

# 2018-20 Strategic Plan

## Southeastern Universities Research Association Doing Business for Jefferson Science Associates, LLC [936]

### Mission

As a national and international nuclear physics research facility, Jefferson Lab provides unique research capabilities at the forefront of nuclear physics and in particle accelerator technology, provides research opportunities for Virginia faculty and students, and explores and develops core technologies and new initiatives for the economic benefit of the Commonwealth of Virginia.

### Vision

Jefferson Science Associates (JSA)/Jefferson Lab (JLab) will continue to lead 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. To this end, JLab will continue to conduct experiments using a unique facility that is continually being upgraded to serve some 1,600 users, provide theoretical analysis to guide and evaluate experiments, and develop state-of-the-art computer simulations to compute experimentally verifiable predictions. JLab will lead the world in the technology of superconducting radio frequency (SRF) and energy recovering linear accelerators (linacs). These technologies will be put to use with JLab participation for the research aims of nuclear physics.

Research and development (R&D) activities using these innovative technologies will enable the Lab to continue to leverage Commonwealth funds to develop applications and new initiatives that benefit economic development in Virginia. A prerequisite to achieving these goals, and success for JLab, is the recruitment and retention of a top quality leadership team that will ensure exceptional institutional management.

### Values

### Finance

#### Financial Overview

The FY2019 initial general fund (GF) appropriation of \$1,775,439 represents base funding of \$1,275,439 and supports the recruitment and retention of JLab leaders, faculty and staff positions, and industry-led research that will promote economic development opportunities in the Commonwealth, plus an additional \$500,000 in seed funding to establish a center for nuclear femtography (CNF) in partnership with the Commonwealth's research universities. Through multidisciplinary collaboration with Virginia universities, the CNF will enable new insights in understanding the subatomic world through the development of novel methods for imaging the structure of atomic nuclei. The knowledge and technology developed through the CNF have the potential for future technological developments associated with structure at a much smaller distance scale than current nanotechnology. The center would also support JLab's case as the site to establish a future electron ion collider (EIC). JLab plans to dedicate a portion of its base funds to a newly established EIC Center to support graduate and postdoctoral fellowships. The FY2020 Initial GF Appropriation of \$1,275,439 represents base funding that supports the recruitment and retention of JLab leaders, faculty positions and industry-led research that will promote economic development opportunities in the Commonwealth. The FY2020 (GF) Changes to Initial Appropriation of \$500,000 represents support of the CNF's continuing activities.

In addition to these funds, JLab received \$1,400,000 (GF) in FY2017 and \$1,000,000 (GF) in FY2018 for continued preliminary research and development for an EIC, which has been recommended as the next major facility construction by the Nuclear Science Advisory Committee in its 2015 Long Range Plan for Nuclear Science and was endorsed in the National Academy of Sciences June 2018 report. Two laboratories, including JLab, are developing concepts for this facility and site characterization to prepare for the construction project phase and selection process for the US Department of Energy. Completing these studies would advance JLab's position as a potential site for this facility; thereby allowing Virginia to extend and expand its world leadership in this area of nuclear physics. These funds were made available through the Commonwealth's Development Opportunity Fund (Item 106.A.1, Chapter 836).

#### Biennial Budget

	2019 General Fund	2019 Nongeneral Fund	2020 General Fund	2020 Nongeneral Fund
Initial Appropriation for the Biennium	1,775,439	0	1,275,439	0
Changes to Initial Appropriation	0	0	500,000	0

*(Changes to Initial Appropriation will be 0 when the plan is created. They will change when the plan is updated mid-biennium.)*

### Customers

#### Anticipated Changes to Customer Base

#### Current Customer List

Predefined Group	User Defined Group	Number Served Annually	Potential Number of Annual Customers	Projected Customer Trend
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Higher Education Institutions	Commonwealth nuclear physics students and faculty	286	286	Stable
Higher Education Institutions	Nuclear physics users	1,597	1,597	Stable

## Partners

Name	Description
United States Department of Energy	The United States Department of Energy is the landlord and primary funding source for the infrastructure and operations of Jefferson Lab.

