2014-16 Executive Progress Report

Commonwealth of Virginia
Secretary of Education

Southeastern Universities Research Association Doing Business for Jefferson Science Associates, LLC

At A Glance

As a national and international nuclear physics research facility, Jefferson Lab provides unique research capabilities at the forefront of nuclear physics and light source research and development (R&D) for university users, provides research opportunities for Virginia faculty and students, and explores and develops core technologies for the economic benefit of the Commonwealth.

Staffing	0 Salaried Employees, 0 Contracted Employees, 0 Authorized, and 0 Wage Employees.
Financials	Budget FY 2015, $4.79 million, 100.00% from the General Fund.

Trends	↑ Number of customers	Key Perf Areas	→ % VA users to total users
Legend	↑ Increase, ↓ Decrease, → Steady	Productivity	→ ratio fed/private funds to state funds
		Legend	↑ Improving, ↓ Worsening, → Maintaining

For more information on administrative key, and productivity measures, go to www.vaperforms.virginia.gov

Background and History

Agency Background Statement

Jefferson Laboratory (JLab) is a Department of Energy (DOE) Office of Science facility for conducting nuclear physics research, and is managed by Jefferson Science Associates (JSA), LLC. Construction of the Continuous Electron Beam Accelerator Facility (CEBAF) started in 1987 and the first experiment began in 1995. JLab leads the world in exploring the complex dynamics by which quarks (elementary particles of matter), interacting via gluons (the strong force between quarks), form the stable and solid massive matter of everyday experience. The Lab conducts experiments (178 to- date) using a unique facility that is continually being upgraded to serve some 1,300 active users. JLab is a world leader in the technology of superconducting radio frequency (SRF) and energy recovering linacs (linear accelerators).

Research and development (R&D) activities using the technology capabilities of the Free Electron Laser (FEL), will continue to build on the investments made by the Navy and to leverage Commonwealth funds to develop applications that benefit economic development in Virginia.

Major Products and Services

To provide world-class unique facilities for research in nuclear physics -- products include: experiments, Ph.D.s, papers in refereed journals, invited talks and scientific and technical prizes or awards.

Provide research support and development of industry-university in emerging fields partnerships to explore and develop applications for lab-developed technologies that could provide economic benefit to the Commonwealth -- products are collaborations, partnerships, proposals, research papers and publications, patents, new business spin-offs, and licenses.

Customers

Customer Summary

JSA/Jefferson Lab has four specific categories of customers served by activities funded by the Commonwealth:

- Nuclear physics researchers in hadronic (particles of quarks and gluons) physics
- Nuclear physics faculty and students in the Commonwealth
- Free Electron Laser research and development community

- Commonwealth university faculty and student FEL Users

It is expected that the first and second categories (United States and Virginia nuclear physics users and faculty) will increase as Jefferson Lab continues to deliver its forefront experimental program and construction continues on the 12 GeV CEBAF upgrade of the facility. The upgrade, doubling the current energy of the accelerator, will enhance the capabilities available for the current program and allow researchers access to new discovery- caliber science. Because the upgrade includes a new experimental hall, it will increase by nearly one-fourth the number of scientific users (currently, approximately 1,300) and will result in a commensurate projected increase.

Customer Table

Predefined Group	User Defined Group	Number Served Annually	Potential Number of Annual Customers	Projected Customer Trend
Higher Education Institutions	Commonwealth Free Electron Laser users	11	11	Stable
Higher Education Institutions	Commonwealth nuclear physics students and faculty	256	256	Stable
Higher Education Institutions	Free Electron Laser users	17	17	Stable
Higher Education Institutions	Nuclear physics users	1,260	1,500	Increase

Finance and Performance Management

Finance

Financial Summary

Commonwealth financial assistance for educational and general services supports the Governor's Distinguished Continuous Electron Beam Accelerator Facility (CEBAF) Professorships, Scientists and Fellows, provides research support for development of new technologies including the Free Electron Laser, and leverages federal investment in the $338 million 12 GeV CEBAF upgrade. A critical component of this upgrade is a new experimental Hall D, which will provide capabilities to explore new scientific avenues that address some of the most pressing fundamental questions regarding the quark structure of matter and the force that holds matter together. The Laboratory received $1.8 million in funding from the Commonwealth in FY2013 and $1.2 million in FY2014 (through Old Dominion University) to support upgrading the Free Electron Laser equipment, specifically the Cryogenic Unit and Buncher Cavity. Commonwealth support of $6 million in FY2010 and $3 million in FY2011, from the Higher Education Research Initiative in Chapters 879/781 and Chapters 874/890, supported the 12 GeV CEBAF upgrade project. Experimental Hall D construction is now complete and installation of experimental equipment is underway.

