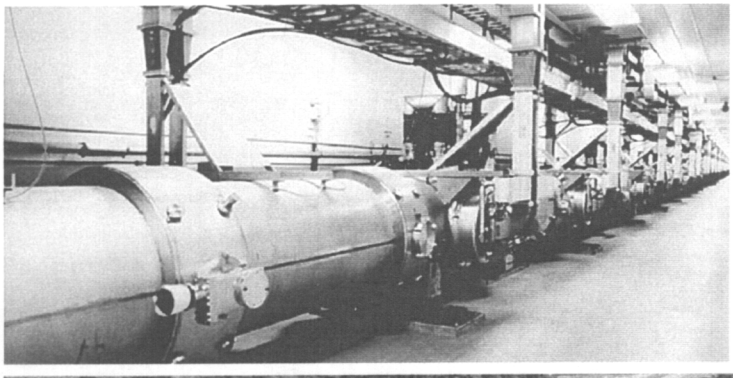
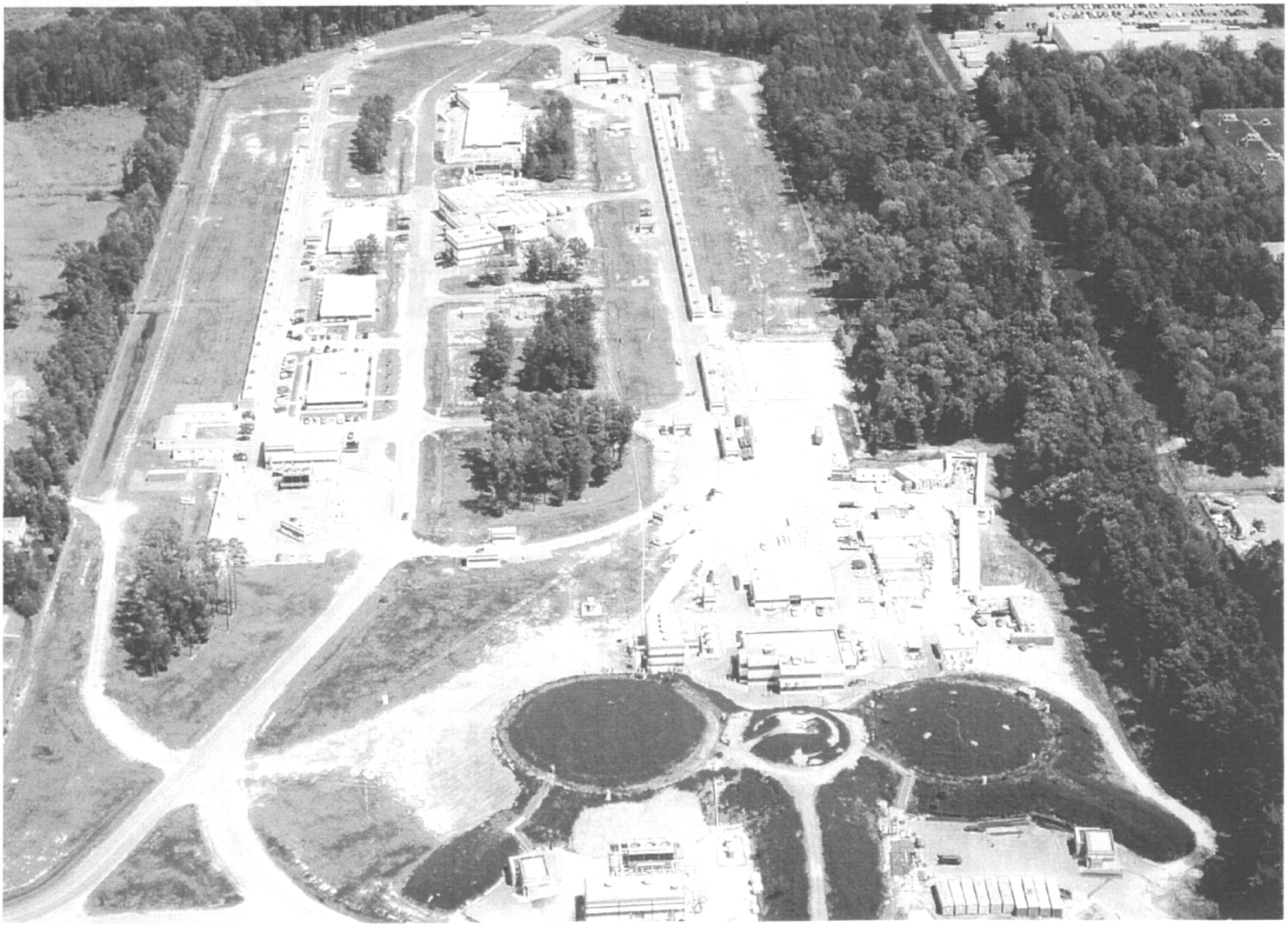




Performance report of the

U.S. Department of Energy's Jefferson Lab





Managed by Southeastern Universities Research Association for the U.S. Department of Energy • Jefferson Lab, 12000 Jefferson Avenue, Newport News, Virginia 23606 • (757) 269-7100 • www.jlab.org

Cover photos:

Top left: Hall A with two high resolution spectrometers.
Top center: Hall B 4π toroidal detector.
Top right: Hall C with short orbit spectrometer and high momentum spectrometer.
Center left: Cryomodules containing superconducting accelerating cavities.
Center right: West arc with four separate beamlines.
Bottom: Racetrack-shaped accelerator "footprint" and three underground end stations.

For additional information regarding this document (JLAB-ADM-99-01) contact
Julie Oyer at 757-269-7120 or oyer@jlab.org.

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Performance Report of the
U.S. Department of Energy's
Thomas Jefferson National Accelerator Facility
(Jefferson Lab)
June 1999