## Agency Goals

- **Maintain a 60-1 ratio of federal/private matching funds to state provided funds for basic and applied research.**

### Summary and Alignment

Enhancement of Virginia's economy requires that new science and technology is moved from the laboratory and university to the marketplace. By effectively leveraging Commonwealth-provided funds to yield new applications and developments, JLab is helping university researchers to identify and develop new products and services to stimulate high-tech economic development in Virginia based on the unique research capabilities. Commonwealth funds were also utilized to leverage federal investment in the \$338 million 12 GeV CEBAF upgrade. This goal is aligned with Chapter 4.9:1 Virginia Higher Education Opportunity Act of 2011, purposes 5 (To promote university-based research that produces outside investment in Virginia, fuels economic advances, triggers commercialization of new products and processes, fosters the formation of new businesses, leads businesses to bring their facilities and jobs to Virginia, and in other ways helps place the Commonwealth on the leading edge in the knowledge-driven economy; and 6 (To support the national effort to enhance the security and economic competitiveness of the United States of America, and to secure a leading economic position for the Commonwealth of Virginia, through increased research and instruction in science, technology, engineering, mathematics, and related fields, which require qualified faculty, appropriate research facilities and equipment, public-private and intergovernmental collaboration, and sustained state support.

### Objectives

#### Associated State Goal

Economy: Be a national leader in the preservation and enhancement of our economy.

#### Associated Societal Indicator

Business Climate

#### Objectives

- » **Increase the total funding for the support of basic and applied research by leveraging state funds from all other non-state sources by a factor of 60 or greater.**

#### Description

Increase the total funding for the support of basic and applied research by leveraging state funds from all other non-state sources by a factor of 60 or greater.

#### Objective Strategies

- Jefferson Lab uses state funds to develop proposals, foster collaborations and for targeted experiments used to develop new applications with potential economic development impact for the Commonwealth and to leverage further federal investment.

#### Measures

- ♦ Ratio of federal/private matching funds to state-provided funds for the support of basic and applied research.

- **Leverage Jefferson Lab's unique capabilities, expertise, facilities and resources to increase Virginia university participation in basic and applied science and emerging areas of research.**

### Summary and Alignment

By increasing the number of Virginia university faculty and students in high-profile experiments and in exploring and developing technologies for application, JLab raises the profile of the research conducted, attracts more and better students and faculty to Virginia and advances the development of applications with economic development impact for the Commonwealth. This goal is aligned with Chapter 4.9:1 Virginia Higher Education Opportunity Act of 2011, purposes 2 (To take optimal advantage of the demonstrated correlation between higher education and economic growth by investing in a manner that will generate economic growth, job creation, personal income growth, and revenues generated for state and local government in Virginia), 4 (To enhance personal opportunity and earning power for individual Virginians by increasing college degree attainment in the Commonwealth, especially in high-demand, high-income fields such as science, technology, engineering, mathematics, and health care, and by providing information about the economic value and impact of individual degree programs by institution), 5 (To promote university-based research that produces outside investment in Virginia, fuels economic advances, triggers

commercialization of new products and processes, fosters the formation of new businesses, leads businesses to bring their facilities and jobs to Virginia, and in other ways helps place the Commonwealth on the leading edge in the knowledge-driven economy), and 6 (To support the national effort to enhance the security and economic competitiveness of the United States of America, and to secure a leading economic position for the Commonwealth, through increased research and instruction in science, technology, engineering, mathematics, and related fields, which require qualified faculty, appropriate research facilities and equipment, public-private and intergovernmental collaboration, and sustained state support).

#### Associated State Goal

Education: Elevate the levels of educational preparedness and attainment of our citizens.

#### Objectives

- » **Make Jefferson Lab available to Virginia universities for high-profile experiments and applications development, and increase Virginia university participation in emerging research areas such as medical imaging and nanotechnology.**

##### Description

Make Jefferson Lab available to Virginia universities to participate in high-profile experiments and technology applications development, and increase Virginia university participation in emerging research areas such as medical imaging and nanotechnology.

##### Objective Strategies

- Jefferson Lab is seeking to increase the participation of Virginia university faculty and students in research at the Lab to enhance Virginia's economic development and to attract the best and brightest students and faculty to pursue these opportunities.

##### Measures

- ◆ Percentage of participation by Virginia university faculty and students in research at Jefferson Lab

## 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.

To provide research support and development of industry-university partnerships in emerging fields 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.