In addition to the $1.15 million of initial appropriations received from the General Fund for FY2015, the laboratory was awarded $3.7 million from the Commonwealth's Development Opportunity Fund to support site characterization studies for a future potential $620 million Electron Ion Collider (EIC) at Jefferson Lab. In FY2016, the Lab will receive $250 thousand for EIC preliminary Research and Development. An EIC has been ranked by the Nuclear Science Advisory Committee's Subcommittee on Facilities as "absolutely central" in its ability to contribute to world-leading science in the next decade. Two laboratories, including Jefferson Lab, are developing concepts for this facility and site characterization to move to the construction project process for the US Department of Energy. Completing these studies would advance Jefferson Lab's position as a possible site for this facility, allowing Virginia to extend and expand its world leadership in this area of nuclear physics.

Note: Shown below -- for FY2015, the total net appropriation $4,792,505 results from the original allocation $1,150,005, plus an additional $3,700,000 for EIC, and a reduction of $57,500 for the Commonwealth's reductions savings plan. For FY2016, the total appropriation of $1,342,505 results from the original allocation of $1,150,005, plus an additional $250,000 for EIC R&D, and a reduction of $57,500 for the Commonwealth's reduction savings plan.

Fund Sources

Fund Code	Fund Name	FY 2015	FY 2016
0100	General Fund	$4,792,505	$1,342,505

Revenue Summary

Jefferson Laboratory is not a revenue generating entity.

Performance

Performance Highlights

Jefferson Science Associates (JSA)/Jefferson Laboratory measures its progress and performance via a performance-based management and operating contract with the United States Department of Energy (U.S. DOE). For activities funded by the Commonwealth of Virginia, it also reports progress towards metrics to the Virginia Performs database. These activities are:

1. Support for new research directions and technology development, including emerging technologies with economic development potential. Support for these research activities provides an opportunity for Virginia research universities to participate in research at an international level, and may lead to important developments in science, defense, security, health and manufacturing with economic impact.
2. The Governor's Distinguished Continuous Electron Beam Accelerator Facility (CEBAF) Professorships, Scientists and Fellows provide support for salaries that allow JSA and Jefferson Lab to attract and retain top scientific and technological talent to the Commonwealth.
3. Leveraging support for the $338 million federal investment in the 12 GeV CEBAF upgrade of Jefferson Laboratory.

Jefferson Science Associates (JSA)/Jefferson Lab has shown excellent scientific and technological productivity in its basic research and technology transfer missions. The lab has approximately 1,300 active users from the international scientific community, including 133 on approved experiments led by scientists at Virginia research universities.

Selected Measures

Measure ID	Measure	Alternative Name	Estimated Trend
93611004.001.001	Percentage of participation by Virginia university faculty and students in research at Jefferson Lab	% VA users to total users	Maintaining
93611004.002.002	Ratio of federal/private matching funds to state-provided funds for the support of basic and applied research.	ratio fed/private funds to state funds	Maintaining

Key Risk Factors

The primary impediment to the accomplishment of goals is the availability of adequate federal funding to operate and upgrade Jefferson Lab. Pressure on the discretionary portion of the federal budget since 2009 will continue to impact the Lab and could delay or obstruct progress toward goals and initiatives.

Agency Statistics

Statistics Summary

It is expected that the total number of publications will increase as completed experiments undergo analysis and new experiments start producing results. The total number of Ph.D.s awarded is also projected to increase as future experiments provide opportunities for university faculty and students to participate and produce theses based on JLab research.