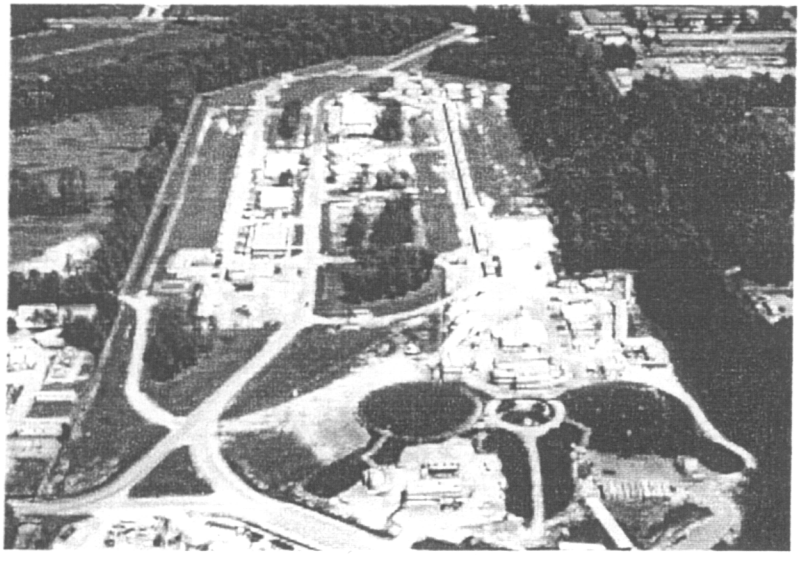
Executive Summary

Jefferson Lab, the newest of the U.S. Department of Energy's 16 national laboratories, has been functioning effectively since its inception in 1984, first during construction and later during operations. As shown in this report, JLab aligns itself directly with DOE's strategic planning, both in terms of laboratory visions and plans and in terms of actual laboratory performance. Most importantly, JLab contributes significantly to DOE's Science and Technology mission in the area of nuclear physics, under the Office of Science. The laboratory practices continuous improvement and has made a number of important effectiveness and efficiency enhancements in recent years. Laboratory performance has been demonstrated by completion of the construction phase on cost and schedule, by exceeding technical specifications when coming on-line for physics research, and then—during operations in the mid- and late-1990s—by the application of the performance measures in the laboratory's performance-based contract with DOE.

Lab Overview

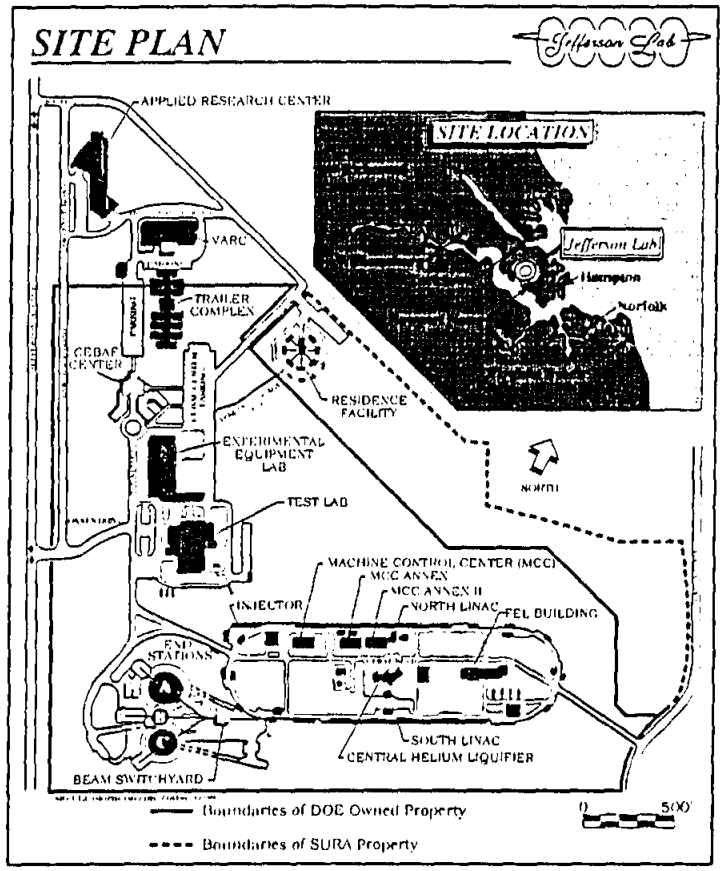
History

Jefferson Lab (JLab), the newest of the Department of Energy's 16 national laboratories, centers on a continuous-electron-beam accelerator nearly a mile in circumference. In the mid-1990s, nuclear physics experimenters from across the country and around the world began using this highly precise, multi-billion-electron-volt (multi-GeV) research tool for studies that will elucidate the quark structure of the atom's nucleus.



Aerial view of the CEBAF accelerator complex at Jefferson Lab. Service buildings above ground trace the underground accelerator's racetrack shape. Nuclear physics users conduct their experiments in the earthen-topped, domed, semi-underground experiment halls in the foreground. They use house-sized electronics arrays to observe and record the interactions of the accelerated beam's electrons with nuclei inside hand-sized targets.

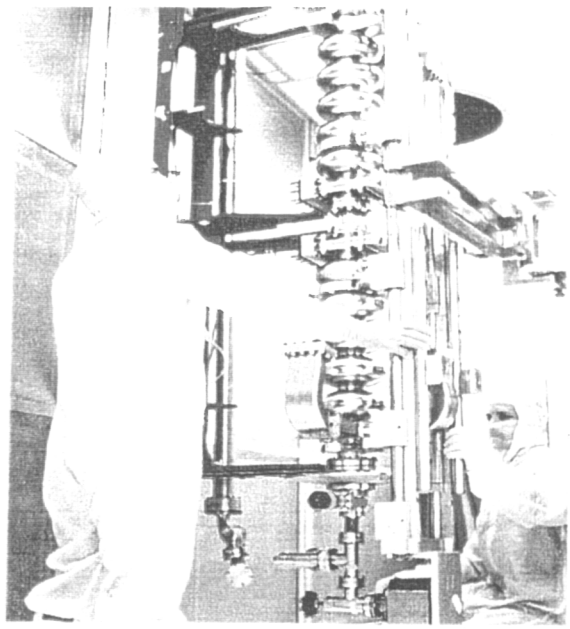
The need for such studies was identified in the late 1970s, and the envisioned research was made a national priority. As nuclear constituents, quarks had recently become well confirmed, though they remained little understood. As useful probes of the nuclear realm, electrons had long been well understood. So the Nuclear Science Advisory Committee (NSAC) of DOE and the National Science Foundation called for construction of a national electron accelerator like the one now operating at JLab.



The Jefferson Lab research campus.

The laboratory was originally called the Continuous Electron Beam Accelerator Facility. CEBAF construction began in 1987 in Newport News, Virginia. Though originally slated to use conventional accelerating technology, JLab's CEBAF machine uses superconducting radio-frequency (SRF) technology to provide beams of electrons simultaneously to experiments in each of three experiment halls. CEBAF became the first large-scale U.S. use of SRF. This superconducting technology limits CEBAF's operating power costs to less than 2% of those that would be incurred with conventional technology.

Designed for 4 GeV energy, the CEBAF SRF accelerator is approaching 6 GeV, much to the delight of its scientific users. In fact, SRF technology has been the basis for much of JLab's success to date. Besides its intrinsic operating-cost advantage, SRF provides superb beam quality, ease of upgrading to higher energy, and opportunities for technology transfer benefiting science, national defense, and U.S. industrial competitiveness.