## Performance Highlights

Jefferson Science Associates (JSA)/Jefferson Lab (JLab) 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 and Governor's CEBAF Scientist (GCS) programs, funded by the Commonwealth, provide opportunities for JLab leaders to hold faculty positions at Virginia universities.
3. Funding support that allows JSA to attract and retain top scientific and technological leaders to JLab.
4. Leveraging support for the ~\$1.5 billion potential federal investment in an Electron Ion Collider at JLab.

JSA/JLab has shown excellent scientific and technological productivity in its basic research and technology transfer missions. It has approximately 1,600 active users from the international scientific community, including 176 on approved experiments led by scientists at Virginia research universities.

## Staffing

Authorized Maximum Employment Level (MEL)	0
Salaried Employees	0
Wage Employees	0
Contracted Employees	0

## Key Risk Factors

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

## Management Discussion

### General Information About Ongoing Status of Agency

JSA/JLab will continue to be a national and international center for nuclear physics research and with the 12 GeV CEBAF upgrade now complete, 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. JLab 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 and as endorsed in the 2018 National Academy of Sciences Electron Ion Collider report.

JSA/JLab will continue its participation in research and development (R&D) and technology using the capabilities of the Low Energy Recirculator Facility (LERF), further building on the investments made by the Navy and leveraging Commonwealth funds to develop applications to benefit economic development in Virginia. Future LERF planned activities include a DOE funded initiative to develop medical isotope production in collaboration with Virginia Commonwealth University (VCU).

JSA/JLab 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/JLab 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 JLab 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.

### Estimate of Technology Funding Needs

### 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 Superconducting Radio Frequency (SRF) scientists and engineers, cryogenic systems engineers, superconducting magnet engineers, electrical and mechanical R&D engineers.

### Physical Plant

JLab is located on a 169 acre DOE-owned federal complex within Newport News and includes 69 buildings.

Adjacent to the federal complex is a five acre parcel owned by the Commonwealth containing the Virginia Associated Research Campus which provides additional office and shop space at a de minimus cost to the Lab. Also adjacent to the federal complex is an 11 acre parcel owned by Newport News that contains the Applied Research Center which provides additional office and lab space. SURA owns 37 acres adjacent to the JLab site where it operates a 42-room Residence Facility providing temporary housing for Lab users, researchers, and guests.

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

## Supporting Documents

Title	File Type
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**Sponsored Programs [11004]****Description of this Program / Service Area**

As a national and international nuclear physics research facility, JLab provides unique research capabilities at the forefront of nuclear physics and in particle accelerator technology, provides research opportunities for Virginia faculty and students, and explores and develops core technologies and new initiatives for the economic benefit of the Commonwealth of Virginia.

**Mission Alignment**

Jefferson Science Associates (JSA)/JLab, as a basic research facility for university users, provides unique educational and research opportunities for students and faculty enhancing the educational and research and development (R&D) infrastructure of the Commonwealth.

Jefferson Lab is managed and operated via a performance-based contract by JSA, LLC for the U.S. Department of Energy. [www.energy.gov](http://www.energy.gov)

**Products and Services****Description of 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 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.

Products / Services					
Product / Service	Statutory Authority	Regulatory Authority	Required Or Discretionary	GF	NGF
Experiments	n/a				
Ph.D.s	n/a				
Publications	n/a				
Awards and prizes	n/a				
Invited talks	n/a				
Collaborations and partnerships	n/a				
Proposals	n/a				
Research papers	n/a				
Patents and licenses	n/a				
Business spin-offs	n/a				

**Anticipated Changes**

JLab anticipates that the 12 GeV CEBAF upgrade project will result in ramped-up participation of new users in its experimental program.

Emerging areas of technology will be identified and developed. Most recent is the future potential ~\$1.5 billion Electron Ion Collider (EIC) at Jefferson Lab. An EIC has been recommended for future construction by the Nuclear Science Advisory Committee and endorsed in the 2018 National Academy of Sciences Electron Ion Collider report. Commonwealth support for an EIC has enabled preliminary Research and Development.

**Factors Impacting**

Declining federal funding levels in the physical sciences could:

- Impact operations of the 12 GeV CEBAF upgrade science program
- Negatively impact the number of students entering nuclear physics,
- Reduce the number of experiments that can be done at JLab,

Significant power cost increases could impact scientific output of JLab, competitiveness for future projects, and expansion.

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Supporting Documents

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