Commonwealth support of Jefferson Lab's research activities and technology development provides important benefits including emerging technologies with economic development potential and opportunities for Virginia research universities to participate in research at an international level. This research may lead to important developments in science, defense, security, health and manufacturing with economic impact. Additionally, The Governor's Distinguished Continuous Electron Beam Facility (CEBAF) Professorships, Scientists and Fellows program provides salary support that allows JSA and Jefferson Lab to attract and retain top scientific and technological talent in the Commonwealth.

Jefferson Laboratory has approximately 1,300 active users from the international scientific community, including 133 on approved experiments led by scientists at Virginia's research universities. Nearly one-third of all nuclear science PhDs awarded in the United States is based on Jefferson Lab's science. .Four hundred- seventy-eight Ph.D.s (150 from Virginia institutions) have been awarded as of 9/30/13, with 210 more in progress (89 from Virginia institutions). Jefferson Lab research has been cited in more than 84,000 times in scientific literature, including some top cited papers in the field. The Jefferson Lab Free Electron Laser was awarded a 2005 R&D 100 Award as one of the 100 top technology advances in the United States. Work at Jefferson Lab has resulted in 129 patents and two spin-off companies: 1), Dilon Technologies, now producing breast imagers for use in centers around the world, and was featured on the ABC Evening News on October 23, 2006, and 2) BNNT (Boron Nitride Nanotubes), LLC. Eighty-eight faculty positions in nuclear science and JLab related technologies have been created at Virginia's research universities.

According to a recent study, Jefferson Lab generates an estimated $132 million in income in the Hampton Roads area, while creating 1,607 jobs. Statewide, it is estimated that the Lab generates $151 million in income and more than 1,700 jobs. Nationwide, the Lab is estimated to produce $318 million in income and nearly 2,700 jobs.

Statistics Table

Description	Value
PhDs produced	478
Publications in Physical Review Letters	352
Publications in other refereed journals	1,127

Management Discussion

General Information About Ongoing Status of Agency

JSA/Jefferson Lab will continue to be a national and international center for nuclear physics research and with the 12 GeV CEBAF upgrade, will remain at the forefront of the field for the next several decades. JLab expects to sustain or increase its scientific productivity in terms of Ph.D.s produced and in scientific papers and journal articles based on this program expansion. Jefferson Lab is also well-positioned to compete for another planned U.S. DOE Office of Science project, an Electron Ion Collider, a facility of central importance to the field of Nuclear Physics, as identified by the Nuclear Science Advisory Committee.

JSA/Jefferson Lab will continue its participation in photon science research and development (R&D) and technology using the capabilities of the Free Electron Laser (FEL), further building on the investments made by the Navy and leveraging Commonwealth funds to develop applications to benefit economic development in Virginia. Future FEL planned activities also include running a potentially groundbreaking nuclear physics experiment, “DarkLight”, and an opportunity to develop isotope production.

JSA/Jefferson Lab will continue to identify and develop emerging research opportunities that open new avenues for collaboration with university researchers and business/industry partners.

Information Technology

JSA/Jefferson Lab receives its primary funding from the DOE Office of Science that supports the information technology requirements of the facility.

Southeastern Universities Research Association (SURA) institutions, Old Dominion University (ODU), College of William & Mary (W&M), Virginia Polytechnic and State University (Va. Tech.) and University of Virginia (UVA) work collaboratively with Jefferson Lab to maintain E-LITE and MARIA networking services to provide high-speed connectivity to Virginia research institutions and to the Department of Energy's ESnet. This collaboration leverages the networking expertise at ODU, W&M, Va. Tech., and ESnet to provide a cost-effective, high-speed Internet connection to collaborators around the world in support of the laboratory's scientific mission.

Workforce Development

JSA/JLab faces a specific workforce challenge in recruiting for positions with highly specialized skill sets that are critical to the Lab’s success including SRF scientists and engineers, superconducting magnet engineers, electrical and mechanical R&D engineers.

Physical Plant

JSA/Jefferson Lab receives its primary funding from the U.S. DOE Office of Science that supports the infrastructure and maintenance requirements of the facility.