Electrons are accelerated by 1497 MHz radio waves while passing lengthwise through pairs of JLab's five-cell SRF accelerating cavities. The accelerator contains over 150 such cavity pairs. When cooled to the accelerator's operating temperature of 2 degrees Kelvin—near absolute zero—the niobium of these delicate structures is superconductive.

Distinctive Competencies and Major Facilities (from the DOE Lab Profile Report)

Description

Thomas Jefferson National Accelerator Facility, formerly known as the Continuous Electron Beam Accelerator Facility, is a national user facility for scientific research using continuous beams of high-energy (0.5 - 6.0 GeV) electrons to elucidate the underlying quark and gluon structure of nucleons and nuclei. The facility was constructed on a green site from 1987 through 1995 for $600 million. As the U. S. leader in this branch of research, complementing the planned research at the Relativistic Heavy Ion Collider being built at Brookhaven National Laboratory, the Facility offers users unique capabilities for experiments studying atomic nuclei using electrons, our best understood probe particle. Machine capabilities include energies in the multi-GeV range - providing spatial resolutions ranging from the size of a large nucleus down to about one-tenth the size of a proton; high currents - permitting the study of reactions with very small cross-sections; and continuous beam operation - supporting precision coincidence experiments. The user community includes about 1600 members, with 834 experimenters. The innovative design and technology of the accelerator allow a gradual, cost-effective upgrade to 12 GeV and then to 24 GeV. A spin-off of the Laboratory's accelerator technology is the 1-kW infrared Free Electron Laser developed in collaboration with industrial, Navy, and university partners for industrial, defense, and research applications.

Distinctive Competencies

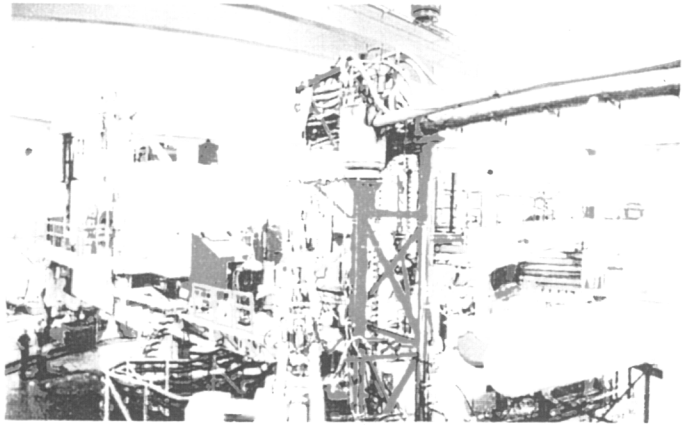
- Design, execution, and analysis of precision experiments involving studies of nucleons and nuclei by both electron scattering and photon-induced reaction, and involving: state of the art simulations; the design, construction, and operation of super-conducting spectrometers,

advanced detectors, and polarized and cryogenic targets; and the use of very high-rate data acquisition and analysis systems.

- Theoretical calculations in both the quantum chromodynamics and conventional nuclear physics frameworks to interpret, analyze, and plan experiments, and to project future research directions.
- Accelerator technology and accelerator physics expertise necessary to produce high brightness and highly-polarized continuous wave electron beams, including: superconducting radiofrequency technology; very large scale 2K (superfluid) He cryogenics; large real-time control systems (>100,000 control points); and photocathode electron sources and advanced laser systems.

Major Facilities

- The Continuous Electron Beam Accelerator Facility (CEBAF) provides continuous wave electron beams with energies from 0.5 to 5.5 GeV (6 GeV anticipated in FY00 and 12 GeV in 08), with currents from 100 pA to 200 μA (and with polarization approaching 80% to three endstations simultaneously).
- Three endstations with a set of complementary experimental equipment. Hall A has a pair of superconducting, high-resolution magnetic spectrometers optimized for precision electron scattering coincidence experiments. Hall B houses the CEBAF Large Acceptance Spectrometer (CLAS), a nearly 4 detector and ancillary equipment that supports studies of both electron and monochromatic photon-induced reactions with loosely-correlated particles in the final state. Hall C contains a pair of moderate resolution spectrometers (one capable of high momentum particle detection and the second optimized for detection of short-lived reaction products) and provides additional space and infrastructure for supporting major experiment setups optimized for specific measurements that cannot be carried out using available instruments.
- The Testlab and Applied Research Center (ARC), providing a state of the art surface science and superconducting radiofrequency research and development and production capability.
- The Infrared Free Electron Laser (IFEL), designed to provide 1 kW of infrared light with picosecond pulse length, transform limited bandwidth, and diffraction limited emittance.



Hall C with short orbit spectrometer and high momentum spectrometer.

Budget

JLab's budget for FY 1999 is $71 million of DOE funds. The Commonwealth of Virginia provides approximately $1.3M of additional annual funding, and also provided substantial funding for construction of the FEL user facility. The city of Newport News provided the funds for the purchase of the land for the lab, for the construction of the residence facility, and for the construction of the Applied Research Center (ARC) building, which provides leased office space for some JLab staff members, freeing on-site office space for JLab users and bringing JLab technical staff into productive contact with ARC researchers from universities and industry.

Workforce

JLab has a total of 515 employees in full- or part-time regular or term status, and another 75 casual, student, and temporary employees. Supplementing these staff members are 14 Commonwealth of Virginia employees permanently detailed to JLab. CEBAF's user community numbers about 1600 members from 277 institutions in 36 countries; about half the members are actively working on approved experiments.

Vision, Goals, and Strategic Plans

Vision

The vision for Jefferson Lab is to:

- Foster user-driven nuclear physics research of international significance as part of the U.S. national laboratory system.
- Leverage resources to support national goals for economic competitiveness.
- Prepare a broadly educated next generation of scientists and engineers for a globally competitive research environment and economy, including in the process traditionally underrepresented populations.
- Contribute to public science literacy through outreach and motivational/educational programs for math and science.
- Develop a world-class workforce.
- Lead responsibly by conducting environmentally sound and safe operations.

Goals

This vision translates into specific goals underlying Jefferson Lab's strategic and institutional planning:

1. Enable and conduct a physics research program of the highest scientific priority at the nuclear/particle physics interface.
   - Provide leadership and technical and theoretical support for the user-driven experimental program.

- Maximize beam time and accelerator and experimental equipment reliability.
- Increase the maximum beam energy toward 12 GeV (intermediate-term goal) and then to 24 GeV (long-range goal) to extend the scientific reach of the advancing experimental program.

2. Continue world leadership in underlying core competencies.
   - Superconducting radio-frequency technology.
   - Electron source development.
   - Innovative detector technologies.

3. Apply Jefferson Lab technologies to achieve Department of Energy mission and national goals.
   - High-power, energy- and cost-efficient, compact infrared/ultraviolet free-electron lasers.
   - Detectors for medical diagnostics and other applications.

4. Improve laboratory productivity and cost-effectiveness to accomplish more physics research, reduce the unit cost per running hour, and create new paradigms of effectiveness.
   - Accelerator and experimental equipment availability.
   - Business systems efficiency and effectiveness.
   - Demonstration through quantitative metrics (performance contract, DOE productivity metrics).

5. Continue as a recognized leader in environmentally sound and safe operation.
   - Recognized for good performance by regulators.
   - Continue to practice integrated safety management.

6. Serve as an asset to our community.
   - Outreach programs to increase science literacy.
   - Motivation of students in math and science through participation in science.
   - Partnerships with regional universities.

Strategic Plan

At the summary level, Jefferson Lab's Strategic Plan includes the following six elements:

- As the highest priority, conducting its internationally preeminent nuclear physics research program.
- Increasing the beam energy to 12 GeV (intermediate-term goal) and then to 24 GeV (long-range goal) as warranted by scientific priorities, a process endorsed by the DOE/NSF Nuclear Science Advisory Committee.
- Advancing Jefferson Lab's core competencies and enabling technologies, specifically superconducting radio-frequency (SRF) technology, polarized and high-intensity electron sources, and detector technologies, to support Jefferson Lab's program, other DOE missions, and potential spinoffs.

- Applying our expertise and core competencies for national benefit, symbiotic with the nuclear physics mission, with an SRF free-electron laser for scientific, industrial, and defense, applications.
- Participating in partnerships mutually beneficial to DOE, the lab, the region, and the nation.
- Engaging our diverse stakeholders and customers in discussions of their interests and needs, including preservation of environment, health, and safety, and in light of Jefferson Lab's capabilities and core competencies, developing initiatives that will create a dynamic and responsive portfolio of challenges and opportunities applicable to DOE's mission.

JLab's Performance Aligns with DOE's Strategic Planning

JLab aligns its visions, its plans, and also its actual actions and performance with DOE's Strategic Plan of 1997. Briefly reported below are the many cases in which JLab's DOE-aligned visions and plans are being concretely realized. All of the summarized performance items respond to specific goals, objectives, and strategies in DOE's plan. Appendix 1 explicitly correlates these items with specific statements in the plan.

In line with DOE's National Security strategic planning:

JLab aided national assessment of tritium-replenishment alternatives.
With technical analyses and workshop-style consultations, JLab supported Los Alamos National Laboratory's investigation of the Accelerator for Production of Tritium (APT) concept for producing replacement quantities of the warhead-vital radioactive hydrogen isotope that decays by half every 12.5 years. JLab studied and advised about the possibility of basing APT on SRF acceleration, JLab's core technological competency.

In line with DOE's Science and Technology strategic planning:

JLab's scientific output is perennially confirmed "outstanding."
In every year since annual peer reviews began providing ratings, the quality and relevance of JLab's science and technology have received the very highest rating: outstanding. All three of JLab's experiment halls were in full operation by the end of FY 1998, and have continued in full operation since. The scientific users have begun to publish their findings. JLab's Program Advisory Committee, which evaluates the scientific quality and relevance of experiment proposals, continues to identify top-quality experiments among the proposals.

JLab operates around the clock over 30 weeks per year to maximize scientific output.
JLab's operational pace more than meets stated expectations. The lab maintains over-30-weeks-per-year accelerator operations in support of nuclear physics experiments.

JLab supports the National Spallation Neutron Source initiative, key for materials science.
JLab senior staff members have participated in NSNS design reviews, and JLab is prepared to share the lab's core competency in superconducting radio-frequency technology if needed.

JLab supports Energy Science Network development to enhance U.S. scientific collaborations.
An internationally recognized JLab scientific computing expert has played a key role in ESnet development—the effort to exceed a billion bits per second in Internet transmission speed.

JLab contributes to improving global-climate-change computer modeling.
In collaboration with universities, JLab is preparing proposals to achieve sustained processing and calculational speeds of 2 trillion operations per second.

JLab models open, competitive, affiliation-neutral access to scientific opportunities.
All "beam time" is allocated based on competitive experiment proposals, openly solicited and openly peer-reviewed by the JLab Program Advisory Committee. The criteria are scientific excellence and the likelihood of successful experiment completion. Proposers' organizational affiliations are not considered.

JLab leverages research through national and international partnerships and collaborations.
With a scientific User Group numbering over 1400 and representing 277 institutions in 36 countries, JLab's nuclear physics research program benefits from users' construction of experiment equipment and from a wealth of user expertise.

JLab develops technologies with economic, energy, environment, and national security benefits.
JLab's technology transfer efforts derive directly from the accelerator-based main mission of nuclear physics research. Contributions so far include:

- Accelerating technologies that, thanks to JLab development work, provide 460% more acceleration per meter than was the state-of-the-art when CEBAF construction began.
- An initial energy-efficient free-electron laser—65 times more powerful than predecessors—in a program aiming at scientific, defense, and industrial FEL applications, including the replacement of environmentally harmful chemical industrial processes.
- Medical imaging devices that improve resolution and reduce the need for biopsies.
- Collaborative development of a widely applicable control system for large, complex systems; in the case of CEBAF, it can simultaneously handle 130,000 input-output control points.
- Polarized electron sources that deliver orders of magnitude more charge than predecessors.

JLab partners with others to develop, commercialize, and implement beneficial technologies.
JLab collaborates with universities, industry, other laboratories, and defense organizations in technology development. Commercialized technologies include production processes for superconducting accelerating cavities, a reliable liquid-level sensor, a medical imaging device, and a control system. These technologies have increased the productivity of industry, improved medical care, and improved the quality of commercially available products. JLab also directly implements new technologies: its longer-lifetime polarized electron source and higher-power FEL were tested and placed into research use during FY 1999.

JLab management practices bring leading-edge results at low cost—and a Hammer Award too.
JLab was designed and constructed on schedule and within budget, and has exceeded its technical specifications. The biennial Institutional Management Peer Review has found a high level of satisfaction among scientific users. Annual peer reviews have found administrative excellence in quality of service, effectiveness, and efficiency. In collaboration with the DOE Site Office,

DOE administrative requirements were reviewed and custom-tailored specifically for JLab. Some of this work received the Vice-President's Hammer Award.

JLab raises public science literacy and promotes diversity in education and research.
JLab collaborates with highly diverse local school systems to conduct programs for K-12 students and teachers, holds public-outreach programs, reaches well over 40,000 more people annually at the Virginia State Fair and via the JLab Web site, and has programs for both undergraduate and graduate student research. The number of graduate students performing thesis research within experiment collaborations has increased significantly in recent years. An annually increasing number of JLab researchers hold JLab-supported bridge and joint positions with historically minority colleges and universities.

Corporate Management

JLab models sound environment, safety, and health (ES&H) management and training practices.
In the 15 years of JLab's existence, there have been no fatalities, one disabling injury, and no releases causing significant environmental damage. DOE validated the laboratory's Integrated Safety Management System in May 1999. JLab maintains a comprehensive self-assessment program which involves line self-assessments, line inspections, independent self-assessments, corporate auditing, and semi-annual performance reporting, all to identify ES&H and other deficiencies and vulnerabilities for correction. As part of a comprehensive labwide ES&H training program, JLab supervisors identify training and other competency requirements for employees performing hazardous work. Competency is established by testing and supervisory observation.

JLab communicates constructively and effectively with official stakeholders and the public.
The most recent biennial Institutional Management Peer Review of JLab's relationships with its various stakeholders in DOE and in regulatory agencies deemed the laboratory "a respected community asset." The most recent annual scores for JLab's contract performance concerning media reports on JLab's work and on mentioning JLab as a DOE lab, respectively, were "outstanding" and "excellent."

JLab continuously improves human resources systems and practices.
The annual Administrate Peer Review and the biennial Institutional Management Peer Review have consistently evaluated JLab's performance as "excellent" or "outstanding" in these areas.

JLab uses self-assessments to ensure optimal resource use and safe and secure operations.
The independent peer review of JLab's administrative area is conducted annually. Line self-assessments and independent internal self-assessments also are used to ensure that resources are used efficiently and that operations are safe and secure.

10

Effectiveness and Efficiency Improvements

Overview

The cost of operating CEBAF at JLab was established in FY 1995 through actual experience that year. Since then, JLab management has undertaken a number of measures to improve effectiveness and efficiency. Since the measures were not implemented in isolation from other changes, improvements and cost savings or avoidance associated with each one cannot be precisely determined. However, the total cost savings can be determined by the total operations cost in subsequent years and the amount of operation achieved in each of those years. The total savings was $14.0 million for FY 1996 through FY 1998, and continues at approximately $4 million per year. This savings is invested in programmatic activities which would not otherwise be possible. The specific improvement measures taken are described below.

Programmatic Improvements

More physics results per accelerator operations dollar

- Enhanced power efficiency. To minimize accelerator power consumption, transformer tap settings are customized to correspond with the combination of energy and beam current specifically needed for the experiments underway at any given time.
- Maximized experiment concurrency. The accelerator schedule and three experiment hall schedules are carefully arranged, on a 15 month rolling and 6 month fixed basis, to maximize the number of experiments which can run simultaneously. The ability to run simultaneously is enhanced by the capability of the accelerator to deliver three different (although correlated) energies simultaneously, each at a customized current.
- Faster scientific data collection. The rate at which data can be collected by the experiment equipment continues to be increased, thereby increasing the rate at which nuclear physics information can be collected.

More capability per accelerator technology dollar

- Better accelerating-structure processing. Chemical processing techniques for accelerating cavities have been improved so that newly produced accelerating cavities can provide more acceleration and lower power dissipation than previously.
- In-place accelerating-structure enhancement. A procedure called "helium processing" has been used to increase the voltage capability of *in situ* accelerating cavities, thereby providing the ability to meet increasing physics demands for higher accelerator energy without the expensive process of replacing cavities.
- Shared control-system efforts. The EPICS control system for the accelerator was adopted in order to share development and maintenance efforts with other labs that are also using this system.

Management Improvements

Structural measures for productivity enhancement

- Organization flattened. Selected portions of the organization were flattened, reducing the level of management needed, and simplifying vertical communication.
- Well-targeted manpower. Term positions were used during construction, and not continued into operations. Staff in regular positions were cross-trained so that they are able to work on the accelerator when it is not operating, and on the experiment equipment in one experiment hall while the accelerator and the other two halls are operating. Quarterly priorities meetings with senior management, together with ongoing coordination between accelerator managers and experimental physics managers, ensure that this process works well.
- Streamlined business services organization. The Procurement Department and the Finance Department were merged into the Business Services Department to eliminate duplication of document systems, eliminate manual re-entry of information, and to reduce management requirements.

Paperwork reduction and process simplification

- Less paperwork for managers. Adopted a performance-based contract with DOE. It provides quantitative goals and methods of evaluation, and substantially reduces the management time required to provide evidence of performance.
- Red-tape overlaps among directives eliminated (Hammer Award). A directives review process was used by a joint DOE Site Office–JLab team to identify all ES&H, quality assurance, and operations requirements contained in the 89 DOE orders and other directives in Appendix E of JLab's contract. Deleted as redundant were those contained in law or regulation. Deleted as inappropriate were those requiring no JLab actions and those providing no net added value. As many as possible value-adding requirements were converted to performance measures, with the remainder replacing the corresponding directives in contract Appendix E. The Vice-President's Hammer Award recognized this red-tape-cutting work.
- Well-clarified ES&H-standard applicability. A joint Site Office-laboratory team used the DOE Necessary and Sufficient process (or Work Smart Standards process) to agree upon a set of ES&H standards which would provide an appropriate level of protection at the laboratory. This process clarified which standards are applicable.
- Fewer reviews. The number of DOE ES&H functional reviews—major diversions of management attention—has been substantially reduced in response to the performance-based contract, the directives review process, and the Necessary and Sufficient process.

Idea generation for productivity enhancement

- Staff-generated productivity enhancements. An employee suggestion program has been implemented. A cross-cutting team screens suggestions for potential productivity enhancements, and recommends that important ones be implemented. Examples include posting of notices on doors to improve visibility, and e-mail registration to receive e-mail notification of available vendor discounts.

- Staff-identified and staff-prioritized plant projects. A cross-cutting team is used to identify and prioritize plant maintenance and improvement projects, thereby helping ensure that the appropriate projects receive the needed resources each fiscal year.
- Inter-laboratory sharing of productivity ideas. JLab participates in the DOE National Laboratories Improvement Council, which permits the lab to learn about high-productivity practices at other labs, and to share its own.

Self-assessment and training for productivity enhancement

- Line self-assessments formalized. The conduct of line self-assessments has been formalized, in addition to independent self-assessments, to enable the most knowledgeable people to identify productivity enhancement opportunities.
- Individual self-assessments enhanced. Employee performance appraisals have been enhanced by the incorporation of individual self-assessments to ensure recognition of all significant contributions, by the addition of 360 degree feedback, and by use of rating definitions which enhance employee morale without overstating performance.
- Motorola training for managers. On-site Motorola University training was provided for 80 staff and managers, and has increased their knowledge of techniques for analyzing and improving productivity.

Administrative and Business Practice Improvements

Direct economizing measures

- Fare minimization via advance travel booking. When travel needs are known well in advance and are relatively certain, advance booking is used to obtain lower air fares.
- Optimized benefits package rates. The employee benefits package is carefully negotiated to obtain rates below market rates.
- Repackaged telecommunications subcontracts. The telecommunications subcontracts have been repackaged to reduce overall cost and improve service.

Simplified documentation and recordkeeping

- Electronic timesheets. A process improvement team has improved the timesheet system. Timesheets are completed and signed on-line, and the timekeeping process for exempt employees has been simplified.
- Optimized records-preservation process. A process improvement team has clarified which official records which must be preserved, and for how long.
- Statistical inventorying. Statistical property sampling has replaced a 100% inventorying process, thereby greatly reducing the work involved and permitting concentration on the highest-risk property.
- Electronic document retrieval. Selected sets of documents have their keywords and category numbers kept in a database to improve reliability and speed of retrieval.
- Paperless business practices. An increasing fraction of documents are transferred electronically, reducing paper procurement and handling costs.
- Enhanced real-time managers' finance tracking. The previous financial management software has been replaced with a system which provides tailored reports for managers

without extensive manual post-processing of the information. The information is available to managers in real time rather than monthly.

- Web-automated training sign-up. Training course sign-up via the Web has been implemented, providing real-time enrollment information and reducing paperwork.
- Automated training status tracking. Employee training is centrally tracked in a database to reduce the total cost and to improve reliability. Automated e-mail messages are sent to employees to advise them when their training is about to expire.

Best business practice procurement processes

- Private-sector procurement methods adopted. The lab has adopted private sector procurement processes to the extent permitted, such as credit cards for small purchases, credit card use by the procurement group for intermediate-size purchases, the use of single-source procurements where cost-effective, and use of the DOE consortium purchase program where applicable.
- Simplified procurement process. In response to the work of one process improvement team, the number of steps involved in placing a procurement has been reduced. Computer-based requisitions have replaced a paper system for small- and medium-sized procurements.

Improvements in subcontracting

- Fixed-price subcontracting. Fixed-price subcontracts are used whenever the scope of work can be adequately specified, which occurs in practically all cases.
- Improved Subcontractor ES&H. Incentive/penalty clauses are included in civil construction subcontracts to enhance ES&H performance at little net cost.

Savings via outsourcing

- Outsourced services. Security, janitorial, and shipping and receiving are subcontracted to reduce costs.
- Copy service consolidation, control, accountability. The lab's assortment of copiers was replaced with a copy service subcontract under which the subcontractor provides and maintains a uniform type of copier, provides user and on-demand copying services, and provides off-site copying services for high peak demands. Keypad entry of user access codes promotes user accountability.
- Outsourcing plant engineering tasks. Plant engineering outsources its work to the maximum extent practicable.
- Just-in-time business supplies. The business supplies stockroom has been replaced with a just-in-time supply delivery contract.

Efficient plant and site management

- Centralized alarm monitoring. Alarms from the site's variety of building alarm systems will be routed, along with identifying information, to the continuously occupied guard station, ensuring prompt responses and minimizing the need for roving guards.
- Card-key access. A card-key access system is being implemented to reduce needed off-hour staffing of entrance doors, and to provide more reliable access control.
- Leased space. With economies of scale in plant services, the Applied Research Center (ARC) adjacent to JLab provides leased office space for some staff members, freeing on-site office space for users and bringing JLab technical staff into productive contact with ARC researchers from universities and industry.

- Bar-coded plant gauge data entry. Plant engineering gauges which must be regularly read have been bar-coded to reduce manual data-entry labor and to improve data accuracy.

Communication Improvements

- Improved labwide general communication. A Malcolm Baldrige-type self-assessment was performed to find productivity improvement opportunities. The principal opportunity identified was improvement of communications, and a number of measures have been implemented in response, such as publication of the newsletters "On-Target" and "On-Target Briefs" and creation of the television-based Site Wide Information System. A further improvement has been an increase in the amount of Web-based information available to employees and users. "Core manager" meetings have been instituted to enhance communications between senior and key mid-level managers.
- Improved labwide real-time communication. Internal communication of incidents has been enhanced by use of telephone extension 4444, identified on a tag attached to every lab phone, to contact the one continuously occupied guard station. The guard sends simultaneous communications of an incident to people needing to know about this type of incident; this is done through the use of alphanumeric pagers. Staff are instructed to first dial 911 if appropriate, and then to dial the internal notification number.
- On-line ES&H Manual. A comprehensive on-line ES&H manual has been developed. It streamlines the tasks of providing or accessing EH&S information, incorporates legal and regulatory requirements (in addition to "common sense" safety practices), is continuously improved based on lessons learned, reduces paper usage, and can be updated or modified simply and with a high level of change control. The manual attracts much use from outside JLab, as demonstrated when failure of our Web server for four hours evoked complaints from two other national laboratories.
- Institutional Plan summarized for staff. The first edition of an annual publication of a condensed version of the Institutional Plan has been distributed to all staff.

Performance Results

Overview

JLab has had advantages relative to other DOE labs in three notable areas. One area is that, as the newest of DOE's labs, JLab is not faced with legacy environmental problems, and does not have an aging or badly deteriorating infrastructure.

The second area has been an excellent relationship with the DOE Site Office. This relationship contributed to a first contract in 1984 which contained very few requirements of questionable value. The contract renewal in 1995 contained additional requirements; working cooperatively with the Site Office, a graded approach for tailoring the application of these requirements was developed. The consistent result has been that JLab has very little cost associated with requirements of questionable value.

The third area also results from the excellent relationship with the DOE Site Office. JLab and the Site Office cooperatively developed the original set of performance measures incorporated into the 1995 contract renewal. These measures were developed to answer the question, "How do we know if the lab is being well managed?" The set of measures was result- and outcome-oriented, allowed either actual direct measurement or judgment by independent peer review, was numerical with adjectival descriptions assigned to various numerical ranges, and was intended to form a complete and balanced set, with appropriate weighting assigned to each performance measure. The performance measures have been fine-tuned each year, but the basic measures have not changed appreciably from the original set. The measures, some of which are roll-ups of contributory measures, cover the following seven areas. Weightings are shown in parentheses:

Science and Technology (30%)
Operations (25%)
Education (7.5%)
Corporate Citizenship (7.5%)
Environment, Health, and Safety (10%)
Business and Administrative (10%)
Institutional Management (10%)

Three of these performance measures rely primarily on peer reviews. All of the reviews result in written reports by the peer review committees.

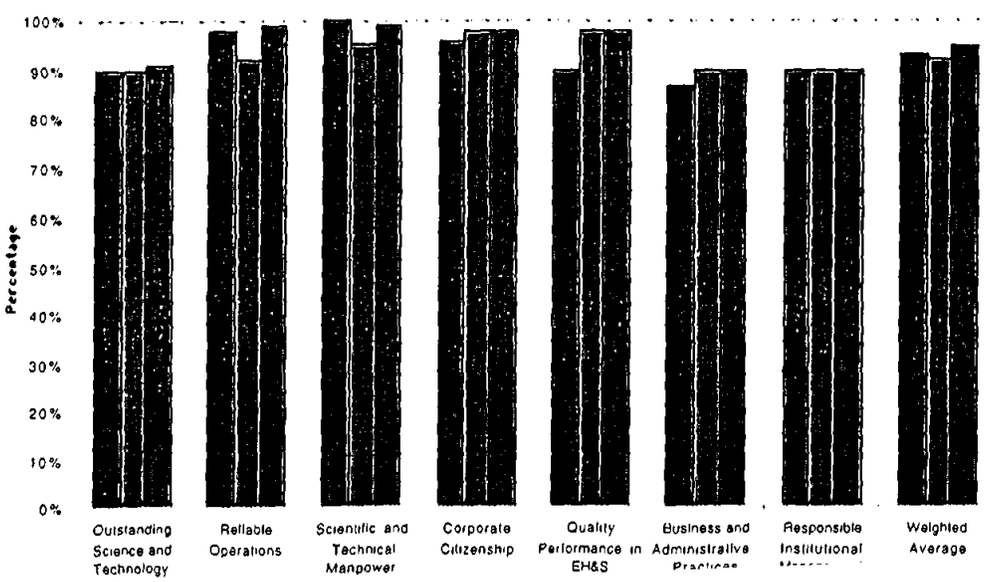
"Outstanding Science and Technology" is judged solely by an annual peer review. The most recent review was held September 15 - 17, 1998, and was chaired by Dr. Peter Barnes.

"Business and Administrative Practices" has 70% of its available points based on an annual peer review. The most recent review was held February 23 - 25, 1999, and was chaired by Dr. Richard Orr.

"Responsible Institutional Management" is judged solely by a biennial peer review. This review considers the results of all other performance measures, plus other information obtained directly by the review committee. The most recent review was held October 19 - 20, 1998, and was chaired by Dr. William Madia.

The results for all seven of these measures for fiscal years 1996, 1997, and 1998: 20 "outstanding," 1 "excellent," and 0 "good" or below.

FY 96, 97 and 98 Contract Performance Measure Results



Appendix 1: Linkage Between JLab Visions and Plans and DOE Strategic Plans

JLab's visions and plans primarily support DOE's Science and Technology mission in the area of nuclear physics through the operation of the CEBAF user facility. JLab's visions, plans, and recent work also support DOE's Strategic Plan (September 1997) in a substantial number of areas, as identified below.

National Security mission

STRATEGIC GOAL: Support national security, promote international nuclear safety, and reduce the global danger from weapons of mass destruction.

OBJECTIVE 1: Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing.

Strategy 4: Provide a reliable source of tritium as required for the nuclear weapons stockpile by FY 2005 or FY 2007, depending on the production option selected.

- Continue evaluation of the tritium production options and select the preferred option in FY 1998.

  JLab supported Los Alamos National Lab in exploration of the Accelerator for the Production of Tritium through application of JLab's core competency in superconducting radio frequency technology.

Science and Technology mission

STRATEGIC GOAL: Deliver the scientific understanding and technological innovations that are critical to the success of DOE's mission and the Nation's science base.

OBJECTIVE 1: Develop the science that underlies DOE's long-term mission.

Strategy 1: Conduct relevant, high quality, innovative research that responds to the needs of the DOE mission.

- Maintain the high quality and relevance of DOE's science as evaluated by annual peer reviews and advisory committees.

  JLab designed and built the CEBAF accelerator, which was ranked by the Nuclear Science Advisory Committee as the highest-priority new construction in nuclear physics. The science and technology has been ranked "outstanding," the highest rating, by an annual review for each of the past three years (ratings were not provided by peer reviews prior to that time).

- Maintain maximum operating schedules for all major scientific-user facilities (advanced scientific facilities made available to the general science community), including operations for applicable facilities at levels established by the Scientific Facility Initiative.

  JLab operates around the clock for more than 30 weeks per year.

- Complete preparations for the start of construction for the National Spallation Neutron Source in FY 1999.

  JLab senior staff members have participated in reviews of this design, and JLab is prepared to share the lab's core competency in superconducting radio frequency technology should this technology be chosen for construction.

- Reach transmission speeds of over one billion bits per second on the nationwide Energy Science Network (ESnet) in FY 2000, enhancing scientific collaborations over the Internet.

One of JLab's scientists has played a key role in ESnet development.

• Achieve sustained processing and calculational speeds of two trillion operations per second for application in a global climate change model.

JLab is preparing proposals, in collaboration with universities, for contributions to this improved computational capability.

Strategy 2: Provide new insights into the fundamental nature of energy and matter.

• Maintain the high quality and relevance of DOE's science as evaluated by annual peer reviews and advisory committees.

JLab's annual Science and Technology Peer Review continues to rank the quality and relevance of JLab's science as "outstanding." JLab's Program Advisory Committee, which evaluates the scientific quality and relevance of experiment proposals, continues to identify top-quality experiments among the proposals.

• Commence full operation in FY 1998 of all 3 experiment halls at the Thomas Jefferson National Accelerator Facility to explore the structure of atomic nuclei.

All three of JLab's experiment halls were in full operation by the end of FY 1998, and have continued in full operation since that time.

Strategy 3: Search for and utilize the best talent from all sources to perform DOE research.

• Increase the already extensive amount of research committed to open, competitive solicitations through FY 2000.

All of JLab's experiment operating time is allocated based on open, competitive solicitations for experiment proposals.

• Increase the weight of proposal evaluation criteria that emphasize the scientific excellence of performers independent of organizational affiliation.

All of JLab's experiment operating time is allocated based on the scientific excellence of the performers, as evidenced by their proposals, and the ability of the performers to conduct the proposed experiments successfully. The evaluation is independent of their organizational affiliation.

Strategy 6: Leverage research opportunities through science partnerships and pursue international science collaborations.

JLab has established scientific partnerships with many universities and laboratories, in both the U.S. and elsewhere. These partners have contributed to the construction of the experiment equipment, and are the primary contributors to the performance of experiments.

OBJECTIVE 2: Deliver leading-edge technologies that are critical to the DOE mission and the Nation.

Strategy 1: Develop the technologies required to meet DOE's energy, national security, and environmental quality goals.

• Validate, in FY 2000, new DOE technologies that deliver benefits faster, better, and cheaper than existing technologies.

JLab, in some cases in collaboration with other laboratories, has developed control systems that simultaneously handle 130,000 input-output control points, accelerating technologies that provide 460% more acceleration per meter than was the state-of-the art when construction of CEBAF began, medical imaging devices that improve resolution and reduce the need for biopsies, polarized electron sources that deliver orders of magnitude

more charge than their predecessors, and a free-electron laser that delivers 6500% more power than the previous state-of-the-art, to name just a few.

Strategy 2: Pursue technology research partnerships with industry, academia and other government agencies and proactively accelerate the transition of technologies to end users.

- Increase the number of demonstrated feasible technologies that are commercialized by the private sector through FY 2000.

  Several of JLab's technologies have been commercialized: the production of superconducting accelerating cavities, a reliable liquid-level sensor, a medical imaging device, and a control system.

- Increase the aggregate estimate of benefits of technologies introduced through FY 2000.

  The technologies listed above have increased the productivity of industry, improved medical care, and improved the quality of commercially available products.

- Increase the number of new technologies field tested and used at DOE facilities in FY 1999.

  The longer-lifetime polarized electron source and higher-power free-electron laser were tested and placed in use at JLab during FY 1999.

OBJECTIVE 3: Improve the management of DOE's research enterprise to enhance the delivery of leading edge science and technology at reduced costs.

Strategy 1: Manage the National Laboratories, science-user facilities, and other DOE research providers and research facilities in a more integrated, responsive, and cost-effective way, building on unique core strengths and corresponding roles

- Reduce the cost of performing research by reducing the administrative burdens on the laboratories and through laboratory reengineering.

  JLab's administrative functions are peer reviewed annually for quality of service, effectiveness, and efficiency. These peer reviews, in addition to providing useful recommendations for improvement, have found the administrative functions to be excellent. In collaboration with the Jefferson Lab DOE Site Office, JLab has tailored DOE requirements to be appropriate for this particular laboratory; some of this work received the Vice-President's Hammer Award.

- Increase the ratings of user-facility satisfaction as determined by periodic customer satisfaction surveys.

  An Institutional Management Peer Review of JLab's management is conducted every two years. Among other things, the peer review committee interviews users to determine their level of satisfaction, and has found a high level of satisfaction among the users.

Strategy 2: Design, construct, and operate research facilities in a timely and cost-effective manner.

JLab was designed and constructed on schedule and within budget, and exceeded its technical specifications. The institutional management peer review mentioned above evaluates the timeliness and cost-effectiveness of the operation, and finds it to be excellent.

OBJECTIVE 4: Assist in the government-wide effort to advance the Nation's science education and literacy.

Strategy 2: Leverage DOE's human and physical research infrastructure, working with the National Science Foundation and other Federal agencies, to promote science awareness, enable advanced educational research opportunities, build capabilities at educational institutions, and improve educational opportunities for diverse groups.

- Expand sponsorship of collaborations for local and regional science awareness events starting in FY 1998.

  JLab collaborates with local school systems to conduct a program for K-12 students and teachers. It participates in the annual Virginia State Fair, and typically reaches 40,000 people through that medium.

- Demonstrate increased opportunities for undergraduate and graduate student research at DOE labs and other facilities through FY 2000.

  JLab has programs for both undergraduate and graduate student research. The number of graduate students performing thesis research within experiment collaborations has increased significantly over the last several years.

- Demonstrate an annual increase in the diversity of DOE research performers through FY 2000.

  For many years, JLab has maintained a program of establishing bridge and joint positions with historically minority colleges and universities. The number of such positions has increased annually, and the positions involve research at JLab.

Corporate Management

STRATEGIC GOAL: The Department of Energy continuously demonstrates organizational excellence in its environment, safety and health practices, communication and trust efforts, and its corporate management systems and approaches.

OBJECTIVE 1: Ensure the safety and health of the DOE workforce and members of the public, and the protection of the environment in all Departmental activities.

Strategy 1: Integrate and embed sound environment, safety, and health (ES&H) management practices into the performance of DOE's day-to-day work.

- Prevent fatalities, serious accidents, and environmental releases at Departmental sites.

  In the 15 years of JLab's existence, there have been 0 fatalities, 1 disabling injury, and 0 releases which caused significant environmental damage.

- Implement Integrated Safety Management Systems at DOE's 10 priority facilities and in all major management and operations contracts in FY 1999.

  JLab's Integrated Safety Management System was validated by DOE on May 24, 1999.

- Conduct annual self-assessments at all DOE sites to identify ES&H deficiencies and vulnerabilities, and develop and pursue corrective action plans.

  JLab maintains a comprehensive self-assessment program which involves line self-assessments, line inspections, independent self-assessments, corporate auditing, and semi-annual performance reporting. All of these activities identify ES&H deficiencies and vulnerabilities which lead to appropriate corrective actions.

Strategy 3: Ensure that all DOE employees are appropriately trained and technically competent commensurate with their ES&H responsibilities.

- Ensure employees that perform physically hazardous work and activities at non-defense facilities meet or exceed competency requirements.

  JLab supervisors identify training and other competency requirements for employees performing hazardous work. Competency is established by testing and supervisory observation.

OBJECTIVE 2: As a good neighbor and public partner, continually work with customers and stakeholders in an open, frank, and constructive manner.

Strategy 1: Foster strong partnerships with neighboring DOE communities, regulators, and other stakeholders to determine priorities and solutions.

JLab's relationships with its various stakeholders are evaluated by the biennial Institutional Management Peer Review. The FY 1999 review deemed JLab "a respected community asset."

Strategy 2: Increase customer and public awareness of DOE's mission areas by improving the quality, timeliness, frequency, and sufficiency of information disseminated on the Department's functions, successes, lessons learned, and future activities.

JLab's contract contains performance measures of the number of media reports of JLab's work and of the percentage of these reports that identify JLab as a DOE lab. The most recent annual scores in these areas were "outstanding" and "excellent," respectively.

OBJECTIVE 3: Use efficient and effective corporate management systems and approaches to guide decision making, streamline and improve operations, align resources and reduce costs, improve the delivery of products and services, and evaluate performance.

Strategy 4: Implement quality management principles, value diversity, and continue to improve human resources systems and practices.

JLab's performance in this area is evaluated by the annual Administrative Peer Review and the biennial Institutional Management Peer Review, and is adjudged to be "excellent" or "outstanding."

Strategy 5: Strengthen the management of projects, materials, facilities, land, infrastructure, and other assets, to ensure safe, sound, and cost-effective operations, appropriate maintenance of sites, and to ensure intended project results.

- Conduct annual business management self-assessments to ensure that sites are maximizing their resources and maintaining safe and secure operations.

  The independent peer review of JLab's administrative area is conducted annually. Line self-assessments and independent internal self-assessments also are used to ensure that resources are used efficiently and that operations are safe and secure.